# 4.7 GLOBAL CLIMATE CHANGE

This section discusses potential impacts of the proposed General Plan Update related to greenhouse gas emissions and climate change. The analysis herein is based partially on the traffic study prepared by Wood Rodgers, Inc. (September 2015). Air quality impacts are discussed in Section 4.3, Air Quality.

## 4.7.1 Setting

**a. Climate Change and Greenhouse Gases.** Climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other substantial changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. The term "climate change" is often used interchangeably with the term "global warming," but "climate change" is preferred to "global warming" because it helps convey that there are other changes in addition to rising temperatures. The baseline against which these changes are measured originates in historical records identifying temperature changes that have occurred in the past, such as during previous ice ages. The global climate is continuously changing, as evidenced by repeated episodes of substantial warming and cooling documented in the geologic record. The rate of change has typically been incremental, with warming or cooling trends occurring over the course of thousands of years. The past 10,000 years have been marked by a period of incremental warming, as glaciers have steadily retreated across the globe. However, scientists have observed acceleration in the rate of warming during the past 150 years. Per the United Nations Intergovernmental Panel on Climate Change (IPCC), the understanding of anthropogenic warming and cooling influences on climate has led to a high confidence (90% or greater chance) that the global average net effect of human activities since 1750 has been one of warming. The prevailing scientific opinion on climate change is that most of the observed increase in global average temperatures, since the mid-20th century, is likely due to the observed increase in anthropogenic greenhouse gas concentrations (IPCC, 2007).

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHGs). GHGs are present in the atmosphere naturally, are released by natural sources, or are formed from secondary reactions taking place in the atmosphere. The gases that are widely seen as the principal contributors to human-induced climate change include carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxides ($N_2O$), and fluorinated gases such as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$). Water vapor is excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are largely determined by natural processes, such as oceanic evaporation.

GHGs are emitted by both natural processes and human activities. Of these gases, $CO_2$ and $CH_4$ are emitted in the greatest quantities from human activities. Emissions of $CO_2$ are largely by-products of fossil fuel combustion, whereas $CH_4$ results from off-gassing associated with agricultural practices and landfills. Man-made GHGs, many of which have greater heat-absorption potential than $CO_2$, include fluorinated gases and $SF_6$ (California Environmental Protection Agency [CalEPA], 2006). Different types of GHGs have varying global warming potentials (GWPs). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas ($CO_2$) is used to relate the amount of heat absorbed to the amount of the gas

emissions, referred to as "carbon dioxide equivalent" ($CO_2E$), and is the amount of a GHG emitted multiplied by its GWP. $CO_2$ has a GWP of one. By contrast, $CH_4$ has a GWP of 21, meaning its global warming effect is 21 times greater than $CO_2$ on a molecule per molecule basis (IPCC, 1997).

The accumulation of GHGs in the atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHG, Earth's surface would be about 34° C cooler (CalEPA, 2006). However, it is believed that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. The following discusses the primary GHGs of concern.

Carbon Dioxide. The global carbon cycle is made up of large carbon flows and reservoirs. Billions of tons of carbon in the form of $CO_2$ are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural processes (i.e., sources). When in equilibrium, carbon fluxes among these various reservoirs are roughly balanced (United States Environmental Protection Agency [USEPA], April 2012). $CO_2$ was the first GHG demonstrated to be increasing in atmospheric concentration, with the first conclusive measurements being made in the last half of the 20th century. Concentrations of $CO_2$ in the atmosphere have risen approximately 40% since the industrial revolution. The global atmospheric concentration of $CO_2$ has increased from a pre-industrial value of about 280 parts per million (ppm) to 391 ppm in 2011 (IPCC, 2007; National Oceanic and Atmospheric Association [NOAA], 2010). The average annual $CO_2$ concentration growth rate was larger between 1995 and 2005 (average: 1.9 ppm per year) than it has been since the beginning of continuous direct atmospheric measurements (1960–2005 average: 1.4 ppm per year), although there is year-to-year variability in growth rates (NOAA, 2010). Currently, $CO_2$ represents an estimated 82.8% of total GHG emissions (Department of Energy [DOE] Energy Information Administration [EIA], 2012). The largest source of $CO_2$, and of overall GHG emissions, is fossil fuel combustion.

Methane. Methane ($CH_4$) is an effective absorber of radiation, though its atmospheric concentration is less than that of $CO_2$ and its lifetime in the atmosphere is limited to 10 to 12 years. It has a GWP approximately 21 times that of $CO_2$. Over the last 250 years, the concentration of $CH_4$ in the atmosphere has increased by 148% (IPCC, 2007), although emissions have declined from 1990 levels. Anthropogenic sources of $CH_4$ include enteric fermentation associated with domestic livestock, landfills, natural gas and petroleum systems, agricultural activities, coal mining, wastewater treatment, stationary and mobile combustion, and certain industrial processes (USEPA, April 2012).

Nitrous Oxide. Concentrations of nitrous oxide ($N_2O$) began to rise at the beginning of the industrial revolution and continue to increase at a relatively uniform growth rate (NOAA, 2010). $N_2O$ is produced by microbial processes in soil and water, including those reactions that occur in fertilizers that contain nitrogen, fossil fuel combustion, and other chemical processes. Use of these fertilizers has increased over the last century. Agricultural soil management and mobile source fossil fuel combustion are the major sources of $N_2O$ emissions. The GWP of $N_2O$ is approximately 310 times that of $CO_2$.

