4.6 Air Quality

This section addresses potential air quality impacts of the proposed General Plan Update under year 2030 conditions and buildout of the Planning Area (post-2030 conditions). This section also identifies anticipated greenhouse gas emissions and associated effects of climate change.

4.6.1 EXISTING SETTING

AIR BASIN CHARACTERISTICS

The City of Madera is located in the central portion of the San Joaquin Valley Air Basin (SJVAB), whose geographic boundary is defined by the Sierra Nevada in the east, the Coast Ranges in the west, and the Tehachapi mountains in the south. The SJVAB has an "inland Mediterranean" climate, averaging over 260 sunny days per year. The valley floor is characterized by warm, dry summers and cooler winters. Summer highs often exceed 100 °F, averaging in the low 90s in the northern valley and high 90s in the south. In the entire San Joaquin Valley (SJV), high daily temperature readings in summer average 95 °F. Over the last 30 years, the SJV averaged 106 days a year 90 °F or hotter, and 40 days a year 100 °F or hotter. The daily summer temperature variation can be as high as 30 °F.

In winter, as the cyclonic storm track moves southward, the storm systems moving in from the Pacific Ocean bring a decidedly maritime influence to the SJV. The high mountains to the east prevent the cold, continental air masses of the interior from influencing the valley. Thus, winters are mild and humid. Temperatures below freezing are unusual. Average high temperatures in the winter are in the 50s, but highs in the 30s and 40s can occur on days with persistent fog and low cloudiness. The average daily low temperature is 45 °F.

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

Temperature and solar radiation are particularly important in the chemistry of ozone formation. Ozone is formed in a photochemical reaction requiring sunlight. Generally, the higher the temperature, the more ozone formed, since reaction rates increase with temperature. However, extremely hot temperatures can "lift" or "break" the inversion layer. Typically, if the inversion layer doesn't lift to allow the build up of contaminants to be dispersed into the Southeast Desert, the ozone levels will peak in the late afternoon, sometimes as late as 3 to 7 p.m. If the inversion layer breaks and the resultant afternoon winds occur, the ozone will peak in the early afternoon and decrease in the late afternoon as the contaminants are transported to the Southeast Desert.

AIR POLLUTANTS OF CONCERN AND HEALTH EFFECTS

Ambient air quality in the City of Madera is similar to that of the larger San Joaquin Valley Air Basin. Because of the unique geography and meteorology of the San Joaquin Valley, the City has air pollution issues for several pollutants that the federal government regulates. In particular, there are six pollutants with health-based standards that identify pollutant levels of air quality for that are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect public health and welfare. These six "criteria pollutants" include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter 10 microns in size and smaller (PM_{10}), and lead.

Ozone

Ground level ozone, commonly referred to as smog, is greatest on warm, windless, sunny days. Ozone is not emitted directly into the air from point sources (e.g., mobile or stationary); rather, they are formed through a complex series of chemical reactions between reactive organic gases (ROG) and nitrogen oxides (NOx). These reactions occur over time in the presence of sunlight.

Ozone is a public health concern because it is a respiratory irritant that increases susceptibility to respiratory infections and diseases, and because it can harm lung tissue at high concentrations. In addition, ozone can cause substantial damage to leaf tissues of crops and natural vegetation, and can damage many natural and manmade materials by acting as a chemical oxidizing agent.

The principal sources of the ozone precursors (ROG and NOx) are the combustion of fuels and the evaporation of solvents, paints, and fuels.

Particulate Matter (PM)

Particulate matter can be divided into several size fractions. Coarse particles are between 2.5 and 10 microns in diameter, and arise primarily from natural processes, such as wind-blown dust or soil. Fine particles are less than 2.5 microns in diameter and are produced mostly from combustion, or burning activities. Fuel burned in cars and trucks, power plants, factories, fireplaces and wood stoves produces fine particles.

The level of fine particulate matter in the air is a public health concern because it can bypass the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs. The health effects vary depending on a variety of factors, including the type and size of particles. Research has demonstrated a correlation between high PM concentrations and increased mortality rates. Elevated PM concentrations can also aggravate chronic respiratory illnesses such as bronchitis and asthma.

Carbon Monoxide (CO)

Carbon monoxide (CO) is an odorless, colorless gas that is formed by the incomplete combustion of fuels. Motor vehicle emissions are the dominant source of CO in the Madera area. At high concentrations, CO reduces the oxygen-carrying capacity of the blood and can cause dizziness, headaches, unconsciousness, and even death. CO can also aggravate cardiovascular disease. Relatively low concentrations of CO can significantly affect the amount of oxygen in the bloodstream because CO binds to hemoglobin 220–245 times more strongly than oxygen.

CO emissions and ambient concentrations have decreased significantly in recent years. These improvements are due largely to the introduction of cleaner burning motor vehicles and motor vehicle fuels. The San Joaquin Valley area has attained the state and national CO standard. CO is still a pollutant that must be closely monitored, however, due to its severe effect on human health.

Nitrogen Oxides

Nitrogen oxides (NO_x) refer to a family of nitrogen-based compounds, including nitric oxide, nitrogen dioxide (NO_2), and other oxides of nitrogen. NO oxides are produced from burning

fuels, including gasoline, diesel, and coal. Nitrogen oxides react with volatile organic compounds to form ozone. Nitrogen oxides are also major components of acid rain.

Sulfur Oxides

Sulfur oxides (SOx) are composed mainly of sulfur dioxide (SO_2) and sulfates. Sulfur oxides are pungent, colorless gases (sulfates are solids) formed primarily by combustion of sulfur-containing fossil fuels, especially coal and oil. Some industrial processes, such as production of paper and smelting of metals, produce sulfur dioxide. Sulfur dioxide is closely related to sulfuric acid and plays an important role in the production of acid rain.

In addition to the criteria pollutants discussed above, there are other pollutants for which there are no explicit criteria that are often air pollution issues of concern for communities. These include toxic air contaminants, odors, and wood smoke, which can produce localized health risks or nuisances for sensitive nearby land uses, also known as "sensitive receptors."

Sensitive receptors include facilities that house or attract children, the elderly, and people with illnesses or others who are especially sensitive to the effects of air pollutants. Hospitals, schools, convalescent facilities, and residential areas are examples of sensitive receptors. The proximity of sensitive receptors to existing or potential sources of localized air pollution can result in land use conflicts that expose people to unhealthful air quality.

Lead (Pb)

Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Lead was used until recently to increase the octane rating in auto fuel. Since gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels and the use of leaded fuel has been mostly phased out, the ambient concentrations of lead have dropped dramatically. In fact, the SJVUAPCD no longer monitors lead in the ambient air of the SJVAB.

TOXIC AIR CONTAMINANTS (TACS)

In addition to the criteria pollutants discussed above, toxic air contaminants (TACs) are another group of pollutants of concern. Unlike criteria pollutants, no safe levels of exposure to TACs have been established. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure. Two types of risk are usually assessed: chronic non-cancer risk and acute non-cancer risk. There are many different types of TACs, with varying degrees of toxicity.

Sources of TACs include industrial processes such as petroleum refining and chrome plating operations, commercial operations, such as gasoline stations and dry cleaners, and motor vehicle exhaust. Public exposure to TACs can result from emissions from normal operations, as well as accidental releases of hazardous materials during upset conditions. The health effects of TACs include cancer, birth defects, neurological damage and death.

It is important to understand that TACs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, EPA and ARB regulate Hazardous Air Pollutants (HAPs) and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology (MACT and BACT) to limit emissions. These, in conjunction with additional rules set forth by SJVUAPCD, establish the regulatory framework for TACs.

Based on data from the Air Toxics "Hot Spots" Information and Assessment Act, there are numerous stationary sources in the Planning Area that have the potential to emit TACs, as illustrated in **Table 4.6-1**.

TABLE 4.6-1
FACILITY EMISSIONS AND TOXIC PLUS RISK DATA FOR MADERA

Facility ID	Facility Name	TOG (tons/year)	ROG (tons/year)	CO (tons/year)	NOx (tons/year)	SOx (tons/year)	Total PM (tons/year)	PM_{10} (tons/year)
2496	28th Aero Squadron Industrial	-	0	0	0.1	0	0	0
936	Armstrong Petroleum Corporation	0	0	0	0	0	0	0
73	Baltimore Aircoil Of Cal		0	0	0.9	0	0.3	0.3
2498	Bullet Fiberglass	0.1	0.1	0	0	0	0	0
1353	C W Us Inc dba Paul Masson Cellars	28.8	28.8	0.3	0.4	0	0.1	0.1
628	Canandaigua West, Inc	38.5	37.8	0.4	0.3	0.3	1.1	1
4110	Carl's Jr.	-	0	0	0.1	0	0.2	0
4111	Carl's Jr.	-	0	0	0.1	0	0.2	0
5222	Cellco Partnership, Dba Verizon Wireless	-	0	0	0	0	0	0
29	Cemex Construction Materials L P	0	0	0	0	0	6.6	6

Source: Air Resources Board, 2008.
http://www.arb.ca.gov/app/emsinv/facinfo/facinfo.php?dd=y

Diesel exhaust is a TAC of growing concern in California. In 1998, ARB identified diesel engine particulate matter as a TAC. The exhaust from diesel engines contains hundreds of different gaseous and particulate components, many of which are toxic, but are not considered to have acute non-cancer risks.

Mobile sources, such as trucks, buses, automobiles, trains, ships and farm equipment are by far the largest source of diesel emissions. Studies show that diesel particulate matter concentrations are much higher near heavily traveled highways and intersections. Land uses where individuals could be exposed to high levels of diesel exhaust include:

- Warehouses
- Schools with high volume of bus traffic
- High volume highways
- High volume arterials and local roadways with high level of diesel traffic.

The state has begun a program of identifying and reducing risks associated with particulate matter emissions from diesel-fueled vehicles. In September 2000, the Air Resources Board approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled engines and vehicles. The goal of the Plan is to reduce diesel PM emissions and the associated health risk by 75 percent in 2010 and 85 percent by 2020. The Plan consists of new regulatory standards for all new on road, off-road and stationary diesel-fueled engines and vehicles, new retrofit requirements for existing on-road, off-road and stationary diesel-fueled engines and vehicles, and new diesel fuel regulations to reduce the sulfur content of diesel fuel as required by advanced diesel emission control systems.

ODORS

Odors are typically regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word "strong" to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; in fact, an odor that is offensive to one person (e.g., from a fast-food restaurant) may be perfectly acceptable to another. It is also important to note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

PESTICIDES

Most pesticides are designed to harm or kill pests, and because some pests have systems similar to the human system, some pesticides also can harm or kill humans (EPA, 2009). The hazards associated with pesticides depend on the toxicity of the pesticide and the exposure a human will receive in any situation.

The effects, or symptoms, of pesticide poisoning can be defined as either topical or systemic. Topical effects generally develop at the site of pesticide contact and are a result of either the pesticide's irritant properties or an allergic response by the victim. Dermatitis, or inflammation of the skin, is the most commonly reported topical effect associated with pesticide exposure. Symptoms of dermatitis range from reddening of the skin to rashes and/or blisters. Other symptoms include coughing, wheezing and sneezing when exposed to pesticide sprays (Penn State, 2007).

