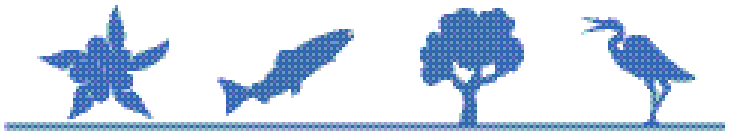
MARIN COUNTYWIDE PLAN



Air Quality Technical Background Report

Alex Hinds, Community Development Director
Michele Rodriguez, Principal Planner, AICP
Frederick Vogler, GIS Manager
Dan Dawson, Senior Planner
Kristin Drumm, Planner
Don Allee, Clerical Support

Special Consultants:

Illingworth & Rodkin, Inc.
505 Petaluma Blvd. South
Petaluma, CA 94952

Nichols • Berman
110 East D Street, Suite E
Benicia, CA 94510

April 2002
Updated December 2005

The Marin County Community Development Agency, Planning Division
3501 Civic Center Drive, San Rafael, CA 94903

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF EXHIBITS

I. PURPOSE

Air quality in Marin County is very good due to favorable climate conditions and the lack of air pollutant sources. However, emissions from human activities within Marin County, i.e., mostly traffic, contribute to air quality problems experienced elsewhere in the Bay Area. The Bay Area Air Quality Management District (BAAQMD) along with other regional planning agencies relies on local jurisdictions to assist with plans to improve air quality. Many land use and transportation strategies to reduce air quality rely on cities and counties as implementing agencies. Under the California Government Code, air quality is mentioned only as an optional issue in the "Conservations" element. The BAAQMD encourages local jurisdictions to include General Plan policy ideas or elements that, when implemented, will improve air quality. Although air quality elements are not mandated, general plans are required to be consistent with any air quality policies and programs that exist within that jurisdiction. Local plans should also be consistent with regional air quality plans, i.e., the Bay Area Clean Air Plan. This background report provides a discussion of current air quality conditions and future planning efforts. Climate and meteorological conditions that affect air quality in the project area are also described.

II. PHYSICAL ENVIRONMENT

The ambient air quality in a given area depends on the quantities of pollutants emitted within the area, transport of pollutants to and from surrounding areas, local and regional meteorological conditions, as well as the surrounding topography of the air basin. Air quality is described by the concentration of various pollutants in the atmosphere. Units of concentration are generally expressed in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The significance of a pollutant concentration is determined by comparing the concentration to an appropriate ambient air quality standard. The standards represent the allowable pollutant concentrations designed to ensure that the public health and welfare are protected, while including a reasonable margin of safety to protect the more sensitive individuals in the population.

Marin County is located in the northern portion of the San Francisco Bay Area Air Basin. The basin includes the counties of San Francisco, Santa Clara, San Mateo, Marin, Napa, Contra Costa, and Alameda, along with the southeast portion of Sonoma County and the southwest portion of Solano County. The local air quality regulatory agency responsible for this basin is the Bay Area Air Quality Management District (BAAQMD).

A. CLIMATE AND METEOROLOGICAL CONDITIONS

The climate varies throughout Marin County, depending on proximity to the Pacific Ocean and San Francisco Bay. It is mainly characterized by warm dry summers and cool moist winters. The proximity of the San Francisco Bay and Pacific Ocean has a moderating influence on the climate, especially near the coast.

The major large-scale weather feature controlling the area's climate is a large high pressure system located in the eastern Pacific Ocean, known as the Pacific High. The strength and position of the

Pacific High varies seasonally. It is strongest and located off the west coast of the United States during summer. Large-scale atmospheric subsidence associated with the Pacific High, produces an elevated temperature inversion along the West Coast. The base of this inversion is usually located from 1,000 to 3,000 feet above mean sea level, depending on the intensity of subsidence and the prevailing weather condition. Vertical mixing is often limited to the base of the inversion, trapping air pollutants in the lower atmosphere. Marine air trapped below the base of the inversion is often condensed into fog or stratus clouds by the cool Pacific Ocean. This condition is typical of the warmer months of the year from roughly May through October. Stratus clouds usually form offshore and move into the Bay Area during the evening hours. As the land warms the following morning, the clouds often dissipate, except along the immediate coast. The stratus then redevelops and moves inland late in the day. Otherwise, clear skies and dry conditions prevail during summer.

As winter approaches, the Pacific High becomes weaker and shifts south, allowing pressure systems associated with the polar jet stream to affect the region. Low pressure systems produce periods of cloudiness, strong shifting winds, and precipitation. The number of days with precipitation can vary greatly from year to year, resulting in a wide range of annual precipitation totals. Precipitation is generally lowest along the Bay, with highest amounts occurring along south and west facing slopes. Annual average precipitation totals for Marin County vary from about 30 to 50 inches. Topography results in the large variation of precipitation, with portions of southwest Marin County receiving nearly twice as much rainfall as eastern portions of the county. About 90 percent of rainfall occurs from November through April. High pressure systems are also common in winter and can produce cool stagnant conditions. Radiation fog and haze are common during extended winter periods where high pressure systems influence the weather

Topographical features of Marin County include series of mountains (mostly 1,000 feet or lower in elevation) and valleys. The valleys, where most of the population resides, act as a series of miniature air basins. Marine air penetrates much of the county; however, it is moderated by bayside conditions as it reaches the eastern portions of the county furthest from the ocean.

The proximity of the eastern Pacific High and relatively lower pressure inland produces a prevailing west to northwest sea breeze along the central and northern California coast for most of the year. As this wind is channeled through the Golden Gate and other topographical gaps, it branches off to the northeast and southeast, following the general orientation of the San Francisco Bay system. Although wind conditions vary across much of Marin, the prevailing wind is primarily from the northwest. Nocturnal winds and land breezes during the colder months of the year prevail with variable drainage out of the mountainous areas. Wind speeds are highest along coastal parts, averaging about 8 to 10 miles per year. The complex terrain throughout the County creates sufficient friction to slow airflow. At Hamilton Air Force Base, the average annual wind speeds are only 5 miles per hour.

Temperatures along the Coast and Bay tend to be less extreme compared to inland locations, due to the moderating effect of the Pacific Ocean. Coast side temperatures vary little between summer and wintertime months. In summer, high temperatures are generally in the high 50's to about 70, and in the 50's during winter. Summer high temperatures at inland portions are considerably warmer in summer ranging from the 70's to 80's. Winter high temperatures inland are also in the 50's. Low temperatures throughout the county range from the 50's in summer to the 30's in winter.

During the fall and winter months, the Pacific High can combine with high pressure over the interior regions of the western United States (known as the Great Basin High) to produce extended periods of light winds and low-level temperature inversions. Fair weather and very warm temperatures are common throughout the County with this weather pattern. This condition frequently produces poor atmospheric mixing that results in degraded regional air quality. Ozone standards traditionally are exceeded when this condition occurs during the warmer months of the year.

III. REGULATORY FRAMEWORK

A. AIR QUALITY STANDARDS

The Federal and California Clean Air Acts have established ambient air quality standards for different pollutants. National ambient air quality standards (NAAQS) were established by the federal Clean Air Act of 1970 (amended in 1977 and 1990) for six "criteria" pollutants. These criteria pollutants now include carbon monoxide (CO), ozone (0_3), nitrogen dioxide ($N0_2$), particulate matter with a diameter less than 10 microns ($PM\text{-}_{10}$), sulfur dioxide ($S0_2$), and lead (Pb). Recently, EPA added fine particulate matter or PM-2.5 as a criteria pollutant. The air pollutants that standards have been established are considered the most prevalent air pollutants that are known to be hazardous to human health.

California established ambient air quality standards as early as 1969 through the MulfordCarrol Act. Pollutants regulated under the California Clean Air Act are similar to those regulated under the Federal Clean Air Act. In many cases, California standards are more stringent than the national ambient air quality standards. Federal and State air quality standards are shown in Table 1. Both the national and California ambient air quality standards have been adopted by the BAAQMD. A brief description of the six criteria air pollutants is as follows:

TABLE 1 -- CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	National Standards [a]	
			Primary [b,c]	Secondary [b,d]
Ozone	8-hour	0.07 ppm (154 µg/m^3)	0.08 ppm (176µg/m^3)	–
	1-hour	0.09 ppm (180 µg/m^3)	--(e)	Same as primary
Carbon monoxide	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	–
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	–
Nitrogen dioxide	Annual	–	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.25 ppm (470 µg/m^3)	–	–
Sulfur dioxide	Annual	–	0.03 ppm (80 µg/m^3)	–
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	–
	3-hour	–	–	0.5 ppm (1,300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	–	–
PM_{10}	Annual	20 µg/m^3	50 µg/m^3	Same as primary
	24-hour	50 µg/m^3	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	–
	24-hour	–	65 µg/m^3	–
Lead	Calendar quarter	–	1.5 µg/m^3	Same as primary
	30-day average	1.5 µg/m^3	–	–

Notes: (a) Standards, other than for ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

(b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.

(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the EPA.

(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

(e) The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

Ozone. Ground-level ozone is the principal component of smog. It is not directly emitted into the atmosphere, but is formed by the photochemical reaction of reactive organic gases and nitrogen oxides (known as ozone precursors) in the presence of sunlight. Ozone levels are highest during late spring through early summer when precursor emissions are high and meteorological conditions are favorable for the complex photochemical reactions to occur. Approximately half of the reactive organic gas and nitrogen oxide emissions in the Bay Area are from motor vehicles. Adverse health effects of ground-level ozone include respiratory impairment and eye irritation. High ozone concentrations are also a potential problem to sensitive crops such as wine grapes.

