11 CLIMATE CHANGE

SECTION 11.1 INTRODUCTION

This chapter presents an overview of climate change and how it may affect Gilroy's future. The City has also prepared interim guidelines for a Climate Action Plan (CAP), which identifies greenhouse gas (GHG) emission sources and quantities. Included in the CAP are GHG reduction goals and other environmental objectives that recognize the current economic context and trends. The CAP Team proposed programs, policies, and best practices for implementing the Plan and recommended a monitoring program to track and report on progress over time.

This chapter is organized into the following sections:

- Introduction (Section 11.1)
- Climate Change (Section 11.2)
- Greenhouse Gas Emissions Inventory (Section 11.3)

SECTION 11.2 CLIMATE CHANGE

Introduction

This section summarizes the impacts from climate change that Gilroy can expect to experience over the coming decades. It includes a discussion of the cause of climate change impacts, the effects of climate change, and how those effects will impact the city.

Major Findings

- Temperatures in Gilroy have historically averaged about 56.8°F and are projected to rise between 3.6 and 6.0°F by 2090. Additionally, Gilroy is projected to experience 57 extreme heat days per year by 2090. Gilroy has historically experienced an average of four extreme heat days per year.
- Gilroy is expected to experience a decrease in annual precipitation by 2100 under a high emissions scenario; annual precipitation could decrease from an annual average of 20 inches in 2010 to 15 inches in 2100.
- The spring snowpack in the Sierra Nevada, which provides 80 percent of the state's water, has decreased by 10 percent in the last century and may decrease up to 80 percent by 2100. For each 1.8°F increase in Earth's average temperature, the Sierra snowpack will retreat 500 feet in elevation.
- As of 2005, 25 miles of Gilroy's roadways are in the 100-year flood plain, while an additional 93 miles of roadway are in other flood-prone areas. Altogether, 869 acres in Gilroy are in the 100-year flood plain, while an additional 3,190 acres are in other flood-prone areas. Twenty-four city-owned critical facilities are in the 100-year flood plain.

Existing Conditions

Climate change is expected to affect us all, threatening to harm our health and safety. In particular, climate change will affect physical and mental health, economic stability, and overall quality of life. It will affect our access to, and the quality of, basic goods and services such as water, shelter, and food; as well as other key priorities for well-being such as education, employment, and crime rates. According to the U.S. Global Change Research Program, climate change is already reshaping the United States, and warns that global warming could have serious consequences for how Americans live and work.

Causes of Climate Change

The greenhouse effect naturally regulates the Earth's temperature. However, human activity has increased the intensity of the greenhouse effect by releasing increasing amounts of greenhouse gasses (GHGs) into the atmosphere. GHGs can remain in the atmosphere for decades. The GHG emissions that are already in the atmosphere will continue to cause climate change for years to come, just as the warming we are experiencing now is the result of emissions produced in the past. Climatic changes are happening now and are projected to increase in frequency and severity before the benefits of GHG emission reductions will be realized. Increased concentrations of GHGs in the atmosphere result in increased air, surface, and ocean temperatures. Many of the effects and impacts of climate change stem from resulting changes in temperature and meteorological responses to those changes.

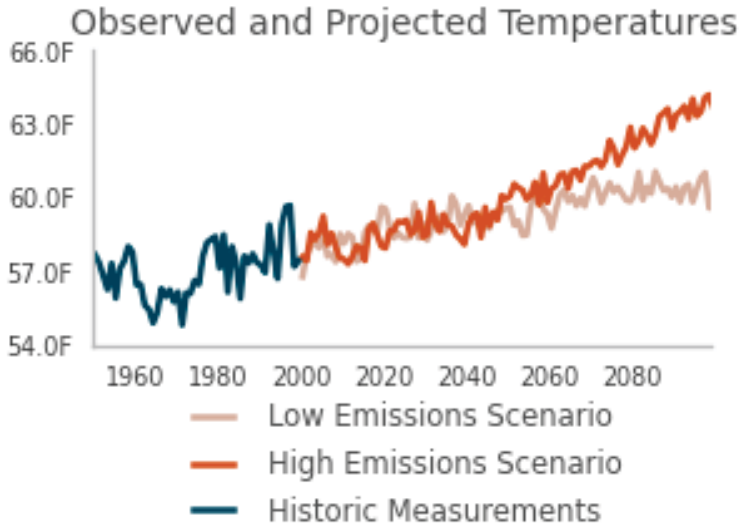
The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, estimated that over the last century, global temperatures have increased by about 1.3 degrees Fahrenheit (°F). IPCC forecasts indicate that global temperatures can be expected to continue to rise between 2.5 and 10°F over the next century. According to the California Climate Adaptation Strategy (ARB 2009), average state temperatures are currently predicted to increase 1.8 to 5.4°F by 2050 and 3.6 to 9°F by 2100. Some regional models show average temperatures in California increasing as much as 10.8°F.

Temperature increase predictions are based on ranges of global GHG emissions expected within the next century. The IPCC temperature ranges mentioned above reflect a variety of low, medium, and high scenarios for emissions. Global GHG emissions are being monitored annually and they continue to increase. As a result, achieving the low emission scenarios has become unlikely, while the probability of reaching the medium and high scenarios is believed to be more likely. For purposes of this discussion, the focus is mostly on the effects of the medium- or high-range emissions scenario, although information about low ranges is also presented where relevant or available.

Gilroy's Rising Temperatures

Gilroy has already experienced a rise in average temperatures. According to the U.S. Global Change Research Program, winters are now shorter and warmer than they were 30 years ago. Temperatures in California have already risen 1°F on average. According to Cal-Adapt, a climate change projection modeling tool developed by California Energy Commission, temperatures in Gilroy have historically averaged about 56.8°F. As shown in Figure 11-1, temperatures are projected to rise between 3.6 and 6.0°F by 2090, based on average low and high emissions scenarios.

FIGURE 11-1
OBSERVED AND PROJECTED AVERAGE TEMPERATURES
Gilroy Area
1960-2090



Source: Cal-Adapt, http://cal-adapt.org/tools/factsheet/, accessed January 2014.

While temperatures are relatively low in Gilroy compared to other areas in the state, Gilroy will still experience temperature changes related to climate change. As shown in Figure 11-2, Gilroy has historically experienced four extreme heat days per year (over 91°F), but by 2013 this number increased to nine extreme heat days per year and is projected to increase to 57 extreme heat days per year by 2090. While Gilroy does not currently (2013) experience heat waves, the city could experience up to six heat waves per year by 2090.

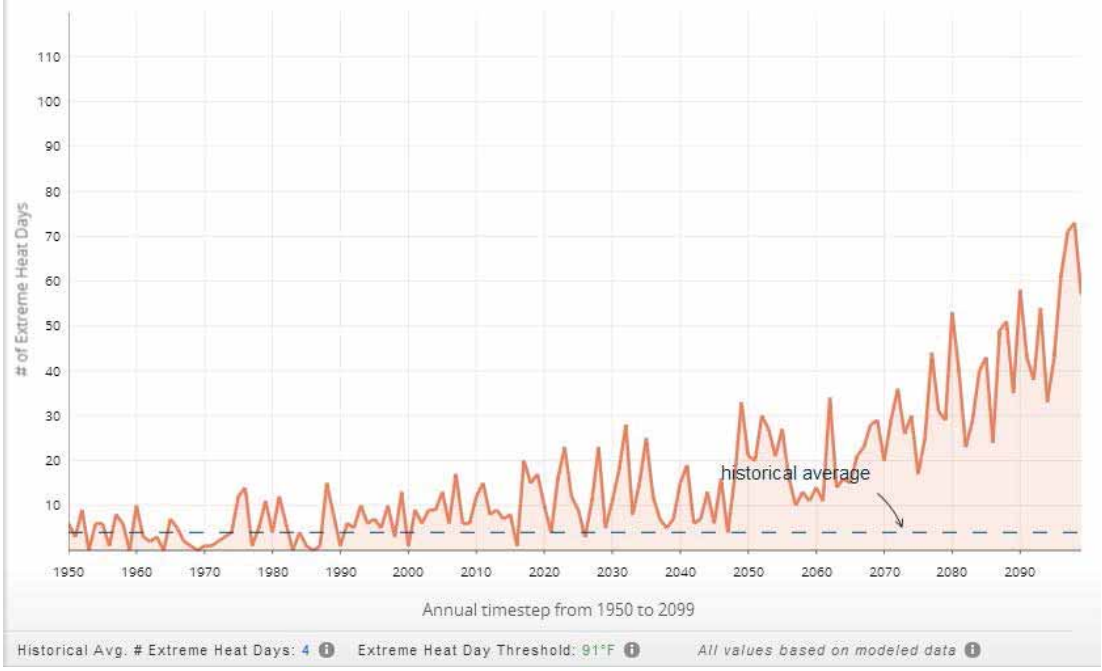
Anticipated Climate Change Effects in Gilroy

Variable Precipitation Patterns

Precipitation levels are difficult to predict compared to other indicators of climate change. Annual rain and snowfall patterns vary widely from year to year, especially in California. Generally, higher temperatures increase evaporation and decrease snowfall, resulting in a drier climate. A majority of scientific models have shown that northern California precipitation is expected to decrease after 2030. Precipitation may decrease as much as 12 to 35 percent. Additionally, more precipitation is expected to fall as rain rather than as snow.

According to Cal-Adapt, Gilroy's annual precipitation will generally remain the same between the years of 2010 and 2100 under a low emissions scenario, despite projections of fluctuation in precipitation experienced in each decade. Under a high emissions scenario, however, Gilroy is expected to generally experience a decrease in annual precipitation by 2100. Annual precipitation averages about 20 inches for both 2010 and 2100 under a low emissions scenario, while annual precipitation could decrease from an annual average of 20 inches in 2010 to 15 inches in 2100 under the high emissions scenario.

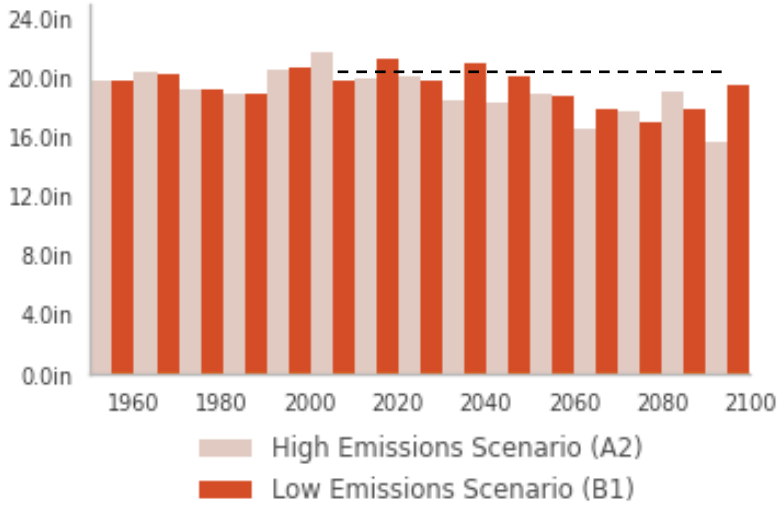
FIGURE 11-2
OBSERVED AND PROJECTED AVERAGE EXTREME HEAT DAYS
Gilroy Area
1950-2100



Source: Cal-Adapt, http://cal-adapt.org/tools/factsheet/, accessed January 2014.