Systemic effects often occur away from the original point of contact as a result of the pesticide being absorbed into and distributed throughout the body. Systemic effects often include nausea, vomiting, fatigue, headache, and intestinal disorders. In advanced poisoning cases, the individual may experience changes in heart rate, difficulty breathing, convulsions, and coma, which could lead to death (Penn State, 2007).

Common locations for pesticide use are agricultural land uses, where they are often used to prevent insect damage to crops. Because of this, the proximity of sensitive receptors to agricultural land uses could expose people to the hazards listed above.

WOOD SMOKE

Wood smoke has long been identified as a significant source of pollutants in urban and suburban areas. Wood smoke contributes to particulate matter and carbon monoxide concentrations, reduces visibility and contains numerous toxic air contaminants. Present controls on this source include the adoption of emission standards for wood stoves and fireplace inserts. Interest in wood smoke is likely to increase with the recent adoption of a $PM_{2.5}$ (particulate matter less than 2.5 microns in diameter) national standard.

AMBIENT AIR QUALITY STANDARDS

Both the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (ARB) have established ambient air quality standards for common pollutants. The national ambient air quality standards ("NAAQS", or "federal standards") and California ambient air quality standards ("CAAQS", or "state standards") for important pollutants are summarized in **Table 4.6-2**. These ambient air quality standards are levels of contaminants that represent levels that protect public health and welfare, and avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. EPA and ARB have focused on the following air pollutants as indicators of ambient air quality: ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter (PM), and lead. The federal and state ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health related effects. As a result, the federal and state standards differ in some cases. In general, the California standards are more stringent. This is particularly true for ozone and PM_{10}.

A geographical area identified to have air quality as good as, or better than, the national or California ambient air quality standard is referred to as being in attainment of these standards. An area may be an attainment area for one pollutant and a nonattainment area for others

The federal standard for ozone ground-level ozone is 0.075 ppm, measured over an 8-hour averaging period. This standard replaces the previous 1-hour ozone standard that U.S. EPA had enforced for decades. National standards for fine particulate matter (diameter 2.5 microns or less) have also been established for 24-hour and annual averaging periods. The current PM_{10} standards were retained, but the method and form for determining compliance with the standards were revised. Implementation of the new ozone and particulate matter standards was delayed by a lawsuit. On February 27, 2001 the U.S. Supreme Court unanimously ruled in favor of the U.S. EPA, clearing the way for implementation of the new standards.

ARB has developed recommended designations for California air basins, designating the San Joaquin Valley as non-attainment for the new 8-hour ozone standard. On April 28, 2005, the ARB approved the 8-hour average standard at 0.070 ppm.

TABLE 4.6-2
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards [a, c]	National Standards [b, c]	
			Primary [d]	Secondary [e]
Ozone (O_3)	1-hour	0.09 ppm (180 µg/m^3)	--	Same as Primary
	8-hour	0.070 ppm (137 µg/m^3)	0.08 ppm[g]	
Particulate Matter (PM_{10})	AAM	20 µg/m^3	(Revoked)[f]	
	24-hour	50 µg/m^3	150 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$)	AAM	12 µg/m^3	15 µg/m^3	
	24-hour	No Separate Standard	35 µg/m^3 [f]	
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	None
	8-hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	
	8-hour (Lake Tahoe)	6 ppm (7 mg/m^3)	–	
Nitrogen Dioxide (NO_2)	AAM	–	0.053 ppm (100 µg/m^3)	Same as Primary
	1-hour	0.25 ppm (470 µg/m^3)	–	
Sulfur Dioxide (SO_2)	AAM	–	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)	–	–
Lead	Rolling 3-Month Average	–	0.15 µg/m^3	Same as Primary
	30-day Average	1.5 µg/m^3	–	–
	Quarterly Average	–	1.5 µg/m^3	Same as Primary
Sulfates	24-hour	25 µg/m^3	No Federal Standards	
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)		
Vinyl Chloride	24-hour	0.01 ppm (26 µg/m^3)		

Pollutant	Averaging Time	California Standards [a, c]	National Standards [b, c]	
			Primary [d]	Secondary [e]
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer —visibility of 10 miles or more (0.07—30 miles or more for Lake Tahoe) due to particles when the relative humidity is less than 70%.		

a California standards for O3, CO (except Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, PM (PM_{10} and $PM_{2.5}$), and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded.

b National standards (other than O3, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The O3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of daily concentrations, average over three years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25EC and a reference pressure of 760 torr.

d The levels of air quality necessary to protect the public health.

e The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

f Based on revised particulate standards adopted by the US EPA on September 21, 2006. Due to lack of evidence linking health problems to long-term exposure to coarse particulate pollution, the US EPA has revoked the annual PM_{10}.

g The federal primary ozone standard, as averaged over an 8-hour period, was revised in 2008 to 0.075 ppm.

AAM = Annual Arithmetic Mean

Source: ARB 2008a; US EPA 2008a.

AMBIENT AIR QUALITY

The ARB maintains several air quality monitoring sites in and around Madera. The three years of data provided in **Table 4.6-3** show the number of days standards were exceeded for each year, as well as the concentration of pollutants in the given area. The nearest air quality monitoring site in relation to the project for Ozone and Nitrogen Dioxide is the Madera Pump monitoring station. The Fresno Clovis N. Villa monitoring station is the nearest for Inhalable Particulates (PM_{10}), and Ultra-Fine Particulates ($PM_{2.5}$). For 8 hour Carbon Monoxide, the nearest air monitoring station is Fresno Sierra Skypark #2. The nearest station for Sulfur Dioxide is the Fresno 1st Street monitoring station, although it should be noted that only 2007 data is available, and the number of total days exceeding California standards is not available. Data for the study years is not available for 1 hour CO, or 2005-2006 SO_2.

TABLE 4.6-3
AIR MONITORING STATION ANNUAL SUMMARY

Pollutant/Standard	2006	2007	2008
O_3 (8-hour) [A]			
Maximum Concentration (ppm)	0.095	0.083	0.107
Days > CAAQS (0.070 ppm)	35	12	46
Days > NAAQS (0.08 ppm)	15	5	24
$PM_{2.5}$ (24-hour) [B]			
Maximum Concentration ($\mu g/m^3$)	65.8	64.7	49.7
Days > NAAQS (65 $\mu g/m^3$)	28	51.5	N/A
PM_{10} (24-hour) [B]			
Maximum Concentration ($\mu g/m^3$)	106.0	116.0	80.5
Days > CAAQS (50 $\mu\mu g/m^3$)	12	8	13
Days > NAAQS (150 $\mu g/m^3$)	0	0	0
CO (8-hour) [C]			
Maximum Concentration (ppm)	2.08	1.39	1.03
Days > CAAQS (9.0 ppm)	0	0	0
Days > NAAQS (9.0 ppm)	0	0	0
CO (1-hour)			
Maximum Concentration (ppm)	N/A	N/A	N/A
Days > CAAQS (20 ppm)	N/A	N/A	N/A
Days > NAAQS (35 ppm)	N/A	N/A	N/A
SO_2 (24-hour) [D]			
Maximum Concentration (ppm)	N/A	0.067	0.030
Days > CAAQS (0.04 ppm)	N/A	N/A	N/A
Days > NAAQS (0.14 ppm)	N/A	N/A	N/A
NO_2 (1-hour) [A]			
Maximum Concentration (ppm)	0.051	0.047	0.053
Days > CAAQS (0.25 ppm)	0	0	0

Source: California Air Resources Board website, http://www.arb.ca.gov/adam/cgi-bin/db2www/adamtop4b.d2w/Branch. Accessed February 25, 2008.

[A] Data taken from the Madera Pump Air Monitoring Station.

[B] Data taken from the Fresno Clovis N. Villa Monitoring Station.

[C] Data was taken from the Fresno Sierra Skypark #2 Monitoring Station.

[D] Data taken form the Fresno 1st Street Monitoring Station.

As shown in **Table 4.6-3**, the following criteria pollutants have exceeded state or federal standards between the years 2006-2008: PM_{10}, $PM_{2.5}$, 8 hour O_3 and 1 hour O_3.

Based on these monitoring data, **Table 4.6-4** shows the Federal and State attainment status for the San Joaquin Valley Air Basin. The region is non-attainment for federal ozone and $PM_{2.5}$ standards.

TABLE 4.6-4
FEDERAL AND STATE ATTAINMENT STATUS FOR MADERA

Pollutants	Federal Classification	State Classification
Ozone	Non-attainment	Non-attainment
$PM_{2.5}$	Non-attainment	Non-attainment
PM_{10}	Attainment	Non-attainment
CO	Unclassified/Attainment	Unclassified
NO_2	Unclassified/Attainment	Attainment
SO_2	Unclassified	Attainment

Source: California Air Resources Board, http://www.arb.ca.gov/desig/adm/adm.htm, accessed February 25, 2009.

CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; $PM_{2.5}$ = particulate matter less than 2.5 micrograms in diameter PM_{10} = particulate matter less than 10 micrograms in diameter.

4.6.2 REGULATORY FRAMEWORK

Air quality in the Basin is regulated through the efforts of federal, State, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulations, planning, policy-making, education, and a variety of programs. The agencies primarily responsible for improving the air quality in Madera are discussed below, along with their individual responsibilities.

FEDERAL

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) is responsible for enforcing the Federal Clean Air Act and the 1990 amendments to it ("Federal CAA"), and the national ambient air quality standards (federal standards) that the EPA establishes. These standards identify levels of air quality for six "criteria" pollutants, which are considered the maximum levels of ambient (background) air pollutants considered safe, with an adequate margin of safety, to protect public health and welfare. The U.S. EPA also has regulatory and enforcement jurisdiction over emission sources beyond state waters (outer continental shelf), and sources that are under the exclusive authority of the federal government, such as aircraft, locomotives, and interstate trucking.

Federal Hazardous Air Pollutant Program

Title III of the CAA requires EPA to promulgate national emissions standards for HAPs (NESHAP). The NESHAP may differ for major sources than for area sources of HAPs (major sources are defined as stationary sources with potential to emit more than 10 tons per year [TPY] of any HAP or more than 25 TPY of any combination of HAPs; all other sources are considered area sources).

The emissions standards are to be promulgated in two phases. In the first phase (1992–2000), EPA developed technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring MACT. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), EPA was required to promulgate health risk–based emissions standards where deemed necessary to address risks remaining after implementation of the technology based NESHAP standards.

The CAAA required EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1, 3-butadiene. In addition, Section 219 required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions.

STATE

California Air Resources Board

The California Air Resources Board, a department of the California Environmental Protection Agency (Cal EPA), oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1989 amendments to the California Clean Air Act (CCAA), responding to the federal CAA requirements, and for regulating emissions from motor vehicles and consumer products within the State. ARB has established emission standards for vehicles sold in California and for various types of equipment available commercially. It also sets fuel specifications to further reduce vehicular emissions.

The amendments to the CCAA establish ambient air quality standards for the State (state standards) and a legal mandate to achieve these standards by the earliest practical date. These standards apply to the same six criteria pollutants as the Federal CAA, and also include sulfate, visibility, hydrogen sulfide, and vinyl chloride. They are more stringent than the federal standards and, in the case of PM_{10} and SO_2, far more stringent.