Fluorinated Gases (HFCS, PFCS and SF6). Fluorinated gases, such as HFCs, PFCs, and $SF_6$, are powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are

used as substitutes for ozone-depleting substances such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and halons, which have been regulated since the mid-1980s because of their ozone-destroying potential and are phased out under the Montreal Protocol (1987) and Clean Air Act Amendments of 1990. Electrical transmission and distribution systems account for most $SF_6$ emissions, while PFC emissions result from semiconductor manufacturing and as a by-product of primary aluminum production. Fluorinated gases are typically emitted in smaller quantities than $CO_2$, $CH_4$, and $N_2O$, but these compounds have much higher GWPs. $SF_6$ is the most potent GHG the IPCC has evaluated.

**b. Statewide Greenhouse Gas Emissions Inventory.** Worldwide anthropogenic emissions of GHGs were approximately 40,000 million metric tons (MMT) $CO_2E$ in 2004, including ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes (i.e., deforestation, biomass decay) (IPCC, 2007). $CO_2$ emissions from fossil fuel use accounts for 56.6% of the total emissions of 49,000 MMT $CO_2E$ (includes land use changes) and $CO_2$ emissions from all sources account for 76.7% of the total. Methane emissions account for 14.3% of GHGs and $N_2O$ emissions account for 7.9% (IPCC, 2007).

Total U.S. GHG emissions were 6,821.8 MMT $CO_2E$ in 2009 (USEPA, April 2012). Total U.S. emissions have increased by 10.5 % since 1990; emissions rose by 3.2 % from 2009 to 2010 (USEPA, April 2012). This increase was primarily due to (1) an increase in economic output resulting in an increase in energy consumption across all sectors; and (2) much warmer summer conditions resulting in an increase in electricity demand for air conditioning. Since 1990, U.S. emissions have increased at an average annual rate of 0.5%. In 2010, the transportation and industrial end-use sectors accounted for 32% and 26% of $CO_2$ emissions from fossil fuel combustion, respectively. Meanwhile, the residential and commercial end-use sectors accounted for 22% and 19% of $CO_2$ emissions from fossil fuel combustion, respectively (USEPA, April 2012).

Based upon the California Air Resources Board's (CARB) California GHG Inventory for 2000-2013, California produced 459.3 MMT $CO_2E$ in 2013 (CARB, June 2015). The major source of GHG in California is transportation, contributing 37% of the state's total GHG emissions. Industrial sources are the second largest source of the state's GHG emissions (CARB, June 2015). California emissions are due in part to its large size and large population compared to other states. However, a factor that reduces California's per capita fuel use and GHG emissions, as compared to other states, is its relatively mild climate. CARB has projected statewide unregulated GHG emissions for the year 2020 will be 509.4 MMT $CO_2E$ (CARB, May 2014). These projections represent the emissions that would be expected to occur in the absence of any GHG reduction actions.

**c. Potential Effects of Climate Change.** Globally, climate change has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. Scientists have projected that the average global surface temperature could rise by1.0-4.5°F (0.6-2.5°C) in the next 50 years, and the increase may be as high as 2.2-10°F (1.4-5.8°C) in the next century. In addition to these projections, there are identifiable signs that climate change is currently taking place, including substantial ice loss in the Arctic (IPCC, 2007).

According to the CalEPA's *2010 Climate Action Team Biennial Report*, potential impacts of climate change in California may include loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years (CalEPA, April 2010). Below is a summary of some of the potential effects that could be experienced in California as a result of climate change.

Sea Level Rise. According to *The Impacts of Sea-Level Rise on the California Coast*, prepared by the California Climate Change Center (CCCC) (May 2009), climate change has the potential to induce substantial sea level rise in the coming century. The rising sea level increases the likelihood and risk of flooding. The study identifies a sea level rise on the California coast over the past century of approximately eight inches. Based on the results of various climate change models, sea level rise is expected to continue. The California Climate Adaptation Strategy (California Natural Resources Agency, December 2009) estimates a sea level rise of up to 55 inches by the end of this century.

Air Quality. Higher temperatures, which are conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier, conditions the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thereby ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CEC, March 2009).

Water Supply. Analysis of paleoclimatic data (such as tree-ring reconstructions of stream flow and precipitation) indicates a history of naturally and widely varying hydrologic conditions in California and the west, including a pattern of recurring and extended droughts. Uncertainty remains with respect to the overall impact of climate change on future water supplies in California. However, the average early spring snowpack in the Sierra Nevada decreased by about 10% during the last century, a loss of 1.5 million acre-feet of snowpack storage. During the same period, sea level rose eight inches along California's coast. California's temperature has risen 1°F, mostly at night and during the winter, with higher elevations experiencing the highest increase. In a span of only two years, Los Angeles experienced both its driest and wettest years on record (California Department of Water Resources [DWR], 2008; CCCC, May 2009).

This uncertainty complicates the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood. The Sierra snowpack provides the majority of California's water supply by accumulating snow during wet winters and releasing it slowly during California's dry springs and summers. Based upon historical data and modeling DWR projects that the Sierra snowpack will experience a 25 to 40% reduction from its historic average by 2050. Climate change is also anticipated to bring warmer storms that result in less snowfall at lower elevations, reducing the total snowpack (DWR, 2008).