FIGURE 11-3
OBSERVED AND PROJECTED PRECIPITATION DECADAL AVERAGES

Gilroy Area
1960-2100



Source: Cal-Adapt, http://cal-adapt.org/tools/factsheet/, accessed January 2014.

Reduced Snowpack and Snowline at Higher Elevations

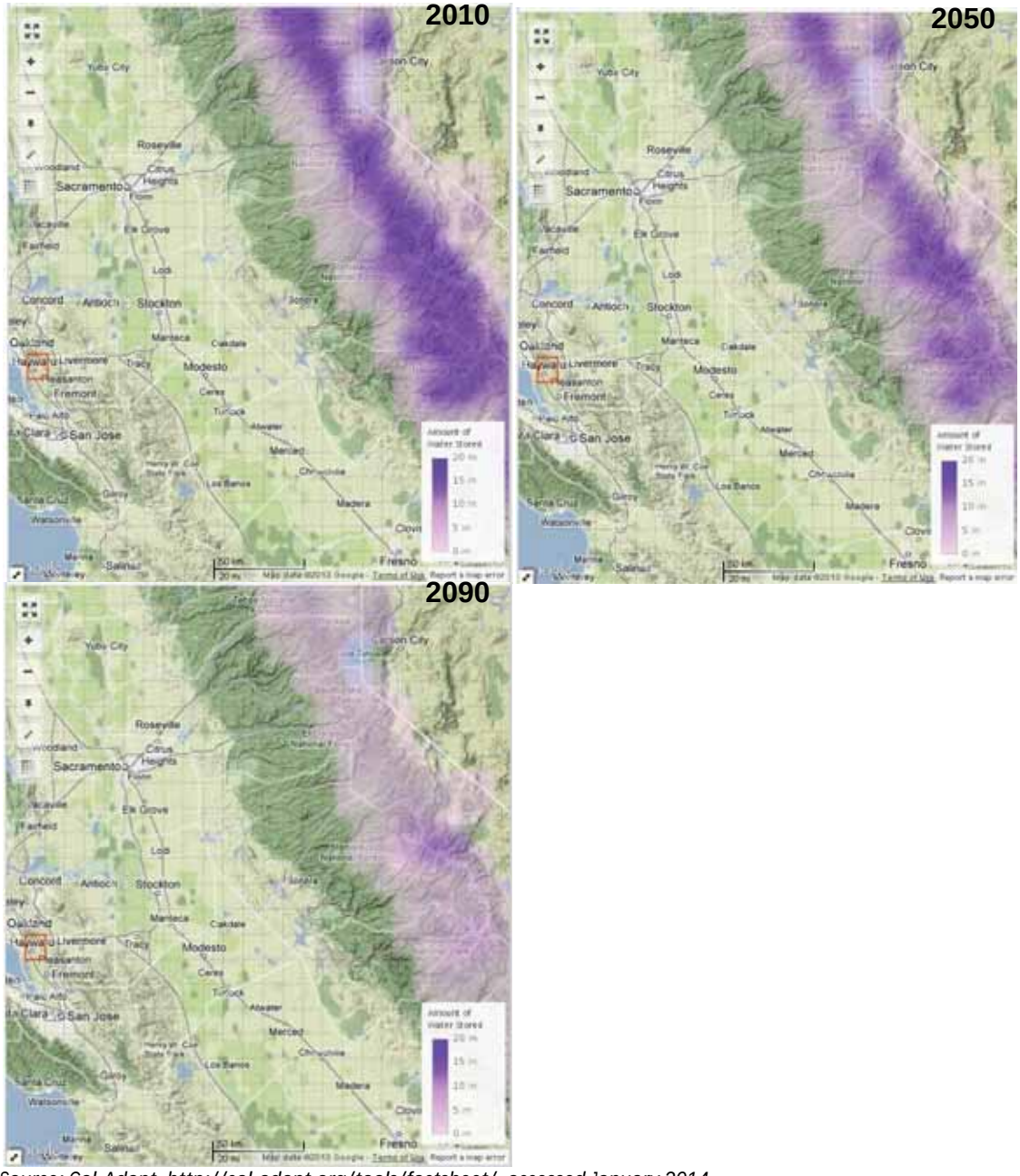
The Sierra Nevada snowpack acts as a large natural reservoir that stores water during the winter and releases it into rivers and reservoirs in the spring and summer. It is expected that there will be less snowfall in the Sierra Nevada and that the elevations at which snow falls will rise. Similarly, there will be less snowpack water storage to supply runoff water in the warmer months. It has already been documented that California's snow line is rising. According to Cal-Adapt, more precipitation is expected to fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack (see Figure 11-4).

The spring snowpack in the Sierra Nevada decreased by 10 percent in the last century and may decrease up to 80 percent by 2100. The California Department of Water Resources also estimates that for each 1.8°F increase in Earth's average temperature, the Sierra snowpack will retreat 500 feet in elevation. According to DWR, the Sierra Nevada can expect to experience a decrease in snowpack at lower elevations and an overall reduction of 25 to 40 percent reduction in snowpack by 2050.

The Sierra Nevada snowpack provides approximately 80 percent of California's annual water supply. Although the water supplied to Gilroy is procured primarily from groundwater well sources, the alarming decrease in snowpack, and consequently spring melt, poses a threat to groundwater resources as well.

FIGURE 11-4
OBSERVED AND PROJECTED SNOWPACK DECADAL AVERAGES

Sierra Nevada
2010-2090



Source: Cal-Adapt, http://cal-adapt.org/tools/factsheet/, accessed January 2014.

More Frequent and Extreme Storm Events

Extreme weather is expected to become more common throughout California. More extreme storm events are expected to increase water runoff to streams and rivers during the winter months, heightening flood risks. Warmer ocean surface temperatures have caused warmer and wetter conditions in the Sierra Nevada, increasing flood risk. Strong winter storms may produce atmospheric rivers that transport large amounts of water vapor from the Pacific Ocean to the California coast. They often last for days and drop heavy rain or snow for days. As the strength of these storms increase and transport increased amounts of precipitation, the risk of flooding is increased.

Diminished Air Quality

Climate change is expected to exacerbate air quality problems by increasing the frequency, duration, and intensity of conditions conducive to air pollution formation. Higher temperatures and increased ultraviolet radiation from climate change are expected to facilitate the chemical formation of more secondary air pollutants from ground-level sources. Conversely, decreased precipitation is expected to reduce the amount of particulates cleansed from the air.

Californians experience the worst quality air in the nation. More than 90 percent of California's population lives in an area that has ozone or particulate matter levels above the State air quality standard. Incidents of wildfires in nearby foothills and mountain regions are expected to increase and further contribute to air quality problems. In 2012 Santa Clara County did not meet the California attainment standards for ozone, PM2.5, or PM10 pollutants, or the Federal attainment standards for ozone or PM2.5 pollutants.

Anticipated Climate Change Impacts on Gilroy

According to the 2009 California Climate Change Adaptation Strategy, Gilroy can expect to experience increased average temperatures with overall hotter and drier conditions, reductions in winter snow, increases in winter rains, accelerating sea-level rise, and more extreme weather events. The Cal Adaptation Strategy indicates that extreme weather events (e.g., heat waves), wildfires, droughts, and floods are likely to be some of the earliest climate impacts.

Water Supply and Quality

Climate change is expected to increase pressure on and competition for water resources, further exacerbating already stretched water supplies. Decreasing snowpack and spring stream flows and increasing demand for water from a growing population and hotter climate could lead to increasing water shortages. Water supplies are also at risk from rising sea levels.

The San Francisco Bay Area is expected to experience hotter and drier conditions and reduced snowpack that could cause reduced reservoir supplies and river flows. The region may experience more intense rainfall events that could increase demand for reservoir capacity to provide for water capture and storage. As a result, water supply is expected to decrease and water yields from reservoirs are expected to become more unreliable. As Earth's temperature rises, water demands are expected to increase and could result in a longer season of peak treated water demands. Competition for water is expected to increase among cities, farmers, and the environment.

Changes to air and land temperatures will have an impact on the timing, amount, type, and location of precipitation and runoff. This will impact the quantity of water supplies, the management of those quantities, the quality of the source water, and the demand for treated drinking water. DWR has identified anticipated changes to the source water conditions in the watershed that will likely impact the quality of the source waters, including more intense storm events, longer drought periods, reduced snowpack at lower elevations, and earlier spring runoff.

Changes in source water quantity and quality may impact the treatment necessary to produce potable drinking water. These changes could result in additional treatment processes required and increased costs for treated drinking water in order to avoid potential for human health risk via drinking water consumption.

Health and Safety

Respiratory Illness

As temperatures rise from global warming, the frequency and severity of heat waves will grow and increase the potential for bad air days, which can lead to increases in illness and death due to dehydration, heart attack, stroke, and respiratory disease. According to the Environment News Service, poor air quality results in approximately 21,000 deaths per year across California. In the winter of 2013, the Bay Area Air Quality Management District (BAAQMD) registered 20 “Spare the Air” day alerts and exceeded the California 24-hour standard for PM 10 (set at 50 micrograms per cubic meter) five times. Additionally, dry conditions can lead to a greater number of wildfires producing smoke that puts people with asthma and respiratory conditions at risk of illness or death.

Heat-related Illness

Higher temperatures and the increased frequency of heat waves associated with climate change are expected to significantly increase heat-related illnesses, such as heat exhaustion and heat stroke, while also exacerbating conditions associated with cardiovascular and respiratory diseases, diabetes, nervous system disorders, emphysema, and epilepsy.

In California heat waves have killed more people than all other disaster events in the last 15 years, usually affecting vulnerable populations such as infants, the sick, the elderly, or those of low incomes who lack access to air conditioning or work outdoors. An increase of every 10°F in average daily temperature is associated with a 2.3 percent increase in mortality. During heat waves mortality rates can increase to about nine percent. By 2090 Gilroy could experience up to a six percent increase in average temperature and up to six heat waves per year. As temperatures in Gilroy increase, vulnerable populations such as children, the elderly, people with existing illnesses, and people who work outdoors will face the greatest risk of heat-related illness.

Vector-borne Diseases

As climate change affects the temperature, humidity, and rainfall levels across California, some areas could become more suitable habitats for insects (especially mosquitoes), ticks, and mites that may carry diseases. Wetter regions are typically more susceptible to vector-borne diseases, especially human hantavirus cardiopulmonary syndrome, Lyme disease, and West Nile virus.

The amount and pattern of precipitation, as well as warmer winter weather, affects the abundance of vector habitat and food supply. Gilroy is projected to have warmer winters with up to approximately 20 inches of rain under a low emissions scenario. This may attract vector populations (e.g., mosquito inhabited still-water pools may become more prolific).

Floods can also increase the food supply available to rodents that may transmit Lyme disease, plague, tularemia, and rickettsial infections. In each of these cases the increase in vector-borne disease occurrences is expected to impact public health and increase demand on health care systems.

Health Care Systems

Finally, increased health and safety impacts are expected to cause a corresponding increase in demand for health care and place additional strain on health care systems by overloading emergency rooms and medical facilities. As a result, residents and businesses may experience increased health care costs and higher insurance premiums.

Flood Risk

Increased flood frequency and elevated flood risk are expected in California as a result of sea level rise, more intense storm events, and shifts in the seasonal timing of rainfall and snowpack runoff. Gilroy is protected by a system of levees that will be further strained to meet the challenges expected from sea level rise and more extreme storm events. Additionally, more frequent and heavier precipitation may cause flooding and landslides, which would result in considerable costs in damages to property, infrastructure, and even human life.