Tanner Air Toxics Act

California regulates TACs primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for ARB to designate substances as TACs. This includes research, public participation, and scientific peer review before ARB can designate a substance as a TAC. To date, ARB has identified more than 21 TACs and has adopted EPA's list of HAPs as TACs. Most recently, diesel PM was added to the ARB list of TACs.

Once a TAC is identified, ARB then adopts an Airborne Toxics Control Measure (ATCM) for sources that emit that particular TAC. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate BACT to minimize emissions.

The AB 2588 requires that existing facilities that emit toxic substances above a specified level prepare a toxic-emission inventory, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures. ARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses and off-road diesel equipment (e.g.,

tractors, generators). In February 2000, ARB adopted a new public-transit bus-fleet rule and emission standards for new urban buses. These rules and standards provide for (1) more stringent emission standards for some new urban bus engines, beginning with 2002 model year engines; (2) zero-emission bus demonstration and purchase requirements applicable to transit agencies; and (3) reporting requirements under which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Current and upcoming milestones include the low-sulfur diesel-fuel requirement, and tighter emission standards for heavy-duty diesel trucks and off-road diesel equipment (2011) nationwide.

Air Quality and Land Use Handbook

As part of its Community Health Program, ARB has developed an Air Quality and Land Use Handbook, which is intended to serve as a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process. ARB is also developing related information and technical evaluation tools for addressing cumulative air pollution impacts in a community. Any recommendations or considerations contained in the Handbook are voluntary and do not constitute a requirement or mandate for either land use agencies or local air districts.

The primary goal in developing this document was to provide information that will help keep California's children and other vulnerable populations out of harm's way with respect to nearby sources of air pollution. Recent air pollution studies have shown an association between respiratory and other non-cancer health effects and proximity to high traffic roadways. Other studies have shown that diesel exhaust and other cancer-causing chemicals emitted from cars and trucks are responsible for much of the overall cancer risk from airborne toxics in California.

ARB community health risk assessments and regulatory programs have produced important air quality information about certain types of facilities that should be considered when siting new residences, schools, day care centers, playgrounds, and medical facilities (i.e., sensitive land uses). Sensitive land uses deserve special attention because children, pregnant women, the elderly, and those with existing health problems are especially vulnerable to the non-cancer effects of air pollution. There is also substantial evidence that children are more sensitive to cancer-causing chemicals.

The Handbook identifies ARB's recommendations regarding the siting of new sensitive land uses near freeways, distribution centers, rail yards, ports, refineries, chrome plating facilities, dry cleaners, and gasoline dispensing facilities. This list consists of the air pollution sources that have been evaluated from the standpoint of the proximity issue. It is based on available information and reflects ARB's primary areas of jurisdiction – mobile sources and toxic air contaminants.

AB 170

AB (Assembly Bill) 170, which created Government Code Section 65302.1, requires cities and counties in the San Joaquin Valley to amend appropriate elements of their general plans to include data, analysis, comprehensive goals, policies, and feasible implementation strategies to improve air quality. Specifically, the bill recommends that the following be included in the general plan:

(A) Determine and mitigate project level and cumulative air quality impacts under the California Environmental Quality Act (CEQA) (Division 13 (commencing with Section 21000) of the Public Resources Code).

(B) Integrate land use plans, transportation plans, and air quality plans.

(C) Plan land uses in ways that support a multimodal transportation system.

(D) Local action to support programs that reduce congestion and vehicle trips.

(E) Plan land uses to minimize exposure to toxic air pollutant emissions from industrial and other sources.

(F) Reduce particulate matter emissions from sources under local jurisdictions.

(G) Support district and public utility programs to reduce emissions from energy consumption and area sources.

Based upon the schedule outlined in the bill, jurisdictions in Fresno and Kern counties are required to comply with this requirement by June 30, 2009. Jurisdictions in Stanislaus, San Joaquin, Merced, Kings, Tulare, and Madera counties are required to comply by June 30, 2010.

REGIONAL AND LOCAL

San Joaquin Valley Unified Air Pollution Control District

Air Quality Plans

The SJVUAPCD has adopted several attainment plans to achieve State and federal air quality standards to comply with the CCAA and Federal CAA. The SJVUAPCD must continuously monitor its progress in implementing attainment plans and must periodically report to the ARB and the EPA. It must also periodically revise its attainment plans to reflect new conditions and requirements in accordance with schedules mandated by the CCAA and Federal CAA. Following are descriptions and the current status of the District's various air quality attainment plans.

Ozone Plans

Federal 1-Hour Ozone: 2004 Extreme Ozone Attainment Demonstration Plan

After passage of the Federal CAA, the SJVAB was classified "serious" nonattainment for the federal 1-hour ozone standard. Accordingly, the district prepared and submitted the *1994 Ozone Attainment Demonstration Plan* which projected attainment of the federal ozone standard by 1999. This goal was not achieved by the deadline and the SJVAB was reclassified from "serious" to "severe" nonattainment with a new attainment deadline of November 15, 2005. The district began preparing a Severe Ozone Attainment Demonstration Plan in 2001 and determined that attainment could not be achieved by the 2005 deadline. The district requested reclassification from 'severe" to "extreme" nonattainment with a new attainment deadline of November 15, 2010. ARB approved and submitted to EPA the district's 2004 Extreme Ozone Attainment Demonstration Plan for approval in November 2004.

The U.S. EPA has since revoked in full the federal 1-hour ozone ambient air quality standard, including associated designations and classifications, in all areas except 14 early action compact areas that do not include the SJVAB. As such, transportation conformity and de minimis thresholds for 1-hour ozone no longer apply, contingency measures are not needed, and EPA will not make a finding of a failure to attain. However, other requirements still apply,

including anti-backsliding provisions, rate of progress reductions, reasonably available control technologies (RACT), and black box measures (provisions of an Extreme Area's implementation plan that anticipate development of new control techniques of improvement of existing control technologies) (SJVUAPCD, 2008).

State 1-Hour Ozone

In accordance with the CCAA, the District prepared the Air Quality Attainment Plan in 1991 which was subsequently approved by ARB in 1992. California Health and Safety Code requires that a report be prepared every three years that summarizes the progress made by the District in meeting the schedules for developing, adopting and implementing the air pollution control measures contained in the District's plan. The District's most recent progress report, the California Clean Air Act Triennial Progress Report and Plan Revision, 1997-1999 was prepared and submitted to ARB in March 2001(SJVUAPCD, 2008).

Federal 8-Hour Ozone: 2007 Ozone Plan

The SJVAB was classified as "serious" nonattainment for the federal 8-hour ozone standard on April 15, 2004 and was given an attainment deadline of June 15, 2013. The District approved the 2007 Ozone Plan on April 30, 2007 and submitted it, on schedule, to the U.S. EPA on June 15, 2007. The plan was adopted in December 2008 (SJVUAPCD, 2008).

Carbon Monoxide Plan

The 1992 Federal Attainment Plan for Carbon Monoxide established the regulatory groundwork in order to bring the SJVAB into compliance with the NAAQS for carbon monoxide. The Final Carbon Monoxide Redesignation Request and Maintenance Plan for Ten Federal Planning Areas (April 1996) demonstrated that the SJVAB was in compliance with the NAAQS for carbon monoxide and requested redesignation to attainment status. This plan was approved by the U.S. EPA on June 1, 1998. The SJVUAPCD revised this maintenance plan in 1998 and 2004 (SJVUAPCD, 2008).

PM_{10} and $PM_{2.5}$ Plans

PM_{10}

After passage of the Federal CAA, the SJVAB was classified nonattainment for PM_{10} and was required to adopt a PM_{10} plan by November 15, 1991. The District submitted a plan but was unable to demonstrate attainment by the deadline of December 31, 1994. This resulted in reclassification to "serious" nonattainment with a new attainment deadline of December 31, 2001. On May 15, 1997, the District submitted a PM_{10} Attainment Demonstration Plan; however, the EPA indicated that it intended to disapprove the plan and the District withdrew. EPA approved the 2003 PM_{10} Plan on May 26, 2004 and approved the 2005 Amendments to the 2003 PM_{10} Plan on May 19, 2005. The District's most recent PM_{10} plan is the 2006 PM_{10} Plan. This plan sets forth the approach the SJVUAPCD will use to attain the NAAQS for PM_{10} (SJVUAPCD, 2008).

$PM_{2.5}$

The U.S. EPA adopted the first NAAQS for $PM_{2.5}$ in 1997 and classified the SJVAB as nonattainment. The District prepared and adopted the 2008 $PM_{2.5}$ Plan in April 2008 which plans for attainment of the 1997 federal standards, the 2006 federal standards, and the state standard as soon as possible (SJVUAPCD, 2008).

Prevention of Significant Deterioration Consideration

Under federal regulations, areas designated as Class I airsheds are considered pristine, and require specific standards, such as Prevention of Significant Deterioration (PSD) requirements (SJVUAPCD 2002). Within the San Joaquin Valley Air Pollution Control District (SJVUAPCD), the Kings Canyon and Sequoia National Parks and Ansel Adams, Kaiser, John Muir, and Domeland Wilderness Areas are Class I areas. None of these Class I airsheds is within the vicinity of the City of Madera, as the nearest Class I airshed is the Kaiser Wilderness Area, approximately 60 miles away.

Rules and Regulations

There are several rules and regulations administered by the SJVUAPCD that would generally apply to the construction and operation of development projects that would be permitted under the General Plan Update.

Regulation VIII – Fugitive PM_{10} Prohibitions

The SJVUAPCD has adopted a set of PM_{10} Fugitive Dust Rules that are codified through Regulation VIII. Regulation VIII is comprised of District Rules 8011 through 8081 which are designed to reduce PM_{10} emissions (predominantly dust/dirt) generated by human activity, including construction and demolition activities, road construction, bulk materials storage, paved and unpaved roads, carryout and track out, landfill operations, etc.

Rule 4002 – National Emission Standards for Hazardous Air Pollutants

In the event that any portion of an existing building will be renovated, partially demolished or removed, the project will be subject to District Rule 4002. Prior to any demolition activity, an asbestos survey of existing structures on the project site may be required to identify the presence of any asbestos containing building material (ACBM). Any identified ACBM having the potential for disturbance must be removed by a certified asbestos contractor in accordance with CAL-OSHA requirements.

Rule 4102 – Nuisance

This rule applies to any source operation that emits or may emit air contaminants or other materials. In the event that the project or construction of the project creates a public nuisance, it could be in violation and subject to District enforcement actions.

Rule 4601 – Architectural Coatings

This rule limits volatile organic compounds from architectural coatings by specifying architectural coatings storage, clean up and labeling requirements and applies to any person who supplies, sells, offers for sale, applies, or solicits the application of any architectural coating.

Rule 4641 – Cutback, Slow Cure, and Emulsified Asphalt, Paving and Maintenance Operations

If asphalt paving will be used, then paving operations of the proposed project will be subject to Rule 4641. This rule applies to the manufacture and use of cutback asphalt, slow cure asphalt and emulsified asphalt for paving and maintenance operations.

Rule 8021 – Construction, Demolition, Excavation, and Other Earthmoving Activities

District Rule 8021 requires owners or operators of construction projects to submit a Dust Control Plan to the District if at anytime the project involves non-residential developments of five or more acres of disturbed surface area or moving, depositing, or relocating of more than 2,500 cubic yards per day of bulk materials on at least three days of the project. The proposed project will meet these criteria and will be required to submit a Dust Control Plan to the District in order to comply with this rule.