Carbon Monoxide. Carbon monoxide is a non-reactive pollutant that is highly toxic, invisible, and odorless. It is formed by the incomplete combustion of fuels. The largest source of carbon monoxide emissions is motor vehicles. Wood stoves and fireplaces also contribute to high levels of carbon monoxide. Unlike ozone, carbon monoxide is directly emitted to the atmosphere. The highest carbon monoxide concentrations occur during the nighttime and early mornings in late fall and winter. Carbon monoxide levels are strongly influenced by meteorological factors such as wind speed and atmospheric stability. Adverse health effects of carbon monoxide include the impairment of oxygen transport in the bloodstream, increase of carboxyhemoglobin, aggravation of cardiovascular disease, impairment of central nervous system function, and fatigue, headache, confusion, dizziness. Exposure to carbon monoxide can be fatal in the case of very high concentrations in enclosed places.

Nitrogen Dioxide. Nitrogen dioxide is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the primary sources of nitrogen dioxides. Nitrogen dioxide contributes to ozone formation. Adverse health effects associated with exposure to high levels of nitrogen dioxide include the risk of acute and chronic respiratory illness.

Sulfur Dioxide. Sulfur dioxide is a colorless gas with a strong odor and potential to damage materials. It is produced by the combustion of sulfur containing fuels such as oil and coal. Refineries and chemical plants are the primary sources of sulfur dioxide emissions in the Bay Area. Sulfur dioxide concentrations in the North Bay Area are well below the ambient standards. Adverse health effects associated with exposure to high levels of sulfur dioxide include aggravation of chronic obstruction lung disease and increased risk of acute and chronic respiratory illness.

Inhalable Particulate Matter. Inhalable particulate matter or PM-l0 (particulate matter 10 microns or less in diameter) and PM-2.5 (particulate matter 2.5 microns or less in diameter) refer to a wide variety of solid or liquid particles in the atmosphere. These include smoke, dust, aerosols, and metallic oxides. Some of these particulates are considered toxic. Although particulates are found naturally in the air, most particulate matter found in the Bay Area is emitted either directly or indirectly by motor vehicles, industry, construction, agricultural activities, and wind erosion of disturbed areas. Most PM-2.5 is comprised of combustion products (i.e., soot). Small particulate matter may be inhaled, and possibly lodge in and/or irritate the lungs. Exposure to small particulate matter can also increase the risk of chronic respiratory illness with long-term exposure and altered lung function in children.

Lead. Lead occurs in the atmosphere as particulate matter. It is primarily emitted by gasoline-powered motor vehicles, although the use of lead in fuel has been virtually eliminated. Because of lead being eliminated from fuels, levels in the Bay Area have dropped dramatically. Lead concentrations in the Bay Area are well below the ambient standards.

Besides the "criteria" air pollutants, there is another group of substances found in ambient air referred to as Toxic Air Contaminants. These contaminants tend to be localized and are found in relatively low concentrations in ambient air. However, they can result in adverse chronic health effects if exposure to low concentrations occurs for long periods. They are regulated at the local, state, and federal level.

B. FEDERAL AIR QUALITY REGULATIONS

If an area does not meet the NAAQS over a set period (three years), the EPA designates it as a "nonattainment" area for that particular pollutant. The EPA requires states that have areas that do not comply with the national standards to prepare and submit air quality plans showing how the standards would be met. If the states cannot show how the standards would be met, then they must show progress toward meeting the standards. These plans are referred to as the State Implementation Plan (SIP). Under severe cases, the EPA may impose a federal plan to make progress in meeting the federal standards.

Prior to 1998, the Bay Area was a "moderate nonattainment" area for carbon monoxide due to localized exceedances of the national carbon monoxide standards in downtown San Jose and Vallejo. The carbon monoxide standards have not been exceeded since 1991. Since the region had not experienced exceedances of the carbon monoxide standards, the San Francisco Bay Area Redesignation Request and Maintenance Plan for the National Carbon Monoxide Standard was submitted to EPA in 1994. In 1998, EPA approved the plan and reclassified the area as a carbon monoxide "maintenance" area.

Prior to 1995, the San Francisco Bay Area air basin was classified by the EPA as a "moderate nonattainment" area for ozone, since some air pollutant monitors in the area routinely measure concentrations exceeding the national one-hour ozone standard. In 1993, after three years of monitoring compliance with the one-hour ozone standard, the Bay Area Air Quality Management District (BAAQMD) submitted the 1993 Ozone Maintenance Plan to the EPA to request the redesignation of the region to an ozone maintenance area. The plan included measures to maintain the attainment of the ozone NAAQS. In 1995, the EPA formally recognized that the area attained the ozone standard and approved the 1993 Ozone Maintenance Plan. The Bay Area was classified by EPA as a "maintenance" area, since the region had not violated the ozone standard for 5 years (1990-1994). However, violations of the national one-hour ozone standards occurred during the summers of 1995 and 1996. As a result, in 1997 EPA revoked the region's clean air status and designated the area as an "unclassified nonattainment" area for ozone. In April 2004, EPA designated the Bay Area as a "marginal nonattainment" area under the 8-hour ozone NAAQS. At the same time, EPA announced it would revoke the NAAQS for I-hour ozone in June 2005.

In response to the redesignation of the area back to a ozone nonattainment area, the Bay Area co-lead agencies (BAAQMD, Metropolitan Transportation Commission, and Association of Bay Area Governments) prepared and submitted the San Francisco Bay Area Ozone Attainment Plan or ozone SIP to the California Air Resources Board (CARB). This plan, which was a revision to the 1993 Ozone Maintenance Plan, was submitted to EPA in 1999. The plan includes a compilation of existing and proposed plans and regulations that govern how the region complies with the federal Clean Air Act requirements. This plan was designed to show how the region would attain the federal ozone standard by the end of the 2000 ozone season (summer) and thereafter. EPA defines attainment of the national one-hour ozone standard as when the Bay Area does record an exceedance of the ozone standard more

than 3 times in a year for three consecutive years. The Bay Area continued to violate the ozone NAAQS in 1998; therefore, attainment of the standard was not possible prior to 2000. In March 2001, EPA formerly announced that the region had not attained the one-hour ozone standard and it would only partially approve the plan. As a result, the Bay Area 2001 Ozone Attainment Plan was prepared and submitted to EPA after approval by the CARB. This is the most current plan for reducing ozone levels to meet the NAAQS in the Bay Area.

For all pollutants other than ozone, the San Francisco Bay Area air basin is in attainment of the NAAQS. The Bay Area counties, including Marin County, have not measured ambient air pollutant concentrations in excess of those allowed by the NAAQS for all other criteria air pollutants.

Under Section 176(c) of the 1990 Clean Air Act Amendments, the "conformity" provisions for federal projects are outlined. Federal actions are required to conform to the requirements of a SIP and must not jeopardize efforts for a region to achieve the NAAQS. Section 176(c) also assigns primary oversight responsibility for conformity assurance to the federal agency undertaking the project, not the EPA, state, or local agency. For there to be conformity, federally supported or funded activities must not (1) cause or contribute to any new air quality standard violation, (2) increase the frequency or severity of any existing standard violation, or (3) delay the timely attainment of any standard, interim emission reduction, or other SIP milestone aimed at bringing the region into attainment.

In 1993, the U.S. EPA issued conformity regulations that addressed transportation projects (Transportation Conformity) and conformity of all other non-transportation federal actions (General Conformity). The primary requirements of the transportation conformity rule are that implementation of transportation plans or programs cannot produce more emissions of pollutants than budgeted in the latest SIP.

The EPA also has programs for identifying and regulating toxic air contaminants. The Clean Air Act requires EP A to set standards for air toxics and sharply reduce emissions of controlled chemicals. Industries were classified as major sources if they emitted certain amounts of toxic air contaminants.

C. CALIFORNIA AIR QUALITY REGULATIONS

The California Clean Air Act of 1988, amended in 1992, outlines a program for areas in the state to attain the CAAQS by the earliest practical date. The California Air Resources Board (CARB) is the state air pollution control agency. The California Clean Air Act set more stringent air quality standards for all of the pollutants covered under national standards, and additionally regulates levels of vinyl chloride, hydrogen sulfide, sulfates, and visibility-reducing particulates. If an area does not meet the CAAQS, the CARB designates the area as a nonattainment area. Based on the California standards, the Bay Area is a serious nonattainment area for ozone (since the area cannot forecast attainment of the state ozone standard in the foreseeable future). It is also a state nonattainment area for PM-10. The Bay Area has met the CAAQS for all other air pollutants. The CARB requires regions that do not meet the CAAQS for ozone to submit clean air plans that describe plans to attain the standard.

The CARB regulates the amount of air pollutants that can be emitted by new motor vehicles sold in California. Motor vehicle emissions standards have always been more stringent than federal standards since they were first imposed in 1961. The CARB has also developed 1/M and "Smog Check"

programs with the California Bureau of Automotive Repair. Inspection programs for trucks and buses have also been implemented. The CARB also has authority to set standards for fuel sold in California.

The Air Toxic "Hot Spots" Information and Assessment Act was enacted by the California Legislature. This act, known also as AB2588, is intended to identify toxic air contaminant hot spots where emissions from specific sources may expose individuals to elevated risk of adverse health effects. Businesses or establishments (including dry cleaning facilities) identified as a significant source or toxic air emissions are required to notify the affected population and provide them with information about the associated health risk. The implementation and enforcement provisions of this Act are the responsibility of the BAAQMD in Marin County.

D. REGIONAL AIR QUALITY REGULATIONS AND PLANNING

Regional air quality is regulated by the BAAQMD. The BAAQMD regulates stationary sources (with respect to federal, State, and local regulations), monitors regional air pollutant levels (including measurement of toxic air contaminants), develops air quality control strategies and conducts public awareness programs. The BAAQMD has also developed CEQA guidelines that establish significance thresholds for evaluating new projects and plans and provide guidance to lead agencies for evaluating air quality impacts of projects and plans.