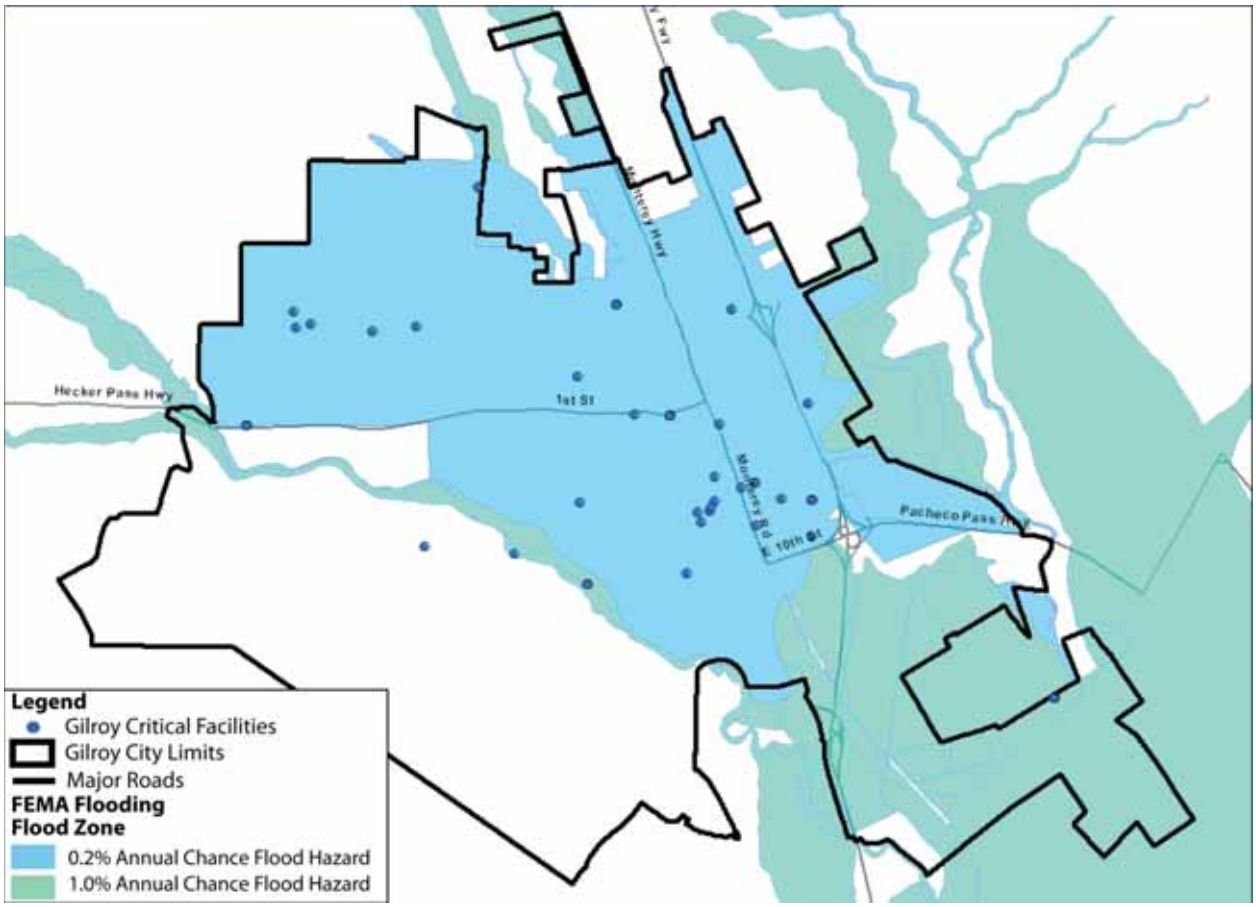
The City of Gilroy is bound to the southwest and to the east by Uvas Creek and Llagas Creek respectively. Large portions of the Gilroy area are subject to flood hazards due to seasonal run-off along Llagas and Uvas Creeks. The problem is particularly acute in the eastern agricultural areas along Llagas Creek and along the southern portion of Uvas Creek.

These creeks originate in the Santa Cruz Mountains and flow in a southeasterly direction through the City before their confluence with the Pajaro River. While not intended for flood control, each creek is dammed and has controlled releases from reservoirs upstream of the City. Chesbro Reservoir controls Llagas Creek and Uvas Reservoir controls Uvas Creek. In addition to the unintentional flood control from the reservoirs, several flood control projects have been completed within the City. These projects consist of: PL-566 Channel and Levee Improvements on Llagas Creek and its tributaries, and the Army Corps of Engineers Levee Improvements on Uvas Creek.

As of 2005, 25 miles of Gilroy's roadways are in the 100-year flood plain, while an additional 93 miles are in other flood-prone areas. A totally of 869 of acres are in the 100-year flood plain, while an additional 3,190 acres are in other flood-prone areas. As can be seen in Figure 11-5, 24 city-owned critical facilities are in the 100-year flood plain. Sixty-four out of the City's 78 identified critical facilities are at risk of being inundated from one or more dams failing (Figure 11-6). Five health care facilities and nine schools are in other flood-prone areas.

FIGURE 11-5
CRITICAL FACILITIES AND FLOODPLAIN

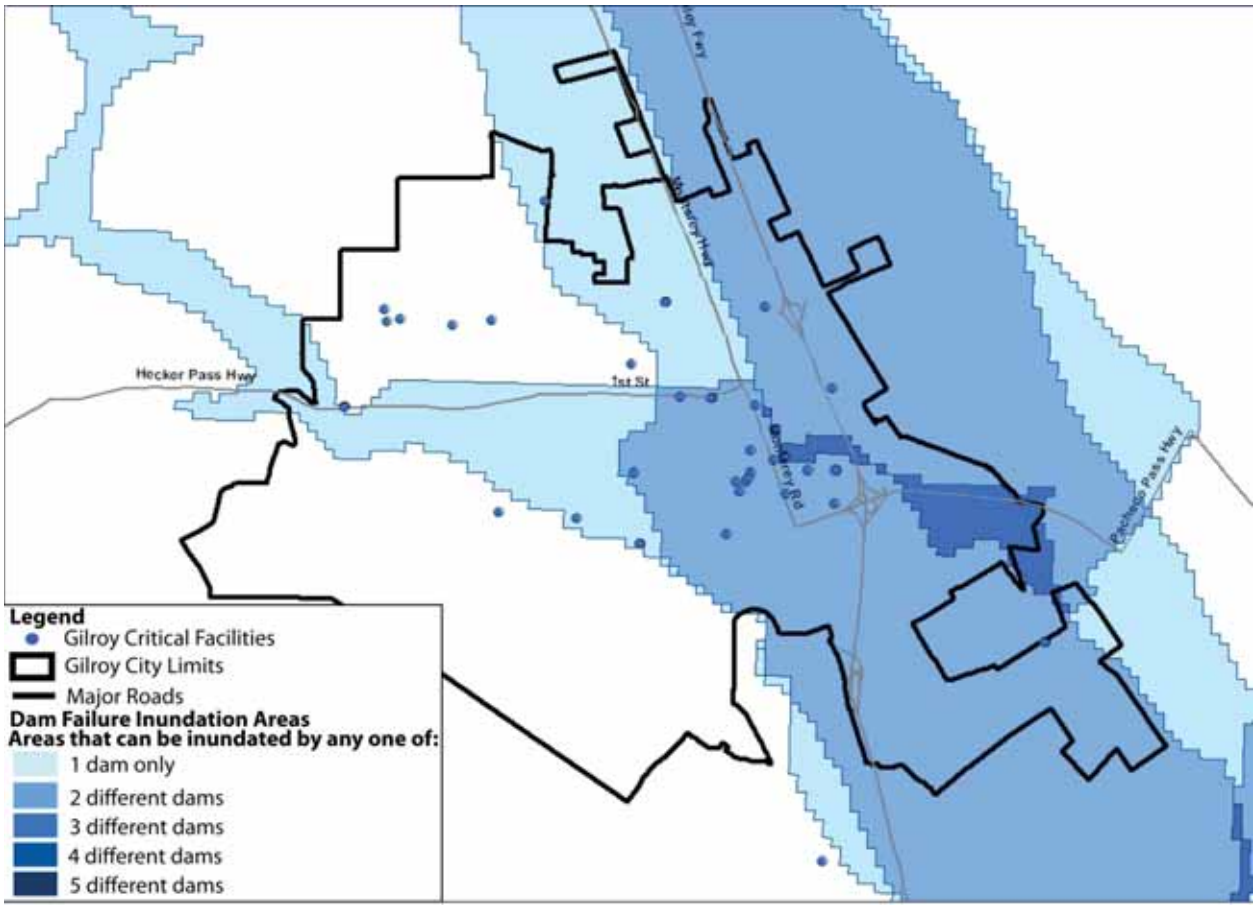
City of Gilroy
2011



Source: Santa Clara County Hazard Mitigation Plan, November 10, 2011.

FIGURE 11-6
CRITICAL FACILITIES AND DAM FAILURE INUNDATION AREAS

City of Gilroy
2011



Source: Santa Clara County Hazard Mitigation Plan, November 10, 2011.

Fire Risk

Recent practice of wildfire suppression has resulted in large fuel loads accumulating in many grassland ecosystems, leading to a dramatic increase in large-scale wildfires in the western United States. Fire season has also become longer in duration due to warmer, earlier springs that dry out vegetation, and more serious as drought and temperature increases intensify the drying effect of the season. Gilroy's western hillside areas pose a high fire hazard for the residents who live there, especially along the "wildland-urban interface." These areas are subject to special development controls to help reduce the potential loss of life and property in the event of a local wildfire. As of 2005, 189 acres are subject to high or very high wildfire threat (because of the urban-rural interface of the City's western perimeter), and 2,938 acres of urban land uses are in the wildland-urban interface threat areas.

Economic Growth and Stability

Economic impacts due to climate change will likely affect all sectors of the economy with negative consequences. A study conducted in 2008 by the University of California, Berkeley, and Next10, estimated that if no action is taken, potential statewide direct costs due to climate change-induced

damage could exceed tens of billions of dollars annually, with even higher direct economic costs and placing trillions of dollars of real estate at risk. Consequently, the economic well-being of communities declines with higher risk and greater uncertainty about the future. Residents, businesses, and public agencies will likely see everyday costs for food and services increase. Costs will increase to cover energy, water, food, and health related issues, leaving less money for discretionary household spending, business investment and profits, and government services.

Overall energy demand could increase six percent by 2020 and electricity demand by residential dwellings could increase by up to 55 percent by 2100. Energy costs are expected to rise as demand increases to cool buildings due to higher temperatures and extreme heat waves. Energy prices may also be affected due to more variable energy supplies locally and from increased competition for electricity, natural gas, and oil.

Water is crucial for the economy, as virtually every industry relies on it to grow and ultimately sustain their business. Water costs will likely rise due to increased demands for potable, landscaping, and irrigation water use (e.g., metered water cost increases) and scarcity of and competition for water supplies. Some businesses claim water availability is a bigger challenge than energy security, and that we may run out of water before we run out of fuel. Water shortages and reduced water quality may result in regulatory caps for water use and conflicts between local businesses and communities.

Food prices are expected to increase as the agricultural sector experiences lower yields or crop patterns shift due to higher temperatures and droughts, crops are damaged from extreme weather events, and/or operation costs increase (e.g., irrigation water costs). The amount of irrigated land may increase by as much as 40 percent by 2080.