Hydrology. As discussed above, climate change could potentially affect: the amount of snowfall, rainfall, and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise may be a product of climate change through two main processes: expansion of sea water as the oceans warm and melting of ice over land. A rise in sea levels could jeopardize California's water supply due to salt water intrusion. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Agriculture. California has a $30 billion agricultural industry that produces half of the country's fruits and vegetables. Higher $CO_2$ levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater air pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thereby affect their quality (CCCC, 2006).

Ecosystems and Wildlife. Climate change and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists project that the average global surface temperature could rise by 1.0-4.5°F (0.6-2.5°C) in the next 50 years, and 2.2-10°F (1.4-5.8°C) in the next century, with substantial regional variation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes, such as carbon cycling and storage (Parmesan, 2004; Parmesan, C. and H. Galbraith, 2004).

**d. Local Effects of Climate Change.** While the above discussion identifies the possible effects of climate change at a global and potentially statewide level, current scientific modeling tools are unable to predict what local impacts may occur with a similar degree of accuracy. In general, regional and local predictions are made based on downscaling statewide models (CalEPA, 2010). Further, certain factors such as sea level rise would not have a direct impact to the Tuolumne County region which is located more than approximately 80 miles inland of the Pacific Ocean.

**e. Regulatory Setting.** The following regulations address both climate change and GHG emissions.

International and Federal Regulations. The United States is, and has been, a participant in the United Nations Framework Convention on Climate Change (UNFCCC) since it was produced by the United Nations in 1992. The UNFCCC is an international environmental treaty with the objective of, "stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." This is generally understood to be achieved by stabilizing global GHG concentrations between 350 and 400 ppm, in order to limit the global average temperature increases between 2 and 2.4°C above pre-industrial levels (UNFCCC 2007). The UNFCCC itself does not set limits on GHG emissions

for individual countries or enforcement mechanisms. Instead, the treaty provides for updates, called "protocols," that would identify mandatory emissions limits.

Five years later, the UNFCCC brought nations together again to draft the *Kyoto Protocol* (1997). The Kyoto Protocol established commitments for industrialized nations to reduce their collective emissions of six GHGs ($CO_2$, $CH_4$, $N_2O$, $SF_6$, HFCs, and PFCs) to 5.2% below 1990 levels by 2012. The United States is a signatory of the Kyoto Protocol, but Congress has not ratified it and the United States has not bound itself to the Protocol's commitments (UNFCCC, 2007). The first commitment period of the Kyoto Protocol ended in 2012. Governments, including 38 industrialized countries, agreed to a second commitment period of the Kyoto Protocol beginning January 1, 2013 and ending either on December 31, 2017 or December 31, 2020, to be decided by the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its seventeenth session (UNFCCC, November 2011).

The United States is currently using a voluntary and incentive-based approach toward emissions reductions in lieu of the Kyoto Protocol's mandatory framework. The Climate Change Technology Program (CCTP) is a multi-agency research and development coordination effort (led by the Secretaries of Energy and Commerce) that is charged with carrying out the President's National Climate Change Technology Initiative. However, the voluntary approach to address climate change and GHG emissions may be changing. The United States Supreme Court in *Massachusetts et al. v. Environmental Protection Agency et al*. ([2007] 549 U.S. 05-1120) held that the USEPA has the authority to regulate motor-vehicle GHG emissions under the federal Clean Air Act.

EPA and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps to enable the production of a new generation of clean vehicles with reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. This will be done through coordination of the GHG emission limits and the NHTSA Corporate Average Fuel Economy (CAFE) standards. In May 2010, the final combined EPA and NHTSA standards that comprise the first phase of this national program were promulgated regarding passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. The CAFE standards require these vehicles to meet an estimated combined average emissions level of 250 grams of $CO_2$ per mile, equivalent to 35.5 miles per gallon (mpg) if the automobile industry were to meet this $CO_2$ level solely through fuel economy improvements. In October 2010, the agencies each proposed complementary GHG and CAFE standards under their respective authorities covering medium and heavy-duty trucks for the model years 2014-2018. In August 2012, new emissions limits and CAFE standards for the 2017 to 2025 model years were promulgated, increasing fuel economy to the equivalent of 54.5 mpg for cars and light-duty trucks.

In October 2009, the USEPA issued a Final Rule for mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons (MT) $CO_2E$ per year. This Final Rule applies to fossil fuel suppliers, industrial gas suppliers, direct GHG emitters, and manufacturers of heavy-duty and off-road vehicles and vehicle engines, and requires annual reporting of emissions. The first annual reports for these sources were due in March 2011. Additionally, the reporting of emissions is required for owners of $SF_6$- and PFC-insulated equipment when the total nameplate capacity of these insulating gases is above 17,280 pounds.

On May 13, 2010, the USEPA issued a Final Rule that took effect on January 2, 2011, setting a threshold of 75,000 MT $CO_2E$ per year for GHG emissions. New and existing industrial facilities that meet or exceed that threshold require a permit prior to operation. On November 10, 2010, the USEPA published the "PSD and Title V Permitting Guidance for Greenhouse Gases." The USEPA's guidance document is directed at state agencies responsible for air pollution permits under the federal Clean Air Act to help them understand how to implement GHG reduction requirements while mitigating costs for industry.