As discussed above, the BAAQMD along with the other regional agencies (i.e., Association of Bay Area Governments and the Metropolitan Transportation Commission) has prepared the Ozone Attainment Plan to address the federal standard for ozone. A Carbon Monoxide Maintenance Plan was also prepared in 1994 to demonstrate how the federal carbon monoxide standard will be maintained. The Bay Area Clean Air Plan was prepared to address the more stringent requirements of the California Clean Air Act with respect to ozone. This plan includes a comprehensive strategy to reduce emissions from stationary, area, and mobile sources. The plan objective is to indicate how the region would attain the stricter state air quality standards, as mandated by the California Clean Air Act. The plan is designed to achieve a region-wide reduction of ozone precursor pollutants through the expeditious implementation of all feasible measures. Air quality plans addressing the California Clean Air Act are developed on a triennial basis, with the latest approved plan developed in 2000 (i.e., Bay Area 2000 Clean Air Plan). The new Bay Area Ozone Strategy was recently released as a draft and is expected to be approved in late 2005. This plan proposes implementation of transportation control measures (TCMs) and programs such as *Spare the Air.* Some of these measures or programs rely on local governments for implementation.

A key element in air quality planning is to make reasonably accurate projections of future human activities that are related to air pollutant emissions. Most important is vehicle activity. The BAAQMD uses population projections made by the Association of Bay Area Governments and vehicle use trends made by the Metropolitan Transportation Commission to formulate future air pollutant emission inventories. The basis for these projections comes from cities and counties. In order to provide the best plan to reduce air pollution in the Bay Area, accurate projections from local governments are necessary. When individual projects are not consistent with these projections, they cumulatively reduce the effectiveness of air quality planning in the region.

The BAAQMD administers the Toxic Air Contaminant Control Program. The main objective of this program is to reduce public exposure to toxic air contaminants. The BAAQMD has regulated air toxics

since the 1980's. To date, a risk-based approach, meaning that decisions over what sources and pollutants to control and the degree of control have been based on results of health risk assessments.

After the level of risk from a new project has been determined, a decision must be made as to the significance of this risk level. If a new source has a cancer risk of one in a million or less over a 70-year-lifetime exposure period, and will not result in non-cancer health effects, it is considered a non-significant risk and no further review of all health impacts is required. If a project has a risk greater than one in a million, it must be further evaluated in order to determine acceptability. Factors that affect acceptability include the presence of controls on the rate of emissions, the location of the site in relation to residential areas and schools, and contaminants reductions in other media such as water. In general, projects with risks greater than one in a million, but less than ten in a million, are approved if other determining factors are acceptable. In general, projects with risks greater than ten in a million are not approved. Non-approved projects may be reevaluated if emissions are reduced thus reducing their risks.

E. BAAQMD CEQA GUIDELINES

The BAAQMD has prepared CEQA Guidelines to assist lead agencies, analysts, project proponents, and other interested parties in evaluating potential air quality impacts of projects and plans proposed in the Bay Area. The guidelines recommend procedures for evaluating projects or plans and thresholds to determine whether the impacts are significant. The guidelines also provide direction for identifying measures to mitigate impacts.

The BAAQMD CEQA Guidelines recommend significance thresholds as follows:

Construction Impacts. The BAAQMD normally considers construction-related emissions as short-term in duration. PM-I0, caused by dust generation is the pollutant of greatest concern, since other emissions from construction equipment are included in emission inventories that are the basis for regional air quality planning. The BAAQMD CEQA Guidelines identify feasible control measures for emissions of PM-I0 that would greatly reduce the impacts from construction activities. Under the guidelines, proper incorporation of these measures would result in less than significant construction-related impacts to air quality.

Local Carbon Monoxide Concentrations. A project would have a significant adverse impact if it causes a violation of any air quality standard or contributes substantially to an existing or projected air quality violation.

A significant impact to local air quality is defined under the guidelines as increased carbon monoxide concentrations at the closest sensitive receptors that cause a violation of the most stringent ambient standard for carbon monoxide (20 ppm for the one-hour averaging period, 9.0 ppm for the eight-hour averaging period).

Total Emissions A significant impact on air quality is defined under the guidelines as an increase in emissions of any ozone precursor pollutant (i.e., reactive organic gases or nitrogen oxides) or PM-l0 exceeding 80 pounds per day (or 15 tons/year). Total emissions include direct and indirect emissions.

Toxic Air Contaminants. Exposing sensitive receptors or the public to substantial levels of toxic air contaminants would be considered significant. A significant impact is defined as follows: 1) the probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds ten in one million; or 2) ground-level concentrations of non-carcinogenic toxic air contaminants would result in a hazard Index greater than one for the MEI.

Odors. Any project with the potential to expose members of the public frequently to objectionable odors would be considered significant. Analysis of potential odor impacts should be analyzed for both of the following situations: 1) sources of odorous emissions locating near existing receptors, and 2) receptors locating near existing odor sources. The BAAQMD CEQA Guidelines identify screening distances between potential odor sources and receptors that should be considered when evaluating odor impacts.

Acute Hazardous Air Emissions or Accidental Releases. A determination of significance for potential impacts from accidental releases of acutely hazardous materials should be made in consultation with the local administering agency of the Risk Management Prevention Program (RMPP). This determination should be made for both projects using or storing acutely hazardous materials proposed near existing receptors as well as proposed projects locating near existing facilities that use or store these materials.

Cumulative Impacts. Any project that would individually have a significant air quality impact is also considered to have a significant cumulative air quality impact. For other projects, the determination of a significant cumulative air quality impact should be based on the consistency of the project with the Bay Area's most recently adopted Clean Air Plan. In order to show consistency with the Clean Air Plan, the project must be consistent with the Countywide Plan (i.e., not requiring a General Plan Amendment) and the Countywide Plan must be found to be consistent with population and travel assumptions used to develop the Clean Air Plan. In addition, the project and Countywide Plan must incorporate the control measures contained in the Clean Air Plan. The Clean Air Plan uses the latest population and travel estimates developed by the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG). Projects located in a jurisdiction where the general plan is not consistent with the Clean Air Plan would be required to compare impacts of it along with recent past, present and reasonably foreseeable future projects to the thresholds described above.

Note: Although the effects of a pre-existing contaminated environment upon a proposed project may be beyond the scope of CEQA, the BAAQMD recommends that impacts of existing sources of air pollution on proposed project occupants be analyzed. Such impacts include those from toxic air contaminants, odors, and dust.

F. CARB AIR QUALITY AND LAND USE HANDBOOK

In April 2005, the CARB released the final version of the Air Quality and Land Use Handbook, which is intended to encourage local land use agencies to consider the risks from air pollution prior to making decisions that approve the siting of new sensitive receptors (e.g., homes or daycare centers) near sources of air pollution. Unlike industrial or stationary sources of air pollution, siting of new sensitive receptors does not require air quality permits, but could create air quality problems. The primary purpose of the

document is to highlight the potential health impacts associated with proximity to common air pollution sources, so that those issues are considered in the planning process. CARB makes recommendations regarding the siting of new sensitive land uses near freeways, truck distribution centers, dry cleaners, gasoline dispensing stations, and other air pollution sources. These "advisory" recommendations, summarized in Table 2, are based primarily on modeling information and may not be entirely reflective of conditions in Marin County. Siting of new sensitive land uses within these recommendation distances may be possible, but only after site-specific studies are conducted to identify the actual health risks. CARB acknowledges that land use agencies have to balance other siting considerations such as housing and transportation needs, economic development priorities and other quality of life issues.

TABLE 2 -- CARB RECOMMENDED SETBACK DISTANCES FOR COMMON SOURCES OF TOXIC AIR CONTAMINANTS

Source Type	Recommended Buffer Distance
Freeways and busy arterial roadways	- 500 feet
Distribution Centers with 100 or more daily truck trips or 40 daily truck trips that use refrigeration units	- 1,000 feet
Dry cleaners (onsite dry cleaning)	- 300 feet for any dry cleaning operation - at least 500 feet for operations with 2 or more machines
Large gasoline stations	- 50 feet for typical gas stations - up to 300 feet for large gas stations

IV. EXISTING AIR QUALITY CONDITIONS

Air quality is affected by the rate of pollutant emissions and by meteorological conditions such as wind speed, atmospheric stability, and mixing height, all of which affect the atmosphere's ability to mix and disperse pollutants. Long-term variations in air quality typically result from changes in air pollutant emissions, while short-term variations result from changes in atmospheric conditions.

A. CRITERIA AIR POLLUTANTS

1. Bay Area

In general, the San Francisco Bay Area is considered one of the cleanest major metropolitan areas in the country with respect to air quality. The air pollutants of greatest concern in to the Bay Area and Marin County are ground-level ozone and PM-10. The San Francisco Bay region as a whole does not comply with air quality standards for either pollutant.

The San Francisco Bay Area annually exceeds the California Ambient Air Quality Standard for one-hour ozone, 8-hour ozone and 24-hour average PM-10 levels. Throughout the Bay Area, the previous national one-hour ozone standard (revoked in 2005) was exceeded at one or more stations from zero to three days annually over the last five years and the new eight-hour ozone standard was exceeded from zero to seven days annually. The number of days that, on an annual basis, exceeded the more stringent one-hour State ozone standard at one or more stations in the Bay Area ranged from seven to 19 days over the last five years. The NAAQS for PM-l0 is not exceeded anywhere in the Bay Area, but the more stringent State standard is routinely exceeded in the Bay Area, as well as most other parts of the State. No other air quality standards are exceeded in the Bay Area. As a result, the San Francisco Bay region is considered nonattainment for ground-level ozone at both the State and federal level, and nonattainment for PM-I0 at the State level only. The San Francisco Bay region currently complies with State and federal standards for all other air pollutants (e.g., carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead).