Rule 9510 Indirect Source Review

District rule 9510 Indirect Source Review (ISR) was adopted on December 15, 2005. ISR was adopted to fulfill the District's emission reduction commitments in the PM_{10} and Ozone Attainment Plans. ISR requires submittal of an Air Impact Assessment (AIA) application no later than the date on which application is made for final discretionary approval by the public agency. The AIA is used to determine the construction and operational impacts of a proposed development project. The proposed project qualifies as a development project under Rule 9510 because it contains more than 2,000 square feet of commercial space. Section 6.0 of the Rule outlines general mitigation requirements for construction equipment emissions, the rule specifies that exhaust emissions for construction equipment greater than 50 horsepower need to reduce NOx exhaust emissions by 20 percent and PM_{10} exhaust emissions by 45 percent. The alternative to achieving these onsite reductions is to pay a fee for the excess emissions of NOx and/or PM_{10}.

4.6.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

This air quality analysis uses both the State CEQA Guidelines Appendix G significance criteria and recommended significance thresholds from the SJVUAPCD.

The Air Quality Section of Appendix G of the CEQA Guidelines contains a list of effects that may be deemed potentially significant. These are:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project is non-attainment under applicable federal or state ambient air quality standards;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Create objectionable odors affecting a substantial number of people.

Furthermore, the SJVUAPCD has developed the following recommended thresholds of significance for construction and operations:

Construction

The SJVUAPCD recommends that projects should be evaluated in terms of air pollution control thresholds established by the SJVUAPCD and that any determination of significance with respect to construction emissions should be based on a consideration of the control measures to be

implemented. As development projects that are allowed due to the proposed policies of the General Plan Update are constructed, compliance with Regulation VIII and implementation of the control measures required by the SJVUAPCD under Regulation VIII will constitute sufficient mitigation to reduce PM_{10} impacts to a level considered less-than-significant (SJVUAPCD 2002).

Operational Carbon Monoxide Analysis

The General Plan Update would have a significant impact on localized CO concentrations if:

- A traffic study indicates that the Level of Service (LOS) on one or more streets or at one or more intersections will be reduced to LOS E or F; or
- A traffic study indicates that the General Plan Update will substantially worsen an already existing LOS F on one or more streets or at one or more intersections.

If either of the above criteria can be associated with any intersection affected by the project, a CO Protocol Analysis would be needed to determine significance. The SJVUAPCD has established a preliminary screening protocol that can be used to determine with fair certainty whether the proposed General Plan buildout would potentially cause a future CO exceedance of federal standards.

METHODOLOGY

This air quality analysis for the General Plan EIR is based on land use designations identified in the General Plan Land Use Element and the projected traffic. Construction-related emissions for potential future development projects were characterized using the ARB's URBEMIS 9.4.2 emissions model. Increases in long-term, regional criteria air pollutants from motor vehicles were calculated using the ARB's EMFAC 2007 emissions modeling software utilizing data from the Traffic Impact Analysis. In addition, emissions from stationary, area, and other mobile sources were calculated using technical air quality emission factors from ARB and other entities paired with activity data (e.g., household, population projections) from the General Plan update.

IMPACTS AND MITIGATION MEASURES

Contribute to an Existing Air Quality Violation or Result in a Cumulative Net Increase In Any Criteria Pollutant in Non-Attainment from Construction Emissions

Impact 4.6.1 Implementation of the General Plan Update may expose sensitive receptors to short-term particulate matter emissions resulting from construction. However, subsequent development would be subject to SJVUAPCD construction standards that address construction emissions. This would be a **less than significant** impact.

The proposed General Plan Update implementation would include new development that would allow for future construction of residential, commercial, industrial, and other projects. This will result in construction-related emissions from future projects that would generally be short-term in duration, but may still cause adverse air quality impacts. Inhalable PM_{10} is the pollutant of greatest concern associated with construction activities. PM_{10} emissions can result from construction activities facilitated by the proposed General Plan, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces.

Construction emissions of PM_{10} can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors. **Table 4.6-5** illustrates a profile of construction-related emissions from a hypothetical one-acre development site with moderate grading and construction activities. This table demonstrates that even a 43,560 square foot site can produce substantial emissions of PM_{10} and other criteria pollutants, though there can be great variability in emissions depending upon the amount of earthmoving activities that are necessary.

Despite this variability in emissions, there are a number of feasible control measures that can be reasonably implemented to significantly reduce PM_{10} emissions from construction. SJVUAPCD's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions. SJVUAPCD has identified a set of feasible PM_{10} control measures for construction activities. Implementation of the control measures required by the SJVUAPCD under Regulation VIII constitutes sufficient mitigation to reduce PM_{10} impacts during construction to a level considered **less than significant** (SJVUAPCD 2002).

TABLE 4.6-5
CONSTRUCTION EMISSIONS FROM HYPOTHETICAL ONE-ACRE CONSTRUCTION SITE (POUNDS/DAY)

	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Construction Emissions (2025)							
Fine Grading	2	11	9	0	5	1.5	2,350
Paving	1	6	7	0	0.5	0.4	1,163
Construction	1	4	5	0	0.2	0.2	1,379
Coating	7	0	0	0	0	0	8
Total	10.4	21	21	0	6	2	4,900

Source: URBEMIS 2007 v. 9.2.4 Outputs

The following mitigation measures typically used to address construction air quality impacts consistent with SJVUAPCD Rule VIII. Additional air quality mitigation measures for construction activities are listed in Tables 6-3 and 6-4 of the SJVUAPCD's Guide for Assessing and Mitigating Air Quality Impacts (GAMAQI).

- All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover.

- All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.

- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.

- With the demolition of buildings up to six stories in height, all exterior surfaces of the building shall be wetted during demolition.

- When materials are transported off-site, all material shall be covered, or effectively wetted to limit visible dust emissions, and at least six inches of freeboard space from the top of the container shall be maintained.

- All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden).

- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.

- Within urban areas, trackout shall be immediately removed when it extends 50 or more feet from the site and at the end of each workday.

- Any site with 150 or more vehicle trips per day shall prevent carryout and trackout.

Proposed General Plan Update Policies and Action Items that Provide Mitigation

The proposed General Plan Update includes the following mitigation requirements that include specific performance standards.

Policy CON-28: *The creation of dust during construction/demolition activities should be reduced to the extent feasible.*

Action Item CON-28.1: *Work with the San Joaquin Valley Air Pollution Control District to reduce particulate emissions from construction, grading, excavation, and demolition through standard and/or special conditions on these activities.*

Policy CON-28 and Action Item 28.1 specifically requires that the City work with SJVACD on reduction measures, which would include compliance with SJVUAPCD Rule VIII. Thus, this impact would be **less than significant**.

Mitigation Measures

None required

Create Objectionable Odors or Expose Sensitive Receptors to Substantial Pollutant Concentrations

Impact 4.6.2 Implementation of the General Plan Update may create objectionable odors or expose sensitive receptors to toxic air contaminants. This impact is **less than significant** given current SJVUAPCD, State and proposed General Plan Update provisions.

The SJVUAPCD's CEQA Guidelines classify several types of projects that could create objectionable odors, including: wastewater treatment plant, sanitary landfill, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing, fiberglass manufacturing, auto body shops, rendering plants, and coffee roasters. Impacts

resulting from odors can occur when sensitive receptors are located near the odor sources listed above, or vice-versa.

To avoid significant impacts, the SJVUAPCD's CEQA Guidelines require that buffer zones be established around existing and proposed land uses that would emit odors and toxic air contaminants to avoid adverse impacts and should be reflected in local plan policies. It should also be noted that stationary sources of TACs are required to obtain permitting from SJVUAPCD, which considers the health and risk associated with emissions on sensitive receptors. The largest sources of TACs in the City of Madera are shown in **Table 4.6-1**.

In addition to these sources, agricultural land also represents a potential source of toxics and odors (depending on the agricultural operation). The City's Right to Farm Ordinance (Chapter 10-3.418 of the Madera Municipal Code) protects and encourages agricultural operations in the City, as long as proper and accepted customs and standards are met. The Ordinance states that residents of property in or near agricultural districts should be prepared to accept the inconveniences and discomfort associated with normal farm activities. The policy establishes that no agricultural operation conducted in a manner consistent with proper and accepted customs and standards shall be or become a nuisance due to any changed condition after the operation has been in operation for more than one year, if it was not a nuisance at the time it began. The Ordinance also includes a provision to record a right to farm notice in conjunction with prezoning and subdivision applications for all such applications within 300 feet of agricultural lands.

Implementation of the General Plan may locate sensitive receptors near potential existing and future sources of odors or TACs. For example, in the Planning Area, there is proposed heavy industrial land use designation adjacent to schools as well as varying densities of residential development. In addition to possible processes which will emit toxics and odors, heavy industrial land uses also tend to have diesel truck traffic. In the northwest and northeast areas of the planning area, residential land uses are placed near agricultural land uses. In addition, the project proposes policies that may result in new or expanded transportation improvement projects which could generate additional sources of toxic air contaminants and odors that may affect surrounding land uses.

As previously identified above, AB 2588 requires that existing facilities that emit toxic substances above a specified level prepare a toxic-emission inventory, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures. ARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses and off-road diesel equipment (e.g., tractors, generators). In February 2000, ARB adopted a new public-transit bus-fleet rule and emission standards for new urban buses. These rules and standards provide for (1) more stringent emission standards for some new urban bus engines, beginning with 2002 model year engines; (2) zero-emission bus demonstration and purchase requirements applicable to transit agencies; and (3) reporting requirements under which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Current and upcoming milestones include the low-sulfur diesel-fuel requirement, and tighter emission standards for heavy-duty diesel trucks and off-road diesel equipment (2011) nationwide.

Implementation and enforcement of SJVUAPCD Rule 4102 for subsequent projects would ensure that adverse odor impacts do not occur. Specifically, Rule 4102 states "A person shall not discharge from any source whatsoever such quantities of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such person or the

public or which cause or have a natural tendency to cause injury or damage to business or property."

Proposed General Plan Update Policies and Action Items that Provide Mitigation

The proposed General Plan Update includes the following mitigation requirements that include specific performance standards.

Policy CON-26: *Residential development projects and projects categorized as sensitive receptors shall be located an adequate distance from existing and potential sources of toxic emissions such as freeways, major arterials, industrial sites, and hazardous material locations. "Adequate distance" will be based on site-specific conditions, on the types and amounts of potential toxic emissions, and other factors.*

Policy CON-27: *The City shall require new air pollution point sources (such as, but not limited to, industrial, manufacturing, and processing facilities) to be located an adequate distance from residential areas and other sensitive receptors. "Adequate distance" will be based on site-specific conditions, the type and location of sensitive receptors, on the types and amounts of potential toxic emissions, and other factors.*

As identified above, SJVUAPCD requirements (e.g., Rule 4102), implementation of AB 2588, and proposed Policy CON-26 CON-27 (placement of sensitive receptors in relation to air pollutant sources) would ensure that sensitive receptors are not exposed to inappropriate levels of TACs or odors. Thus, this impact is **less than significant**.

Mitigation Measures

None required.