On January 2, 2011, the USEPA implemented the first phase of the Tailoring Rule for GHG emissions Title V Permitting. Under the first phase of the Tailoring Rule, all new sources of emissions are subject to GHG Title V permitting if they are otherwise subject to Title V for another air pollutant and they emit at least 75,000 MT $CO_2E$ per year. Under Phase 1, no sources were required to obtain a Title V permit solely due to GHG emissions. Phase 2 of the Tailoring Rule went into effect July 1, 2011. At that time new sources were subject to GHG Title V permitting if the source emits 100,000 MT $CO_2E$ per year, or they are otherwise subject to Title V permitting for another pollutant and emit at least 75,000 MT $CO_2E$ per year.

On July 3, 2012 the USEPA issued the final rule that retains the GHG permitting thresholds that were established in Phases 1 and 2 of the GHG Tailoring Rule. These emission thresholds determine when Clean Air Act permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities.

State Regulations. CARB is responsible for the coordination and oversight of state and local air pollution control programs in California. Various statewide and local initiatives to reduce the state's contribution to GHG emissions have raised awareness about climate change and its potential for severe long-term adverse environmental, social, and economic effects.

Assembly Bill (AB) 1493 (2002), referred to as "Pavley," requires CARB to develop and adopt regulations to achieve "the maximum feasible and cost-effective reduction of GHG emissions from motor vehicles." On June 30, 2009, USEPA granted the waiver of Clean Air Act preemption to California for its GHG emission standards for motor vehicles beginning with the 2009 model year. Pavley I took effect for model years starting in 2009 to 2016 and Pavley II, which is now referred to as "LEV (Low Emission Vehicle) III GHG" will cover 2017 to 2025. In January 2012, CARB approved a new emissions-control program combining the control of smog, soot causing pollutants and GHG emissions into a single coordinated package of requirements for passenger cars and light trucks model years 2017 through 2025. The Advanced Clean Cars program coordinates the goals of the Low Emissions Vehicles (LEV), Zero Emissions Vehicles (ZEV), and Clean Fuels Outlet programs and would provide major reductions in GHG emissions. By 2025, when the rules would be fully implemented, new automobiles would emit 34% fewer GHGs. Statewide $CO_2E$ emissions would be reduced by 3% by 2020 and by 12% by 2025. The reduction increases to 27% in 2035 and even further to a 33% reduction in 2050 (CARB, September 2013).[1]

[1] *Percent reductions are from 2008 baseline emissions levels.*

In 2005, former Governor Schwarzenegger issued Executive Order (EO) S-3-05, establishing statewide GHG emissions reduction targets. EO S-3-05 provided that by 2010, overall GHG emissions shall be reduced to 2000 levels; by 2020, emissions shall be reduced to 1990 levels; and by 2050, emissions shall be reduced to 80% of 1990 levels (CalEPA, 2006). In response to EO S-3-05, CalEPA created the Climate Action Team (CAT), which in March 2006 published the Climate Action Team Report or "2006 CAT Report" (CalEPA, 2006). The 2006 CAT Report identified a recommended list of strategies that the state could pursue to reduce GHG emissions. These are strategies that could be implemented by various state agencies to ensure that the emission reduction targets in EO S-3-05 are met and can be met within the existing authority of the state agencies. The strategies include the reduction of passenger and light duty truck emissions, the reduction of idling times for diesel trucks, an overhaul of shipping technology/infrastructure, increased use of alternative fuels, increased recycling, landfill methane capture, etc.

California's major initiative for reducing GHG emissions is outlined in Assembly Bill 32 (AB 32), the "California Global Warming Solutions Act of 2006," signed into law in 2006. AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020 (essentially a 15% reduction below 2005 emission levels; the same requirement as under S-3-05), and requires CARB to prepare a Scoping Plan that outlines the main state strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions.

After completing a comprehensive review and update process, CARB approved a 1990 statewide GHG level and 2020 limit of 427 MMT $CO_2E$. The Scoping Plan was approved by CARB on December 11, 2008, and includes measures to address GHG emission reduction strategies related to energy efficiency, water use, recycling and solid waste, among other measures. The Scoping Plan includes a range of GHG reduction actions that may include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms.

In 2014, CARB published The First Update to the Climate Change Scoping Plan (May 2014). The update defines CARB's climate change priorities and the groundwork to reach post-2020 goals set forth in EO S-3-05 and highlights California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan (2008). It also evaluates how to align the state's longer-term GHG reduction strategies with other state policy priorities, such as for water, waste, natural resources, clean energy, transportation, and land use.

On April 29, 2015, Governor Brown issued an executive order to establish a statewide mid-term GHG reduction target of 40 percent below 1990 levels by 2030. According to CARB, reducing GHG emissions by 40 percent below 1990 levels in 2030 ensures that California will continue its efforts to reduce carbon pollution and help to achieve federal health-based air quality standards. Setting clear targets beyond 2020 also provides market certainty to foster investment and growth in a wide array of industries throughout the State, including clean technology and clean energy. CARB is currently working to update the Scoping Plan to provide a framework for achieving the 2030 target. The updated Scoping Plan is expected to be completed and adopted by CARB in 2016 (CARB 2015).