Exceedances of the state and federal ozone standard are the greatest ambient air quality problem. Progress has been made in reducing this problem. Over the last 20 years, the peak one-hour concentrations throughout the Bay Area have declined more than 20 percent. The number of days that standards were exceeded shows a similar trend. The trend has not been consistently downward. Concentrations and number of exceedances generally declined from 1980 to 1994, but increased sharply from 1995 to 1998. Levels in 1999 through 2004 have declined from levels in 1995. Indications are that the Bay Area will attain the NAQQS in a timely manner; however, continued progress is required to meet the more stringent state standards ozone standards.

PM-l0 is another pollutant of concern since the area exceeds the state ambient air quality standards. Since PM-I0 sampling in the Bay Area began in 1988, mean annual levels have decreased by about 25 percent. The calculated number of annual exceedances of the 24-hour standard has decreased from a high of over 100 days in 1991 to about 50 days in 2001. The national 24-hour standard was last exceeded in 1991.

Carbon monoxide concentrations have declined substantially over the last 20 years. Current peak levels in the Bay Area are less than half of 1980 levels and neither state nor national standards have been exceeded since 1991. As a result, the area has attained the standard. Much of the decline is attributed to cleaner motor vehicles and use of cleaner burning fuels.

2. Marin County

The BAAQMD monitors air pollutant levels continuously throughout the nine-county Bay Area Air Basin. The San Rafael monitoring station is the only monitoring station in Marin County. A summary of air quality monitoring data is shown in Table 3. The values in the table are the highest air pollutant levels measured at these stations over the past 5 years (2000-2004). The number of days that measured concentrations exceeded the NAAQS or CAAQS are given in Table 4. Air quality conditions in Marin County are described for each criteria air pollutant below:

TABLE 3 -- HIGHEST MEASURED AIR POLLUTANT CONCENTRATIONS

Pollutant	Average Time	Measured Air Pollutant Levels				
		2000	2001	2002	2003	2004
San Rafael						
Ozone (03)	1- Hour	0.07 ppm	0.09 ppm	0.08 ppm	0.09 ppm	0.07 ppm
	8-Hour	0.06 ppm	0007 ppm	0006 ppm	0.07 ppm	0006 ppm
Carbon Monoxide (CO)	8- Hour	2.3 ppm	2.4 ppm	1. 9 ppm	2.0 ppm	2.3 ppm
Nitrogen Dioxide (N02)	I-Hour	0.06 ppm	0.06 ppm	0006 ppm	0.09 ppm	0007 ppm
	Annual	00016 ppm	0.013 ppm	0.017 ppm	0.018ppm	0.016ppm
Fine Particulate Matter (PM-2.5)	1- Hour	NA	NA	NA	NA	NA
	Annual	NA	NA	NA	NA	NA
Respirable Particulate Matter (PM-l 0)	24- Hour	40 ug/m^3	**74** ug/m^3	**70** ug/m^3	41 ug/m^3	40 ug/m^3
	Annual	19 ug/m^3	21 ug/m^3	21 ug/m^3	18 ug/m^3	18 ug/m^3
Bay Area (Basin Summary)						
Ozone (03)	1- Hour	**0.15** ppm	**0.13** ppm	**0.16** ppm	**0.13** ppm	**0.11** ppm
	8- Hour	**0.11** ppm	**0.10** ppm	**0.11** ppm	**0.10** ppm	0.08 ppm
Carbon Monoxide (CO)	8-Hour	6.3 ppm	5.1 ppm	4.5 ppm	4.0 ppm	3.4 ppm
Nitrogen Dioxide (N02)	1- Hour	0.11 ppm	0.11 ppm	0.08 ppm	0.09 ppm	0007 ppm
	Annual	0.025ppm	0.024ppm	0.0 14ppm	00021ppm	0.019ppm
Fine Particulate Matter (PM-2.5)	I-Hour	NA	NA	77 ug/m^3	56 ug/m^3	**74** ug/m^3
	Annual	NA	NA	14 ug/m^3	11.7 ug/m^3	11.6 ug/m^3
Respirable Particulate Matter (PM-I0)	24- Hour	**76** ug/m^3	**109** ug/m^3	**84** ug/m^3	**60** ug/m^3	**65** ug/m^3
	Annual	**24** ug/m^3	**26** ug/m^3	**25** ug/m^3	**25** ug/m^3	**26** ug/m^3

Note: ppm = parts per million

Values reported in bold exceed ambient/t air quality standard

NA = data not available

TABLE 4. SUMMARY OF MEASURED AIR QUALITY EXEEDANCES

	Standard	Monitoring Station	Days Exceeding Standard				
			2000	2001	2002	2003	2004
Ozone (0_3)	NAAQS 1-hr	San Rafael	0	0	0	0	0
		BAY AREA	3	1	2	1	0
	NAAQS 8-hr	San Rafael	0	0	0	0	0
		BAY AREA	4	7	7	7	0
	CAAQS 1-hr	San Rafael	0	0	0	0	0
		BAY AREA	12	15	16	19	7
Fine Particulate Matter (PMIO)	NAAQS 24-hr	San Rafael	0	0	0	0	0
		BAY AREA	0	0	0	0	0
	CAAQS 24-hr	San Rafael	0	2	2	0	1
		BAY AREA	7	10	6	6	7
Fine Particulate Matter (PM2s)	NAAQS 24-hr	San Rafael	0	--	--	--	--
		BAY AREA	1	5	7	0	1
All Other (CO, N02, Lead, S02)	All Other	San Rafael	0	0	0	0	0
		BAY AREA	0	0	0	0	0

Source: BAAQMD, Bay Area Air Pollution Summaries 2000-2004

Ozone. In San Rafael, state ozone levels were not exceeded over the last five years. Ozone level shave not exceeded standards since 1999. These high ozone levels in Marin County occurred in October of 1999 on a Sunday. Exhibit 1 shows ozone concentration maps produced by EPA for October 10, 1999 when the highest levels were measured at San Rafael. It should be noted that this map is based on computer interpolation of a sparse data set for the western portion of the Bay Area. On a typical day during the summer ozone season, ozone levels are usually moderate to low over Marin County, with the lowest levels occurring at the western rural portions of Marin County. This pattern occurs since prevailing winds are from the west, where there are no sources of ozone precursor emissions. During the early or late portions of the season (late spring or early fall), light easterly winds can affect ozone precursor pollutants over Marin County leading to higher concentrations, especially over the eastern portions of the County. Ozone levels in western Marin County tend to always be low to moderate due to the rural nature of the area and persistent marine influence.

Carbon Monoxide. Highest carbon monoxide concentrations measured in San Rafael have been well below the national and state ambient standards. Since the primary source of carbon monoxide in Marin County is automobiles, highest concentrations would be found near congested roadways. In particular would be local congested roadways that carry large volumes of traffic. Carbon monoxide emitted from a vehicle is highest near the origin of a trip and considerably lower when vehicles are operating in a hot-stabilized mode (usually five to ten

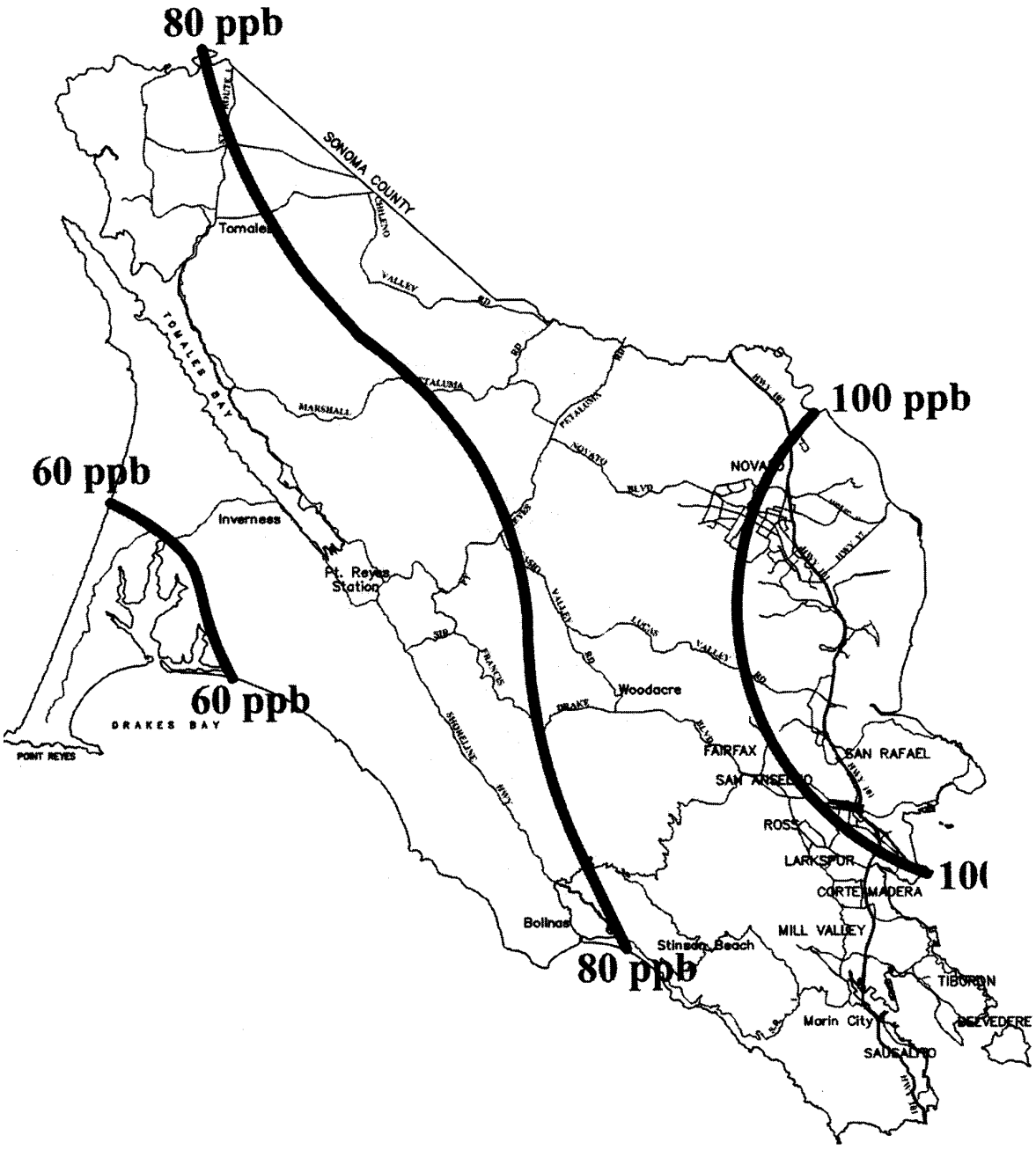
minutes into a trip). Vehicles near the origin of a trip are considered to be in Cold-Start mode. Vehicle operation on US 101 is usually in a hot-stabilized mode so the individual emission rates are much lower than those encountered on arterial roadways leading to the freeway. The highest concentrations of carbon monoxide in Marin County are likely to be found adjacent to large congested intersections, particularly in and around San Rafael.