Workforce productivity may be more frequently disrupted by climate change-induced health impacts to residents and employees due to vector- and water-borne disease; heat related illness; and increased demand for and costs of health care. Outdoor labor and industries (e.g., construction) may be at even higher risk as more frequent, unhealthy working conditions become more common (e.g., higher temperatures, poorer air quality, heat waves, extreme weather events). Workers may be harmed when climate-related events, such as floods, cause them to lose their jobs and incomes. The indirect effects of climate change also may lead to similar outcomes, as businesses move away from areas affected by climate change impacts to less affected areas.

Finally, climate change impacts will likely result in property damage due to hotter temperatures, more extreme weather events, and flooding. Damages to development in the western United States due to extreme weather and storm events have already exceeded $1 billion in six of the past 15 years (1981 to 2006). Preparation for and adaptation to new and changing conditions will likely generate new costs that were not necessary to address similar concerns in the past. Residents, businesses, and the City can expect increased costs for maintenance and upgrades to address these issues, or to make repairs in the event of damage. As climate change generates conditions not experienced in the past, preparation and adaptation will be more costly in terms of requiring new information, institutions, infrastructure, and behaviors.

Environmental Protection

Climate change effects will have broad impacts on local and regional ecosystems, habitats, and wildlife as average temperatures increase, precipitation patterns change, and more extreme weather events occur. Species have adapted to natural, and more gradual, environmental changes for millions of years.

However, a more quickly changing climate, as current trends indicate, could require adaptation on larger and faster scales than in the past. Similarly, the timing of many natural events, such as growing seasons and migrations, are linked to temperature, moisture availability, and amount of daylight. Changes in weather patterns and extreme events associated with climate change will disrupt these natural patterns. Species that cannot adapt are at risk of extinction. Even the loss of a single species can have subsequent impacts on other species connected through food webs and other relationships. Climate change is expected to bring more radical and accelerated change to the ecosystems that many plants and animals rely on for survival.

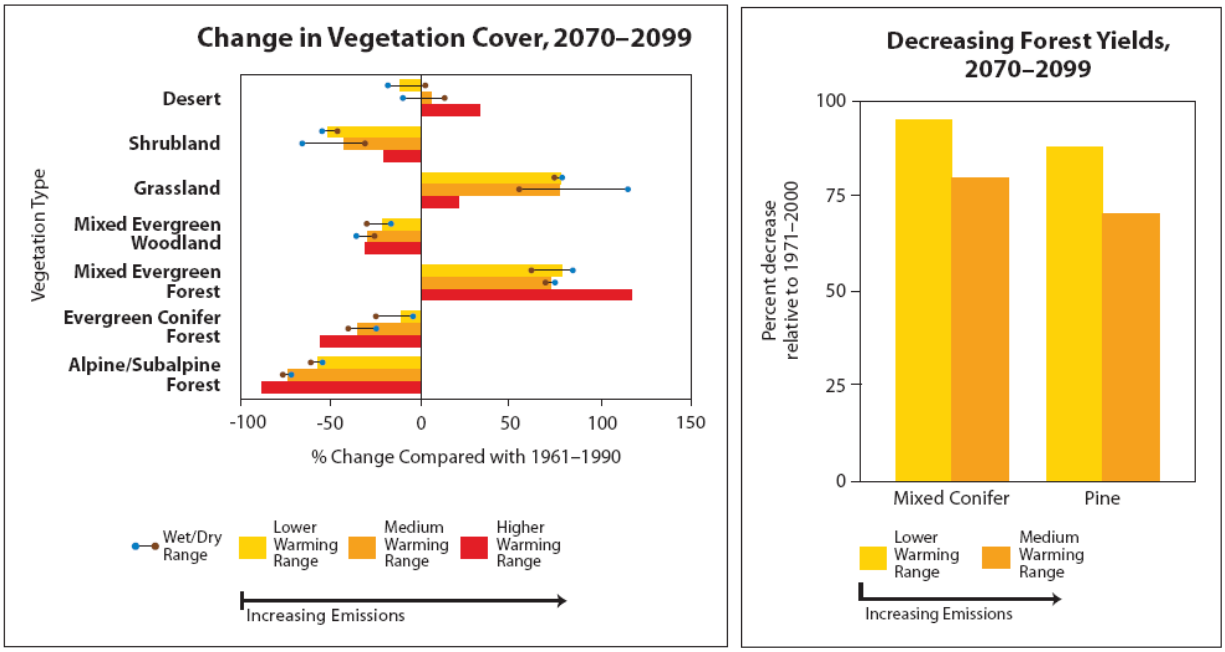
Some species will be able to adapt to changing habitats by shifting their range or altitudes in order to adjust to rising temperatures. However, others might not be able to adapt fast enough to keep pace with the rate of climate change. Climate change may even allow some species to increase the range of habitat where they can live; however, plants and animals that need to move to survive may find wildlife corridors blocked or face competition from other species.

The risk of extinction could increase for many species, especially those that are already endangered or at risk due to isolation by geography or human development, low population numbers, or a narrow temperature tolerance range. Additionally, as species move to more favorable areas, new competitions for food and resources may form. Some species that thrive may be invasive (not native to a region) and could gradually drive out or even kill native species.

As temperatures increase, California vegetation is expected to change. As shown in Figure 11-7, desert and grassland vegetation is projected to increase while forest vegetation is projected to generally decline. The natural cycle of plant flowering and pollination, as well as the temperature conditions necessary for a thriving locally adapted agriculture, may also be affected. Perennial crops, such as grapes, may take years to recover. Increased temperatures also provide a foothold for invasive species of weeds, insects, and animals.

FIGURE 11-7
CHANGE IN VEGATATION COVER

California
2070-2099



Source: California Climate Change Center. Our Changing Climate: Assessing the Risks to California, December 2013.

Social Vulnerability to Climate Change

The impacts of climate change will not affect us equally. Some people are more likely to be impacted than others. People exposed to the most severe climate-related hazards are often those least able to cope with the associated impacts, due to their limited adaptive capacity. Globally, climate change is expected to have a greater impact on a larger population living in poorer and developing countries. People in these areas have lower incomes and rely on natural resources and agricultural systems that will likely be affected by changing climates. These countries also often lack the technology and social systems needed to address and adapt to climate change on a large scale.

Certain groups in developed countries like the United States will also experience more impacts from climate change than others. People in rural areas are more likely to be affected by climate change impacts, such as droughts or severe storms, compared to their urban counterparts. However, certain groups living in cities will also be at higher risk than others. Gilroy residents who are at greatest risk for the impacts described earlier in this section include children, the elderly, those with existing health problems (i.e., obese youth), the socially and/or economically disadvantaged (i.e., people of color, foreign born population, households speaking little English, low income households, unemployed, population without a high school diploma), those who are less mobile (i.e., living in group quarters, women giving birth in the last 12 months, households without a vehicle), and those who work outdoors. Place of residence is another vulnerability indicator, as renters, households without air conditioning, households lacking access to grocery stores, households in treeless areas, and households on impervious land cover are also more vulnerable to climate change impacts.

State and Local Climate Change Initiatives

Executive Order S-13-08, signed by Governor Arnold Schwarzenegger in 2008, requires development of a Climate Adaptation Strategy that directs statewide management of climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events. The California Natural Resources Agency (CNRA) adopted the California Climate Change Adaptation Strategy in 2010. The Strategy is grouped into seven subject areas: public health, ocean and coastal resources, water supply and flood protection, agriculture, forestry, biodiversity and habitat, and transportation and energy infrastructure. CNRA also adopted updated CEQA guidelines that provide direction on addressing GHG emissions in environmental review documents.

In November 2009 the California State legislature passed and the Governor approved a comprehensive package of water legislation, including SB 7x7 addressing water conservation. In general SB 7x7 requires a 20 percent reduction in per capita urban water use by 2020, with an interim 10 percent target in 2015. The legislation requires urban water users to develop consistent water use targets and to use those targets in their Urban Water Management Plans (UWMPs). SB 7x7 also requires certain agricultural water supplies to implement a variety of water conservation and management practices and to submit Agricultural Water Management Plans in 2012.

SECTION 11.3 GREENHOUSE GAS EMISSIONS INVENTORY

Introduction

This section provides a discussion of existing global climate conditions, climate change science, and greenhouse gas (GHG) emissions sources in California, the San Francisco Bay Area, and the city of Gilroy.

GHG emissions have the potential to adversely affect the environment because, on a cumulative basis, they contribute to global climate change. In turn, global climate change has the potential to result in rising sea levels, which can inundate low-lying areas; affect rain and snow fall, leading to changes in water supply; and to affect habitat, leading to adverse effects on biological and other resources. Because GHG emissions come from many different sources in both current and expected future activities in a growing community, identification and reduction of GHG emissions is an important consideration in long-range planning efforts.

Major Findings

- Total GHG emissions in Gilroy were an estimated 261,205 metric tons of CO_2 equivalent in 2010. The primary source of GHG emissions in Gilroy is the energy sector, comprising 55.3 percent of all GHG emissions in the city.
- The forecasted emissions for 2020 and 2035 are 296,752 MT CO_2e and 391,384 MT CO_2e, respectively.

Existing Conditions

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared

radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on Earth. Without the greenhouse effect, Earth would not be able to support life as we know it.

Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). CO_2 is the most prevalent of all GHG emissions. All GHG's are classified in terms of their global warming potential (GWP). GWP is a simplified index that uses the warming potential of carbon dioxide as the base unit of measurement. For example, CO_2 has a GWP of 1, but methane (CH_4) has a GWP of 21 because methane has approximately 21 times more warming potential than CO_2. Since there are numerous GHG's with varying degrees of GWP, GHG's are frequently expressed in a unit known as carbon dioxide equivalent (CO_2e), which normalizes all GHG's to equivalent CO_2 levels. This allows varying types and amounts of GHG emissions to be expressed in the same unit of measurement.

Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of the earth's climate, known as global warming or global climate change. It is extremely unlikely that global climate change of the past 50 years can be explained without taking into consideration the contribution of GHG emissions from human activities (IPCC 2007).

Climate change is a global problem. GHGs originate from local and regional sources all over the world, but they are global pollutants. GHGs differ from criteria air pollutants and toxic air contaminants, which are mostly generated locally and regionally, have mostly localized air quality effects and have relatively short atmospheric lifetimes (about 1 day). GHGs have long atmospheric lifetimes (1 year to several thousand years), and thus GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the exact lifetime of any particular GHG molecule is dependent on multiple variables and cannot be pinpointed, it is understood that more CO_2 is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions, approximately 54 percent is sequestered through ocean uptake, uptake by northern hemisphere forest regrowth, and other terrestrial sinks within a year, whereas the remaining 46 percent of human-caused CO_2 emissions remains stored in the atmosphere (Seinfeld and Pandis 1998).

Statewide GHG Emissions

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation. California produced 478 million gross metric tons of CO_2e in 2008.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2008, accounting for 37 percent of total GHG emissions in the state. This sector was followed by the electric power sector (including both in-state and out-of-state sources) (24 percent) and the industrial sector (19 percent). California GHG emissions inventory and projections are summarized in Table 11-1 below.