EO S-01-07 was enacted on January 18, 2007. The order mandates that a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020.

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Natural Resources Agency (Natural Resources Agency) adopted amendments to the *State CEQA Guidelines* for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts.

CARB Resolution 07-54 establishes 25,000 metric tons of GHG emissions as the threshold for identifying the largest stationary emission sources in California for purposes of requiring the annual reporting of emissions. This threshold is just over 0.005% of California's total inventory of GHG emissions for 2004.

Senate Bill (SB) 375, signed in August 2008, enhances the state's ability to reach AB 32 goals by aligning transportation planning and funding, land use planning and state housing mandates at the Metropolitan Planning Organization (MPO) level in order to reduce vehicle miles traveled (VMT) and transportation-related GHG emissions. SB 375 only applies to the 36 counties that are located within a boundary of an MPO. Tuolumne County is not located within a boundary of an MPO and therefore is not subject to SB 375.

In early 2010, CARB adopted a regulation for reducing $SF_6$ emissions from electric power system gas-insulated switchgear (17 CCR 95350). The regulation requires owners of such switchgear to: (1) annually report $SF_6$ emissions; (2) determine the emission rate relative to the $SF_6$ capacity of the switchgear; (3) provide a complete inventory of all gas-insulated switchgear and their $SF_6$ capacities; (4) produce a $SF_6$ gas container inventory; and (5) keep all information current for CARB enforcement staff inspection and verification. Changes to relevant facilities owned by PG&E and any gas insulated switchgear associated with the project would be subject to this regulation.

The California Renewables Portfolio Standards (RPS) pursuant to SB 1038, SB 1078, SB 1250, and SB 107 previously required investor-owned utilities, electric service providers, and community choice aggregators to increase the portion of energy that comes from renewable sources to 20% by 2010.

- *Senate Bill 1038 (Chapter 515, Statutes of 2002). The pertinent provisions of SB 1038 were formerly codified in Public Utilities Code Sections 383.5 and 445, but are now codified in Public Resources Code Sections 25740 through 25751 as a result of Senate Bill 183 (Chapter 666, Statutes of 2003).*

- *Senate Bill 1078; Chapter 516, Statutes of 2002. The pertinent provisions of SB 1078 are codified in Public Utilities Code Section 399.11 through 399.15. This law was subsequently amended to add Sections 399.16, 399.17, and 399.12.5 under Senate Bill 67 (Chapter 731, Statutes of 2003),*

*Assembly Bill 200 (Chapter 5, Statutes of 2005), and Assembly Bill 2189 (Chapter 747, Statutes of 2006), respectively.*

- *Senate Bill 1250; Chapter 512, Statutes of 2006. SB 1250 amends pertinent provisions in Public Resources Code Sections 25740 through 25751*

- *Senate Bill 107; Chapter 464, Statutes of 2006. SB 107 amends pertinent provisions in Public Resources Code Sections 25740 through 25751 and Public Utilities Code Sections 399.11 through 399.16*

In April 2011, Governor Brown signed SB 2X requiring California to generate 33% of its electricity from renewable energy by 2020.

For more information on the Senate and Assembly bills, Executive Orders, and reports discussed above, and to view reports and research referenced above, please refer to the following websites: www.climatechange.ca.gov and www.arb.ca.gov/cc/cc.htm.

Local Regulations and CEQA Requirements. Pursuant to the requirements of SB 97, the Natural Resources Agency has adopted amendments to the *State CEQA Guidelines* for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted CEQA Guidelines provide general regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents, but contain no suggested thresholds of significance for GHG emissions. Instead, they give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts. The general approach to developing a Threshold of Significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation, adopted for the purpose of reducing statewide GHG emissions sufficiently to move the state towards climate stabilization. If a project would generate GHG emissions above the threshold level, its contribution to cumulative impacts would be considered significant.

*Tuolumne County Regional Blueprint Greenhouse Gas Study.* In 2012, TCTC conducted a regional blueprint planning effort which presented the results of a countywide (including incorporated and unincorporated areas) GHG emissions inventory, which evaluated existing (2010) GHG emissions, and projected (2020, 2030, and 2040) emissions for three growth scenarios, including the Distinctive Communities scenario (the General Plan Update). It also identified policies and measures Tuolumne County and land use project applicants can implement to reduce GHG emissions consistent with AB 32 and prepare for the potential impacts of climate change. In 2010, Tuolumne County emitted approximately 782,846 metric tons of carbon dioxide equivalent GHG emissions (MT $CO_2e$) as a result of activities and operations that took place within the transportation, residential (energy consumption), non-residential (energy consumption), off-road vehicles and equipment, agriculture and forestry, wastewater, and solid waste sectors. This equates to 9.8 MT $CO_2e$ per resident and employee in Tuolumne County's service population.[2] The transportation sector, which accounts for GHG emissions from fuel used to power the cars and trucks that move goods and people, was the largest contributor with 58 percent of the region's total GHG emissions (Rincon, 2012).