Expose Sensitive Receptors to Substantial Pollutant Concentrations

Impact 4.6.3 The General Plan Update would allow continued growth in population, housing, and jobs in the City of Madera that would increase traffic volumes on local roadways. This would result in elevated CO emissions from motor vehicle congestion that could expose sensitive receptors to elevated CO concentrations. However, based on the projections of traffic congestion, this is not expected to result in exceedances of CO standards. As a result, this is considered to be a **less than significant** impact.

Local mobile-source carbon monoxide emissions near roadway intersections are a function of traffic volume, speed, and delay. Transport of CO is extremely limited because it disperses rapidly with distance from the source under normal meteorological conditions. Under specific meteorological conditions, CO concentrations near roadways and/or intersections may reach unhealthy levels. These concentrations are also impacted by vehicle delay associated with roadways or intersections. As vehicles speeds slow to LOS E or F, or worsen from a LOS F, CO concentrations are increased, creating a scenario in which localized CO could possibly cause a hotspot (SJVUAPCD, 1998).

The proposed General Plan update would have a significant impact on localized CO concentrations if:

- A traffic study indicates that the Level of Service (LOS) on one or more streets or at one or more intersections will be reduced to LOS E or F; or

- A traffic study indicates that the project will substantially worsen an already existing LOS F on one or more streets or at more or more intersections.

If either of the above criteria can be associated with any intersection affected by the project, a CO Protocol Analysis would be needed to determine significance. The SJVUAPCD has established a preliminary screening protocol that can be used to determine with fair certainty whether the proposed General Plan buildout would potentially cause a future CO exceedance of federal standards. According to the SJVUAPCD recommended Caltrans protocol, a project which does not involve or lead directly to construction, such as the General Plan Update, is considered exempt from CO hotspot analyses (Caltrans, 1997).

In addition, the Final Carbon Monoxide Redesignation Request and Maintenance Plan for Ten Federal Planning Areas (April 1996) demonstrated that the SJVAB was in compliance with the NAAQS for carbon monoxide and requested redesignation to attainment status. This plan was approved by the U.S. EPA on June 1, 1998. As shown in **Table 4.6-3**, monitoring station data has not identified any exceedance of state or federal CO standards

As a result, this impact is considered **less than significant**.

Mitigation Measures

None required.

Conflict With or Obstruct Air Quality Plan or Result in a Cumulative Net Increase in Any Criteria Pollutant in Non-Attainment

Impact 4.6.4 Implementation of the General Plan Update would allow for population growth that may exceed projections assumed in the 2007 Ozone Plan and potentially conflict with particulate matter reduction measures. This inconsistency could obstruct the SJVUAPCD's ozone attainment strategy and particulate matter (PM_{10} and $PM_{2.5}$) attainment efforts. This impact is considered to be **significant and unavoidable**.

Implementation of the General Plan update will result in long-term emissions from a variety of sources, including motor vehicles and area source emissions from energy use associated with future growth. As illustrated in **Table 4.6-6**, emissions from motor vehicles citywide are generally decreasing over time, despite the growth in population, housing, and employment associated with the General Plan update. This is largely due to advancements in motor vehicle engine technology.

TABLE 4.6-6
AVERAGE DAILY VEHICLE EMISSIONS IN THE YEAR 2030 (TONS/DAY)

Pollutant	2008	2030	Change in Emissions from 2008 to 2030	Percent Change in Emissions from 2008 to 2030
VMT	1,592,588	2,981,260	-	-
CO	11.74	4.75	-6.99	-60%
NOx	4.83	1.85	-2.98	-62%
SOx	0.01	0.02	+0.01	+100%
ROG	1.13	0.53	-0.6	-53%
PM_{10}	0.23	0.2	-0.03	-13%
$PM_{2.5}$	0.19	0.13	-0.06	-32%

Source: Emfac 2007 model outputs. 2030 VMT data provided by the traffic impact analysis. 2008 VMT data extrapolated from the data provided in the traffic impact analysis.

The General Plan Update would also allow more growth that would result in emissions from energy use that would challenge the region's ability to meet ozone and PM standards. As shown in **Table 4.6-7** and **4.6-8**, emissions from electricity and natural gas use associated with planned growth would increase, primarily from residential heating in the winter, landscaping activity in the summer, consumer products, and architectural coatings.

TABLE 4.6-7
AREA SOURCE EMISSIONS FROM ENERGY USE (TONS/DAY)

Pollutant	2008	2030	Change in Emissions from Existing to 2030	Percent Change in Emissions from Existing to 2030
ROG	1.2	2.9	+1.6	+142%
NOx	0.2	0.5	+0.3	+150%
CO	2.9	6.2	+3.3	+114%
SOx	0.01	0.02	+0.01	+100%
PM_{10}	0.4	0.9	+0.5	+125%
$PM_{2.5}$	0.4	0.9	+0.5	+125%

Source: URBEMIS 2007 v. 9.2.4 Outputs

TABLE 4.6-8
TOTAL LONG-TERM EMISSIONS (TONS/DAY)

Pollutant	2008	2030	Change in Emissions from Existing to 2030	Percent Change in Emissions from Existing to 2030
ROG	2.4	3.4	+1	+44%
NOx	5.0	2.3	-2.7	-54%
CO	14.6	10.9	-3.6	-25%
SOx	0.02	0.04	+0.02	+108%
PM_{10}	0.7	1.1	+0.5	+71%
$PM_{2.5}$	0.6	1.0	+0.4	+69%

Source: Emfac 2007 and URBEMIS 2007 v. 9.2.4 Outputs

Ultimately, the General Plan Update's impact on cumulative air quality in the region is determined by comparing proposed population growth accommodated by the General Plan update with the projected population for the City that was assumed by both MCTC and the SJVUAPCD in the 2007 Ozone Plan. **Table 4.6-9** shows the estimated increase in housing resulting from implementation of the proposed General Plan Update. **Table 4.6-10** shows the population estimates from Madera County Transportation Commission's (MCTC) 2007 RTP. These were incorporated into the SJVUAPCD's 2007 Ozone Plan. **Table 4.6-11** compares the data from **Tables 4.6-9** and **4.6-10**.

TABLE 4.6-9
SUMMARY OF EXISTING AND GENERAL PLAN BUILDOUT CONDITIONS

Land Uses	City Limits Only (2008)			Entire Planning Area		
	Existing	2030	Buildout	Existing	2030	Buildout
Residential Units	16,418	19,072	24,788	22,071	47,739	73,747
Population	56,710	68,088	88,495	78,368	170,431	263,278
Total Employment[1]	11,624	18,199	18,593	19,491	35,315	67,648

Note: Buildout projections under the Entire Planning Area include the City.

1 Total employment also includes jobs that are not included under commercial, office and industrial, such as public school employment.

Total Square Footage totals only include commercial, office and industrial and do not include other square footage from other uses, such as public and quasi-public uses (e.g., schools and churches).

TABLE 4.6-10
SUMMARY OF 2007 MCTC RTP POPULATION FORECASTS

Land Uses	Entire Planning Area		
	2010	2020	2030
Households	24,061	30,853	38,647
Population	77,139	98,914	123,903
Total Employment	26,583	34,086	42,698

Source: MCTC 2007 RTP.

Note: The totals from the MCTC 2007 RTP were incorporated in the 2007 RTP and 2007 FTIP Air Quality Conformity Analysis.

TABLE 4.6-11
COMPARISON OF GENERAL PLAN UPDATE 2030 POPULATION FORECASTS WITH REGIONAL AIR PLAN FORECASTS

Land Uses	MCTC RTP	General Plan Update	Difference
Households	38,647	47,739	+9,092
Population	123,903	170,431	+46,528
Total Employment	42,698	50,364	+7,666

Although there will be a general reduction in long-term vehicle emissions, the General Plan Update may have a significant and unavoidable impact on regional ozone air quality, given that it would accommodate more growth through 2030 than is planned for in the 2007 Ozone Plan.

Proposed General Plan Update Policies and Action Items that Provide Mitigation

The proposed General Plan Update includes the following mitigation requirements that include specific performance standards.

Policy CON-28: *The creation of dust during construction/demolition activities should be reduced to the extent feasible.*

Action Item CON-28.1: *Work with the San Joaquin Valley Air Pollution Control District to reduce particulate emissions from construction, grading, excavation, and demolition through standard and/or special conditions on these activities.*

Policy CON-29: *The City seeks to reduce the urban heat island effect in the City, which causes increased temperatures and increases in ground level ozone formation through methods such as:*

- *Increasing the amount of tree coverage in the city.*
- *Green roofs and rooftop gardens.*
- *The use of reflective treatments on roofs (such as those which qualify for the EPA/DOE's Energy Star rating).*
- *The use of cool pavements such as permeable and light colored and reflective pavements.*

Action Item CON-29.1: *Develop and adopt a Tree Ordinance that protects existing trees in the public right of way and promotes the establishment of new tree resources in public areas. The tree ordinance could provide for the creation of a Master Tree Plan that would include an inventory of the City Forest including tree type, condition and size, and a City-approved tree planting list.*

Action Item CON-29.2: *Update or amend the City's building codes to address the construction of green roofs and provide training to the City's Building Department staff on this subject.*

Policy CON-30: *Where feasible, the City's vehicle fleet should include clean fuel, hybrid, electric, or other fuel-efficient vehicles, so long as their utility, durability, and cost meets the City's needs.*

Action Item CON-30.1: *Update the City's procurement policies to include criteria for vehicle purchases that implement this policy.*

Policy CON-32: *The City shall consider air quality when making changes to planned land uses and transportation systems.*

Policy LU-10: *The Growth Boundary is considered by the City to define the physical limits of development in Madera. The City shall direct all future growth in Madera and in the unincorporated area outside the city limits to occur inside the Growth Boundary shown on the Land Use Map in this General Plan. Within the City's Planning Area, the City encourages the County to assist the City in maintaining an agricultural green belt around the Growth Boundary by only allowing agricultural uses where land is designated for such use on the City's General Plan Land Use Map.*

The following apply to the Growth Boundary:

- *The Growth Boundary may only be revised as part of a comprehensive update of the General Plan involving, at a minimum, the Land Use and Circulation elements.*
- *Any revision to the Growth Boundary shall be accompanied by a statement of findings which demonstrate the following:*

1) That the revision is consistent with the intent of the Growth Boundary and all other applicable policies in this General Plan

2) That the revision is necessary to accommodate planned growth in Madera

Policy LU-11: *The City specifically envisions the establishment and maintenance of a greenbelt of agricultural and other open space lands around the urbanized portion of the Planning Area, outside the Growth Boundary, as shown on the Land Use Map. In addition to the maintenance of appropriate agricultural land use designations, the City encourages the use of Williamson Act contracts and similar mechanisms to ensure the maintenance of the greenbelt.*

Along the west edge of the Planning Area, the Greenbelt is intended to be permanent, and the implementing mechanisms on the west edge should reflect that intent, including transfer of development rights, permanent conservation easements, etc. (See specific policies for Villages D & E for requirements to establish a permanent edge/buffer on the western boundary of these Villages)

Policy LU-35: *VILLAGE D: SPECIFIC POLICIES*

The following policies are intended to identify some of the unique issues for this area which will need to be addressed, and to guide development, as the area transitions to urban use.