TABLE 11-1
CALIFORNIA GHG EMISSIONS INVENTORY AND PROJECTIONS
California
1990-2020

Emissions Sector	MMT CO_2e/yr				
	1990	2000	2005	2008	2020
Electrical Generation[2]	110.6	103.9	111.0	116.4	110.4
Residential/Commercial	44.1	42.9	40.8	43.1	45.3
Transportation	150.7	171.1	184.3	175.0	183.9
Industrial	103.0	97.3	90.7	92.7	91.5
High GWP Gases	-[3]	11.0	14.2	15.7	37.9
Agriculture	23.4	25.4	29.0	28.1	29.1
Waste Management	-[2]	6.2	6.5	6.7	8.5
Forestry	0.2	0.2	0.2	0.2	0.2
Gross Total Emissions[4]	**433**	**458.0**	**476.7**	**477.7**	**506.8**
Carbon Sequestration	-6.7	-4.7	-4.2	-4.0	0.0
Total Net Emissions[3]	**427**	**453.3**	**472.6**	**473.8**	**506.8**

Notes:
1GWP = global warming potential; MMT CO2e/yr = million metric tons carbon dioxide equivalent per year.
2 Includes in-state-generated and imported electricity production.
3 Contained within Industrial Sector emissions.
4 Totals may not sum exactly due to rounding.
Source: ARB 2007:6, 2011b, 2011c.

Regional and Local GHG Emissions

San Francisco Bay Area

The Bay Area Air Quality Management District (BAAQMD) conducts periodic inventories of GHG emissions within the San Francisco Bay Area Air Basin. In 2010, BAAQMD updated its regional GHG emissions inventory (originally conducted for the baseline year of 2002) to the base year 2007. In 2007, 95.8 million metric tons of CO_2 equivalent ($MMTCO_2e$) were emitted as a result of activities in the San Francisco Bay Area. Of these, 88.7 $MMTCO_2e$ were emitted within the Air Basin and 7.1 $MMTCO_2e$ were indirect emissions from imported electricity. The Transportation sector contributed approximately 36 percent of total GHG emissions in the Bay Area, including on-road motor vehicles, locomotives, ships and boats, and aircraft. The Industrial/Commercial also contributed about 36 percent of regional GHG emissions, with primary sources including oil refining, natural gas and other fuel combustion, waste management, cement manufacturing, and other sources (BAAQMD 2010a).

A summary of the 2007 regional GHG emissions inventory, by sector and County, is shown in Table 11-2. Santa Clara County, in which the City of Gilroy is located, emitted approximately 18.8 $MMTCO_2e$, or about 20 percent of total regional emissions.

TABLE 11-2
2007 BAY AREA GHG EMISSIONS, BY SECTOR AND COUNTY ($MMTCO_2E$)
San Francisco Bay Area Basin
2010

	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano*	Sonoma*	Total SF Bay Area
Industrial/ Commercial	3.3	19.2	0.5	0.3	1.9	1.6	4.7	2.9	0.6	35.0
Residential Fuel	1.3	1.1	0.4	0.1	0.9	0.8	1.6	0.3	0.4	6.9
Electricity/Co-Generation	2.0	5.7	0.3	0.2	1.3	1.0	3.6	0.4	0.6	15.1
Off-Road Equipment	0.6	0.4	0.1	0.0	0.4	0.3	0.8	0.1	0.2	2.9
Transportation	8.4	5.0	1.3	0.9	2.7	4.8	7.9	1.8	2.1	34.9
Agriculture/ Farming	0.1	0.2	0.2	0.1	0.0	0.0	0.2	0.1	0.2	1.1
TOTAL (All Sectors)	**15.7**	**31.5**	**2.7**	**1.6**	**7.1**	**8.5**	**18.8**	**5.7**	**4.1**	**95.8**

Notes:
$MMTCO_2e$ = million metric tons of carbon dioxide equivalent. Totals may not be completely accurate, due to rounding of figures. * = Portion within BAAQMD.
Source: BAAQMD 2010a.

The 2007 Regional GHG Emissions Inventory also includes a list of the "Top 200" major GHG emitting point source facilities in the region. Four of the facilities on the list are located within the City of Gilroy, as shown in Table 11-3.

TABLE 11-3
BAY AREA "TOP 200" MAJOR GHG EMITTING FACILITIES LOCATED IN GILROY
City of Gilroy
2007

Rank in Top 200	Facility Name	Address	Total GHG Emissions in 2007 ($MTCO_2e$)
33	Gilroy Cogeneration Plant	1400 Pacheco Pass Hwy	94,712
66	Norcal Waste Systems Pacheco Pass Landfill, Inc	Bloomfield Rd & Highway 152	27,370
72	ConAgra Foods, Gilroy Foods	1350 Pacheco Pass Hwy	23,928
166	Bay Sheets	6791 Alexander St	5,204

Source: BAAQMD 2010a.

City of Gilroy Emissions Inventory

A greenhouse gas inventory helps the City of Gilroy tailor its emission reduction strategies to the specific needs of the community and jurisdiction. The inventory provides local governments with a baseline from which to improve their greenhouse gas emissions by breaking down and identifying different sources of CO_2e emissions. This inventory helps Gilroy set reasonable reduction targets and to prioritize actions to reduce emissions. The GHG emission inventory described in the section was prepared by AECOM in 2013 as part of a regional effort called Silicon Valley 2.0.

Emissions Baseline

The baseline inventory provides an estimated, annual appraisal of Gilroy's emissions. The baseline year of 2010 was used to calculate Gilroy's emissions and as a basis for comparing current and future emission levels. The inventory identifies emissions that can be accurately measured from the energy, water, solid waste, and transportation sectors.

Table 11-4 illustrates the different sources of emissions in metric tons of carbon dioxide equivalents and their relative percent contribution. The energy sector contributed the greatest percentage of Gilroy's emissions at 55.3 percent. The second largest source of greenhouse gas emissions in Gilroy was on-road transportation at 36.8 percent. In total, the city of Gilroy produced an estimated 261,205 metric tons of CO_2e in 2010.

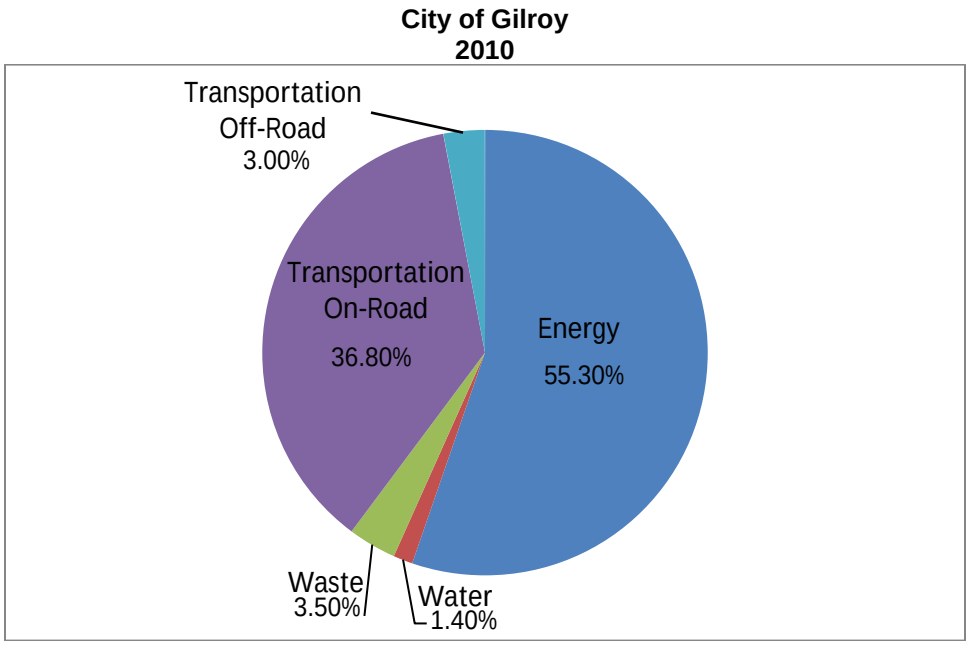
TABLE 11-4
GREENHOUSE GAS EMISSIONS BY CO_2E
City of Gilroy
2010

Sector	Greenhouse Gas Emissions	
	Metric Tons of CO_2e	Percent
Energy	144,415	55.3%
Water	3,618	1.4%
Solid Waste	9,135	3.5%
Transportation-On Road	96,114	36.8%
Transportation-Off Road	7,923	3.0%
Total	**261,205**	**100.0%**

Source: City of Gilroy 2010 Greenhouse Gas Emissions Inventory, prepared by AECOM, 2013.

Figure 11-8 divides the citywide emission sources by percentage contribution.

FIGURE 11-8
CITYWIDE GHG EMISSIONS BY PERCENTAGE



Source: City of Gilroy 2010 Greenhouse Gas Emissions Inventory, prepared by AECOM, 2013.

Emissions Forecast

The emissions forecast represents a "business-as-usual" (BAU) prediction forecast to the years 2020, 2035, and 2050 for estimating how GHG emissions may change over time with a continuation of the normal course of citywide activities. By comparing the emissions forecasts to the 2010 baseline inventory, the City can calculate the consequences of implementing emission-reducing measures in the interim and compare the results with the emissions impacts of continuing with business-as-usual. The primary information used in the forecast was based on changes in the city's population and jobs and their impact on transportation, energy consumption, and solid waste generation.

According to the City's 2010 Greenhouse Gas Emissions Inventory, as summarized in Table 11-5, citywide emissions are expected to increase, under the BAU scenario, to 296,752 metric tons of CO_2e in 2020, 391,384 metric tons of CO_2e in 2035, and 529,556 metric tons of CO_2e in 2050. The 2020 emissions forecast is 13.6 percent above the 2010 baseline, the 2035 emissions forecast is 49.8 percent above the 2010 baseline, and the 2050 emissions forecast is 102.7 percent above the 2010 baseline. However, the percentages of forecasted emissions in all sectors are expected to decrease with the exception of the on-road transportation sector, which will continue to increase.

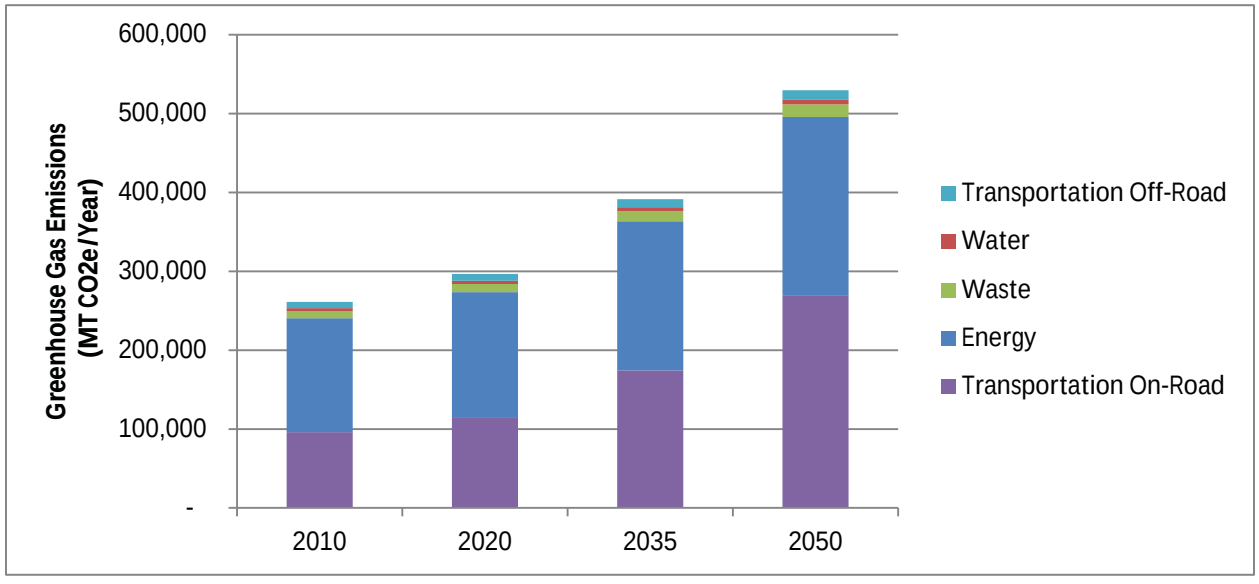
TABLE 11-5
FORCASTED EMISSIONS GROWTH
City of Gilroy
2020, 2035, AND 2050

Sector	Greenhouse Gas Emissions					
	2020		2035		2050	
	Metric Tons of CO_2e	Percent	Metric Tons of CO_2e	Percent	Metric Tons of CO_2e	Percent
Energy	159,374	53.7%	189,003	48.3%	226,791	42.8%
Water	4,122	1.4%	5,094	1.3%	6,295	1.2%
Solid Waste	10,406	3.5%	12,860	3.3%	15,893	3.0%
Transportation-On Road	114,128	38.5%	174,366	44.6%	268,971	50.8%
Transportation-Off Road	8,722	2.9%	10,061	2.6%	11,605	2.2%
Total	**296,752**	**100.0%**	**391,384**	**100.0%**	**529,556**	**100.0%**

Source: City of Gilroy 2010 Greenhouse Gas Emissions Inventory, prepared by AECOM, 2013.