PM-10. Measured exceedances of the PM-10 standards occurred on five separate days over the last five years. However, PM-10 is only measured once every sixth day at San Rafael (most monitoring stations measure PM10 every 6th day according to a national schedule). It is estimated that there were 30 days over the past five years that the State PM-l0 standard was exceeded. Most stations in the Bay Area reported exceedances of the State standard on the same days fall/winter days as reported in San Rafael. This indicates a regional air quality problem. Although not measured, elevated PM-10 and carbon monoxide levels in late fall and winter are a concern in sheltered valleys. The primary sources of these pollutants are wood smoke and local traffic. Meteorological conditions that are common during this time of the year result in calm winds and strong surface-based inversions that trap pollutants in these valleys. The build up of these pollutants is greatest during the evenings and early morning periods. The high levels of PM-l0 result in not only health effects, but also reduced visibility and odors.

Other Pollutants. Other criteria pollutants, such as nitrogen dioxide, sulfur dioxide, and lead have always been measured at low levels in Marin County. These pollutants should not pose a major air pollution concern in Marin County.

Additional discussion of air quality emissions in Marin County is provided on pages 25 through 27 of *Marin Profile 2005* prepared by the Marin Economic Commission.

EXHIBIT 1 -- MAP OF OZONE CONCENTRATIONS ON DAY WITH HIGHEST LEVELS IN MARIN (October 10, 1999)



Source: EP A (www.epa.gov/cgi-bin/aimow)

B. TOXIC AIR CONTAMINANTS

The BAAQMD and CARB measure concentrations of air toxics throughout the Bay Area. Compounds measured by the BAAQMD include benzene, 1,3-butadiene, carbon tetrachloride, chloroform, ethylene dibromide, ethylene dichloride, methyl tert buytl ether (MTBE), methylene chloride, acetaldehyde, perchloroethylene, toluene, 1,3-butadiene, and formaldehyde. Since the ambient concentrations of these toxic air contaminants are very small, they are measured and reported as part per billion (ppb) on a volume basis. Table 5 contains a summary of the measured concentrations for each of the compounds at the San Rafael monitoring station in 2002. Also included in Table 5 are the overall Bay Area monitoring results along with the calculated cancer risk. The information used to develop this table was obtained from the California Air Resources Board 2001 Almanac of Emissions and Air Quality (available at *http://www.arb.ca.gov/aqd/almanac/almanac.htm)* and the BAAQMD's 1999 status report for the Toxic Air Contaminant Control Program (available at http://www.baaqmd.gov/pmt/air_toxics/annual_reports/index.htm).

Table 5 reports concentrations of air toxic contaminants that pose the greatest health risk. Not all contaminants shown in Table 5 are measured at San Rafael. As can be seen from Table 5, the maximum measured toxic air contaminant concentrations in San Rafael are similar or slightly higher than overall Bay Area values. The BAAQMD conducts these measurements at the air monitoring station located on 4th Street in San Rafael. This station is in close proximity to a dry cleaning shop, which highly influences some compounds, specifically perchloroethylene. Several of the highest concentrations measured in the Bay Area were measured in San Rafael (perchloroethylene). Since the station is located in the most urbanized portion of Marin County, the levels measured are likely representative of the highest levels in Marin County.

Emissions of the major air toxic contaminants are as follows:

- Diesel particulate: Heavy-duty trucks, buses, ferries, construction equipment, and electrical generation.
- 1,3 Butadiene: Primarily on-road motor vehicles. Like carbon monoxide, older model vehicles without adequate catalytic converters have much higher emission rates.
- Benzene: Primarily on-road motor vehicles and gasoline evaporation.
- Formaldehyde: Emitted both directly and indirectly into the atmosphere. It is primarily formed through photochemical oxidation in the atmosphere with elevated levels of ozone and nitrogen oxides. Sources of emissions leading to elevated formaldehyde levels are fuel combustion from a variety of mobile and stationary sources. A primary source is from motor vehicle operations.

In 1998, the CARB identified diesel particulate matter as a toxic contaminant based on its potential to cause cancer and other adverse health effects. Typical sources of diesel exhaust in the Bay Area include trucks, buses, ships, trains, construction equipment and backup power generators. Diesel engines emit a complex mixture of air pollutants. The visible emissions are particulate matter. Some of the gaseous emissions become particulate matter after they cool or undergo chemical reactions in the atmosphere. Particulate matter from diesel is not measured. However, the CARB has conducted receptor modeling to assess the health risk potential. The health risk associated with diesel in the Bay Area is estimated to be about 500 excess cancer cases per one million people. Compared to the combined health risk value of about 200 for all of the other most prevalent toxic air contaminants, diesel particulate matter poses the greatest health risk in the Bay Area. The ARB has approved a comprehensive Diesel Risk

Reduction Plan to reduce diesel particulate matter emissions from new and existing diesel engines. The goal of the plan is to reduce diesel particulate emissions by 75 percent in 2010 and 85 percent or more by 2020.

Bay Area cancer risks represents the number of excess cancer cases per million people based on a lifetime exposure (70-year) to the annual average concentration in the Bay Area. The cancer risk reported in Table 4 is based on those annual averages reported and changes from year-to-year based on current monitoring results. It is important to note a couple of points with regard to air toxic contaminants: (1) The health risks are based on the average concentration for the entire region and the health risk at individual locations will vary considerably; and (2) Since 1990, average concentrations of toxic air contaminants and the associated health risks have been reduced (by 50 percent or more for many compounds).

C. EXISTING SOURCES OF AIR POLLUTION

Sources of air pollution in and around Marin County are primarily traffic or on-road vehicles. Table 6 summarizes emissions for Marin County and the Bay Area. For ozone, traffic accounts for 75 to 95 percent of the emissions of ozone precursor pollutants (NOx and ROG). Area wide sources, which include construction activities, residential wood smoke, off-road travel, and agriculture, account for the greatest portion of PM-I0 emissions (about 85 percent).

1. Mobile Sources

Mobile sources of air pollution make up a large portion of the emissions inventory for Marin County. Mobile sources include traffic, boats, and local aircraft. Approximately 73 percent of the ROG and 93 percent of the NOx emitted in Marin County is from mobile sources.

2. Stationary Sources

Emissions of criteria air pollutants from permitted stationary sources in Marin County can be found by facility on the ARB's website: (*http://www.arb.ca.gov/ei/maps/statema/lcntymap.htm).* Exhibit 2 shows locations of the largest (most significant) stationary air pollution sources in Marin County.

Excluding gas stations, dry cleaning facilities and repair shops, the ARB's emission inventory database indicates approximately 55 permitted facilities throughout Marin County. According to the ARB's database, the largest stationary source of nitric oxides is the Central Marin Sanitation District. The largest source of reactive organic gases is Redwood Landfill near Novato. San Rafael Rock Quarry and the Marin Sanitary Service in San Rafael are the largest stationary sources of PM-l0. These individual sources not only generate emissions directly from the facilities, but also from truck traffic associated with their operations.

3. Toxic Air Contaminants

Emissions of air toxic contaminants from stationary sources in Marin County can be found in the most recent version of the BAAQMD's annual Toxic Contaminant Control Report (see website *http://www.baaqmd.gov/pmt/airtoxics/annualreports/index.htm*). A majority of these sources are dry cleaning facilities, which emit perchloroethylene. However, the most prevalent toxic contaminants in Marin County are benzene and diesel from mobile sources and

formaldehyde, which comes from a variety of sources. Other sources of toxic air contaminants include sanitary districts or landfills, wastewater treatment facilities, and manufacturing facilities.

4. Dust

Construction and agricultural activities result in the generation of dust, which leads to elevated PM-l0 levels in the county and region. Most agricultural activities in Marin County do not occur near residential areas; and therefore, have not been a concern. Dust from construction activities can affect nearby active land uses. Activities that generate visible dust clouds extending beyond their boundaries are a source of air pollution that can be controlled.

