

5.15 CLIMATE CHANGE

This section includes a discussion of existing climate conditions, climate change, and greenhouse gas (GHG) emissions sources in California; a summary of applicable regulations; and a description of potential impacts of the proposed General Plan related to climate change.

5.15.1 Environmental Setting

General Description of Global Climate Change

Climate change is a recorded change in the average weather of the earth, measured by variables such as wind patterns, storms, precipitation, and temperature, that lasts for a long period of time (e.g., decades or centuries). According to overwhelming scientific consensus on the subject, climate change is already under way. Global scientific research on climate change indicates very high confidence (i.e., at least 90 percent) that the rate and magnitude of current global temperature changes are anthropogenic¹ (i.e., human caused), and that global warming will lead to adverse climate change effects around the globe (Intergovernmental Panel on Climate Change IPCC 2007). It is extremely unlikely that global climate change of the past 50 years can be explained without the contribution from human activities (IPCC 2007).

Greenhouse Gases

Atmospheric GHGs² and clouds within the Earth's atmosphere influence the Earth's temperature by absorbing most of the infrared radiation rising from the Earth's sun-warmed surface that would otherwise escape into space. This process is commonly known as the greenhouse effect. GHGs are emitted by natural processes and human activities. The Earth's surface temperature averages about 58 degrees Fahrenheit (°F) because of the greenhouse effect. Without it, the Earth's average surface temperature would be somewhere around an uninhabitable 0°F (Henson 2006). The resulting balance between incoming solar radiation and outgoing radiation from both the Earth's surface and atmosphere keeps the planet habitable.

¹ Anthropogenic effects or processes are derived from human activities, as opposed to those occurring naturally and without human influence.

² GHGs are global pollutants, unlike criteria air pollutants (CAPs) and toxic air contaminants (TACs), which are pollutants of regional and local concern. While pollutants with localized air quality effects have relatively short atmospheric lifetimes (generally on the order of a few days), GHGs have relatively long atmospheric lifetimes ranging from 1 year to several thousand years. The long atmospheric lifetimes allow for GHGs to disperse around the globe. In addition, the impacts of GHGs are borne globally, as opposed to the localized air quality effects of CAPs and TACs.

The increasing emissions of GHGs—primarily associated with the burning of fossil fuels (during motorized transport, electricity generation, industrial activity, manufacturing, etc.) and deforestation, as well as agricultural activity and the decomposition of solid waste—have led to a trend of anthropogenic warming of the Earth’s average temperature, which is causing changes in the Earth’s climate. This increasing temperature phenomenon is known as global warming and the climatic effect is known as climate change or global climate change.

Anthropogenic emissions of GHGs into the atmosphere enhance the greenhouse effect by absorbing the radiation from other atmospheric GHGs that would otherwise escape to space, thereby trapping more radiation in the atmosphere and causing temperature to increase. Carbon dioxide (CO₂) is the most important anthropogenic GHG. The global atmospheric concentration of CO₂ has dramatically increased from a preindustrial (roughly 1750) value of about 280 parts per million (ppm) to 379 ppm in 2005, primarily due to fossil fuel use, with land use change providing a significant but smaller contribution. The annual rate of growth in CO₂ concentrations continues to increase, with a larger annual CO₂ concentration growth rate during the last 10 years (1995–2005 average: 1.9 ppm), than since the beginning of continuous direct measurements in 1960.

The human-produced GHGs responsible for increasing the greenhouse effect and their relative contribution to global warming (i.e., their relative ability to trap heat in the atmosphere) are CO₂ (53 percent); methane (CH₄) (17 percent); near-surface ozone (O₃) (13 percent); nitrous oxide (N₂O) (12 percent); and chlorofluorocarbons (CFCs) (5 percent). The most common GHG is CO₂, which constitutes approximately 84 percent of all GHG emissions in California (CEC 2006).

Like CO₂, the global atmospheric concentration of CH₄ in 2005 exceeded its preindustrial value. CH₄ growth rates have declined since the early 1990s with total emissions being nearly constant during this period. The observed increase in CH₄ concentration is very likely (at least 90 percent likelihood) due to anthropogenic activities, primarily agriculture and fossil fuel use. The atmospheric concentrations of CO₂ and CH₄ in 2005 greatly exceeded the natural range over the last 650,000 years. The global concentration of N₂O in 2005 also exceeded the preindustrial value. The growth rate in N₂O concentration has been approximately constant since 1980. More than a third of all N₂O emissions are anthropogenic and primarily due to agriculture.

Eleven of the 12 years from 1995–2006 rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850). Global average temperature has risen approximately 0.76 degree Celsius (°C) since 1850; even if global emissions were decreased to

zero today, global average temperature would rise an additional 0.5°C by the end of this century. This phenomenon is caused by the inertia of the climate system and time scale of the main sequestration mechanism in the carbon cycle—the ocean. In other words, global climate is committed to an additional 0.5°C of warming associated with past human activities. Since GHG emissions will continue to occur to some degree for the foreseeable future, a range of scenarios for global average temperature rise would be 1.8–4.0°C by the end of the century, depending on the global emissions scenario that ultimately occurs. (For example, the IPCC’s B1 scenario—low population growth, clean technologies, and low emissions—is the best-case scenario; its A2 scenario—high population growth, fossil-fuel dependence, and high emissions—is the worst-case scenario; and its A1B scenario is a moderate scenario.)

Impacts associated with the incremental increase in global temperature have already begun to occur. Such impacts are projected to occur in numerous forms: sea level rise, reduction in the extent of polar and sea ice, changes to ecosystems, changes in precipitation patterns, reduced snowpack, agricultural disruption, increased intensity and frequency of storms and temperature extremes, increased risk of floods and wildfires, increased frequency and severity of drought, effects on human health from vectorborne disease, species extinction, and acidification of the ocean.

It is accepted that some level of climate change impacts is unavoidable as a result of past human activities and the existing mass of GHGs in the atmosphere. However, international treaties on climate change attempt to avoid “dangerous” climate change—in other words, to manage the risk of foreseeable impacts to a “tolerable” level of climate change that would avoid the most catastrophic impacts. For this to occur, CO₂ concentrations should be stabilized at 350–400 ppm, with an associated global average temperature increase of no more than 2°C–2.4°C above preindustrial times. To avoid “dangerous” climate change, global CO₂ emissions would be required to peak during the 2000–2015 period (IPCC 2007).

Prominent GHGs contributing to the greenhouse effect are CO₂, CH₄, O₃, N₂O, and fluorinated compounds. GHGs vary widely in the power of their climatic effects; therefore, climate scientists have established a unit called global warming potential (GWP). The GWP of a gas is a measure of both potency and lifespan in the atmosphere as compared to CO₂. For example, since CH₄ and N₂O are approximately 21 and 310 times more powerful than CO₂, respectively, in their ability to trap heat in the atmosphere, they have global warming potentials of 21 and 310 (CO₂ has a global warming potential of 1). Carbon dioxide equivalent (CO₂e) is a figure that enables all GHG emissions to be considered as a group despite their varying GWP. The GWP of each GHG is multiplied by the prevalence of that gas to produce CO₂e.

The atmospheric lifetime and GWP of selected GHGs are summarized in Table 5.15-1. As shown in the table, GWP ranges from 1 (carbon dioxide) to 23,900 (sulfur hexafluoride).

**Table 5.15-1
Global Warming Potentials and Atmospheric Lifetimes**

Greenhouse Gas	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)
Carbon Dioxide (CO ₂)	50 – 200	1
Methane (CH ₄)	12 +/-3	21
Nitrous Oxide (N ₂ O)	120	310
HFC-134a	48.3	1,300
PFC: Tetrafluoromethane (CF ₄)	50,000	6,500
PFC: Hexafluoroethane (C ₂ F ₆)	10,000	9,200
Sulfur Hexafluoride (SF ₆)	3,200	23,900

Source: USEPA 2007; CCAR 2008

The State Legislature adopted the public policy position that global warming is, “a serious threat to the economic well-being, public health, natural resources, and the environment of California” (Health and Safety Code § 38501). Further, the State Legislature has determined that, “the potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra Nevada snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious disease, asthma, and other human health-related problems,” and that, “(g)lobal warming will have detrimental effects on some of California’s largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry (and)...will also increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the State” (Health and Safety Code § 38501). These public policy statements became law with the enactment of Assembly Bill (AB) 32, Statutes of 2006.