- *All future development in this Village shall conform to the Building Blocks principles as described in this General Plan.*
- *In conjunction with village and neighborhood planning, a mechanism shall be established which creates a permanent agricultural buffer where the westerly edge of the Village abuts the Growth Boundary.*

Mitigation Measures

Implementation of the above policies and action items would include measures to reduce particulate matter and ozone emissions under the proposed General Plan Update at 2030. The Land Use Element, Circulation Element, and Conservation Element of the General Plan Update together provide integrated policies to address emissions, in compliance with AB 170. In particular, LU-10 and LU-11 establish a growth boundary around the City and greenbelt around portions of the City that coupled with the Building Block principles established in the General Plan Land Use Element (LU-35), will encourage more compact development, infill development, and a mix of land use types that will serve to reduce vehicle miles traveled, thereby reducing emissions. The Circulation Element also includes policies that will reduce emissions. CI-3, CI-4, and CI-5 provide for a multi-modal transportation system that will reduce the reliance on motor vehicles by providing viable biking, pedestrian, and transit systems. However, even with the implementation of the above policies, the General Plan Update at 2030 would exceed growth projections used in attainment plan development as well as result in substantial increase in emissions. There are no feasible mitigation measures to fully offset the General Plan Update's increase in emissions. Thus, this impact is **significant and unavoidable**.

4.6.4 CUMULATIVE SETTING, IMPACTS AND MITIGATION MEASURES

AIR QUALITY CUMULATIVE SETTING

The cumulative setting regarding cumulative air quality impacts consists of the San Joaquin Valley Air Basin and associated growth and development anticipated in the Basin (regional anticipated development is described in Section 4.0). This includes consideration of attainment efforts for the Basin. The cumulative setting includes the consideration of the buildout of the Planning Area that would consist of a population of approximately 263,278 residents post year 2030 (see **Table 3.0-1** and **4.6-9** for detailed buildout projections).

AIR QUALITY CUMULATIVE IMPACTS AND MITIGATION MEASURES

Cumulative Air Quality Impacts

Impact 4.6.5 Implementation of the proposed General Plan Update, in combination with cumulative development in the San Joaquin Valley Air Basin, would contribute to a cumulative air quality impacts and could conflict with ozone and particulate matter attainment efforts. This is considered a **cumulatively considerable** and **significant and unavoidable** impact.

As described under Impact 4.6.4, subsequent development under the proposed General Plan Update would exceed growth projections used in regional air quality planning and attainment efforts under year 2030 conditions. Buildout of the Planning Area would generate additional emissions beyond 2030 and could further conflict with attainment efforts.

Proposed General Plan Policies, Objectives and Actions That Provide Mitigation

The proposed General Plan Update contains policies and action items that would assist in reducing this air quality impact. Those policies and action items that contain specific, enforceable requirements and/or restrictions and corresponding performance standards that address this impact are listed under Impact 4.6.4.

Mitigation Measures

While implementation of the above policies and action items would include measures to reduce particulate matter and ozone emissions, buildout anticipated under the proposed General Plan Update would exceed growth protections used in attainment plan development as well as result in substantial increase in emissions. There are no feasible mitigation measures to fully offset the General Plan Update's increase in emissions. Thus, this impact is **cumulatively considerable** and **significant and unavoidable**.

GREENHOUSE GAS AND CLIMATE CHANGE SETTING

To fully understand global climate change it is important to recognize the naturally occurring "greenhouse effect" and to define the greenhouse gases (GHG) that contribute to this phenomenon. The temperature on Earth is regulated by this greenhouse effect, which is so named because the Earth's atmosphere acts like a greenhouse, warming the planet in much the same way that an ordinary greenhouse warms the air inside its glass walls. Like glass, the gases in the atmosphere let in light yet prevent heat from escaping.

GHG are naturally occurring gases such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) that absorb heat radiated from the Earth's surface. Greenhouse gases – carbon dioxide, methane, nitrous oxide, and others – are transparent to certain wavelengths of the sun's radiant energy, allowing them to penetrate deep into the atmosphere or all the way to the Earth's surface. Clouds, ice caps, and particles in the air reflect about 30 percent of this radiation, but oceans and land masses absorb the rest (70 percent of the radiation received from the sun) before releasing it back toward space as infrared radiation. GHG and clouds effectively prevent some of the infrared radiation from escaping; they trap the heat near Earth's surface where it warms the lower atmosphere. If this natural barrier of atmospheric gases were not present, the heat would escape into space, and Earth's average global temperatures could be as much as 61 degrees Fahrenheit cooler (NASA, 2007).

In addition to natural sources, human activities are exerting a major and growing influence on climate by changing the composition of the atmosphere and by modifying the land surface. Particularly, the increased consumption of fossil fuels (natural gas, coal, gasoline, etc.) has substantially increased atmospheric levels of greenhouse gases. Measured atmospheric levels of certain GHG such as carbon dioxide, methane, and nitrous oxide have risen substantially in recent decades (Miller, 2000). This increase in atmospheric levels of GHG unnaturally enhances the greenhouse effect by trapping more infrared radiation as it rebounds from the Earth's surface and thus trapping more heat near the Earth's surface. Prominent GHGs contributing to the greenhouse effect and climate change include carbon dioxide (CO_2), methane (CH_4), ozone, nitrous oxide (N_2O), and chlorofluorocarbons (CFCs). Emissions of these gases are

attributable to human activities associated with the industrial/manufacturing, utilities, transportation, residential, and agricultural sectors (California Energy Commission, 2006a).

According to the U.S. Environmental Protection Agency (EPA), the Earth's average surface temperature has increased by about 1.2 to 1.4°F since 1900. The warmest global average temperatures on record have all occurred within the past 15 years, with the warmest two years being 1998 and 2005. Eleven of the last 13 years rank among the hottest years on record (since 1850, when reliable worldwide temperature measurements began) (IPCC, 2007). Most of the warming in recent decades is likely the result of human activities. Other aspects of the climate are also changing such as rainfall patterns, snow and ice cover, and sea level.

Many complex mechanisms interact within Earth's energy budget to establish the global average temperature. For example, a change in ocean temperature would be expected to lead to changes in the circulation of ocean currents, which in turn would further alter ocean temperatures. There is uncertainty about how some factors could affect global climate change because they have the potential to both enhance and neutralize future climate warming. For instance, aerosols, including particulate matter, reflect sunlight back to space. As particulate matter attainment designations are met and fewer emissions of particulate matter occur, the cooling effect of anthropogenic aerosols would be reduced and the greenhouse effect would be further enhanced. Similarly, aerosols act as cloud condensation nuclei, aiding in cloud formation and increasing cloud lifetime.

Clouds can efficiently reflect solar radiation back to space (see discussion of the cloud effect below). As particulate matter emissions are reduced, the indirect positive effect of aerosols on clouds would be reduced, potentially further amplifying the greenhouse effect. As global temperature rises, the ability of the air to hold moisture increases, facilitating cloud formation. If an increase in cloud cover occurs at low or middle altitudes, resulting in clouds with greater liquid water content such as stratus or cumulus clouds, more radiation would be reflected back to space, resulting in a negative feedback mechanism, wherein the side effect of more cloud cover resulting from global warming acts to balance further warming. If clouds form at higher altitudes in the form of cirrus clouds, however, these clouds actually allow more solar radiation to pass through than they reflect, and ultimately they act as a GHG themselves. This results in a positive feedback mechanism in which the side effect of global warming acts to enhance the warming process. This feedback mechanism, known as the "cloud effect," contributes to uncertainties associated with projecting future global climate conditions.

Other mechanisms include permafrost and polar and sea ice. As global temperature continues to rise, CH_4 gas currently trapped in permafrost would be released into the atmosphere when areas of permafrost thaw. Thawing of permafrost attributable to global warming would be expected to accelerate and enhance global warming trends. Additionally, as the surface area of polar and sea ice continues to diminish, the Earth's albedo, or reflectivity, is also anticipated to decrease. More incoming solar radiation will likely be absorbed by the Earth rather than being reflected back to space, further enhancing the greenhouse effect. The scientific community is still studying these and other positive and negative feedback mechanisms to better understand their potential effects on global climate change.

Global Implications

Recognizing the problem of global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. It is open to all members of the United Nations and WMO. The role of the IPCC is to assess on a comprehensive, objective,

open, and transparent basis the scientific, technical, and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation. According to climate models, the IPCC projects that the Earth's average surface temperature should rise 1.8–6.3 °F before the year 2100. If the atmospheric concentration of CO_2 doubles from its late 1700s level of 280 parts per million to 560 parts per million, the most likely rise in temperature would be about 3.6 °F. This may not seem like a significant increase, yet even at the lowest projected increase of 1.8 °F, the Earth would be warmer than it has been for 10,000 years (Miller, 2000).

The IPCC Fourth Assessment Report's Working Group I Summary for Policymakers (Report) synthesizes current scientific understanding of global climate change and projects future climate change using the most comprehensive set of well-established global climate models. The Report incorporates findings of the current effects of global climate change. These findings include:

- The intensity of tropical cyclones (hurricanes) in the North Atlantic has increased over the past 30 years, which correlates with increases in tropical sea surface temperatures.

- Droughts have become longer and more intense and have affected larger areas since the 1970s, especially in the tropics and subtropics.

- Since 1900 the Northern Hemisphere has lost 7 percent of the maximum area covered by seasonally frozen ground.

- Mountain glaciers and snow cover have declined worldwide.

- Satellite data since 1978 show that the extent of Arctic sea ice during the summer has shrunk by more than 20 percent.

- Since 1961, the world's oceans have been absorbing more than 80 percent of the heat added to the climate, causing ocean water to expand and contributing to rising sea levels. Between 1993 and 2003, ocean expansion was the largest contributor to sea level rise.

- Melting glaciers and losses from the Greenland and Antarctic ice sheets have also contributed to recent sea level rise.

An enhanced greenhouse effect will generate new patterns of microclimate and will have significant impacts on the economy, environment, and transportation infrastructure and operations due to increased temperatures, intensity of storms, sea level rise, and changes in precipitation. Impacts may include flooding of tunnels, coastal highways, runways, and railways, buckling of highways and railroad tracks, submersion of dock facilities, and a shift in agriculture to areas that are now cooler. Such prospects will have strategic security as well as transportation implications.

Climate change affects public health and the environment. Increased smog and emissions, respiratory disease, reduction in the state's water supply, extensive coastal damage, and changes in vegetation and crop patterns have been identified as effects of climate change. The impacts of climate change are broad-ranging and interact with other market failures and economic dynamics, giving rise to many complex policy problems. The findings are the latest in a string of reports warning that the rate of carbon dioxide accumulating in the atmosphere is increasing at an alarming pace.

California Implications

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants and TACs, which are pollutants of regional and local concern. Worldwide, California is the 12th to 16th largest emitter of CO_2 and is responsible for approximately 2 percent of the world's CO_2 emissions (CEC, 2006a, 2006b). In 2004, California produced 492 million gross metric tons of carbon dioxide-equivalent (CEC, 2006a).