5. Odors

Significant sources of offending odors are typically identified based on complaint histories received and compiled by the BAAQMD. It is difficult to identify sources of odors without requesting information by facility from the BAAQMD. Typical large sources of odors that result in complaints are wastewater treatment facilities, landfills, food processing facilities and agricultural operations. Other sources typically result in very localized sources of odors. Locations of odor sources in Marin County are also shown in Exhibit 2.

6. Commercial Aircraft Over Flights

Changes to commercial aircraft over flights, both increased number and changes in flight patterns, have recently become a sensitive environmental issue in Marin County. The primary issue has been noise associated with these over flights. Commercial aircraft are a source of air pollution, especially during landing and take off operations. Aircraft emit buoyant exhaust plumes that do not easily mix downward. Air pollutants that are emitted above about 3,000 feet ASL (considered the mixing height) generally do not mix with the lower atmosphere and are not considered by EPA or the BAAQMD to be part of an air basin emissions inventory[1]. Almost all commercial flights over Marin County are well above 3,000 feet. Any commercial aircraft emissions that could mix downward would be well dispersed and affect areas well downwind of Marin County (e.g., Sacramento or San Joaquin Valley). A study conducted by the Volpe National Transportation Systems Center (USDOT FAA 2000) found that under credible worst-case modeling assumptions, concentrations of carbon monoxide and hydrocarbons were negligible due to mixing. In that study, impacts from an older model Boeing 747 flying at an altitude of 3,000 feet were modeled and found to be negligible. Emissions from commercial aircraft flying over Marin County normally do not affect the local air quality. On some occasions, commercial flight tracks over Marin County are below 3,000 feet (e.g., approach to Oakland International Airport). However, emissions from these flights also are not expected to affect air quality in Marin County. The release of liquid substances from commercial aircraft (e.g., deicing agents) would be rapidly dispersed and would not be expected to affect local air quality.

[1] Mixing height or depth is the expanse in which air rises from the earth and mixes with air above it until it meets air equal or warmer in temperature (the inversion cap). The 3,000-foot value is the annual mixing height in the contiguous United States. Generally, in the morning hours the mixing height is lower than 3,000 feet and tends to increase in afternoons. For a large part of a typical day and year, the mixing heights are less than typical altitudes of aircraft operating over Marin County.

TABLE 5 -- SUMMARY OF 2002 MEASURED TOXIC AIR CONTAMINANT CONCENTRATIONS (µg/m³)

Toxic Contaminant	Concentration (in µg/m³) San Rafael	Bay Area	Unit Risk (µg/m³)⁻¹	Cancer Risk Chances in one million San Rafael	Bay Area
Gaseous TACs					
1,3-Butadiene	--	0.28	1.7E-04	--	47.6
Benzene	1.36	1.52	2.9E-05	39	44.1
Carbon Tetrachloride	0.70	0.70	4.2E-05	29	29.4
Formaldehyde	--	2.67	6.0E-06	--	16.0
Acetaldehyde	--	1.08	2.7E-06	--	2.9
Perchloroethylene	0.54	0.34	5.9E-06	3	2.0
Methylene Chloride	0.95	1.34	1.0E-06	1	1.3
MTBE	1.79	2.74	2.6E-07	1	0.7
Chloroform	0.05	0.10	5.3E-06	0	0.5
Trichloroethylene	0.20	0.10	2.0E-06	0	0.2
Particulate TACs					
Chromium (hexavalent)	--	1.00E-04	1.5E-01	--	15.0
Dioxin	--	2.50E-08	3.8E+01	--	1.0
Nickel	--	3.83E-03	2.6E-04	--	1.0
PAHs	--	4.20E-04	1.1E-03	--	0.5
Lead	--	9.17E-03	1.2E-05	--	0.1
Total for all TACs excluding diesel particulate matter				--	162

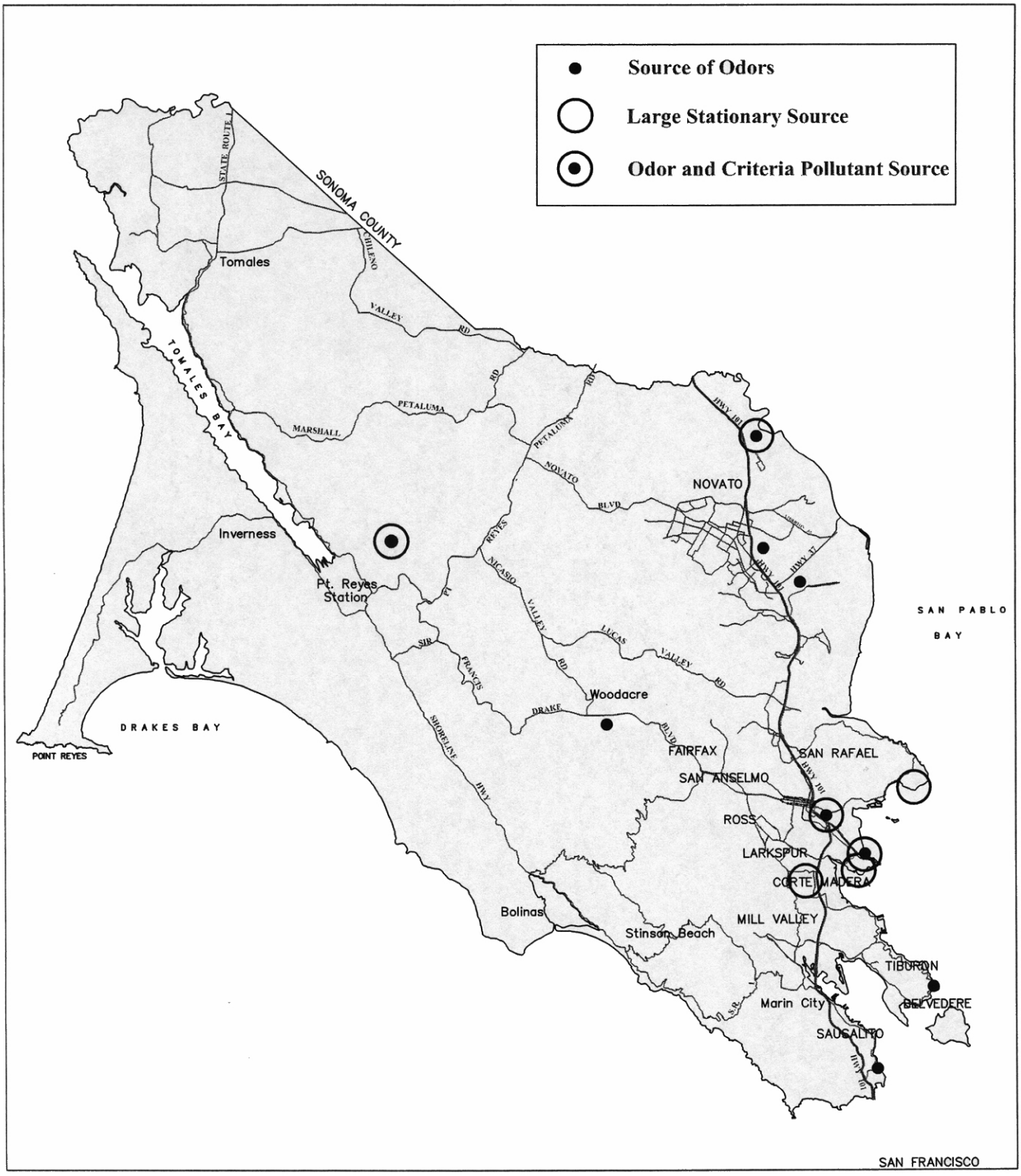
NA = data not available
PPB = parts per billion
nglm3 = nanograms of contaminant per cubic meter of air
uglm3 = micrograms of contaminant per cubic meter of air
Data reported as <x.xx indicates the concentration was below the method detection limit of x.xx.
Source: (1) Air Resources Board Almanac 2001 - Chapter 6, and (2) 1999 Status Report: BAAQMD Toxic Air Contaminant Control Program

TABLE 6. AIR POLLUTANT EMISSIONS INVENTORY IN TONS PER DAY
(for Ozone Precursors and PM-10)

Source: California Air Resources Board (http://www.arb.ca.gov/app/emsinv/fcemssumcat.html)

Source	Reactive Organic Gases (ROG)			Oxides of Nitrogen (NOx)			Particulate Matter (PM-10)		
	1995	2000	2010	1995	2000	2010	1995	2000	2010
Marin County									
Stationary Source	2.7	2.6	2.6	0.2	0.5	0.4	0.2	0.2	0.2
Area-Wide Sources	4.0	3.8	3.7	0.9	0.9	0.8	5.9	6.1	6.3
Mobile Sources	22.1	16.9	8.6	21.4	16.9	10.1	0.9	0.9	0.9
TOTAL (rounded)	29	23	15	23	18	11	7	7	8
Bay Area									
Stationary Source	138	125	126	110	89	90	21	17	19
Area-Wide Sources	94	90	86	18	17	17	125	130	135
Mobile Sources	353	319	186	531	452	303	21	21	20
TOTAL (rounded)	656	534	399	659	558	411	167	169	174

EXHIBIT 2: LOCATIONS OF LARGE STATIONARY AIR POLLUTANT SOURCES AND POTENTIAL SOURCES OF ODORS



D. SENSITIVE RECEPTORS

Sensitive receptors, people who are particularly susceptible to the adverse effects of air pollution, are generally referred to as hospitals, schools, playgrounds, childcare facilities, and convalescent facilities. The BAAQMD considers residences to also be sensitive receptors. In the past, maps have been developed that show the locations of schools, hospitals, and convalescence homes to represent sensitive receivers. These maps are not particularly useful since air quality standards are applicable to all areas and not just sensitive receptors. Many people who are susceptible to air pollution (e.g., asthmatics) also reside in residences. Both State and National ambient air quality standards were developed with intent to protect sensitive receptors from the adverse impacts of air pollution.