Impacts of Climate Change

Overview

Much of the available trend data, modeling, and projections related to climate change are on a global scale. Projecting impacts of climate change often relies on general circulation models

(GCMs), which develop large-scale scenarios of changing climate parameters, usually comparing scenarios with different concentrations of GHGs in the atmosphere. This information is typically at too coarse a scale to make accurate regional assessments. As a result, more effort has recently been put into reducing the scale and increasing the resolution of climate models through various techniques such as “downscaling” or integrating regional models into the global models (Kiparsky and Gleick 2005; Roos 2005; DWR 2006). However, the level of uncertainty related to regional climate change is generally higher than that related to global projections because downscaling and similar activities increase the level of uncertainty. The effects on the environment anticipated under various climate change models should be considered as general projections of potential future conditions, with actual environmental effects likely falling within the range of results provided by a variety of model outputs.

Executive Order S-3-05 discussed below under Regulatory Setting resulted in the preparation of a report on the impacts of climate change on California, including impacts to water supply, public health, agriculture, the coastline, and forestry. *Scenarios of Climate Change in California: An Overview* (Climate Scenarios report), was published in February 2006 (California Climate Change Center 2006). The Climate Scenarios report uses a range of emissions scenarios developed by the IPCC to project a series of potential warming ranges (i.e., temperature increases) that may occur in California during the 21st century: lower warming range (3.0–5.5°F); medium warming range (5.5–8.0°F); and higher warming range (8.0–10.5°F). The Climate Scenarios report then presents analysis of future climate in California under each warming range. Each emissions scenario would result in substantial temperature increases for California. According to the report, substantial temperature increases would result in a variety of impacts to the people, economy, and environment of California associated with a projected increase in extreme conditions, with the severity of the impacts depending upon actual future emissions of GHGs and associated warming. Under the emissions scenarios of the Climate Scenarios report (California Climate Change Center 2006), the impacts of global warming in California are anticipated to include, but are not limited to, the following:

- **Public Health** – Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to O₃ formation are projected to increase from 25 to 35 percent under the lower warming range to 75 to 85 percent under the medium warming range. In addition, if global background O₃ levels increase as predicted in some scenarios, it may become impossible to meet local air quality standards. Air quality could be further compromised by increases in wildfires, which emit fine particulate matter that can travel long distances depending on wind conditions. The Climate Scenarios report indicates

that large wildfires could become up to 55 percent more frequent if GHG emissions are not significantly reduced.

In addition, under the higher warming scenario, there could be up to 100 more days per year with temperatures above 90°F in Los Angeles and 95°F in Sacramento by 2100. This is a large increase over historical patterns and approximately twice the increase projected if temperatures remain within or below the lower warming range.

Rising temperatures will increase the risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory distress caused by extreme heat. In addition, climate change has the potential to influence asthma symptoms and the incidence of infectious disease.

- **Water Resources** – A vast network of man-made reservoirs and aqueducts captures and transports water throughout the state from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada snowpack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snowpack, increasing the risk of summer water shortages.

If GHG emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. Under the lower warming scenario, snowpack losses are expected to be only half as large as those expected if temperatures were to rise to the higher warming range. How much snowpack will be lost depends in part on future precipitation patterns, the projections for which remain uncertain. However, even under the wetter climate projections, the loss of snowpack would pose challenges to water managers, hamper hydropower generation, and nearly eliminate all skiing and other snow-related recreational activities.

The state's water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality and reliability of water within the southern edge of the Sacramento/San Joaquin River Delta—a major state fresh water supply.

Global warming is also projected to seriously affect agricultural areas, with California farmers projected to lose as much as 25 percent of the water supply they need; decrease the potential for hydropower production within the state (although the effects on hydropower are uncertain); and seriously harm winter tourism. Under the lower warming range, the ski season at lower elevations could be reduced by as much as a month. If temperatures reach the higher warming range and precipitation declines, there might be many years with insufficient snow for skiing and snowboarding.

- **Agriculture** – Increased GHG emissions are expected to cause widespread changes to the agriculture industry reducing the quantity and quality of agricultural products statewide. Although higher CO₂ levels can stimulate plant production and increase plant water-use efficiency, California’s farmers will face greater water demand for crops and a less reliable water supply as temperatures rise. Crop growth and development will change, as will the intensity and frequency of pest and disease outbreaks. Rising temperatures will likely aggravate O₃ pollution, which makes plants more susceptible to disease and pests and interferes with plant growth.

Plant growth tends to be slow at low temperatures, increasing with rising temperatures up to a threshold. However, faster growth can result in less-than-optimal development for many crops, so rising temperatures are likely to worsen the quantity and quality of yield for a number of California’s agricultural products, including wine grapes, fruits, and nuts. In addition, milk production has been found to decline when temperatures rise above 25°C (77°F).

In addition, continued global warming will likely shift the ranges of existing invasive plants and weeds and alter competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Should range contractions occur, it is likely that new or different weed species will fill the emerging gaps. Continued global warming is also likely to alter the abundance and types of many pests, lengthen pests’ breeding season, and increase pathogen growth rates.

- **Forests and Landscapes** – Global warming is expected to increase the risk of wildfire and alter the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in

the lower warming range. However, since wildfire risk is determined by a combination of factors, including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the state. For example, if precipitation increases as temperatures rise, wildfires in southern California are expected to increase by approximately 30 percent toward the end of the century. In contrast, precipitation decreases could increase wildfires in northern California by up to 90 percent.

Moreover, continued global warming will alter natural ecosystems and biological diversity within the state. For example, alpine and subalpine ecosystems are expected to decline by as much as 60 to 80 percent by the end of the century as a result of increasing temperatures. The productivity of the state's forests (i.e., timber yields and ecosystem value for habitat) is also expected to decrease as a result of global warming.

Greenhouse Gas Emissions Sources and Inventory

California

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors (CEC 2006a). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (CEC 2006a). Emissions of CO₂ are byproducts of fossil-fuel combustion. CH₄, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) largely associated with agricultural practices and landfills. CO₂ sinks, or reservoirs, include vegetation and the ocean, which respectively absorb CO₂ through photosynthesis and dissolution, two of the most common processes of CO₂ sequestration.

California is the 12th to 16th largest emitter of CO₂ in the world and is responsible for approximately 2 percent of the world's CO₂ emissions (CEC 2006). California produced 484 million gross metric tons of CO₂e in 2004. Combustion of fossil fuels in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 41 percent of total GHG emissions in the state (CEC 2006a). This sector was followed by the electric power sector (including both in-state and out-of-state sources) (22 percent) and the industrial sector (21 percent) (CEC 2006a).

City of Orange

No GHG emissions inventory has been conducted for the City of Orange.

5.15.2 Regulatory Setting**Federal Plans, Policies, Regulations, and Laws**

As of this writing, there are no adopted federal plans, policies, regulations or laws mandating reductions in GHG emissions that cause addressing global warming. According to the EPA, “the United States government has established a comprehensive policy to address climate change” that includes slowing the growth of emissions; strengthening science, technology and institutions; and enhancing international cooperation. To implement this policy, “the Federal government is using voluntary and incentive-based programs to reduce emissions and has established programs to promote climate technology and science.” The federal government’s goal is to reduce the GHG intensity (a measurement of GHG emissions per unit of economic activity) of the American economy by 18 percent over the 10-year period from 2002 to 2012. In addition, EPA administers multiple programs that encourage voluntary GHG reductions, including ENERGY STAR, Climate Leaders, and Methane Voluntary Programs (EPA 2007).

The U.S. Supreme Court ruled on April 2, 2007, that CO₂ is an air pollutant as defined under the Clean Air Act (CAA), and that EPA has the authority to regulate emissions of GHGs.

State Plans, Policies, Regulations, and Laws

Various statewide initiatives to reduce the state’s GHG emissions have raised awareness that, even though the various contributors to and the severity of the consequences of global climate change are not yet fully understood, global climate change is under way, and that 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 slows or stops the human-caused increase in average global temperature and associated adverse changes to people and the environment.

California Climate Action Registry (Senate Bills 1771 and 527)

The California Climate Action Registry (CCAR) was established in 2001 by Senate Bill (SB) 1771 and SB 527 as a nonprofit voluntary registry for GHG emissions. The purpose of CCAR is to help companies and organizations with operations in the state establish GHG emissions baselines against which any future GHG emissions reduction requirements may be applied. CCAR has developed a general reporting protocol (GRP) and additional industry-specific protocols that provide guidance on how to inventory GHG emissions for participation in the registry.

