

1 CLIMATE CHANGE

INTRODUCTION TO CLIMATE CHANGE AND GLOBAL WARMING

The average surface temperature of the Earth has risen by about 1 degree Fahrenheit in the past century, with most of that occurring during the past two decades. There is evidence that most of the warming over the last 50 years is due to human activities. Human activities, such as energy production and internal combustion vehicles, have increased the amount of greenhouse gases in the atmosphere, which in turn may be causing the Earth's average temperature to rise. Rises in average temperature may lead to changes in climate patterns and shrinking polar ice caps and a rise in sea level, with a host of corresponding impacts to humans and ecosystems.

Greenhouse gases are atmospheric gases that act as global insulators by reflecting visible light and infrared radiation back to Earth. Some greenhouse gases, such as water vapor, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), occur naturally and are emitted to the atmosphere through natural processes. Although CO₂, CH₄, and N₂O occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From 1750 to 2004, concentrations of CO₂, CH₄, and N₂O have increased globally by 35, 143, and 18 percent, respectively. Other greenhouse gases, such as fluorinated gases, are created and emitted solely through human activities. (EPA 2006.)

The principal greenhouse gases that enter the atmosphere because of human activities are CO₂, CH₄, N₂O, and fluorinated gases.

CARBON DIOXIDE

The natural production and absorption of carbon dioxide (CO₂) is achieved through the terrestrial biosphere and the ocean. However, humankind has altered the natural carbon cycle by burning coal, oil, natural gas, and wood. Since the industrial revolution began in the mid-1700s, each of these activities has increased in scale and distribution.

Carbon dioxide was the first greenhouse gas demonstrated to be increasing in atmospheric concentration, with the first conclusive measurements being made in the last half of the 20th Century. Prior to the industrial revolution, concentrations were fairly stable at 280 ppm. Today, they are around 370 ppm, an increase of well over 30% (EPA 2006). Left unchecked, the concentration of carbon dioxide in the atmosphere is projected to increase to a minimum of 540 ppm by 2100 as a direct result of anthropogenic sources (IPCC 2001)⁴. This could result in an average global temperature rise of at least two degrees Celsius (IPCC 2001).

Carbon dioxide emissions are mainly associated with combustion of carbon-bearing fossil fuels such as gasoline, diesel, and natural gas used in mobile sources and

energy-generation-related activities. The U.S. EPA estimates that CO₂ emissions accounted for 84.6% of greenhouse gas emissions in the United States in 2004. (EPA 2006.) The California Energy Commission (CEC) estimates that CO₂ emissions account for 84% of California's anthropogenic (manmade) greenhouse gas emissions, nearly all of which is associated with fossil fuel combustion. (CEC 2005.) Total CO₂ emissions in the United States increased by 20% from 1990 to 2004. (EPA 2006.)

METHANE

Methane (CH₄) is an extremely effective absorber of radiation, though its atmospheric concentration is less than carbon dioxide and its lifetime in the atmosphere is brief (10-12 years), compared to some other greenhouse gases (such as CO₂, N₂O, and CFCs). CH₄ has both natural and anthropogenic sources. Landfills, natural gas distribution systems, agricultural activities, fireplaces and wood stoves, stationary and mobile fuel combustion, and gas and oil production fields categories are the major sources of these emissions. (EPA 2006)

The U.S. EPA estimates that CH₄ emissions accounted for 7.9% of total greenhouse gas emissions in the United States in 2004. (EPA 2006.) The CEC estimates that in CH₄ emissions from various sources represent 6.2% of California's total greenhouse gas emissions. (CEC 2005.) Total CH₄ emissions in the United States decreased by 10% from 1990 to 2004. (EPA 2006.)

NITROUS OXIDE

Concentrations of nitrous oxide (N₂O) also began to rise at the beginning of the industrial revolution. N₂O is produced by microbial processes in soil and water, including those reactions which occur in fertilizers that contain nitrogen. Use of these fertilizers has increased over the last century. Global concentration for N₂O in 1998 was 314 ppb, and in addition to agricultural sources for the gas, some industrial processes (fossil fuel fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. (EPA 2006.)

The U.S. EPA estimates that N₂O emissions accounted for 5.5% of total greenhouse gas emissions in the United States in 2004. (EPA 2006.) The CEC estimates that nitrous oxide emissions from various sources represent 6.6% of California's total greenhouse gas emissions. (CEC 2005.) Total N₂O emissions in the United States decreased by 2% from 1990 to 2004. (EPA 2006.)

FLOURINATED GASES (HFCs, PFCs, AND SF₆)

Flourinated gases, such as hydroflourocarbons (HFCs), perflourocarbons (PFCs) and sulfurhexafluoride (SF₆), are powerful greenhouse gases that are emitted from a variety of industrial processes. Flourinated gases are occasionally used as substitutes for ozone-depleting substances such as chloroflourocarbons (CFCs), hydrochloroflourocarbons (HCFCs), and halons, which have been regulated since the mid-1980s because of their ozone destroying potential. Flourinated gases are typically

emitted in smaller quantities than CO₂, CH₄, and N₂O, but each molecule can have a much greater global warming effect. Therefore, fluorinated gases are sometimes referred to as High Global Warming Potential (GWP) gases. (EPA 2006.)