*2 Service population is defined as the total residents plus employees within Tuolumne County. In 2010, Tuolumne County's service population was 79,857, with 59,293 residents and 20,564 employees.*

The study identified a countywide target to reduce Tuolumne County's GHG emissions 15 percent below 2010 levels by 2020 (equivalent to 665,419 MT $CO_2e$) and policies that can be implemented to meet the target. The policies are organized into six categories: 1) Energy, 2) Transportation, 3) Resource Conservation, 4) Off-Road Vehicles and Equipment, 5) New Development, and 6) Adaptation. The study also identified a project-level threshold of 4.6 MT $CO_2e$ per service population per year that can be applied evenly to future land development applications countywide to ensure that new development reduces its share of emissions consistent with AB 32 and the countywide reduction target (Rincon, 2012). The Tuolumne County Regional Blueprint Greenhouse Gas Study and associated project-level thresholds were adopted by the County Board of Supervisors in January 2012.

## 4.7.2 Impact Analysis

**a. Methodology and Significance Thresholds** In March 2010, pursuant to the requirements of SB 97, the Natural Resources Agency adopted amendments to the *State CEQA Guidelines* for the feasible mitigation of GHG emissions or the effects of GHG emissions. These guidelines are used in evaluating the cumulative significance of GHG emissions from the proposed project.

According to the adopted *CEQA Guidelines*, impacts related to GHG emissions from the proposed project would be significant if the project would:

- *Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; and/or*
- *Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.*

The vast majority of individual projects do not generate sufficient GHG emissions to create a project-specific impact through a direct influence to climate change; therefore, the issue of climate change typically involves an analysis of whether a project contributes to an impact in a manner that is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when connected with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15355).

For future projects, the significance of GHG emissions may be evaluated based on locally adopted quantitative thresholds, or consistency with a regional or State GHG reduction plan (such as a Climate Action Plan). As described above, Tuolumne County adopted a project-level GHG threshold of 4.6 MT $CO_2e$ per service population per year as part of the Tuolumne County Regional Blueprint GHG Study. The project-level threshold applies to new development within the County and has been incorporated into the General Plan Update as Implementation Program 12.E.z of the Air Quality Element. The Tuolumne County thresholds apply to individual development projects and are not applicable at the programmatic level of the General Plan Update.

Construction Emissions. Although construction activity is addressed in this analysis, the California Air Pollution Control Officier Association (CAPCOA) does not discuss whether any of the suggested threshold approaches adequately address impacts from temporary construction activity. As stated in the *CEQA and Climate Change* white paper, "more study is needed to make this assessment or to develop separate thresholds for construction activity" (CAPCOA, 2008). Additionally, neither Tuolumne County APCD nor the City of Sonora has adopted any construction-related GHG standards. Construction-related emissions are speculative at the General Plan level because such emissions depend on the characteristics of individual development projects. However, because implementing some development projects would generate temporary GHG emissions, primarily due to the operation of construction equipment and truck trips, a qualitative analysis is provided below.

Methodology for Estimating GHG Emissions. Two basic quantities are required to calculate a given emissions estimate: an emission factor and an activity factor. In general, the emission factor is the amount of emissions generated by a certain amount of motor vehicle activity. Vehicle Miles Traveled (VMT) was extracted from the Tuolumne County Transportation Council (TCTC) Travel Demand Model. Emissions estimates used the EMFAC2014 model emissions rates provided by the California Air Resources Board. Default VMT by speed class distributions for Tuolumne County were extracted from EMFAC 2014. The EMFAC 2014 model generates an output of carbon dioxide ($CO_2$) emissions, which were used as the overall indicator of GHG emissions, per the recommendations of the ARB SB 375 Regional Targets Advisory Committee. In order to calculate the $CO_2$ emissions within EMFAC 2014, VMT data was extracted from the TCTC Travel Demand model for the baseline (2015) and target year (2040), based on the General Plan Update and 'No Project' scenario and provided in the traffic study prepared by Wood Rodgers, Inc. (September 2015). This extracted information was then entered into the EMFAC 2014 model. The $CO_2$ emissions associated with vehicle starts are accounted for in the EMFAC 2014 model based on the distribution of vehicle starts by vehicle classification, vehicle technology class, and operating mode. EMFAC 2014 adds these vehicle starts to the running emissions to compute total on-road mobile source emissions. The $CO_2$ emissions for the vehicle classes were then extracted from the EMFAC 2014 output and reported. $CO_2$ emissions reported herein account for State regulations, including Pavley I and the Low Carbon Fuel Standard, both AB 32 Scoping Plan measures. Per capita emissions rates were calculated by dividing total $CO_2$ emissions for each scenario by the region's population in each respective year.