California's Renewable Energy Portfolio Standard Program and Senate Bill 107

In 2002, California established its Renewable Energy Portfolio Standard Program, which originally included a goal of increasing the percentage of renewable energy in the state's electricity mix to 20 percent by 2017. SB 107 requires investor-owned utilities such as Pacific Gas and Electric, SCE, and San Diego Gas and Electric (SDG&E) to meet the 20 percent renewable energy goal by 2010. The state's most recent Energy Action Plan (2005) raised the renewable energy goal to 33 percent by 2020.

Assembly Bill 1493

In 2002, Governor Gray Davis signed AB 1493. AB 1493 required ARB to develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty trucks and other vehicles determined by ARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, ARB approved amendments to the California Code of Regulations (CCR) adding GHG emission standards to California's existing motor vehicle emission standards in 2004. Amendments to CCR Title 13 Sections 1900 (CCR 13 1900) and 1961 (CCR 13 1961) and adoption of Section 1961.1 (CCR 13 1961.1) require automobile manufacturers to meet fleet average GHG emission limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes beginning with the 2009 model year. Emission limits are further reduced each model year through 2016.

In December 2004 a group of car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against ARB to prevent enforcement of CCR 13 1900 and CCR 13 1961 as amended by AB 1493 and CCR 13 1961.1 (*Central Valley Chrysler-*

Jeep et al., v. Catherine E. Witherspoon, in her official capacity as Executive Director of the California Air Resources Board, et al.). The suit, heard in the U.S. District Court for the Eastern District of California, contended that California's implementation of regulations that in effect regulate vehicle fuel economy violates various federal laws, regulations, and policies. In January 2007, the judge hearing the case accepted a request from the State Attorney General's office that the trial be postponed until a decision is reached by the U.S. Supreme Court on a separate case addressing GHGs. In the Supreme Court Case, *Massachusetts vs. EPA*, the primary issue in question is whether the federal CAA provides authority for EPA to regulate CO₂ emissions. In April 2007, the U.S. Supreme Court ruled in Massachusetts' favor, holding that GHGs are air pollutants under the CAA. On December 11, 2007, the judge in the *Central Valley Chrysler-Jeep* case rejected each plaintiff's arguments and ruled in California's favor. On December 19, 2007, the EPA denied California's waiver request. California filed a petition with the Ninth Circuit Court of Appeals challenging EPA's denial on January 2, 2008. California's waiver request has not been granted as of this writing.

Executive Order S-20-04 – The California Green Building Initiative

Governor Schwarzenegger signed Executive Order S-20-04 ("The California Green Building Initiative") establishing California's priority for energy and resource-efficient high performance buildings on December 14, 2004. The executive order sets a goal of reducing energy use in state-owned and private commercial buildings by 20 percent in 2015 using nonresidential Title 20 and 24 standards adopted in 2003 as the baseline. The California Green Building Initiative also encourages private commercial buildings to be retrofitted, constructed, and operated in compliance with the state's Green Building Action Plan.

Executive Order S-3-05

Executive Order S-3-05, signed by Governor Arnold Schwarzenegger on June 1, 2005, proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra Nevada's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. In an effort to avoid or reduce the impacts of climate change, Executive Order S-3-05 calls for a reduction in GHG emissions to the year 2000 level by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050.

To meet the targets established under Executive Order S-3-05, the Governor directed the Secretary of the California EPA to lead a Climate Action Team (CAT) composed of representatives from the Business, Transportation and Housing Agency, the Department of Food

and Agriculture, the Resources Agency, ARB, the California Energy Commission (CEC), and the California Public Utilities Commission (PUC). The 2006 CAT Report to the Governor contains a number of recommendations and strategies to help ensure that the targets established in Executive Order S-3-05 are met. The Secretary will submit biennial reports to the governor and state legislature describing progress made toward reaching the emission targets established by the executive order and on the impacts of climate change on California, including impacts to water supply, public health, agriculture, the coastline, and forestry, and shall prepare and report on mitigation and adaptation plans to combat these impacts. The first of these reports on the impacts to California, “Scenarios of Climate Change in California: An Overview” (Climate Scenarios report), was published in February 2006 (California Climate Change Center 2006) and is discussed further in Section 15.2.1.

Senate Bill 1505

SB 1505 of 2006 establishes environmental performance standards for the production and use of hydrogen fuel for transportation purposes in the state. In general, SB 1505 specifically requires that hydrogen-fueled vehicles reduce GHG emissions by at least 30 percent compared to emissions from new gasoline vehicles; at least one-third of the hydrogen produced or dispensed for transportation purposes in the state must be made from renewable sources of electricity; well-to-tank emissions of smog-forming pollutants from hydrogen fuel dispensed in the state must be reduced by at least 50 percent when compared to gasoline; and emissions of toxic contaminants must be reduced to the maximum extent feasible compared to gasoline on a site-specific basis.

Assembly Bill 32

The State Legislature adopted the public policy position that global warming is, “a serious threat to the economic well-being, public health, natural resources, and the environment of California” (Health and Safety Code § 38501). Further, the State Legislature has determined that, “the potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra Nevada snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious disease, asthma, and other human health-related problems,” and that, “(g)lobal warming will have detrimental effects on some of California’s largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry (and)...will also increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the State” (Health and Safety Code § 38501). These public

policy statements became law with the enactment of AB 32, the California Global Warming Solutions Act of 2006, signed by Governor Arnold Schwarzenegger in September 2006. AB 32 is now codified as Health & Safety Code sections 38500-38599.

AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction is to be accomplished through an enforceable statewide cap on GHG emissions to be phased in starting in 2012. AB 32 directs that ARB establish this statewide cap based on 1990 GHG emissions levels; disclose how it arrived at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms. Emission reductions under AB 32 are to include carbon sequestration projects and best management practices that are technologically feasible and cost-effective. As of this writing, ARB has not yet promulgated GHG emission or reporting standards directly applicable to the proposed project.

GHGs as defined under AB 32 include CO₂, CH₄, N₂O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). General discussions of climate change often include water vapor, O₃, and aerosols in the category of GHGs. Water vapor and atmospheric O₃ are not gases that are formed directly in the construction or operation of development projects nor can they be controlled in these projects. Aerosols are not gases. While these elements have a role in climate change, they are not considered by either regulatory bodies, such as ARB, or other entities, such as CCAR as gases to be reported or analyzed for control. Therefore, no further discussion of water vapor, O₃, and aerosols needs to be provided.

Senate Bill 1368 (Public Utilities Code §§ 8340-41)

SB 1368 is the companion bill of AB 32 and was signed by Governor Schwarzenegger in September 2006. SB 1368 required the PUC to establish a GHG emission performance standard for baseload generation from investor-owned utilities by February 1, 2007. Similarly, the CEC was tasked with establishing a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the GHG emission rate from a baseload combined-cycle natural gas fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the PUC and the CEC. In January 2007, the PUC adopted an interim Greenhouse Gas Emissions Performance Standard, which requires that all new long-term commitments for baseload generation entered into by investor-owned utilities have emissions no greater than a combined cycle gas turbine plant (i.e., 1,100 pounds of CO₂ per megawatt-hour). A “new long-term commitment” refers to new plant investments (new construction), new or renewal contracts with a term of 5 years or more, or major investments by the utility in its existing baseload power

plants. In May 2007, the CEC approved regulations that prohibit the state's publicly owned utilities from entering into long-term financial commitments with plants that exceed the standard adopted by the PUC of 1,100 pounds of CO₂ per megawatt hour.

ARB "Early Action Measures"

On June 21, 2007, ARB approved a list of discrete early action measures to address climate change as required by AB 32. The three measures include (1) a low-carbon fuel standard, which will reduce the carbon intensity in California's transportation fuels by at least 10 percent by 2020, thereby reducing total CO₂ emissions; (2) reduction of refrigerant losses from motor vehicle air conditioning system maintenance through the restriction of "do-it-yourself" automotive refrigerants; and (3) increased CH₄ capture from landfills through the required implementation of state-of-the-art capture technologies.

ARB Resolution 07-55

The adoption of ARB Resolution 07-55 on December 6, 2007, established 427 million metric tons of carbon dioxide equivalent (MMTCO₂e) as the statewide GHG emissions limit to be achieved by 2020 as required by AB 32.