Figure 11-9 compares annual greenhouse gas emissions between the 2010 baseline inventory and the forecasted emissions growth for the years of 2020, 2035, and 2050.

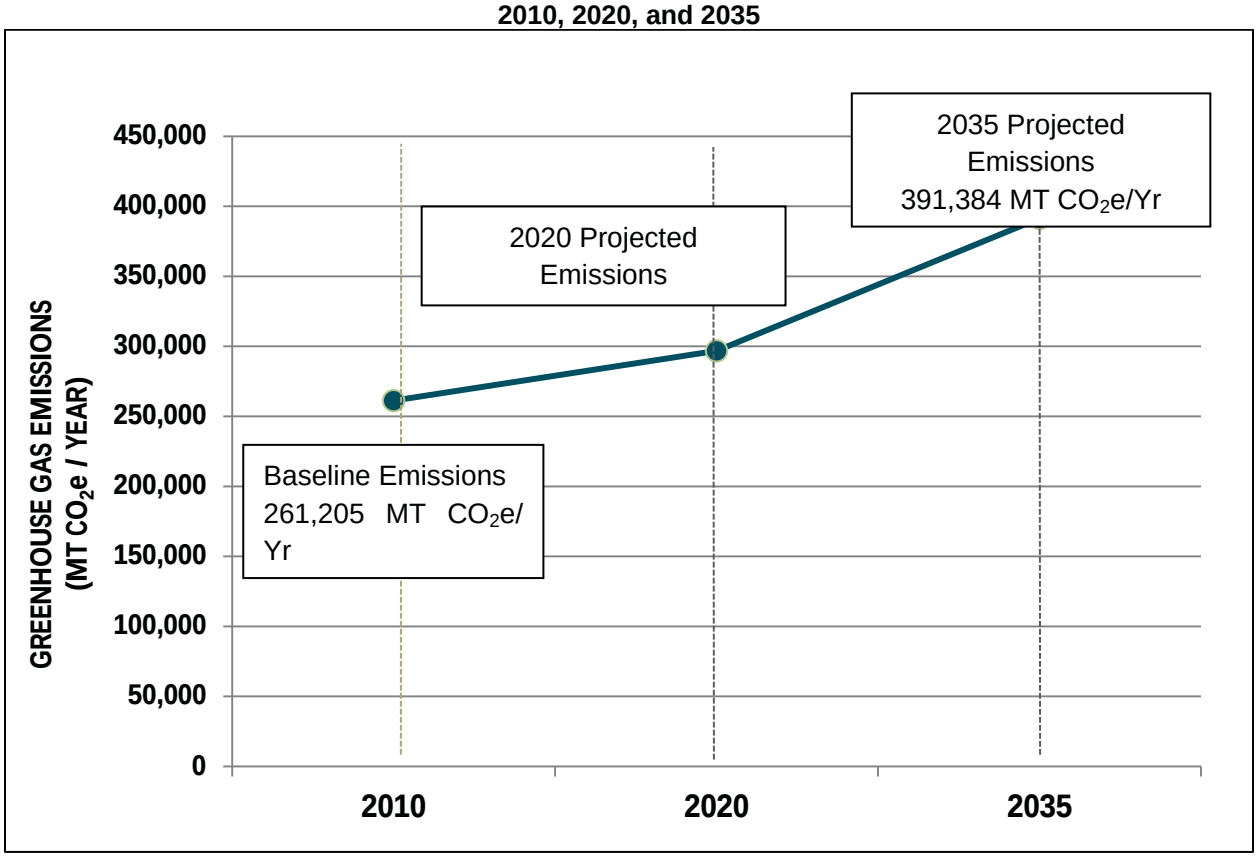
FIGURE 11-9
ANNUAL GREENHOUSE GAS EMISSIONS
City of Gilroy
2010, 2020, 2035, 2050



Source: City of Gilroy 2010 Greenhouse Gas Emissions Inventory, prepared by AECOM, 2013.

Figure 11-10 compares annual greenhouse gas emissions between the 2010 baseline inventory and the forecasted emissions growth for the years of 2020 and 2035.

FIGURE 11-10
GREENHOUSE GAS REDUCTION POTENTIAL: MASS EMISSIONS
City of Gilroy
2010, 2020, and 2035



Source: City of Gilroy 2010 Greenhouse Gas Emissions Inventory, prepared by AECOM, 2013.

REGULATORY SETTING

This report has been prepared at a time where accepted practice and legislation regarding how government agencies should address climate change continues to evolve. This section summarizes the current and relevant federal, State, and local regulatory programs, plans, and policies that apply to GHG emissions and land use planning.

Federal

Supreme Court Ruling

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for implementing the Federal Clean Air Act (CAA). The Supreme Court of the United States ruled on April 2, 2007 that CO_2 is an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs.

Mandatory GHG Reporting Rule

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons (MT) or more

of CO_2 per year. This publicly available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial GHGs along with vehicle and engine manufacturers will report at the corporate level. An estimated 85 percent of the total U.S. GHG emissions, from approximately 10,000 facilities, are subject to this final rule.

Proposed GHG Permitting Requirements on Large Industrial Facilities

On May 13, 2010, EPA issued the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailor Rule (EPA 2010). This final rule sets thresholds for GHG emissions that define when 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.

Endangerment and Cause or Contribute Findings

On December 7, 2009, EPA adopted its Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CAA (Endangerment Finding). The Administrator (of EPA) found that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CAA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are very likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wild fires, droughts, sea level rise, higher-intensity storms) are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations. The Administrator also found that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. EPA's final findings respond to the 2007 U.S. Supreme Court decision that GHGs fit within the CAA definition of air pollutants.

National Program to Cut GHG Emissions and Improve Fuel Economy for Cars and Trucks

On August 28, 2012 EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued joint Final Rules for Corporate Average Fuel Economy (CAFE) standards for vehicle model years 2017 and beyond (NHTSA 2012). These first-ever national GHG emissions standards will increase fuel economy to the equivalent of 54.5 miles per gallon (mpg) for cars and light-duty trucks by model year 2025. EPA approved these standards under the CAA, and NHTSA approved them under the Energy Policy and Conservation Act.

Climate Change Adaptation

Activities are already underway across the federal government to build adaptive capacity and increase resilience to climate change. These activities include efforts to improve understanding of climate science and impacts, to incorporate climate change considerations into policies and practices, and to strengthen technical support and capacity for adaptation decision making. Some efforts are large collaborative undertakings involving federal and non-federal partners while others are smaller and at the program-level. The Climate Change Adaptation Task Force, co-chaired by the White House Council on Environmental Quality (CEQ), the Office of Science and Technology Policy (OSTP), and the National Oceanic and Atmospheric Administration (NOAA), makes recommendations to President Obama for how

Federal Agency policies and programs can better prepare the United States to respond to the impacts of climate change (CEQ 2011).

Federal Emergency Management Agency

In March 2003, the Federal Emergency Management Agency (FEMA) became part of the U.S. Department of Homeland Security. FEMA's continuing mission within the new department is to lead the effort to prepare the nation for all hazards and effectively manage Federal response and recovery efforts following any national incident. FEMA also initiates proactive mitigation activities, trains first responders, and manages the National Flood Insurance Program and the U.S. Fire Administration.

U.S. Environmental Protection Agency (EPA)

The U.S. Environmental Protection Agency (EPA) is responsible for developing and enforcing regulations that implement environmental laws enacted by Congress. EPA is responsible for researching and setting national standards for a variety of environmental programs, and delegates to states and tribes the responsibility for issuing permits, monitoring, and enforcing compliance.

State

The California Air Resources Board (ARB)

The California Air Resources Board (ARB) is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA), which was adopted in 1988. Various statewide and local initiatives to reduce the state's contribution to GHG emissions have raised awareness that, even though the various contributors to and consequences of global climate change are not yet fully understood, global climate change is under way, and there is a real potential for severe adverse environmental, social, and economic effects in the long term. Because every nation emits GHGs and therefore makes an incremental cumulative contribution to global climate change, cooperation on a global scale will be required to reduce the rate of GHG emissions to a level that can help to slow or stop the human-caused increase in average global temperatures and associated changes in climatic conditions.

Executive Order S-3-05

Signed by Governor Schwarzenegger in 2005, the 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 Nevada snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea level. To combat those concerns, the Executive Order established total GHG 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. This Executive Order is binding only on state agencies, and has no force of law for local governments; however, the signing of S-3-05 sent a clear signal to the California Legislature about the framework and content for legislation to reduce GHG emissions.

Assembly Bill 32, The California Global Warming Solutions Action of 2006

In September 2006, Governor Arnold Schwarzenegger signed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished

through an enforceable statewide cap on GHG emissions that was phased in starting in 2012. To effectively implement the cap, AB 32 directs the ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources.

Assembly Bill 32 Climate Change Scoping Plan

In December 2008, ARB adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve reduction of approximately 118 million metric tons (MMT) CO_2e, or approximately 22 percent from the state's projected 2020 emission level of 545 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 47 MMT CO_2e, or almost 10 percent, from 2008 emissions). ARB's original 2020 projection was 596 MMT CO_2e, but this revised 2020 projection takes into account the economic downturn that occurred in 2008 (ARB 2011b). The Scoping Plan reapproved by ARB in August 2011 includes the Final Supplement to the Scoping Plan Functional Equivalent Document (FED), which further examined various alternatives to Scoping Plan measures. The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. ARB estimates the largest reductions in GHG emissions to be achieved by implementing the following measures and standards (ARB 2011b):

- improved emissions standards for light-duty vehicles (26.1 MMT CO2e),
- the Low-Carbon Fuel Standard (LCFS) (15.0 MMT CO2e),
- energy efficiency measures in buildings and appliances (11.9 MMT CO2e), and
- renewable portfolio and electricity standards for electricity production (23.4 MMT CO2e).

In 2011, ARB adopted the cap-and-trade regulation. The cap-and-trade program covers major sources of GHG emissions in the state such as refineries, power plants, industrial facilities, and transportation fuels. The cap-and-trade program includes an enforceable emissions cap that will decline over time. The State distributes allowances, which are tradable permits, equal to the emissions allowed under the cap. Sources under the cap are required to surrender allowances and offsets equal to their emissions at the end of each compliance period (ARB 2012a).