**b. Project and Cumulative Impacts.**

**Impact GHG-1 Construction activities associated with future development envisioned by the General Plan Update would generate temporary short-term GHG emissions. Impacts would be Class III, *less than significant*.**

Construction activities associated with future development under the General Plan Update would generate temporary short-term GHG emissions, primarily due to truck trips and operating construction equipment. Construction-related emissions are speculative at the General Plan level because such emissions depend on the characteristics of individual development projects. However, GHG emissions would be emitted from travel to and from the

worksite and operating construction equipment such as graders, backhoes, and generators. During construction, preparing and grading sites typically emit the most GHG, due to the use of grading equipment and soil hauling. The precise construction timing and construction equipment for individual projects is not specifically known at this time. Nonetheless, construction activities would result in GHG emissions. Impacts would be potentially significant. The Air Quality Element of the Tuolumne County General Plan Update includes Implementation Program 12.E.l which would reduce greenhouse gas emissions (GHG) associated with future development under the General Plan:

*Implementation Program 12.E.l:* *Encourage the following to reduce Greenhouse Gas emissions from construction equipment:*

- *Substitute electrical equipment for diesel- and gasoline-powered equipment where practical.*
- *Use alternatively fueled construction equipment on-site, where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.*
- *Avoid the use of on-site generators by connecting to grid electricity or utilizing solar-powered equipment.*
- *Limit heavy-duty equipment idling time to a period of 3 minutes or less, exceeding the California Air Resources Board regulation minimum requirements of 5 minutes.*

Compliance with Implementation Program 12.E.l would reduce impacts to a less than significant level.

Mitigation Measures. Impacts would be less than significant without mitigation.

Significance after Mitigation. Impacts would be less than significant without mitigation.

**Impact GHG-2 Implementing the General Plan Update would decrease GHG emissions compared to both the 2015 baseline and 'No Project' scenario. Impacts would be Class III, *less than significant*.**

Long-term emissions associated with future development in Tuolumne County in accordance with the General Plan Update would be primarily those associated with mobile (vehicle trips) and area sources (electricity consumption).

**Mobile Sources**

Projected on-road vehicle emissions for the year 2040 under the proposed General Plan Update were compared to 2015 baseline conditions and the 'No Project' scenario. The 'No Project' scenario accounts for future growth, but the transportation improvements and land use scenario identified in the General Plan Update are not implemented. The on-road vehicle source emissions estimates for the proposed General Plan Update were produced with the EPA approved EMFAC2014 emission inventory model developed by CARB for use in California.

As previously discussed, the AB 32 Scoping Plan outlines the main State strategies for reducing GHGs to meet the 2020 target. Many of these strategies contribute to reducing transportation-related emissions at the regional and local levels. The projections discussed below include reductions in emissions resulting from applying Pavley fuel efficiency standards and low carbon fuel standards. Table 4.7-1 summarizes the 2015 baseline, 'No Project' and General Plan Update transportation-related emissions from all vehicles classes.

**Table 4.7-1**
**Carbon Dioxide Emissions Analysis‡**

| Scenario | VMT (Daily) | Total Emissions Per Day (lbs $CO_2$/day) |
|---|---|---|
| Baseline | 1,829,654 | 0.51 |
| 'No Project' Scenario | 2,188,733 | 0.34 |
| Proposed General Plan Update | 2,170,502 | 0.33 |

*‡The on-road mobile source criteria pollutant emissions estimates for the General Plan Update were calculated using CARB's EMFAC2014 emission inventory model. VMT data were extracted from the TCTC Travel Demand Model. VMT data includes pass-through trips from vehicles travelling through Tuolumne County that do not have an origin or destination within the county and therefore represent a worst-case scenario.*

As shown in Table 4.7-1, emissions levels are forecast to decline between 2015 and 2040 despite projected future growth. This is likely a result of the GHG reductions associated with Pavley fuel efficiency standards and low carbon fuel standards discussed above, which reduce transportation-related emissions independent of reductions in vehicle or fuel usage. It is important to note that transportation-related GHG emissions would continue to occur throughout the County regardless of whether the General Plan Update is adopted or not. However, as demonstrated above, GHG emission levels under the General Plan Update would be reduced from 'No Project' scenario levels. The 'No Project' scenario is based on current land use designations and does not incorporate increased density and other VMT-reducing land use strategies included under the General Plan Update. The 2015 GHG emissions for the plan area were estimated to be 0.51 pounds per day. With the proposed General Plan Update, the 2040 GHG emissions for the plan area were modeled to be 0.33 pounds per day, a reduction of 35 percent from 2015. In addition, as shown in Table 4.7-1, GHG emissions under the 'No Project' scenario would be higher compared to GHG emissions under the General Plan Update. The decrease in GHG emissions is primarily due to the reduced daily VMT resulting from the future land use scenario envisioned by the General Plan Update which is intended to encourage land use growth in/near the urbanized, high-density population centers such as the City of Sonora and community of Jamestown, ultimately increasing density and improving circulation and multimodal connections. As such, the General Plan Update would contribute to an overall reduction in transportation-related GHG emissions.

In addition, the Air Quality Element of the Tuolumne County General Plan Update includes policies and implementation programs which would support the reduction of GHG emissions from mobile sources associated with future development under the General Plan:

*Implementation*

*Program 12.B.h:* *Encourage new development to be planned to result in smooth flowing traffic conditions for major roadways. This includes traffic signals and traffic signal coordination, parallel roadways and connections within and between neighborhoods where significant reductions in overall emissions can be achieved.*

Impacts associated with emissions from mobile sources resulting from implementation of the General Plan Update would be less than significant.

**Area Sources**

As stated in Section 2.0, *Project Description*, build-out under the proposed General Plan Update would include the development of 26,399 dwelling units, 5,562,000 square feet of commercial development, and 11,914,000 square feet of industrial development. New development under the General Plan Update would result in GHG emissions due to electricity and consumption. Build-out under the General Plan Update would result in a net increase of 5,159 dwelling units, 938,000 square feet of commercial development, 196,000 square feet of industrial development, and 42 acres of public lands above existing conditions (year 2015). This represents a 24 percent increase in dwelling units, 20 percent increase in commercial development, 11 percent increase in industrial development, and less than one percent increase in public lands above existing conditions. Therefore, the General Plan Update would facilitate proportional increases in area source GHG emissions as a result of increased energy usage from new development.