Governor's Office of Planning and Research Technical Advisory

On June 19, 2008, the State of California Governor's Office of Planning and Research (OPR) issued a Technical Advisory on addressing climate change impacts of a proposed project under CEQA (OPR Climate Change Advisory). The OPR Climate Change Advisory recommends that lead agencies quantify, determine the significance of, and (as needed) mitigate the cumulative climate change impacts of a proposed project. The OPR Climate Change Advisory identifies that each lead agency is required under CEQA to exercise its own discretion in choosing how to determine significance, in the absence of adopted thresholds or significance guidelines from the State, ARB, or the applicable local air district.

Air Resources Board Scoping Plan

As discussed previously, ARB is required by AB 32 (Health and Safety Code § 38500 et seq.) to develop a Scoping Plan to lower the state's GHG emissions to meet the 2020 limit. A Draft Scoping Plan was released for public comment on June 26, 2008. Key elements of the Draft Scoping Plan include expansion and strengthening of existing energy efficiency programs and

building and appliance standards; expansion of the Renewables Portfolio Standard to 33 percent; development of a California cap-and-trade program linked with other similar programs; implementation of existing laws and standards, such as California's clean car standards (AB 1493), goods movement measures, and the Low Carbon Fuel Standard; and targeted fees to fund California's long-term commitment to AB 32 administration.

Senate Bill 97 (2007)

SB 97, signed in August 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA. This bill directs the Governor's OPR to prepare, develop, and transmit to the California Resources Agency by July 1, 2009, guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA. The California Resources Agency is required to certify and adopt those guidelines by January 1, 2010. This bill also removes, both retroactively and prospectively, as legitimate causes of action in litigation any claim of inadequate CEQA analysis of effects of GHG emissions associated with environmental review for projects funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 (Proposition 1B) or the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E). This provision will be repealed by operation of law on January 1, 2010; at that time such projects, if any remain unapproved, will no longer enjoy protection against litigation claims based on failure to adequately address issues related to climate change. This bill would protect only a handful of public agencies from CEQA challenges on certain types of projects for a few years' time.

SB 375

SB 375, signed into law in September 2008, requires the regional transportation plan for regions of the state with a metropolitan planning organization to adopt a sustainable communities strategy, as part of its regional transportation plan, designed to achieve certain goals for the reduction of GHG emissions from automobiles and light trucks in a region. The bill requires the ARB, working in consultation with the metropolitan planning organizations, to provide each affected region with GHG emission reduction targets for the automobile and light truck sector for 2020 and 2035 by September 30, 2010, to appoint a Regional Targets Advisory Committee to recommend factors and methodologies for setting those targets, and to update those targets every 8 years. The bill also aligns planning for transportation and housing, and creates specified incentives for the implementation of the strategies.

Regional and Local Plans, Policies, Regulations, and Ordinances

There are currently no regional or local policies, regulations, or laws specifically pertaining to GHG emissions.

To provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents, the South Coast Air Quality Management District (SCAQMD) staff has been convening a GHG CEQA significance threshold working group. On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for an interim GHG significance threshold. This significance threshold is applicable only to GHG emissions from industrial projects and where the SCAQMD is lead agency.

The City of Orange is in the process of developing a voluntary Green City program. The Green City program will focus on presenting extensive public education, changing City practices to reflect environmentally friendly principles, implementing green building code requirements being required at the State level, and providing incentives for green building developments and retrofits.

Effects of Climate Change on the City of Orange

As discussed previously in this section, human-induced increases in GHG concentrations in the atmosphere have led to increased global average temperatures (global warming) through the intensification of the greenhouse effect, and associated changes in local, regional, and global average climatic conditions.

Although there is a strong scientific consensus that global climate change is occurring and is influenced by human activity, there is less certainty as to the timing, severity, and potential consequences of the climate phenomena. Scientists have identified several ways in which global climate change could alter the physical environment in California (IPCC 2007a; CEC 2006b; DWR 2006). These include:

- increased average temperatures;
- modifications to the timing, amount, and form (rain vs. snow) of precipitation;
- changes in the timing and amount of runoff; and
- reduced water supply.

The changes listed above may translate into a variety of issues and concerns that may affect the City, including but not limited to:

- changes in the composition, health, and distribution of terrestrial and aquatic ecosystems as a result of changing temperatures and precipitation;
- increased energy demand associated with increased temperatures;
- increased air pollution and related effects on human health;
- decreased water supply, reliability, and quality;
- increased risk of flooding and landslide associated with changes to precipitation patterns; and
- increased frequency and intensity of wildfire as result of changing precipitation patterns and temperatures.

Although some uncertainty exists as to the precise levels of these impacts, there is consensus regarding the range that can be expected. For detailed discussions of these potential impacts see Section 5.15.1, “Existing Conditions,” above.

Although climate change is an issue of global scale and the impacts described above are likely to occur whether or not the proposed General Plan is adopted, implementation of the plan would influence the degree to which climate change affects the City’s residents, ecosystems, and economy. Development associated with buildout of the proposed General Plan could subject an increased number of persons and structures to potential hazards, such as flooding and wildfires. Additionally, environmental impacts resulting from implementation of the General Plan (as identified in Sections 5.1 through 5.14 of this EIR) could combine with climate change–associated impacts to intensify such impacts and exacerbate hardships for the City.

Although the proposed General Plan is likely to increase the City’s exposure to such risks and hardships, the General Plan also includes a variety of policies and programs that would assist the City in avoiding and adapting to the impacts of climate change.

5.15.3 Threshold of Significance

By adopting AB 32, the California Legislature has indicated that global climate change is a serious environmental issue and has identified a GHG reduction requirement for the state. To comply with AB 32, California would need to generate fewer GHGs than current levels. However, for most development projects there is no simple metric available to determine

whether the individual project would substantially increase or decrease overall emission levels of GHGs.

The primary objective of AB 32 is to reduce California's contribution to global warming by reducing California's total annual GHG emissions. The impact that emissions of GHGs have on global climate change does not depend on whether they were generated by stationary, mobile, or area sources or whether they were generated in one region or another.

As stated above, the California Legislature and global scientific community have found that global climate change poses the threat of significant adverse effects to the environment of California and the entire world. To mitigate these adverse effects, the California Legislature and Governor, respectively, have required statewide GHG reductions to the 1990 level by 2020 and 80 percent below the 1990 level by 2050.

In light of the substantial GHG emission reductions established by the California Legislature and Governor to mitigate the significant adverse environmental effects of global climate change, the following global climate change significance threshold is used for this analysis:

- The project's incremental contribution to global climate change would be considered cumulatively significant if, due to the size or nature of the project, it would generate a substantial increase in GHG emissions relative to existing conditions.

On September 30, 2008, the City of Orange issued a memorandum adopting interim guidance on GHG emissions.

The City has acknowledged that there is currently no approved CEQA threshold for GHG emissions and global warming. However, the City has used best available information to develop a threshold, until a specific quantitative threshold is adopted by the state or regional air district. Although the SCAQMD adopted a GHG emission threshold in December 2008, the threshold currently applies only where the SCAQMD is the lead agency and where GHG emissions from industrial projects exceed 10,000 metric tons per year CO₂e, including construction emissions amortized over 30 years and added to operational emissions. The threshold does not apply to residential or commercial sectors at this time. Since the City's significance threshold is more conservative because it encompasses emissions from all types of projects, the City's significance threshold will continue to be used.

The City's global climate change significance threshold is:

- The emission of 10,000 metric tons per year CO₂e equivalent to determine the significance of an individual project's contribution to the global GHG emissions environment.

This threshold was intended to be applied at the project level. The City selected this threshold because it requires mitigation of large development projects that have the greatest impacts to global warming and the greatest potential for implementing mitigation at a broad scale, while also recognizing that small projects (which are most likely infill projects in the City of Orange) are not likely to contribute "cumulatively considerable" emissions quantities and are not the focus of future substantial GHG reductions. In addition, based on a comparative analysis of this threshold, it is similar to the scale of emissions that would trigger exceedance of SCAQMD thresholds for regulated criteria pollutants (e.g., NO_x, volatile organic compounds, CO, particulate matter), and therefore appears to be reasonable and appropriate.

If a project generates GHG emissions below this threshold, it is acceptable to conclude that the project generates GHG emissions but does not result in a "cumulatively considerable contribution" to GHG's or global warming.