With regard to land use planning, the Scoping Plan expects that reductions of approximately 3.0 MMT CO_2e will be achieved through implementation of Senate Bill (SB) 375, which is discussed further below (ARB 2011b).

AB 32 also requires that the Scoping Plan be updated every five years. ARB began efforts to update the Scoping Plan in 2012, and the update is scheduled to be adopted by December 2013. ARB expects that the 2013 Update to the AB 32 Scoping Plan will: summarize the scientific advancements concerning the understanding of climate change and its impacts, highlight California's accomplishments to date (including State, regional and local climate initiatives), quantify progress toward meeting the 2020 GHG emissions goal, examine the economic impacts of actions taken to support that goal, identify opportunities to pursue additional measures as appropriate (such as uncovered sectors or short-lived climate pollutants), and lay the foundation for the research and policy work needed to map the path to the post-2020 goals. (ARB 2013).

Senate Bill 375

Signed in September 2008, Senate Bill 375 aligns regional transportation planning efforts, regional GHG emission reduction targets for cars and light trucks, and land use and housing allocation. SB 375 requires

Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS), which integrate regional land use planning within an MPO's Regional Transportation Plan (RTP). The Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) are jointly responsible for developing the SCS for the Bay Area. Known as Plan Bay Area, this SCS is the successor to Transportation 2035, the long-range RTP adopted by MTC in 2009. Plan Bay Area is scheduled for adoption in summer 2013 and covers the time period through 2040 (One Bay Area 2013).

ARB, in consultation with MPOs, will provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every 8 years, but can be updated every 4 years if advancements in emissions technologies affect the reduction strategies to achieve the targets. The specific GHG reduction targets to be used by MTC and ABAG in Plan Bay Area include 7 percent below 2005 emissions levels by 2020, and 15 percent below 2005 levels by 2035 (ARB 2012b). ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG emission reduction targets, transportation projects would not be eligible for funding programmed after January 1, 2012.

Senate Bill 97

As directed by SB 97, the California Natural Resources Agency (CNRA) adopted Amendments to the California Environmental Quality Act (CEQA) Guidelines for GHG emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010.

CEQA allows lead agencies to analyze and mitigate the significant effects of GHG emissions at a programmatic level, such as in a general plan, or as part of a separate plan (e.g., a climate action plan) to reduce GHG emissions (CEQA 15183.5).

Renewable Electricity (or Renewable Portfolio) Standard

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. On November 17, 2008, Governor Schwarzenegger signed Executive Order S-14-08 requiring all retail sellers of electricity to serve 33 percent of their load with renewable energy by 2020. The following year, Executive Order S-21-09 directed the California Air Resources Board, under its Assembly Bill 32 authority, to enact regulations to achieve the goal of 33 percent renewables by 2020. In 2011, Governor Brown signed SB X1-2 codified the 33 percent by 2020 standard into law.

The California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) jointly implement the statewide Renewable Portfolio Standard (RPS) program through rulemakings and monitoring the activities of electric energy utilities in the state (CPUC 2012a).

Executive Order S-1-07, Low-Carbon Fuel Standard

Signed by Governor Schwarzenegger in 2007, Executive Order S-1-07proclaims that the transportation sector is the main source of GHG emissions in California, at over 40 percent of statewide emissions. It establishes a goal that the carbon intensity of transportation fuels sold in California should be reduced by a minimum of 10 percent by 2020. This order also directed ARB to determine if this Low Carbon Fuel

Standard (LCFS) could be adopted as a discrete early action measure after meeting the mandates in AB 32. ARB adopted the LCFS on April 23, 2009.

Advanced Clean Cars Program

In January 2012, ARB approved a new emissions-control program for model years 2017 through 2025 of passenger vehicles and light-duty trucks that addresses emissions from passenger vehicles and light-duty trucks. In addition to establishing more stringent emission standards for both GHGs and criteria air pollutants (and precursors), the program increases requirements of manufacturers to produce more Zero Emission Vehicles, including battery electric vehicles, hydrogen fuel cell vehicles, and plug-in hybrid electric vehicles. The program also includes a Clean Fuels Outlet regulation that helps make sure that fuels such as electricity and hydrogen are available to meet the fueling needs of the new advanced technology vehicles as they come to market. More specifically, it requires major refiners/importers of gasoline to develop hydrogen fueling stations to meet demand for hydrogen fuel (ARB 2012c).

California Building Codes, Title 24

Regulates how each new home and business is built or altered in California. It includes requirements for the structural, plumbing, electrical, and mechanical systems of buildings, and for fire and life safety, energy conservation, green design, and accessibility in and about buildings. Two sections of Title 24 – Part 6, the California Energy Code, and Part 11, the California Green Building Standards Code or CalGreen Code – contain standards that address GHG emissions related to new construction. These two sections require direct electricity, natural gas, and water savings for every new home or business built in California. Part 6, which was last updated in January 2011, also includes requirements for lighting, insulation and equipment upgrades to residential and nonresidential buildings undergoing additions, alterations or repairs. CCR Title 24 codes are statewide codes and standards that must be enforced by local agencies through the construction application process.

The California Green Building Standards Code, or CalGreen, became a mandatory code beginning January 1, 2011. The code takes a holistic approach to green building by including minimum requirements in the areas of planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. The CalGreen code has minimum mandatory standards and two additional tiers of voluntary measures intended to achieve greater levels of efficiency that result in lower levels of GHG emissions. Local governments must enforce the minimum standards and can choose to adopt either Tier 1 or Tier 2 standards to achieve greater positive environmental impacts.

Mandatory CalGreen standards do not require explicit reductions in energy consumption beyond the minimum Title 24 Part 6 standards. However, if a local agency elects to adopt either of the optional tiers of CalGreen, additional prerequisites and electives must be implemented by new development projects. For the voluntary energy efficiency prerequisites, Tier 1 is a 15 percent and Tier 2 is a 30 percent improvement over minimum Title 24 Part 6 requirements.

California Solar Initiative

The California Solar Initiative (CSI) was authorized in 2006 under SB 1 and allows the California Public Utilities Commission (CPUC) to provide incentives to install solar technology on existing residential, commercial, nonprofit, and governmental buildings if they are customers of the State's investor-owned utilities (IOUs), including Pacific Gas & Electric (PG&E). The CSI program has a budget of nearly $2.2 billion to be expended by 2016 with a goal to reach 1,940 megawatts (MW) of installed solar power

throughout the state by that time (CPUC 2012b). The CSI program has several components, including the Research and Development, Single-family Affordable Solar Housing (SASH), Multi-family Affordable Solar Housing (MASH), and Solar Water Heating Pilot Program, each of which provides incentives to further the installation of solar technology on California's buildings.

California Climate Adaptation Strategy

In 2009, California adopted a statewide Climate Adaptation Strategy (CAS) that summarizes climate change impacts and recommends adaptation strategies across seven sectors: public health; biodiversity and habitat; oceans and coastal resources; water; agriculture; forestry; and transportation and energy. The 2009 CAS was the first of its kind in the usage of downscaled climate models to more accurately assess statewide climate impacts as a basis for providing guidance for establishing actions that prepare, prevent, and respond to the effects of climate change (CNRA 2009). The California Natural Resources Agency, in coordination with other state agencies, began updating the Climate Adaptation Strategy in 2012, and a draft is planned for release for public review and comment in early 2013 (CNRA 2013).

Model Policies for Greenhouse Gases in General Plans

In June 2009 the California Air Pollution Control Officers Association (CAPCOA) prepared a white paper that presents model policies for addressing GHG emissions in general plans. CAPCOA intends this paper to be a resource rather than a guidance document intended to dictate how local communities should address GHG emission in their general plans. Model language is provided in nine major categories: GHG reduction planning (overall); land use and urban design; transportation; energy efficiency; alternative energy; municipal operations; waste reduction and diversion; conservation and open space; and education (CAPCOA 2009).

California Department of Public Health

A major component of the California Department of Public Health, Division of Drinking Water and Environmental Management is the Drinking Water Program (DWP), which regulates public water systems. Regulatory responsibilities include enforcement of Federal and State Safe Drinking Water acts, regulatory oversight of approximately 8,700 public water systems, oversight of water recycling projects, issuance of water treatment permits, and certification of drinking water treatment and distribution operators. Other functions include supporting and promoting water systems security, providing support for small water systems and for improving technical, managerial, and financial (TMF) capacity, and providing subsidized funding for water system improvements under the State Revolving Fund (SRF) and Proposition 50.

California Department of Water Resources

The California Department of Water Resources is responsible for preparing and updating the California Water Plan, which is a policy document that guides the development and management of the State's water resources. The plan is updated every five years to reflect changes in resources and urban, agricultural, and environmental water demands. The California Water Plan suggests ways of managing demand and augmenting supply to balance water supply with demand.

California Public Utilities Commission (CPUC)

The California Public Utilities Commission (CPUC) is a State agency created by constitutional amendment to regulate privately owned telecommunications, electric, natural gas, water, railroad, rail transit,

passenger transportation, and in-state moving companies. The CPUC is responsible for assuring California utility customers have safe, reliable utility services at reasonable rates while also protecting utility customers from fraud. The CPUC regulates the planning and approval for the physical construction of electric generation, transmission, or distribution facilities; and local distribution pipelines of natural gas (CPUC Decision 95-08-038). The CPUC also regulates rates and charges for basic telecommunication services, such as how much you pay for the ability to make and receive calls.

Executive Order S-13-08

Executive Order S-13-08, signed by Governor Arnold Schwarzenegger in 2008, requires development of a Climate Adaptation Strategy that directs statewide management of climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events.

Senate Bill (SB) 7x7 Statewide Water Conservation

In November 2009 the California State legislature passed and the Governor approved a comprehensive package of water legislation, including Senate Bill (SB) 7x7 addressing water conservation. In general SB 7x7 requires a 20 percent reduction in per capita urban water use by 2020, with an interim 10 percent target in 2015. The legislation requires urban water users to develop consistent water use targets and to use those targets in their UWMPs. SB 7x7 also requires certain agricultural water supplies to implement a variety of water conservation and management practices and to submit Agricultural Water Management Plans in 2012.

Local

Bay Area Air Quality Management District

The Bay Area Air Quality Management District (BAAQMD) is the lead air quality regulatory agency for the San Francisco Bay Area Air Basin. BAAQMD maintains air quality conditions through comprehensive programs of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues, as well as reducing GHG emissions. A number of BAAQMD programs related to GHG emissions are addressed below.

Climate Protection Program

On June 1, 2005 the Air District Board of Directors adopted a resolution establishing a Climate Protection Program and acknowledging the link between climate protection and programs to reduce air pollution in the Bay Area. The Board of Directors also formed a standing Committee on Climate Protection to provide direction on District climate protection activities.

A central element of the District's climate protection program is the integration of climate protection activities into existing District programs. The District is continually seeking ways to integrate climate protection into current District functions, including grant programs, CEQA commenting, regulations, inventory development, and outreach. In addition, the District's climate protection program emphasizes collaboration with ongoing climate protection efforts at the local and State level, public education and outreach and technical assistance to cities and counties (BAAQMD 2012a).