E. ROADSIDE CONCENTRATIONS AND HEALTH RISK

The effect of air pollution from traffic has been typically described by the resulting concentration of CO. This is usually predicted using dispersion modeling. DPM from truck traffic on freeways or busy arterials has been found to present a substantial health risk. Therefore, the impacts of DPM are analyzed for sensitive land uses near these roadways.

Carbon monoxide emissions from traffic along major roadway segments with high traffic volumes and poor level of service (LOS) were evaluated. This included County roadway segments operating at LOS of D, E, or F. The traffic-generated emissions of CO were predicted using the Caline4 line source dispersion model. The model requires inputs of geometry, traffic volumes, emission factors and meteorology. Existing traffic volumes for selected roadway segments were used. Emission factors used were calculated using the EMFAC2002 model, developed by the California Air Resources Board, with default assumptions for Marin County during winter that include a temperature of 45 deg. F. Slow speeds of 5-15 miles per hour were used to develop the emission factors. Meteorological conditions indicative of elevated CO levels in the Bay Area were used, which include a low wind speed of 1 meter per second, worst-case wind angle, and F stability. Results are reported in Table 7.

TABLE 7. MODELED ROADSIDE CARBON MONOXIDE LEVELS

Roadway Segment Description	Modeled Level*	
	1-Hour	8-hour
U.S. 101 Puerto Suello Hill	7.8 ppm	5.2 ppm
1-580 near the Richmond-San Rafael Bridge	5.7 ppm	3.7 ppm
Sir Francis Drake Blvd. West of U.S. 101	6.6 ppm	4.3 ppm
State Route 1 near Almonte Blvd.	5.6 ppm	3.6 ppm
National Ambient Air Quality Standard	35 ppm	9ppm
California Ambient Air Quality Standard	20 ppm	9.0 ppm

* Includes background level of 4 ppm for I-hour and 2.5 ppm for 8-hour

Diesel particulate matter emitted from trucks or other diesel fueled vehicles on freeways in Marin County affects local air quality. The health impacts associated with the DPM exhaust are expressed in terms of increased risk of contracting cancer by individuals who live or work near the sources, such as freeways. This analysis involved the development of DPM emissions for traffic on US 101 and 1-580 using the EMFAC2002 emission factor model with defaults for Marin County. The EMF AC results

were then adjusted to the traffic mix on US 101 and 1-580 reported by Caltrans2. Emission factors were input to the Ca13qher dispersion model that is acceptable to the BAAQMD for this type of analysis. Modeled concentrations were calculated for various distances from the edge of the freeway. The maximum individual cancer risks were computed using the BAAQMD recommended cancer risk factor of 3 x 10-4 cancer cases per µg/m3 of diesel particulate matter, which are based on "best estimates" of plausible cancer potencies as determined by the California Office Of Environmental Health Hazard Assessment. The existing cancer risk posed by traffic on freeways in Marin County is expressed in terms of distance from the edge of the travel lanes in Table 8. A risk of less than l0 in one million is considered to be less than significant under current BAAQMD CEQA Guidelines. It should be noted, as discussed previously, that emission rates of DPM from traffic are predicted to decrease substantially in the future.

TABLE 8.
SUMMARY OF DPM CANCER RISK AT DISTANCES FROM MARIN COUNTY FREEWAYS

Freeway Segment	Cancer Risk at Receptor Distance (per million)				
	50 ft	1 00 ft.	200 ft.	500 ft.	1,000 ft.
U.S. 101 Southern Marin	15	12	8	4	3
U. S. 101 Central Marin	35	27	19	10	6
U.S. 101 Northern Marin	28	22	15	8	5
1-580 east of San Rafael	29	22	15	8	4

V. AIR QUALITY TRENDS

As previously mentioned, levels of air pollution are related to emissions and meteorology. Short-term variations in air pollutant levels are generally related to changes in meteorology, while long-term variations are related to changes in emissions.

Efforts to reduce air pollutant levels are aimed primarily at reducing emissions from various sources. Other efforts, such as programs like Spare the Air are aimed at temporarily reducing emissions when weather forecasts indicate the potential for elevated air pollutant levels. The BAAQMD along with the CARB conducts detailed computer modeling of ozone levels both in the Bay Area and levels transported to other areas. The modeling is a large effort that is used to identify types of sources of air pollution to further reduce. The modeling is also conducted to predict attainment of air quality standards. Results of these studies are the basis of current air quality regulations and plans.

Table 6 shows the past (1995), near current (2000) and projected (2010) emission inventory for both Marin County and the Bay Area. The emissions inventory shown was prepared for ozone precursor pollutants (ROG and NOx) and PM-l0. Although population and vehicle activity has increased in the Bay Area, emissions of ozone precursor air pollutants have decreased. This trend is expected to continue through 2010. The majority of the decrease is anticipated from vehicle activity. Although PM-l0 emissions are expected to stay relatively flat, some reductions in PM-l0 concentrations are expected. Many of the sources that contribute to ozone formation also lead to PM-l0 formation through chemical

[2] Based on *2004 Average Annual Daily Truck Traffic on the California State Highway System* – http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/

reactions in the atmosphere. These secondary particulates contribute to overall PM-l0 concentrations, especially on days of elevated PM-l0 levels in the fall and winter.

VI. COUNTYWIDE PLAN POLICY REVIEW

Table 9 provides a review of each of the policies and programs from the current Countywide Plan related to air quality issues.

The following provides a discussion of the major air quality issues to be addressed as part of the Countywide Plan update.

- It is recommended that policies to control emissions from construction sites be included. The BAAQMD CEQA Guidelines contain feasible control measures for PM-l 0 at construction sites. These control measures are shown in Table 10.

- New projects should be consistent with local and regional population and vehicle use projections. This means that assuming the Countywide Plan is consistent with regional planning projections, projects should be evaluated for consistency with the Countywide Plan. If projects do not require a General Plan Amendment, no further ana1ysis should be required (they would be assumed to be consistent with plan population and travel projections). The countywide plan should be evaluated for consistency with ABAG population projections, MTC vehicle miles traveled projections, and implementation of Clean Air Plan Transportation Control Measures (TCMs) listed in Table 11. There are two tests for the plan: 1) population growth under the plan is similar or less than ABAG projections and 2) the rate of VMT is expected to increase at a rate similar or less than the rate of population. If these two conditions are met, than the Countywide Plan would be consistent with the Bay Area Clean Air Plan as long as reasonable efforts are made to implement plan TCMs; otherwise, it would not be consistent and growth under the plan would be considered to hinder the process of the region obtaining state and federal air quality standards (a significant impact).

TABLE 9 -- EVALUATION OF EXISTING COUNTYWIDE PLAN AIR QUALITY POLICIES AND PROGRAMS

Existing Policy or Program	Suggestions for Improvements
Policy EQ-2.75 County's Air Quality Standards. The County shall adhere to the Federal or State air quality standards, (Table EQ-5) whichever are more stringent, for management of locally generated pollutants.	Needs refinement: The BAAQMD encourages local jurisdictions to include ambient air quality standards in General Plans. Recommend that these standards be updated with standards shown in Table 1 of this report.
Policy EQ 2.76 Coordination of Air Quality Planning Efforts. The County shall coordinate air quality planning efforts with local, regional, and State agencies.	Needs refinement: This policy recommends that projects exceeding the thresholds under Program EQ 2.76a undergo an air quality analysis that is subject to BAAQMD review. The BAAQMD normally does not conduct a review of project-related air quality impacts unless the District acts as a lead or responsible agency. The BAAQMD CEQA Guidelines were developed to assist local jurisdictions in evaluating the significance of air quality impacts from projects or plans. County staff should evaluate air quality impacts of projects in accordance with those guidelines
Program EQ 2.76a Project Review for Air Quality Concerns. The County shall notify local and regional jurisdictions of proposed projects in unincorporated areas which may affect regional air quality, as governed by project type and size thresholds in Table EQ 6.	Needs Refinement: Consider update to Table EQ 6, since BAAQMD Guidelines have been updated since time of last plan update.
Program EQ-2.76b Cooperative Enforcement of Federal, State and Regional Air Quality Standards. The County shall cooperate with the BAAQMD and California Air Resources Board in enforcing the provisions of the Clean Air Act, State, and regional policies and established standards for air quality.	Needs Refinement: Consider adding reasonable and feasible control measures for construction activities
Policy EQ-2.77 Location of Land Uses Near Air Pollution Sources. The County shall consider air pollution impacts when locating pollution-sensitive land uses near sources of air pollution	Needs Refinement: Recommend that Policy include sources of odors. An example of such sources is shown in Exhibit 2, however, they may not be all sources (especially nuisance sources).