For secondary effects of global climate change, such as water supply, flooding, and wildfire impacts, analysis will rely on the CEQA Initial Study checklist questions related to those topics as general thresholds, e.g., Hazards (h) (related to wildland fires), Hydrology and Water Quality (b) and (i) (groundwater supply and flooding risks, respectively), and Utilities (d) (adequate water supply).

Effects of the Proposed General Plan on Climate Change

Global climate change is caused by the addition of massive quantities of GHGs to the atmosphere due primarily to human activities in the last 150 years from all over the world. For example, about 26 billion metric tons of CO₂ were added to the Earth's atmosphere in 2005 alone. If viewed apart from the GHG emissions produced by activities elsewhere in the world, the mass of GHG emissions generated by an individual development project under a General Plan such as the proposed General Plan would be so minute that the concentration of GHGs in the atmosphere would essentially remain the same. The increasing concentration of GHGs in the atmosphere is caused by the aggregate GHG emissions from a variety of human activities throughout the world, including activities like vehicle miles traveled (VMT) and building energy

use affected by the proposed General Plan. Therefore, it is appropriate to evaluate a project's contribution to global climate change in this cumulative, worldwide context.

The proposed General Plan would generate GHG emissions including CO₂, CH₄, and N₂O primarily associated with VMT; electricity and natural gas consumption of buildings; energy embodied in water consumption (i.e., the electricity required to extract, convey, treat, and distribute treated water to the project site); and construction activities associated with future development activities under the proposed General Plan.

As discussed previously, historic and current global GHG emissions are known by the state and the global scientific community to be causing global climate change, and future increases in GHG emissions associated with development under the proposed project would only exacerbate climate change and contribute to the significant adverse environmental effects described previously. Furthermore, increased GHG emissions associated with the proposed project could potentially impede implementation of the state's mandatory requirement under AB 32 to reduce statewide GHG emissions to the 1990 level by 2020.

Although there are no universally accepted methodologies for quantifying emissions of GHGs, methodologies for calculating GHG emissions do exist and are discussed below to provide a rough calculation of GHG emissions associated with projected future vehicle travel, electricity and natural gas consumption of buildings, and embodied energy of water consumption associated with development allowed by the proposed General Plan. A summary of GHG emissions under existing conditions and development capacity of the proposed General Plan is provided in Table 5.15-2.

CO₂ emissions associated with VMT were calculated in tons per year in 2020 using URBEMIS 2007 (Version 9.2.4). The results were converted to metric tons per year using the standard conversion rate of 1 ton equals 0.90718474 metric tons. The calculations assume that existing (2004) annual VMT is 10,052,145 and projected (2030) VMT under buildout of the General Plan is 14,715,890, consistent with the traffic analysis prepared for this EIR. URBEMIS does not calculate CH₄ or N₂O emissions, two other GHGs associated with the combustion of gasoline and diesel fuel. However, CO₂ emissions are considered a good estimate of total GHG emissions from vehicle trips since CH₄ and N₂O represent a negligible portion of the GHGs associated with the burning of gasoline and diesel fuel compared to CO₂.

**Table 5.15-2
Summary of Greenhouse Gas Emissions under Existing Conditions and
Buildout of the Proposed General Plan**

Source	Existing (2004) GHG Emissions (MTCO₂ or MTCO₂e/yr)	Future Development Capacity (2030) GHG Emissions (MTCO₂ or MTCO₂e/yr)	Percent Increase
Construction (over 20-year buildout of the General Plan)	n/a	108,580	n/a
Vehicles	1,661,646	2,456,275	48%
Building Energy	352,050	643,996	83%
Embodied Energy of Water Consumption	58,797	59,297	1%
Operations Total	2,072,493	3,159,568	52%

Notes:

MTCO₂ = metric tons carbon dioxide per year

MTCO₂e = metric tons carbon dioxide equivalent per year

Source: Data modeled by EDAW in 2008

It is estimated that existing VMT resulted in approximately 1,661,646 metric tons of carbon dioxide (MTCO₂) per year while VMT under buildout of the General Plan in 2030 is projected to result in approximately 2,456,275 MTCO₂ per year. Overall, GHG emissions associated with VMT under buildout of the General Plan would increase by about 48 percent relative to existing conditions. The calculations used to estimate GHG emissions are provided in Appendix F of this EIR.

GHG emissions associated with building energy consumption are estimated based on assumptions for electricity and natural gas consumption per land use from the CEC and GHG emission factors for electricity and natural gas consumption from the California Climate Action Registry General Reporting Protocol (California Climate Action Registry General Reporting Protocol, Version 2.2 March 2007, Appendix C, Tables C.1 and C.2.). Existing buildings studied in this analysis include single- and multiple family residential, and all commercial, office, hospital, and industrial buildings. Other building types were not studied due to a lack of data for either the existing condition or buildout year. However, the building types studied represent the vast majority of land uses within the General Plan area in the existing condition and under buildout of the proposed General Plan. Consumption of energy in the studied buildings is

estimated to have emitted approximately 352,050 MTCO₂e³ in 2004. Energy consumption in the same building types under buildout of the proposed General Plan are expected to result in approximately 643,996 MTCO₂e per year. Overall, GHG emissions associated with building energy consumption under future development capacity of the General Plan would increase by about 83 percent relative to existing conditions.

Water consumption associated with various activities under the proposed General Plan is embedded with energy by virtue of the amount of energy consumed in collecting, extracting, conveying, treating, and distributing water to end users, and treating and disposing of wastewater. The analysis of embodied energy of water consumed by the proposed project assumed that imported water has an embodied energy of 0.013 kilowatt-hours (kWh) per gallon⁴ and 0.002 kWh/gallon for groundwater.⁵ Water demand for the proposed project was assumed consistent with Section 5.8, Hydrology and Water Quality. Existing demand for water is estimated to result in 58,797 MTCO₂e per year, while projected demand for water at buildout of the proposed General Plan would be approximately 59,297 MTCO₂e per year, an increase of less than one percent relative to existing conditions.

As shown in Table 5.15-2, existing GHG emissions from VMT, building energy consumption, and the embodied energy of water consumption were estimated to be approximately 2,072,493 MTCO₂e in 2004 while GHG emissions under buildout of the proposed General Plan in 2030 are projected to be approximately 3,159,568 MTCO₂e.

Together, this represents an approximately 52 percent increase in GHG emissions from these sources. Increased solid waste generation and the associated management and disposal in landfills under the proposed General Plan are also anticipated to result in increased GHG emissions associated with the release of landfill gas (i.e., CH₄), GHG emissions would also result from the collection of solid waste and transport to the landfill. Recycled waste would avoid the

³ Carbon dioxide equivalent (CO₂e) is a calculation that enables all GHG emissions to be considered equally in order to measure the impact of all GHG emissions. This is necessary because GHGs vary widely in their ability to absorb radiation and trap heat in the atmosphere, which means their power to affect the climate—or their global warming potential—also varies widely. The global warming potential of GHGs is measured relative to the global warming potential of CO₂. For example, since CH₄ and NO_x are approximately 23 and 300 times more powerful than CO₂, respectively, in their ability to trap heat in the atmosphere, they have global warming potentials of 23 and 300 (CO₂ has a global warming potential of 1). The global warming potential of each GHG is then multiplied by the prevalence of that gas to produce CO₂e.

⁴ Refining Estimates of Water-Related Energy Use in California. California Energy Commission, Public Interest Energy Research Program. CEC-500-2006-118. December 2006.

⁵ *Energy Down the Drain. The Hidden Costs of California's Water Supply.* Natural Resources Defense Council, Pacific Institute. August 2004.

GHG emissions associated with landfilling, although the collection and transport of recycled materials would still result in emissions. Due to the detailed nature of accurately quantifying the climate change impact of solid waste management, such GHG emissions are not quantified in this section. However, it is acknowledged that such emissions are no less important than those from other sources. Other activities that would result in GHG emissions under the proposed General Plan but are not quantified in this section are public outdoor lighting, such as street lights; sports field lighting; and traffic signals.

New growth anticipated under the proposed General Plan would generate a finite quantity of approximately 108,580 MTCO₂ from the aggregate of construction activities during the lifetime of the proposed General Plan (Table 5.15-2). Construction activities consistent with the proposed General Plan would generate GHG emissions to a much lesser extent than operational activities under the plan.