Greenhouse Gas Fee for Stationary Sources

On May 21, 2008, the District's Board of Directors approved a new fee on air pollution sources in the region to help defray the costs associated with the District's climate protection activities and programs, including environmental review, air pollution regulations and emissions inventory development. Industrial facilities and businesses that are currently required to submit an air quality permit to operate are required to pay a fee of 4.4 cents per metric ton of GHG emissions added to their permit bill. The fee will apply to climate protection program activities related to stationary sources, such as developing emission inventories (BAAQMD 2012a).

Bay Area 2010 Clean Air Plan

The Bay Area 2010 Clean Air Plan provides a comprehensive plan to improve Bay Area air quality and protect public health. The Clean Air Plan defines a control strategy that the BAAQMD and its partners will implement to: (1) reduce emissions and decrease ambient concentrations of harmful pollutants; (2) safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, with an emphasis on protecting the communities most heavily impacted by air pollution; and (3) reduce GHG emissions to protect the climate. In its dual roles as an update to the Bay Area state ozone plan and a multi-pollutant plan, the 2010 Clean Air Plan addresses four categories of pollutants: ground-level ozone and its key precursors (ROG and NO_X), particulate matter ($PM_{2.5}$ as well as precursors secondary to $PM_{2.5}$), air toxics, and greenhouse gases (BAAQMD 2010b).

The 2010 Clean Air Plan provides a control strategy containing over 55 control measures applicable to a number of different sources, including:

- 18 Stationary Source Measures,
- 10 Mobile Source Measures,
- 17 Transportation Control Measures,
- 6 Land Use and Local Impact Measures, and
- 4 Energy and Climate Measures.

California Environmental Quality Act Guidelines

The BAAQMD CEQA Guidelines are developed to assist local jurisdictions and lead agencies in complying with the requirements of CEQA regarding potentially adverse impacts related to both air quality and climate change. These CEQA Guidelines were updated in June 2010 to include reference to thresholds of significance ("Thresholds") adopted by the Air District Board on June 2, 2010. The Guidelines were further updated in May 2011. On March 5, 2012 the Alameda County Superior Court issued a judgment finding that the BAAQMD had failed to comply with CEQA when it adopted the Thresholds. The court did not determine whether the Thresholds were valid on the merits, but found that the adoption of the Thresholds was a project under CEQA. The court issued a writ of mandate ordering BAAQMD to set aside the Thresholds and cease dissemination of them until the Air District had complied with CEQA. The BAAQMD has appealed the Alameda County Superior Court's decision. The appeal is currently pending in the Court of Appeal of the State of California, First Appellate District.

In view of the court's order, BAAQMD is no longer recommending that the Thresholds be used as a generally applicable measure of a project's significant air quality or climate change impacts. Lead

agencies will need to determine appropriate thresholds of significance based on substantial evidence in the record. Although lead agencies may rely on the District's CEQA Guidelines (updated May 2011) for assistance in calculating air pollution and GHG emissions, obtaining information regarding the health impacts of air pollutants, and identifying potential mitigation measures, BAAQMD has been ordered to set aside the Thresholds and is no longer recommending that these Thresholds be used as a general measure of a project's significant impacts. Lead agencies may continue to rely on the BAAQMD's 1999 Thresholds of Significance and they may continue to make determinations regarding the significance of an individual project's air quality impacts based on the substantial evidence in the record for that project (BAAQMD 2012b).The 1999 Thresholds do not address GHG emissions. The proposed 2010 Thresholds related to GHG emissions are as follows:

- Project Level
  - Stationary Sources: 10,000 $MTCO_2e$/year
  - Projects Other than Stationary Sources: a.) Compliance with Qualified GHG Reduction Strategy, OR b.) 1,100 $MTCO_2e$/yr, OR c.) 4.6 $MTCO_2e$ per service population per year (sp/yr). Service population is defined as total residents and employees.
- Plan-Level
  - Compliance with Qualified GHG Reduction Strategy (or similar criteria included in a General Plan), OR
  - 6.6 $MTCO_2e$/ sp/yr (residents + employees)

Greenhouse Gas Plan Level Guidance

In May 2012, the BAAQMD issued GHG Plan Level Guidance to assist local governments in developing community scale GHG emission inventories and projections, quantifying emission reductions from various policies and mitigation measures, and developing effective climate protection strategies. The Guidance is based on established methodologies and practices, and is intended to be a set of recommended approaches rather than formal protocol.

Included within the Guidance are qualitative criteria that the BAAQMD will use to judge whether a climate action plan (CAP) or other plan designed to reduce communitywide GHG emissions (e.g. sustainability plan or general plan) will meet the criteria established by the Governor's Office of Planning and Research (OPR) per CEQA Guidelines Section 15183.5. These qualitative criteria are as follows:

- GHG emissions inventory should be complete and comprehensive,
- calculations and assumptions should be transparent,
- GHG reduction strategies should rely primarily on mandatory measures,
- build in a margin of safety,
- measures should address existing as well as new development, and
- implementation and monitoring should be clearly defined.

The Guidance document also provides guidance on developing the quantitative sections of a local CAP, including development of GHG emission inventories, projections, mitigation measures, and implementation and monitoring procedures (BAAQMD 2012c).

Santa Clara Valley Transportation Authority (VTA)

The Santa Clara Valley Transportation Authority (VTA) is an independent special district that provides transportation planning and services in the region. VTA provides bus, light rail, and paratransit services, and participates as a funding partner in regional rail service including the Caltrain line that serves Gilroy. It is responsible for countywide transportation planning, including congestion management, design and construction of specific highway, pedestrian, and bicycle improvement projects, as well as promotion of transit oriented development.

KEY TERMS

Adaptation. Preparing for climate change impacts that are expected to occur, by making adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects that are aimed at minimizing harm or taking advantage of beneficial opportunities.

Atmospheric River. A meteorological phenomenon that draws water vapor from the Pacific Ocean near the equator and transports it to the U.S. West Coast.

Business-As-Usual. The continuation of the normal course of community and municipal activities.

Carbon dioxide (CO_2). An odorless and colorless GHG. CO_2 is emitted from natural sources, such as the decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic out-gassing. Anthropogenic (man-made) sources include the burning of fossil and other fuels (e.g., coal, oil, natural gas, wood).

Carbon Dioxide Equivalent (CO_2e). A unit for describing how much global warming a given type and amount of GHG may cause, normalized to a functionally equivalent amount or concentration of CO_2 as the reference. See Global Warming Potential.

Climate Action Plan (CAP). A planning document that lays out a set of strategies and policy recommendations intended to reduce GHG emissions associated with a given entity, agency, or jurisdiction.

Climate Change. Any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

Climate Impacts. The consequences of climate change on natural and human systems.

Carbon Sequestration. Carbon storage (sequestration) occurs in forests and soils, primarily through the natural process of photosynthesis. Atmospheric CO_2 is taken up through leaves and becomes carbon in the woody biomass of trees and other vegetation where it is stored.

Electricity. A natural phenomenon, either through lightening or the attraction and repulsion of protons and electrons to create friction, that in turn forms an electric current or power.

Emissions Scenario. A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g., greenhouse gases, aerosols), based on a coherent and internally consistent set of assumptions about driving forces (e.g., demographic and socio-economic development, technological change) and their key relationships. Concentration scenarios, derived from emissions scenarios, are used as input into a climate model to compute climate projections.

Environmental Protection Agency (EPA)-regulated Hazardous Materials Sites. Facilities generating or transporting hazardous waste, or recycling, treating, storing, or disposing (TSD) of hazardous waste.

Erosion. The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds, and underground water.

Extreme Heat Days. A day in April through October where the maximum temperature exceeds the 98thhistorical percentile of maximum temperatures based on daily temperature data between 1961-1990.

Extreme Storm Events. The increase in precipitation intensity and variability, increase in wind speed, and increase in ocean temperatures that increase the number and intensity of tropical cyclones and hurricanes that can increase the risk of flooding, drought, erosion, turbidity, debris in reservoirs, nutrient and pollutant loading, and wildfires.

Flood. A temporary rise in flow rate and/or stage (elevation) of any watercourse or stormwater conveyance system that results in runoff exceeding normal flow boundaries and inundating adjacent, normally dry areas.

Fuel Load. The buildup of easily ignited dry vegetation in grassland areas or on the forest floor.

Global Warming. The recent and ongoing global average increase in temperature near the Earth's surface.

Global Warming Potential. One type of simplified index based upon properties of the GHG that can be used to estimate the effect on the climate system with reference to CO_2. For example, one ton of methane is as potent a GHG as 21 tons of CO_2. Methane has GWP of 21 CO_2. See also Carbon Dioxide Equivalent.

Greenhouse Effect. The warming of the Earth's atmosphere due to accumulated carbon dioxide and other gases in the upper atmosphere. These gases absorb energy radiated from the Earth's surface, "trapping" it in the same manner as glass in a greenhouse traps heat.

Greenhouse Gases (GHG). Gases that contribute to the greenhouse effect. Some GHGs such as carbon dioxide (CO_2) occur naturally, and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The principal GHGs that enter the atmosphere because of human activities include: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), Chlorofluorocarbons (CFCs), and fluorinated gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Greenhouse Gas (GHG) Inventory. An accounting of the amount of GHGs emitted to or removed from the atmosphere over a specific period of time (e.g., one year) for a specified area. A GHG inventory also provides information on the activities that cause emissions, as well as background on the methods used

to make the calculations. Policy makers use GHG inventories to track emission trends, develop strategies and policies, and assess progress in reducing GHG emissions.

Heat-related Illness. A group of physically related illnesses caused by prolonged exposure to hot temperatures, restricted fluid intake, or failure of temperature regulation mechanisms of the body. Disorders of heat exposure include heat cramps, heat exhaustion, and heat stroke.

Heat Waves. A prolonged period of excessive heat, often combined with excessive humidity. A heat wave is defined as 5 or more consecutive extreme heat days.

Invasive Species. An introduced species that invades natural habitats.

Kilowatt Hours. A unit of measurement for electricity equal to one thousand watt hours.

Landslide. A general term for a falling mass of soil or rocks.

Levee. A dike or embankment constructed to confine flow to a stream channel and to provide protection to adjacent land. A levee designed to provide 100-year flood protection must meet FEMA standards.

Methane (CH_4). A GHG with GWP of 21. Human-caused sources of methane emissions include agricultural activities, natural gas consumption, landfills, wastewater treatment plants, and mobile sources. Naturally occurring sources include fires, geologic processes, and bacteria.

Metric Ton. A unit of weight equal to 2,205 pounds.

Mgal. A unit of acceleration equal to one thousandth of a gal.

Mortality Rate. The rate of occurrence of death within a population within a specified time period; calculation of mortality takes account of age-specific death rates, and can thus yield measures of life expectancy and the extent of premature death.

MMBtu. Million Metric British Thermal Units (MMBtu) is equal to one million British Thermal Units (Btu), which is a unit of energy equal to 1055 joules. It is the amount of energy needed to cool or heat one pound of water by one degree Fahrenheit.

Native Species. A species indigenous to a natural habitat.

Nitrous oxide (N_2O). A GHG with GWP of 310. Human caused sources of nitrous oxide include wastewater treatment plants, fertilizer application and soil management in agricultural activities, and mobile sources. Nitrous oxide is also produced in the natural environment by bacteria and major sources including soil, oceans, rivers, and estuaries.

Natural Gas. A hydrocarbon gas mixture that is widely used as an energy source in a variety of applications, including heating buildings, fueling vehicles, and generating electricity.

Therm. A unit of heat equivalent to 100,000 British thermal units (Btu).

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Persons Consulted

None.