Increased ocean temperature could result in increased moisture flux into the state; however, since this would likely increasingly come in the form of rain rather than snow in the high elevations, increased precipitation could lead to increased potential and severity of flood events, placing more pressure on California's flood control system. Sea level has risen approximately 7 inches during the last century and, according to the CEC report, it is predicted to rise an additional 22–35 inches by 2100, depending on the future GHG emissions levels (CEC, 2006c). If this occurs, resultant effects could include increased coastal flooding, saltwater intrusion, and disruption of wetlands (CEC, 2006c). As the existing climate throughout California changes over time, mass migration of species, or worse, failure of species to migrate in time to adapt to the perturbations in climate, could also result.

According to the California Environmental Protection Agency, the climate changes for global warming could affect agriculture, the fishing industry, California's coastline, forests, and ecosystems, increase air pollution, and energy production (CalEPA, 2002).

Agriculture

Potential impacts, such as reduced water supply, more severe droughts, more winter floods, and drier growing seasons will affect California's agriculture. Many farms, especially in the fruit and nut business, require long-term investments, making fast adaptation difficult, and could thus experience serious losses if decisions continue to be made with no regard to expected climate changes.

Fishing

Studies found that as a result of changes in ocean conditions, the distribution and abundance of major fish stocks will change substantially. Impacts to fisheries related to El Niño/Southern Oscillation illustrate how climate directly impacts marine fisheries on short-term scales. Higher sea surface temperatures in 1997–1998 during the El Niño had a great impact on market squid, California's largest fishery by volume. The California Regional Assessment reports that landings fell to less than 1,000 metric tons in that season, down from 110,000 tons in the 1996–1997 season. Other unusual events also occurred such as poor salmon returns, a series of plankton blooms, and seabird die-offs.

Coastline

With climate changes, recreational facilities and developed coastlines will also be more vulnerable to hurricanes, storm surges, and flooding. Increasing population growth in coastal areas is a reason for further concern, since these areas could be more vulnerable to climate change impacts. Impacts of expected sea level rise and increased storm surges are numerous. Beachfront homes and harbors as well as wetlands may flood. Sewage systems may be overwhelmed by storm runoff and high tides. Jetties and seawalls may have to be raised and strengthened to protect harbors which are used for shipping, recreation, and tourism.

Forests

The California Regional Assessment notes an increase in the number and extent of areas burned by wildfires in recent years, and modeling results under changing climate conditions suggest that fires may be hotter, move faster, and be more difficult to contain under future climate conditions. The factors which contribute to the risk of catastrophic fires (fuel loads, high temperatures, dry conditions, and wind) are typically present already in summer and fall seasons in California, but can exist at other times of the year, especially in drought conditions. Public safety is an issue as more home and tourism developments on coastal hills and mountains, and the foothills and higher elevations in the Sierra Nevada are highly susceptible to catastrophic wildfires.

Ecosystems

The current distribution, abundance, and vitality of species and habitats are strongly dependent on climatic (and microclimatic) conditions. Climate change is expected to result in warmer temperatures year-round, accompanied by substantially wetter winters. Rising sea level will significantly affect coastal wetlands because they are mostly within a few feet of sea level. As the sea rises, these wetlands will move inland. The overall acreage of wetlands will be reduced due to constraints by existing urban development and steeper slopes immediately inland of existing wetlands. Tidal rivers, estuaries, and relatively flat shoreline habitats will be more subject to damage by flooding and erosion. More severe storm surges from the ocean, due to higher sea levels, combined with higher river runoff could significantly increase flood levels by more than the rise in sea level alone. Erosion of beaches would decrease habitat for beach-dependent species, such as seals, shorebirds, and endangered species (for example, snowy plover and least tern). Aquatic habitats are also likely to be significantly affected by climatic changes. Most fish have limits to how hot or cold the water can be before they must either find more hospitable temperatures or die. As temperatures warm, many fish will have to retreat to cooler waters.

Changes in temperature and precipitation patterns would also shift California's current climate zones, and thus habitats associated with these zones, northward by approximately 100–400 miles, as well as upwards in elevation by 500–1,500 feet. Global climate change would alter the composition, structure, and arrangement of the vegetation cover of the state (forest and wildland). Species distribution would move geographically as the climate changes, with forest stands, woodlands, and grassland species predicted to move northward and higher in elevation. The entire vegetative community may be affected if non-native invasive species occupy sites and replace native plants. Outbreaks of insects and diseases could compromise forest health and the capability of the forest stands to reproduce and to store carbon on a landscape basis. Forest fires are likely to become more frequent and severe if soils become drier. Changes in pest populations could further increase the stress on forests.

Air Quality

Projected climate changes will impact the quality of California's air, public health, and environment. Higher temperatures increase the formation of ground-level ozone and particulate matter, making it more difficult to meet the health-base air quality standards for these pollutants. Ground-level ozone has been shown to aggravate existing respiratory illnesses such as asthma, reduce lung function, and induce respiratory inflammation. Ambient ozone also reduces agricultural crop yields and impairs ecosystem health.

The particulate matter of most concern – PM_{10} – has a diameter smaller than 10 micrometers and can easily pass into the lungs, contributing to the development of lung tissue damage. PM_{10} has been implicated in exacerbation of cardiovascular disease, asthma, and other respiratory diseases and associated with increased mortality. Air pollution is also made worse by increases in natural hydrocarbon emissions and evaporative emissions of fuels and solvents which lead to higher levels of ozone and PM_{10} during hot weather. Warmer temperatures that cause increased use of air conditioners can cause increased air pollutants from power plants and from vehicle operation. In addition, warming, drying, and increased winds could mean hotter, harder-to-control wildfires. These wildfires could result in increased levels of fine particulate matter that could also exceed state and federal standards and harm public health.

Electricity Generation

California's electricity generation is currently relatively efficient when it comes to emissions of greenhouse gases. The national average for the electricity generation share of total greenhouse gas emissions is approximately 40 percent, while California electricity accounts for only 16 percent of statewide emissions. This is in part due to California's significant amount of imported electricity, mild climate, and lack of energy-intensive industry. Over the past two decades, California has developed one of the largest and most diverse renewable electricity generation industries in the world. However, changes in climate of the magnitude predicted by the Intergovernmental Panel of Climate Change would substantially affect electricity generation throughout California and the entire western states grid, particularly for hydroelectric facilities.

Less snowpack would result in lower levels of hydro-generation in the summer and fall seasons due to reduced runoff in those seasons. Additional hydropower may be available during the winter and the spring. However, on balance hydropower is more useful and valuable within the grid mix of generation sources when it is available throughout the peak summer and fall seasons. Flooding could also impact pipelines, wells, and related petroleum extraction equipment. Warmer weather would result in an increased demand for electricity for cooling appliances in homes and businesses.

Water Supply

While most climate model simulations project relatively moderate changes in precipitation over this century, rising global temperatures are expected to result in reductions in snowpack for the Sierra Nevada Mountains (i.e., precipitation changing in the form of rain from snow). By the 2035 to 2064 period, the Sierra Nevada snowpack could decrease from 12% to 40% as compared to historic levels (depending on the climate scenario) (Cal/EPA, 2006). The Sierra Nevada Mountains snowpack currently acts as a natural water storage (equal to approximately half of the storage capacity of California's major human-made reservoirs) by holding the winter precipitation and releasing it during the spring and early summer months as the snow melts. The reduction of this natural water storage during the winter could mean water shortages in the future and would require the alteration of the management of existing reservoirs (while not losing flood control capacity or hydropower generation capacity) and/or the construction of additional human-made reservoirs to compensate for this storage loss.

The Department of Water Resources (DWR) report, Progress of Incorporating Climate Change into Management of California's Water Resources, included an analysis of climate change impacts on the State Water Project (SWP) and the Central Valley Water Project (CVP) operations and on the Delta. Results presented in the report are preliminary and incorporate several assumptions, and the results reflect only a limited number of climate change scenarios and do not address the probability of each scenario occurring. The results of this analysis suggested

several climate change impacts on overall SWP and CVP operations and deliveries. In three of the four climate scenarios simulated, CVP north-of-Delta reservoirs experienced shortages during droughts. The report recommends that future studies examine operational changes that could avoid these shortages. Based on this initial analysis, it is not clear whether operational changes required would be substantial in nature. The study also found that changes in annual average SWP south-of-Delta (Table A) deliveries ranged from an increase of approximately 1% for a wetter scenario to approximately a 10% reduction for one of the drier scenarios. Future studies are needed to address how north-of-Delta shortages could impact south-of-Delta CVP deliveries. (Placer County, 2007)

The California Environmental Protection Agency's "Scenarios of Climate Change in California: An Overview" identified that climate change will likely result in future storage and delivery issues for the Central Valley Water Project and the State Water Project. By the end of the century, the change in the volume and timing of runoff could reduce the ability to deliver water to agricultural users south of the Delta (15 to 50% reduction in deliveries depending on the climate scenario).

Minimal research has been conducted on the effects of climate change on specific groundwater basins, groundwater quality, or groundwater recharge characteristics. Changes in rainfall and changes in the timing of the groundwater recharge season would result in changes in recharge. Warmer temperatures could lead to higher evaporation as well as prolonged drought periods that would reduce the amount of water entering the ground that could further limit deficient water supply conditions. However, warmer and wetter winters could increase the amount of runoff available for groundwater recharge. Additional winter runoff, however, could be occurring at a time when groundwater basins are being recharged at their maximum capacity. However, the extent to which climate will change and the impact of that change on groundwater are both unknown at this time.

Increased Flooding

Currently, there is no accurate information to accurately assess the impact of climate change for flood frequency or severity, because of the absence of detailed regional precipitation information from climate models and because water-management choices can substantially influence overall flood risk. However, increased amounts of winter runoff could be accompanied by increases in flood event severity and warrant additional dedication of wet season storage space for flood control as opposed to water supply storage. This need to manage water storage facilities to handle increased runoff could in turn lead to water shortages during high water demand. It is recognized that these impacts would result in increased challenges for reservoir management and balancing the competing concerns of flood protection and water supply.

CLIMATE CHANGE REGULATORY FRAMEWORK

STATE

Assembly Bill 1493

Assembly Bill (AB) 1493 required that the California Air Resources Board (ARB) develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty truck and other vehicles determined by the ARB to be vehicles whose primary use is noncommercial personal transportation in the state."

Executive Order S-3-05

Executive Order S-3-05 proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the Executive Order established total greenhouse gas emission targets. Specifically, emissions are to be reduced to the 2000 level by 2010, the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The Executive Order directed the Secretary of the California Environmental Protection Agency (CalEPA) to coordinate a multi-agency effort to reduce greenhouse gas emissions to the target levels. The Secretary will also submit biannual reports to the governor and state legislature describing (1) progress made toward reaching the emission targets, (2) impacts of global warming on California's resources, and (3) mitigation and adaptation plans to combat these impacts. To comply with the Executive Order, the Secretary of the CalEPA created a Climate Act Team (CAT) made up of members from various state agencies and commission. CAT released its first report in March 2006. The report proposed to achieve the targets by building on voluntary actions of California businesses, local government and community actions, as well as through state incentive and regulatory programs.

Assembly Bill 32, the California Climate Solutions Act of 2006

Assembly Bill (AB) 32 requires that statewide GHG emissions be reduced to 1990 levels by the year 2020. The gases that are regulated by AB 32 include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The reduction to 1990 levels will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

AB 32 requires that ARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap, institute a schedule to meet the emissions cap, and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Senate Bill 1368

SB 1368 is the companion bill of AB 32. SB 1368 requires the California Public Utilities Commission (CPUC) to establish a greenhouse gas emission performance standard for baseload generation from investor owned utilities by February 1, 2007. The California Energy Commission (CEC) must establish a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the greenhouse gas emission rate from a baseload combined-cycle natural gas-fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the CPUC and CEC.