Because implementation of the proposed General Plan would result in an approximately 52 percent increase in GHG emissions from approximately 2,072,493 MTCO₂e in 2004 to approximately 3,159,568 MTCO₂e under buildout of the proposed General Plan in 2030, and also exceed the City's threshold of the emission of 10,000 metric tons per year CO₂e equivalent for an individual project's contribution to the global GHG emissions environment, this is a **potentially significant** impact.

Existing federal regulations addressing GHG emissions from passenger cars and trucks (e.g., Corporate Average Fuel Economy [CAFE] standards revised in the 2007 House Energy Bill) and state regulations to increase the amount of electricity generated from renewable sources (e.g., California Renewable Energy Portfolio Standard Program) will likely reduce the rate of GHG emissions increase associated with VMT, building energy consumption, and embodied energy of water consumption under the proposed General Plan. Furthermore, regulations targeting sources of GHG emissions called for in AB 32 are expected to be adopted and in effect by 2012, although it is unknown at this time precisely what effect such regulations will have on emissions related to land development activities under buildout of the proposed General Plan. It is not known at this time what reductions are achievable from other emission sources through state regulatory measures such as the AB 32 Early Action Measures (adopted in July 2007). Also not known at this time is whether additional GHG reductions for mobile sources might be available through legislation such as AB 1493, which would create more stringent vehicle emission standards for GHGs. Finally, market factors could affect the density of land uses actually constructed under the buildout scenario, which are unknown at this time. Therefore, it is not yet clear what the net GHG emissions would actually be under the buildout scenario of the

proposed General Plan, given the uncertainty of future legislative and regulatory actions. Many factors that would be used to calculate the net change in GHG emissions attributable to individual projects within the proposed General Plan are either unknown at this time or outside the control of the City.

However, the City’s proposed General Plan does include a variety of goals, policies, and implementation programs that would reduce GHG emissions, such as supporting transit-oriented development, mixed use development, alternative transportation such as public transit and walking, and other activities that indirectly tend to reduce GHG emissions. The majority of future growth in the planning area will occur in eight land use focus areas. Most of these areas are located in already developed areas adjacent to existing transit services, employment centers, and commercial services, which will lead to a reduction in vehicle trips. This approach to accommodating growth will substantially minimize GHGs produced in the future.

Table 5.15-3 summarizes the climate change-related policies and programs contained in the proposed General Plan. The table categorizes the policies and programs by topic area. Full text of these policies and programs is provided following the table.

**Table 5.15-3
Climate Change–Related General Plan Policies**

Issues	Topic	Policies	
Land Use/Community Form	Variety of Housing Types	LU 1.3	
	Mixed Use and Infill Development		LU 2.1
			LU 2.4
			GM 2.4
			ED 3.4
			ED 7.2
			HE D.1
			HE D.11
			HE D.12
	Pedestrian Supportive Design		LU 2.7
			LU 5.8
			NR 2.10
			UD 1.4
			UD 1.7
			UD 1.8
			UD 2.1
			UD 2.4
	UD 4.3		
	ED 4.5		
	Environmentally Friendly Industry	ED 4.5	

Issues	Topic	Policies	
	Transit-Oriented Development	LU 5.2	
		CM 3.3	
	Sustainable Buildings and Site Design	NR 2.7	
		HE D.34	
		HE D.35	
	Jobs-Housing-Services Balance	LU 3.2	
		GM 1.8	
		GM 2.3	
	Adaptive Reuse	LU 5.3	
		CR 1.4	
		CR 3.5	
	Circulation and Mobility	Multimodal Transportation Network	LU 2.6
CM 1.1			
CM 2.2			
CM 2.3			
CM 2.6			
NR 2.2			
GM 1.7			
UD 2.2			
		Reduce Vehicle Trips	GM 1.12
		Traffic Calming	GM 1.10
		Public Transportation	CM 2.4
			CM 3.1
			CM 3.2
			PS 7.4
		GM 2.5	
		Pedestrian and Bicycle Facilities or Connections	LU 6.3
			LU 6.7
			CM 1.4
			CM 4.1
			CM 4.2
			CM 4.3
			CM 4.4
			CM 4.5
			CM 4.6
	CM 4.7		
	CM 6.2		
	NR 5.1		
	PS 9.1		
	PS 9.2		
	PS 9.3		
	GM 1.9		
	I 3.5		
	UD 4.4		
	UD 4.6		
	Goods Movement via Rail	CM 2.7	
Air Quality	Comply with regional plans including the SCAQMD	NR 2.1	
Energy	Conservation	NR 2.8	
	Efficient Street Lights	I 3.4	

Issues	Topic	Policies
Adaptation	Fire Protection	LU 6.5
		PS 3.1
		PS 3.2
		PS 3.3
Embodied Energy of Water	Landscaping Water Demand	NR 2.4
	Recycled and Reclaimed Water	NR 2.5
	Overall Conservation	I 1.3
Methane from landfills	Solid Waste Reduction and Diversion	NR 2.6
	Recycling	I 2.2
		I 2.3

Source: Data compiled by EDAW in 2008

Land Use Element

- Policy 1.3: Provide a range of housing densities and types to meet the diverse needs and lifestyles of residents.

- Policy 2.1: Encourage development of mixed-use projects to revitalize older commercial areas throughout the City and industrial areas surrounding the Santa Fe Depot.

- Policy 2.4: Encourage mixed-use projects that contain a mixture of compatible uses, and provide necessary supporting public and community facilities.

- Policy 2.6: Encourage linkage in and around mixed-use areas using a multi-modal circulation network, particularly transit, bicycle and pedestrian sidewalk, path, paseo, and trail systems.

- Policy 2.7: Ensure that the architecture, landscape design, and site planning of mixed-use projects are of the highest quality and emphasize a pedestrian orientation and safe and convenient access between uses.

- Policy 3.2: Actively promote the City as a place to shop and conduct business, and encourage local patronage of Orange businesses.

- Policy 5.2: Promote targeted development of mixed-use, transit-oriented development surrounding the Santa Fe Depot to achieve development intensities compatible with the fabric of Old Towne.

- Policy 5.3: Promote adaptive reuse of previously industrial and agricultural historic structures for residential, office, or commercial purposes.
- Policy 5.8: Ensure that roadway improvements within Old Towne are designed to promote walkability and a safe pedestrian environment.
- Policy 6.3: Establish and maintain greenway and pedestrian and bicycle connections between residential, commercial and open space areas that complement each of these environments.
- Policy 6.5: Require planting and maintenance of fire-resistant and sustainable slope cover to reduce the risk of brush fire within the urban-wildland interface areas located in the northern and eastern portions of the City, and implement stringent site design and maintenance standards for all areas with high wild land fire potential.
- Policy 6.7: Enhance the walkability of both new and current development.

Circulation and Mobility Element

- Policy 1.1: Plan, build, and maintain an integrated, hierarchical, and multi-modal system of roadways, pedestrian walkways, and bicycle paths throughout the City.
- Policy 1.4: Prohibit on-street parking to reduce bicycle/automobile conflicts in appropriate target areas as recommended by the *Bikeways Master Plan*.
- Policy 2.2: Coordinate with adjacent cities to plan and develop major east/west and north/south arterials and rapid transit to connect the City with the cities of Anaheim, Tustin, Santa Ana, Garden Grove, and Villa Park, as well as developing areas within the City's sphere of influence.
- Policy 2.3: Cooperate with and support local and regional agencies' efforts to improve regional arterials and transit in order to address increasing traffic congestion.
- Policy 2.4: Coordinate land use planning with anticipated future development of roadways and other transportation facility improvements as well as the expansion of commuter rail and bus service.