It is important to note that new development would continue to occur throughout the County regardless of whether the General Plan Update is adopted or not. However, GHG emissions levels under the General Plan Update would be reduced from the 'No Project' scenario levels. Under the 'No Project' scenario the County would experience a total of 26,415 dwelling units, 5,562,000 square feet of commercial development, 1,915,000 square feet of industrial development, and 11,042 acres of public lands. Development under the General Plan Update would result in a net decrease of 16 dwelling units, 1,000 square feet of industrial development, and one acre of public lands as compared to the 'No Project' scenario. In addition, the General Plan Update would not result in an increase in commercial development over the 'No Project' scenario. Therefore, the General Plan Update would result in proportional decreases in area source GHG emissions compared to the 'No Project' scenario. Long-term area source emissions associated with future development under the General Plan Update would be reduced from levels anticipated under the 'No Project' scenario.

In addition, the Air Quality Element of the Tuolumne County General Plan Update includes policies and implementation programs which would further reduce GHG emissions associated with energy use resulting from future development under the General Plan Update compared to existing conditions:

*Policy 12.E.1:* *Promote energy efficiency and alternative energy while reducing energy demand.*

*Implementation*

*Program 12.E.z:* *Require Greenhouse Gas Mitigation Measures. Require new development to meet project-level screening criteria or demonstrate consistency with the project-level threshold of 4.6 metric tons of carbon dioxide equivalent per service population per year as identified in the Tuolumne County Regional Blueprint Greenhouse Gas Study, as it may be updated from time to time. Consider amending Table 5-9 Project Screening Criteria by Project Features of the Tuolumne County Regional Blueprint Greenhouse Gas Study to include compact parking spaces in combination with low-emitting, fuel-efficient and carpool/vanpool vehicles at 10 percent of the total required spaces to reduce greenhouse gas emissions.*

As described above, *Implementation Program 12.E.z* would allow new development to install compact parking spaces in combination with low-emitting, fuel-efficient and carpool/vanpool parking spaces at 10 percent of the total required parking spaces. This would contribute to an overall reduction in GHG emissions through the provision of supporting infrastructure for low-emission modes of transportation. With adherence to the policy and implementation program listed above, impacts associated with GHG emissions from area sources resulting from implementation of the General Plan Update would be less than significant.

Mitigation Measures. None required.

Significance after Mitigation. Impacts are less than significant.

**Impact GHG-3 Implementing the General Plan Update would be consistent with the goals of applicable GHG reduction plans and policies, including the adopted Tuolumne County Regional Blueprint Greenhouse Gas Study, as well as AB 32. Impacts would be Class III, *less than significant*.**

As discussed above, Tuolumne County has adopted the *Tuolumne County Regional Blueprint Greenhouse Gas Study* that sets goals and targets for reducing GHG emissions, and outlines policies to help achieve those goals. This local GHG Reduction Plan was adopted in an effort to comply with the GHG emissions reduction goals that the AB 32 Scoping Plan recommends for local governments.

One of the goals of AB 32 is to reduce statewide GHG emissions to 1990 levels by 2020 (essentially a 15 percent reduction below 2005 emission levels; the same requirement as under AB 32). ARB's Scoping Plan outlines the main State strategies for reducing GHGs to meet the 2020 deadline and encourages local governments to similarly implement these strategies to meet the 2020 targeted emissions level.

As discussed in Impact GHG-2 above, the proposed General Plan Update would reduce GHG emissions compared to the 'No Project' scenario. The decrease in GHG emissions is primarily due to the reduced daily VMT resulting from the future land use scenario envisioned by the General Plan Update which is intended to encourage land use growth in/near the urbanized, high-density population centers such as the community of Jamestown, ultimately increasing density and improving circulation and multimodal connections. The 'No Project' scenario is based on current land use designations and does not incorporate increased density and other

VMT-reducing land use strategies included under the General Plan Update. As such, the General Plan Update would contribute to reducing vehicle- and energy-related GHG emissions. It is important to note that mobile and area source GHG emissions would continue to occur throughout the County regardless of whether the General Plan is adopted or not. However, as demonstrated above, the General Plan Update would contribute to an overall reduction in mobile and area source GHG emissions. Therefore, implementation of the General Plan Update helps the region achieve GHG emissions reductions consistent with AB 32 targets and Tuolumne County Regional Blueprint Greenhouse Gas Study targets.

Furthermore, the land use scenario and policies identified in the General Plan Update are designed to align regional planning to reduce VMT and transportation-related GHG emissions as well as emissions associated with new development. Therefore, implementing the General Plan Update would help the region reduce GHG emissions, thereby contributing to the State's overall GHG emissions reduction goals identified in AB 32. Since the General Plan Update is consistent with the goals of AB 32, it would not conflict with the goals of local reduction plans designed to meet the same state goals. Impacts would be less than significant.

Mitigation Measures. None required.

Significance after Mitigation. Impacts are less than significant.

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