LOCAL

San Joaquin Valley Air Pollution Control District Climate Change Action Plan

The District is developing its Climate Change Action Plan (CCPA). The CCPA consists of the following key components:

- Guidance on impact analyses for CEQA documents.
- Development of a greenhouse gas banking program.
- Reporting of greenhouse gas emissions as part of existing emission inventory process.
- Voluntary greenhouse emission reduction agreements (GHG-VERA)

Currently, technical workgroup are developing recommendations that will be considered by the District in summer 2009.

GREENHOUSE GAS AND CLIMATE CHANGE IMPACTS AND MITIGATION MEASURES

With regard to climate change impacts, no air district in California has identified a significance threshold for GHG emissions or a methodology for analyzing air quality impacts related to greenhouse gas emissions. The state has identified 1990 emission levels as a goal through adoption of AB 32. To meet this goal, California would need to generate lower levels of GHG emissions than current levels. However, no standards have yet been adopted quantifying 1990 emission targets. Consumption of fossil fuels in the transportation sector accounted for over 15 to 25 percent of the total GHG emissions in California. Current standards for reducing vehicle emissions considered under AB 1493 call for "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles," and do not provide a quantified target for GHG emissions reductions for vehicles.

For this analysis, the General Plan Update's contribution to global climate change would be considered significant if it would:

- Result in a substantial increase in greenhouse gas emissions;
- Be inconsistent with AB 32 and other applicable programs that are intended to reduce greenhouse gas emissions; or
- Expose future growth to significant environmental impacts associated with the effects of global climate change.

Substantial Increase in Greenhouse Gas Emissions and Environmental Effects

Impact 4.6.6 Implementation of the proposed General Plan Update could substantially increase emissions of CO_2e over existing (2008) conditions that could result in environmental effects to the Planning Area. This impact is considered to be **cumulatively considerable** and a **significant and unavoidable** impact.

Energy consumption in the City of Madera Planning Area was responsible for an estimated 340,841 metric tons of carbon dioxide equivalent (CO2e) in calendar year 2007. Approximately 31% of these emissions were from the combustion of natural gas used in residential heating and

commercial/industrial processes. The remainder of the energy emissions were from the consumption of electricity by residents, businesses, and industry in the Planning Area.1

The City of Madera sent approximately 49,194 tons of waste to landfills in calendar year 2007.2 This amount of waste is estimated to produce approximately 12,307.35 metric tons of carbon dioxide equivalent (CO2e), according to the US EPA Waste Reduction Model (WARM) tool.3 This estimate accounts for the methane released from waste and national average recovery practices for landfilled waste.

CO_2e emissions associated with growth in the Planning Area are projected to increase from 2008 to 2030. **Table 4.6-12** illustrates that most of these increases are likely to come from increases in housing associated with the city's population growth and from new commercial and industrial development. It should be noted that the emission estimates provided in **Table 4.6-12** consist of major emission sources and do not include emission sources such as agricultural operations and emissions from electrical generation by Pacific Gas & Electric Company, or airport operations. These increases would increase the carbon footprint of Madera in 2030. These stationary and mobile source emissions would further increase under buildout conditions (post 2030). Buildout emissions were not quantified given the lack of an accurate transportation model that can project vehicle miles traveled beyond year 2030.

TABLE 4.6-12
GREENHOUSE GAS CO_2 EMISSIONS (2008 AND 2030)
(TONS/DAY)

	2008 Existing Conditions	2030 General Plan Conditions	Change 2008 to 2030	
			Tons	Percentage
Vehicle CO_2e Emissions	25	11	-14	-56%
Energy CO_2 Emissions	262	597	+335	+128%

CO2e emissions rates are based on CARB Local Government Operations Protocol Table C.10, 2008.
Energy emissions based on Urbemis 9.2.4 outputs.

As projects from the General Plan Update are developed, carbon dioxide emissions from off-road heavy-duty vehicles and construction equipment would be emitted, contributing to global climate change. However, these emissions are expected to decrease over time, as low-carbon fuel standards and other climate change measures consistent with AB 32 and other similar mandates take hold. Based on an analysis of a conceptual one-acre construction site, **Table 4.6-13** illustrates that using current assumptions about engine technology advancements, construction emissions of CO_2, particularly from building of structures, are likely to decrease over time.

[1] Energy CO_2e estimate based on energy consumption for Madera County and adjusted for City of Madera Planning Area. Source: California Energy Consumption Data Management System, http://ecdms.energy.ca.gov, accessed April 9, 2009. County population estimates obtained from census.gov.
[2] *California Integrated Waste Management Board (CIWMB) Disposal Reporting System (DRS), http://www.ciwmb.ca.gov/LGCentral/Reports.*

[3] *EPA WARM, http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html*

TABLE 4.6-13
EXAMPLE OF TYPICAL EMISSIONS FROM CONSTRUCTION PROJECTS (LB/DAY CO2)

Construction Phase	2008	2030	Difference
Grading	2,376	2,350	-26
Asphalt	1,175	1,163	-12
Building	1,415	1,379	-36
Coating	9	8	-1
Total (One Year)	4,975	4,940	-35.16

Source: CARB URBEMIS 9.2.4 model run. Example assumes one acre site, 12 months of construction activity, with equal phases of fine grading, asphalt, building, and coating.

Proposed General Plan Update Policies and Action Items that Provide Mitigation

The proposed General Plan Update includes the following mitigation requirements that include specific performance standards that address climate change. In addition, the General Plan Update proposed urban growth boundary, in conjunction with the establishment of an average residential density that is higher for new development than existing residential development, as well as compact development form that will encourage pedestrian, bicycle and transit use, are also features of the proposed General Plan Update that are intended to minimize greenhouse gas emissions.

Policy CI-42: *Circulation planning for all modes of travel (vehicle, transit, bicycle, pedestrian, etc.) shall be coordinated with efforts to reduce air pollution and greenhouse gases.*

Policy CON-33: *The City shall implement and enforce State and Regional regulations pertaining to greenhouse gas emissions and climate change.*

Policy CON-34: *The City supports local, regional, and statewide efforts to reduce the emission of greenhouse gases linked to climate change.*

Action Item CON-34.1: *Within one year of the adoption of this General Plan, the City will complete a Greenhouse Gas Inventory that provides an inventory of greenhouse gas emissions from manmade sources in the City.*

Action Item CON-34.2: *Within one year of the completion of the Greenhouse Gas Inventory, the City will prepare a Climate Action Plan (CAP) that identifies desired goals for reducing manmade greenhouse gas (GHG) emissions, establishes resiliency and adaptation programs to prepare for potential impacts of climate change, and provides a phased implementation plan to achieve these goals. The CAP will establish a greenhouse gas emissions reduction target of 15% percent below 2007 levels by 2020, consistent with California Assembly Bill 32, the Global Warming Solutions Act of 2006 (AB32) and the guidance provided in the associated California Air Resources Board Climate Change Scoping Plan approved in December 2008. The CAP will also outline a strategy to achieve 1990 GHG levels by 2020 and an 80% reduction from 1990 GHG levels by 2050 in accordance with California State Executive Order S-3-05.*

Policy CON-35: *The City shall collaborate and coordinate with regional organizations and local jurisdictions within the City to reduce greenhouse gas emissions.*

Policy CON-36: *The City shall partner with local agencies and organizations to coordinate outreach and education regarding the effects of greenhouse gas emissions and climate change.*

Action Item CON-37.3: *City buildings and facilities will be operated in the most energy-efficient manner without endangering public health and safety and without reducing public safety or service levels.*

Action Item CON-37.4: *To the extent practical, integrate appropriate renewable energy and clean generation technologies into existing City facilities, such as solar, wind, biofuel, cogeneration, and fuel cells to power City facilities.*

Action Item CON-38.1: *Develop a voluntary, market-driven Green Building Program that includes performance standards, guidelines, review criteria, incentives, and implementation schedules for private sector development, with criteria tailored to project types (i.e., residential, commercial, retail), size, and location.*

Action Item CON-38.2: *Identify, evaluate, and provide incentives to encourage projects that incorporate green building practices and site design, including the potential for certification through the City's Building Department.*

Action Item CON-38-4: *Offer information, technical assistance, and training to promote green building to property owners, building, design, and planning professionals, school districts, and special districts.*

Action Item CON-39.1: *Evaluate and update the City's procurement processes to provide incentives to bidders who propose the use of green building practices in the construction of City buildings and facilities.*

Mitigation Measures

While implementation of the above policies and action items would include measures that would reduce greenhouse gas emissions (including the commitment to meeting state greenhouse gas reduction goals under AB 32 and SB S-3-05 – see Action Item CON-34.2), these emission reductions are not adequate to fully mitigate the environmental effects of climate change. As specifically noted in Section 4.9 (Hydrology and Water Quality), the Planning Area is already experiencing groundwater overdraft which could be further impacted from the effects of climate change. Thus, this impact is **cumulatively considerable** and **significant and unavoidable**.

Consistency with Greenhouse Gas Reduction Measures

Impact 4.6.7 Implementation of the proposed General Plan Update would implement a number of policies and action items that would complement and be consistent with the state's best practices measures for reducing GHG emissions. This impact is considered to be **less than cumulatively considerable.**

Implementation of the proposed General Plan Update would implement a number of policies that would complement and be consistent with the current implementation and strategies for AB 32 and Executive Order S-3-05 as well as current efforts by the SJVUAPCD under its Climate Change Action Plan. These policy provisions are provided under the proposed Circulation Element (see Action Item CI-1.2 and policies and action items CI-28 through CI-39) and the proposed Conservation Element (see policies and action items CON-33 through CON-39). In addition, the General Plan Update proposed urban growth boundary, in conjunction with the establishment of an average residential density that is higher for new development than existing residential development, as well as compact development form that will encourage pedestrian, bicycle and transit use, are also features of the proposed General Plan Update that are intended to minimize greenhouse gas emissions.

Proposed General Plan Update Policies and Action Items that Provide Mitigation

The following policies and action items include specific performance standards that address climate change consistent with state measures to reduce greenhouse gas emissions, including a commitment to reduction goals under AB 32 and Executive Order S-3-05.

Policy CI-42: *Circulation planning for all modes of travel (vehicle, transit, bicycle, pedestrian, etc.) shall be coordinated with efforts to reduce air pollution and greenhouse gases.*

Policy CON-33: *The City shall implement and enforce State and Regional regulations pertaining to greenhouse gas emissions and climate change.*

Policy CON-34: *The City supports local, regional, and statewide efforts to reduce the emission of greenhouse gases linked to climate change.*

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Action Item CON-38.4: *Offer information, technical assistance, and training to promote green building to property owners, building, design, and planning professionals, school districts, and special districts.*

Action Item CON-39.1: *Evaluate and update the City's procurement processes to provide incentives to bidders who propose the use of green building practices in the construction of City buildings and facilities.*

As identified above, implementation of the proposed General Plan Update would be consistent with state measures to reduce greenhouse gas emissions. Thus, this impact is **less than cumulatively considerable**.

Mitigation Measures

None required.

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