- Policy 2.6: Encourage the use of regional rail, transit, bicycling, carpools and vanpools for work trips to relieve traffic congestion.
- Policy 2.7: Continue to support the use of rail corridors within the City for the movement of freight and goods, and work with rail operators to minimize associated traffic delays.
- Policy 3.1: Work with the Orange County Transportation Authority and other agencies to assess City public transportation needs and to ensure delivery of services when and where they are needed.
- Policy 3.2: Enhance and encourage provision of convenient and attractive transit amenities and streetscapes to encourage use of public transportation (e.g., benches, trash cans, shelters, and lighting).
- Policy 3.3: Require incorporation of transit-oriented design features within major commercial and employment areas as well as medium density residential and mixed-use development areas.
- Policy 4.1: Create a comprehensive bicycle network that is integrated with other transportation systems by establishing complementary on-street and off-street facilities as identified in the City of Orange *Bikeways Master Plan* and OCTA *Commuter Bikeways Strategic Plan*, including Santiago Creek, the Santa Ana River, and the proposed Tustin Branch Trail.
- Policy 4.2: Install racks and safe storage facilities at parking areas for City facilities, as appropriate, and encourage incorporation of such facilities within privately developed projects.
- Policy 4.3: Improve citywide awareness of automobile and bicycle safety.
- Policy 4.4: Encourage use of the bikeway system by providing adequate signage, trail markings, and other amenities.
- Policy 4.5: Ensure that pedestrian sidewalks, trails, and bikeways are safe environments through the use of defensive trail design features, lighting where appropriate, access for emergency vehicles, and links to the roadway signal system.

- Policy 4.6: Explore opportunities to convert abandoned rail corridors into segments of the City's bikeway and pedestrian trail system.
- Policy 4.7: Provide accessible sidewalks and pedestrian amenities throughout the City.
- Policy 6.2: Provide clear indicators in the right-of-way for where pedestrians and bicyclists are encouraged to walk, bike, or cross safely. These may include special paving, line stripes, and crosswalks.

Cultural Resources Element

- Policy 1.4: Encourage alternatives to demolition such as relocation, architecturally compatible rehabilitation, adaptive re-use, and new construction.
- Policy 3.5: Explore additional funding sources for maintenance and rehabilitation of historic resources.

Natural Resources Element

- Policy 2.1: Cooperate with the South Coast Air Quality Management District (SCAQMD) and other regional agencies to implement and enforce regional air quality management plans.
- Policy 2.2: Support alternative transportation modes and technologies, and bicycle- and pedestrian-friendly neighborhoods to reduce emissions related to vehicular travel.
- Policy 2.4: Reduce the amount of water used for landscaping through the use of native and drought-tolerant plants, proper soil preparation, and efficient irrigation systems as parks are built or renovated.
- Policy 2.5: Encourage the production, distribution, and use of recycled and reclaimed water for landscaping projects, while maintaining urban runoff water quality objectives.
- Policy 2.6: Continue to work toward local and regional waste-reduction and diversion goals.
- Policy 2.7: Encourage sustainable building and site designs for new construction and renovation projects.

- Policy 2.8: Coordinate with energy suppliers to ensure adequate supplies to meet community needs, and to promote energy conservation and public education programs.
- Policy 2.10: Encourage development that incorporates pedestrian- and transit-oriented design and landscape elements.
- Policy 5.1: Complete multi-use trail links throughout the City that serve recreational and circulation purposes as funding is available.

Public Safety Element

- Policy 3.1: Continue to identify and evaluate new potential fire hazards and fire hazard areas.
- Policy 3.2: Consider nontraditional methods of controlling vegetation in undeveloped areas.
- Policy 3.3: Encourage residents to plant and maintain fire-retardant slope cover to reduce the risk of brush fires in areas adjacent to canyons, and develop and implement stringent site design and maintenance standards for areas with high fire potential. To the extent possible, native, noninvasive plant materials are encouraged.
- Policy 7.4: Ensure that community areas and amenities such as transit stops, sidewalks, plazas, parks, trails, and bike paths are appropriately lighted, free of hiding places, and frequently patrolled.
- Policy 9.1: Enhance and maintain safe pedestrian and bicycle movement through the integration of traffic control devices, crosswalks, and pedestrian-oriented lighting, into the design of streets, sidewalks, trails, and school routes throughout Orange.
- Policy 9.2: Support creation of safe routes that encourage children to walk or bike to schools and recreational facilities.
- Policy 9.3: Identify and attempt to remove all barriers to pedestrian and bicycle access including those associated with rail, street, freeway, and waterway crossings and poorly marked or maintained pathways and sidewalks.

Growth Management Element

- Policy 1.7: Promote the expansion and development of alternative methods of transportation.
- Policy 1.8: Encourage the development of housing within close proximity to jobs and services.
- Policy 1.9: Ensure that new developments incorporate nonmotorized and alternative transit amenities such as bike racks, bus benches and shelters, and pedestrian connections.
- Policy 1.10: Apply traffic calming measures, where appropriate, to residential neighborhoods affected by cut-through traffic.
- Policy 1.12: Promote traffic reduction strategies through the measures adopted within the City's Transportation Demand Management (TDM) Ordinance.
- Policy 2.3: Continue to work toward achieving a balance between residential, industrial, commercial, and public land uses. Support programs that match Orange residents with local jobs to reduce long commutes and improve the fiscal and public health of the community.
- Policy 2.4: Explore infill development or mixed-use opportunities wherever possible as developable space becomes more limited.
- Policy 2.5: Continue to work with OCTA and other regional transit agencies to provide such amenities as bus shelters, shade, and other special streetscape treatments at transit stations that encourage the use of regional bus and train services.

Infrastructure Element

- Policy 1.3: Promote water conservation programs aimed at reducing demands.
- Policy 2.2: Expand outreach and education regarding recycling opportunities to all City customers.

Policy 2.3: Develop programs that encourage residents to donate or recycle surplus furniture, old electronics, clothing, and other household items rather than disposing of such materials in landfills.

Policy 3.4: Investigate the feasibility of using energy-efficient street lights to conserve energy.

Policy 3.5: Preserve and improve existing on-street bike paths within rights-of-way.

Urban Design Element

Policy 1.4: Support creation of pedestrian-oriented places and connections that define the urban form of the City.

Policy 1.7: Emphasize street-oriented development, with parking located behind or next to buildings rather than in front. Encourage commercial activities such as sidewalk and outdoor dining.

Policy 1.8: Provide for wide sidewalks that accommodate clear pedestrian paths, as well as space for streetscape amenities including trees, street furniture, and landscaping.

Policy 2.1: Transform corridors such as Chapman Avenue, Main Street, The City Drive, and Katella Avenue into active, pedestrian-friendly streets that balance auto, transit, bicycle and pedestrian mobility. These streets should accommodate compact development that is oriented to the sidewalks.

Policy 2.2: Provide convenient pedestrian and transit access throughout commercial and mixed-use corridors, including an interconnected network of high-amenity streetscapes, attractive and comfortable transit stops, and multiple walkways that connect activities and uses.

Policy 2.4: Design and orient buildings in a manner that promotes active street life.

Policy 4.3: Create an attractive, walkable environment within districts and neighborhoods through careful site planning, architectural design, and provision of pedestrian amenities such as sidewalks, benches, plaza areas, information kiosks, and other street furniture.

Policy 4.4: Provide pedestrian linkages between government buildings and around the Civic Center complex.

Policy 4.6: Establish well-defined pedestrian linkages between Orange's commercial districts and its neighborhoods.

Economic Development Element

Policy 3.4: Encourage higher density residential and mixed-use projects to provide a community-based workforce and market for industrial and commercial areas.

Policy 4.5: Encourage an environmentally friendly business atmosphere that maintains local regulations favorable to clean industry, and provides assistance to industries seeking to comply with environmental regulations.

Policy 7.2: Encourage mixed-use developments to provide housing close to employment hubs for employees in all income segments and household types.

Housing Element

The Draft Housing Element (2009 update pending) of the proposed General Plan contains Policy Actions instead of policies. Policy Actions contain a brief statement of action and include specific City responsibilities for implementation. In some cases, the entire Policy Action has not been included here because portions are not relevant to the climate change discussion. Refer to the Draft Housing Element (under separate cover available on the City of Orange website at www.cityoforange.org) of the proposed General Plan for Policy Actions in their entirety.

Policy Action D.1: Adopt a comprehensive revision to the City's General Plan Land Use Element and appropriate sections of the Zoning Code to maximize the potential for infill, mixed use and other creative residential development types. Ensure new land use designations in the updated General Plan provide appropriate densities to accommodate units affordable to Extremely Low-, Very Low-, and Low-Income households.

Policy Action D.11: The City will continue to aggressively pursue infill development within feasible development sites for homeownership and rental units.

Policy Action D.12: The City has an abundance of historically significant structures that provide opportunities for adaptive reuse to contribute to the provision of additional housing opportunities. The City views adaptive reuse as a means to encourage additional housing opportunities while also preserving and enhancing the City's historic resources for the benefit of the entire community.