Existing Policy or Program	Suggestions for Improvements
Program EQ-2.77a Location of Air Pollution Point Sources Near Other Land Uses. The County should consider air pollution impacts when locating air pollution point sources such as manufacturing, extracting, and hazardous materials storage sites proximate to residential areas and other sensitive receptors.	Needs Refinement: Consider screening distances between odor sources and receptors (if screening distances are not met than detailed studies should be required to determine project compatibility). Recommended screening distances need to consider both the type of source and type of receptor, as well as other factors (e.g., odor control equipment, complaint history). Table 4 of the BAAQMD CEQA Guidelines provides project-screening distances, but these assume worst-case conditions (i.e., receptors downwind of uncontrolled sources).
Program EQ-2.77b Upwind Location of Sensitive Receptors. The County should consider the potential air pollution impacts of locating sensitive receptors (facilities where individuals are highly susceptible to the adverse effects of air pollutants) near freeways, arterials and other major transportation facilities and should urge location of these uses upwind of such transportation facilities.	Needs Refinement: Recommend that references to "Upwind" be taken out of Program EQ-2.77b. Winds are usually light and variable during meteorological conditions that are conducive to elevated pollution levels; therefore, locations that are normally upwind could be susceptible to higher levels.
Policy EQ-2.78 Air Quality Impacts of Proposed Projects. As part of its Environmental Review Process, the County shall review proposed projects for their potential impact on air quality conditions	Applicable
Program EQ-2.78a Air Quality Mitigation. The County shall require projects which generate high levels of air pollutants to incorporate air quality mitigation in the project design.	Applicable
Policy EQ-2.79 Vehicular-Generated Pollutants. The County shall support a transportation program which serves to reduce vehicle trips and/or increases ridesharing so as to reduce pollutants emitted by vehicular combustion engines.	Needs Refinement: Recommend including transportation control measures recommended by BAAQMD
Policy EQ-2.80 Vehicular Congestion During Peak Hours. The County shall seek ways to reduce vehicular congestion during peak commuting hours in order to reduce emissions from combustion engines during those times.	Needs Refinement: Recommend including applicable transportation control measures recommended by BAAQMD

TABLE 10 -- FEASIBLE CONTROL MEASURES FOR PM-10 CONSTRUCTION EMISSIONS

Control Type	Measures
Basic Control Measures: The following controls should be implemented at all construction sites.	♦ Water all active construction areas at least twice daily. ♦ Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard. ♦ Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and tagging areas at construction sites. ♦ Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites. ♦ Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
Enhance Control Measures: The following measures should be implemented at construction sites greater than four acres in area.	♦ All "Basic" control measures listed above. ♦ Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more). ♦ Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.) ♦ Limit traffic speeds on unpaved roads to 15 mph. ♦ Install sandbags or other erosion control measures to prevent silt runoff to public roadways. ♦ Replant vegetation in disturbed areas as quickly as possible.
Optional Control Measures: The following control measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors or which for any other reason may warrant additional emissions reductions.	♦ Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site. ♦ Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction sites. ♦ Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph. ♦ Limit the area subject to excavation, grading and other construction activity at any one time.

TABLE 11 -- CLEAN AIR PLAN TCMS TO BE IMPLEMENTED BY LOCAL GOVERNMENT

Transportation Control Measure	Description
1. Support Voluntary Employer Based Trip Reduction Programs	♦ Provide assistance to regional and local ridesharing organizations; advocate legislation to maintain and expand incentives (e.g., tax deductions/credits).
9. Improve Bicycle Access and Facilities	♦ Improve and expand bicycle land system by providing bicycle access in plans for all new road construction or modification. ♦ Establish and maintain bicycle advisory committees in all nine Bay Area counties. ♦ Designate a staff person as a Bicycle Program Manager. ♦ Develop and implement comprehensive bicycle plans. ♦ Encourage employers and developers to provide bicycle access and facilities. ♦ Provide bicycle safety education.
12. Improve Arterial Traffic Management	♦ Study signal preemption for buses on arterials with high volume of bus traffic. ♦ Improve arterials for bus operations and to encourage bicycling and walking. ♦ Continue and expand local signal timing programs, only where air quality benefits can be demonstrated.
15. Local Clean Air Plans, Policies and Programs	♦ Incorporate air quality beneficial policies and programs into local planning and development activities, with a particular focus on subdivision, zoning and site design measures that reduce the number and length of single-occupant automobile trips.
17. Conduct Demonstration Projects	♦ Promote demonstration projects to develop new strategies to reduce motor vehicle emissions. Projects include: low emission vehicle fleets and LEV refueling infrastructure.
19. Pedestrian Travel	♦ Review/revise general/specific plan policies to promote development patterns that encourage walking and circulation policies that emphasize pedestrian travel and modify zoning ordinances to include pedestrian-friendly design standards. ♦ Include pedestrian improvements in capital improvement programs. ♦ Designate a staff person as a Pedestrian Program Manager.
20. Promote Traffic Calming Measures	♦ Include traffic calming strategies in the transportation and land use elements of general and specific plans. ♦ Include traffic calming strategies in capital improvement programs.

- The County should support and implement transportation control measures (TCMs) contained in the latest Clean Air Plan. A list of the most recent TCMs that rely on implementation by local jurisdictions is provided in Table 11.

- Encourage land use planning that would result in less air pollutant emissions from vehicle travel. Land use planning features could include: (1) Promoting a mix of land uses that locate neighborhood services within walking distances of residences, (2) providing or funding pedestrian, bicycle, and transit oriented improvements, (3) promote residential infill in areas served by public transit and commercial services, (4) establish appropriate buffer zones, and (5) adopt parking strategies and other transportation demand management measures to reduce vehicle travel and congestion on major roadways. More information is available from the BAAQMD and ABAG: *Improving Air Quality through Local Plans and Programs - A Guidebook for City and County Governments,* April 1994.

- The County may want to consider adoption of a Model Wood smoke Ordinance. In 1998, the BAAQMD approved a model wood smoke ordinance for local governments. This guidance document assists local governments in reducing PM-I0. In some Bay Area locations, up to 40 percent of PM-l0 concentrations originates from wood smoke. If adopted, the ordinance would limit the installation of wood burning appliances in new homes, or renovations of existing homes that involve a fireplace, to pellet stoves, EP A-certified woodstoves or fireplace inserts, or natural-gas fireplaces. These cleaner burning alternatives reduce wood smoke by 75 to 99 percent over a traditional fireplace. The model ordinance is available at the BAAQMD website: http://www.baaqmd.gov/pio/wood_burning/ordinance_background.htm

- The County may want to consider existing and future ways to assist the BAAQMD with the *Spare the Air* programs. These programs are designed to reduce air pollutant emissions on days that meteorological conditions are conducive to elevated air pollution levels. More information on this program is available at http://www.sparetheair.org/.

VII. FINDINGS

The following summarizes the air quality issues in Marin County:

- In general, air quality in Marin County is very good. This is due to the favorable meteorological conditions and the absence of major air pollution sources. Prevailing winds are mostly from off the ocean; therefore, there are no upwind sources affecting the area.

- Ozone and PM-l 0 levels in other portions of Bay Area are exceeded on an annual basis. Sources of air pollution from Marin County can contribute to these air quality problems.

- Planning for attainment of air quality standards is difficult, but substantial reductions in air quality levels have been achieved. The carbon monoxide standard has been achieved, and for the last several years 2003-05, the national ozone standard was not violated. Attainment of the national standard is expected by 2006. Attainment of the more stringent state ozone or PM-l0

standard cannot be predicted at this time.

- Toxic air contaminants present a health risk to persons in urban areas of Marin County and the Bay Area. This risk has decreased considerably in recent years. About 70 percent of the current risk is attributable to diesel particulate matter. The CARB is currently studying and adopting measures to substantially reduce levels of diesel particulate matter.

- Sheltered valleys in Marin County are susceptible to localized build up of PM-l 0 and carbon monoxide emissions during winter. Poor dispersion characteristics of these valleys during cold periods in winter along with wood burning activities and vehicle use could lead to localized exceedances of air quality standards. The BAAQMD does not measure pollutant concentrations in these more-rural locations.

- Local communities, through the planning process (e.g., Marin Countywide Plan), play an important role in reducing air pollution. Land use planning strategies, traffic and circulation strategies and implementation of transportation control measures are important elements of the BAAQMD's plan to attain and maintain air quality standards.

- Population and vehicle use projections made in General Plans must be accurate. Planning inventories for air quality plans are based on these projections. The BAAQMD obtains these projections from the Association of Bay Area Governments (ABAG) and the Metropolitan Planning Commission (MTC). These agencies use data obtained from local jurisdictions.

VIII. REFERENCES

A. PEOPLE RESPONSIBLE FOR REPORT PREPARATION

Marin County Community Development Agency
Michele Rodriguez, Principal Planner, AICP

Illingworth & Rodkin, Inc., Acoustics and Air Quality
James A. Reyff
Nichols•Berman
Bob Berman

B. PERSONS AND ORGANIZATIONS CONSULTED

Bay Area Air Quality Management District
Henry Hilken, Senior Environmental Planner

C. BIBLIOGRAPHY

Association of Bay Area Governments and Bay Area Air Quality Management District. *Bay Area Air Pollution Summaries 2001-2002 (Table 3)*

Association of Bay Area Governments and Bay Area Air Quality Management District. Improving Air Quality through Local Plans and Programs - *A Guidebook for City and County Governments. April 1994.*

Association of Bay Area Governments and Bay Area Air Quality Management District. *Design Strategies for Encouraging Alternatives to Auto Use through Local Development Review.* April 1994.

Bay Area Air Quality Management District. *BAAQMD CEQA Guidelines -Assessing the Air Quality Impacts of Projects and Plans.* April 1996, revised December 1999.

Bay Area Air Quality Management District. *Bay Area 2000 Clean Air Plan.* Adopted by Board of Directors December 20, 2000.

Bay Area Air Quality Management District. *Toxic Contaminant Control Program -Annual Report* 1999. *Volume I and II. 2000.*

Bay Area Air Quality Management District.

California Air Resources Board. *2001 Almanac of Emissions and Air Quality.* June 2001.

California Air Resources Board *Fact Sheet - California's Plan to Reduce Diesel Particulate Matter Emissions.* October 2000.

California Air Resources Board. http://www.arb.ca.gov/aqd/aqd.htm *Air Quality Data 1995-2000.*

California Air Resources Board *Air Quality and Land Use Handbook.* April 2005.

U.S. Department of Transportation, Federal Aviation Administration. *Consideration of Air Quality Impacts By Airplane Operations at or Above 3000 Feet AGL.* F AA-AEE-OO-01. September 2000.