Policy Action D.34: Promote the inclusion of state-of-the-art water conservation practices in existing and new residential projects where proven to be safe and environmentally sound. Promote the use of low water demand fixtures, landscaping and drought tolerant materials in new and existing residential projects.

Policy Action D.35: To facilitate and encourage the use of green building practices, the City shall conduct a comprehensive review of existing zoning, building and development standards related to green building. The City will analyze current trends and best practices and based on its findings, establish and market a program of information resources and/or incentives that will facilitate and encourage the incorporation of materials and technology that promote resource conservation and efficiency and the development of high-efficiency, sustainable buildings. The program shall encourage residential developers/builders to maximize resource conservation through proactive site, building and building systems design, materials and equipment to maximize resource efficiency and minimize ongoing utility and building maintenance costs. The program will encourage energy and resource conservation in both new construction and remodeling.

The proposed General Plan also includes an Implementation Plan that identifies specific Implementation Programs to achieve the goals, policies, and plans. Where a potentially significant environmental impact exists, these Implementation Programs also function as programmatic mitigation measures.

Implementation Program I-35, in particular, requires the City to develop and adopt a Climate Action Plan (CAP), which will, in part, require the reduction of total GHG emissions in the City to at least 1990 levels by 2020 (which is consistent with AB 32, which requires that statewide GHG emissions be reduced to 1990 levels by 2020).

Adherence to and implementation of regulations, General Plan policies, and implementation of mitigation measures 5.15-1 through 5.15-9, would reduce GHG emissions, but not to a less than

significant level. This impact will remain **significant and unavoidable**. Individual development projects will be required to undergo project-specific environmental review. If project-level significant impacts are identified, specific mitigation measures will be required under CEQA.

Since annual GHG emissions under buildout of the proposed project are projected to exceed the existing level by the substantial margin of 52 percent, the proposed General Plan would contribute to the exacerbation of climate change and the significant adverse environmental effects thereof. Additionally, implementation of the proposed General Plan would exceed the City's threshold of the emission of 10,000 metric tons per year CO₂e equivalent to determine the significance of an individual project's contribution to the global GHG emissions environment.

Furthermore, increased GHG emissions associated with the proposed project could potentially impede implementation of California's mandatory requirement under AB 32 to reduce statewide GHG emissions to 1990 levels by the same year. Therefore, the incremental GHG emissions associated with development under the General Plan would cause a cumulatively considerable incremental contribution to the significant cumulative (worldwide) impacts when viewed in connection with worldwide GHG emissions. By generating increased emissions that contribute to global climate change, development that occurs in accordance with the proposed General Plan throughout the City of Orange would incrementally contribute to the adverse economic, public health, natural resources, and other environmental impacts mentioned earlier in this section that are projected to occur in California and throughout the world as a result of global climate change.

5.15.4 Mitigation Measures

Mitigation measures⁶ shall be applied to development projects throughout the City of Orange where feasible to reduce the cumulatively significant incremental contribution to global climate change. The Implementation Plan of the proposed General Plan contains Implementation Programs that when developed, adopted and implemented, will reduce and serve to mitigate the cumulatively significant incremental contribution to global climate from implementation of the proposed General Plan. In particular, Implementation Program I-35 requires the City to develop and adopt a Climate Action Plan (CAP). The CAP will have two primary objectives: (1) reduce total GHG emissions in the City to at least 1990 levels by 2020 (which is consistent with AB 32,

⁶ These measures are largely based on the Leadership in Energy and Environmental Design (LEED®) for Neighborhood Development Rating System Pilot Version (February 2007).

which requires that statewide GHG emissions be reduced to 1990 levels by 2020), and (2) create adaptation strategies to address the likely impacts of climate change on the City, such as increased risk of flooding, diminished water supplies, increased risks of wildfire, and risks to public health. The CAP will contain thorough GHG emission policies and measures to achieve the reduction objective stated above, and will be more comprehensive than the mitigation measures below.

The following mitigation measures then, are interim measures until the CAP is developed and adopted by the City of Orange:

- 5.15-1 Within 24 months of adoption of the General Plan and certification of the EIR, the City shall establish a global climate change action plan that includes a baseline inventory of all GHG emissions associated with all residences, businesses, industries, agriculture, municipal operations, and other sources within the City limits; establishment of a GHG emissions reduction target; development of enforceable, feasible GHG emissions reduction measures to meet the established target; and performance monitoring of the GHG emissions reduction measures to occur every 3 years to ensure the emissions reductions are being achieved. **(Implementation Program I-35; Responsible Party – Community Development Department; Timeframe – To be developed and adopted by July 2011)**
- 5.15-2 The City shall require that new development for residential projects of 25 units or more comply with at least one of the following:
- Participate in the CEC’s New Solar Homes Partnership (this program provides rebates to developers of six units or more who offer solar power in 50 percent of new units), or a similar program with solar power requirements equal to or greater than those of the CEC’s New Solar Homes Partnership as demonstrated to the City by the project applicant; or
 - Be capable of meeting the certification requirements of one of the accepted green building rating systems for residential development such as LEED, Build It Green, or California Green Builder (no formal certification shall be required).

The project applicant shall demonstrate these requirements to the City.
(Responsible Party – Community Development Department; Timeframe – Immediate and ongoing until adoption of the CAP)

5.15-3 The City shall require that new commercial, office, or industrial development greater than or equal to 25,000 square feet in size or major rehabilitation (additions of 25,000 square feet of office/retail commercial or 100,000 square feet of industrial floor area) must

- Be capable of meeting the certification requirements of one of the accepted green building rating systems such as LEED (no formal certification shall be required), and
- Incorporate renewable energy generation (on- or off-site) to provide 15 percent or more of the project’s energy needs.

The project applicant shall demonstrate these requirements to the City.
(Responsible Party – Community Development Department; Timeframe – Immediate and ongoing until adoption of the CAP)

5.15-4 The City shall require new development or redevelopment projects in excess of 10 acres in size be capable of meeting the certification requirements of LEED for Neighborhood Development Rating System Pilot Version (February 2007) (“LEED ND”). However, no formal certification shall be required, and the project applicant shall demonstrate to the City that the potential for certification has been achieved. All credits used to demonstrate capability to meet the LEED ND certification must directly or indirectly result in a reduction in GHG emissions. **(Responsible Party – Community Development Department; Timeframe – Immediate and ongoing until adoption of the CAP)**

5.15-5 The City shall require that the design or purchase of any new street lights and water and wastewater pumps and treatment systems achieve a 10 percent reduction beyond an estimated baseline energy use for this infrastructure. All new traffic lights installed within Orange shall use LED technology.
(Responsible Party – Community Development Department and Public Works Department; Timeframe – Immediate and ongoing until adoption of the CAP)

5.15-6 The City shall require all new discretionary development or major rehabilitation (additions of 25,000 square feet of office/retail commercial or 100,000 square feet of industrial floor area) projects to recycle and/or salvage at least 50 percent of nonhazardous construction and demolition debris. To implement this requirement, a construction waste management plan identifying materials to be diverted from disposal and whether the materials will be stored on-site or commingled shall be developed and implemented by the applicant for said development or rehabilitation. Excavated soil and land-clearing debris do not contribute to this credit. Calculation can be done by weight or volume but must be consistent throughout. **(Responsible Party – Community Development Department; Timeframe – Immediate and ongoing until adoption of the CAP)**

5.15-7 The City shall require all new discretionary development and major rehabilitation (additions of 25,000 square feet of office/retail commercial or 100,000 square feet of industrial floor area) projects to incorporate any combination of the following strategies to reduce heat gain for 50 percent of the nonroof impervious site landscape (including roads, sidewalks, courtyards, parking lots, and driveways):

- Shaded (within 5 years of occupancy);
- Paving materials with a Solar Reflectance Index (SRI) of at least 29;
- Open grid pavement system; or
- Parking spaces under cover (defined as underground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29.

(Responsible Party – Community Development Department; Timeframe – Immediate and ongoing until adoption of the CAP)

5.15.5 Impact after Mitigation

Implementation of mitigation measures 5.15-1 through 5.15-9 would reduce the incremental GHG emissions associated with buildout of the proposed General Plan, although not to a level less than cumulatively significant. Even with these mitigation measures, buildout of the General Plan will continue to contribute to global climate change. Therefore, the cumulatively

considerable incremental contribution to the worldwide increase in GHG emissions represented by buildout of the General Plan is **significant and unavoidable**.

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