The primary sources of fluorinated gas emissions in the United States include the production of HCFC-22 production, electrical transmission and distribution systems, semiconductor manufacturing, aluminum production, magnesium production and processing, and substitution for ozone-depleting substances. The U.S. EPA estimates that fluorinated gas (HFC, PFC, and SF₆) emissions accounted for 2.0% of total greenhouse gas emissions in the United States in 2004. (EPA 2006.) The CEC estimates that fluorinated gas emissions from various sources represent 3.4% of California's total greenhouse gas emissions. (CEC 2005.) Total fluorinated gas emissions in the United States increased by 58% from 1990 to 2004. (EPA 2006.)

WORLDWIDE, NATIONAL AND STATEWIDE EMISSIONS

Table X presents estimated GHG emissions from California, the United States, and from worldwide sources. The results are presented in units of million metric tons per year of CO₂ equivalents (MMTCO₂Eq). Worldwide GHG emissions were taken from the World Resources Institute's Climate Analysis Indicators Tool (CAIT) version 4 for calendar year 2000 (the latest year for which complete data are available). The United States GHG emissions were taken from Energy Information Administration's Emissions of Greenhouse Gases in the United States 2004. While data for 2005 are available, 2004 data were used because the California data are for 2004. California GHG emissions were taken from the California Energy Commission's Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004 (the latest year for which complete data are available).

Table X
Greenhouse Gases Emissions Worldwide, United States, and California

Geographic Region	CO ₂	CH ₄	N ₂ O
	MMTCO ₂ Eq ^a	MMTCO ₂ Eq ^b	MMTCO ₂ Eq ^c
Worldwide GHG Emissions for calendar year 2000 ¹	32,541.3	5,854.9	3,349.4
United States GHG Emissions for calendar year 2004 ²	5,973.0	639.5	353.7
California GHG Emissions for calendar year 2004 ³	334.9	27.9	33.3

Notes:

^aMMTCO₂Eq means million metric tons per year of CO₂ equivalent, using Global Warming Potential (GWP) values provided by IPCC in its Third Assessment Report (TAR) (IPCC 2001). The GWP for CO₂ is 1.

^bThe GWP from IPCC's TAR for CH₄ is 23.

^cThe GWP from IPCC's TAR for N₂O is 296.

CO₂ = carbon dioxide; N₂O = Nitrous oxide; CH₄ = Methane.

¹Worldwide GHG emissions taken from Climate Analysis Indicators Tool (CAIT) version 4.0. Washington, DC: World Resources Institute, 2007. Available at <http://cait.wri.org>.

²United States GHG emissions taken from *Emissions of Greenhouse Gases in the United States 2004*, Energy Information Administration, U.S. Department of Energy, Washington, DC, December 2005.

³California GHG emissions taken from *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*, California Energy Commission, CEC-600-2006-013-SF, December 2006.

EMISSIONS THRESHOLDS

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of carbon dioxide needed to stabilize global temperatures and climate change impacts. It concluded that a stabilization of greenhouse gases at 400-450 ppm carbon dioxide-equivalent concentration is required to keep global mean warming below 2°C, which in turn is assumed to be necessary to avoid dangerous climate change (IPCC 2001). The California Climate Change Center (CCCC) at UC Berkeley has determined that an 11 percent reduction of greenhouse gases from present levels is required by year 2010, a 25 percent reduction is required by 2020, and an 80 reduction by 2050 in order to stabilize greenhouse gases at 400-450 ppm carbon dioxide-equivalent concentrations and avoid potentially dangerous climate change impacts (CCCC 2006). The California Legislature required these reduction levels by enacting AB 32.

Though reduction rates were established in California law (AB 32), as of the writing of this document there are no established CEQA thresholds for greenhouse gases. AB 32

requires ARB to adopt a statewide greenhouse gas emissions limit equivalent to the statewide greenhouse gas emissions levels in 1990 to be achieved by 2020, as specified.

EXECUTIVE ORDER S-3-05

Executive Order S-3-05 was the precursor to Assembly Bill 32 (AB 32 is described in the next section) and was signed by Governor Schwarzenegger in June 2005. This Executive Order was significant because of its clear declarative statements that climate change poses a threat to the State of California. The Executive Order states that California is “particularly vulnerable” to the impacts of climate change, and that climate change has the potential to reduce Sierra snowpack (a primary source of drinking water), exacerbate existing air quality problems, adversely impact human health, threaten coastal real estate and habitat by causing sea level rise, and impact crop production. The Executive Order also states that “mitigation efforts will be necessary to reduce greenhouse gas emissions”.

To address the issues described above, the Executive Order established emission reduction targets for the state: reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020 and to 80% below 1990 levels by 2050. The Secretary of the California Environmental Protection Agency was named as coordinator for this effort, and the Executive Order required a progress report by January 2006 and biannually thereafter. As a result, the Climate Act Team was created by the California Environmental Protection Agency. The first report from the Climate Act Team was released in March of 2006, which proposed to meet the emissions targets through voluntary compliance and state incentive and regulatory programs.

ASSEMBLY BILL 32

In September 2006, Assembly Bill (AB) 32 was signed by Governor Schwarzenegger of California. AB 32 requires that California GHG emissions be reduced to 1990 levels by the year 2020, just like Executive Order S-3-05. However, AB 32 is a comprehensive bill that requires the California Air Resources Board (ARB) to adopt regulations requiring the reporting and verification of statewide greenhouse gas emissions, and it establishes a schedule of action measures. AB 32 also requires that a list of emission reduction strategies be published to achieve emissions reduction goals.

The following is a list of critical path items incorporated into AB 32 – deadlines that cannot be extended unless the Governor agrees there are “extraordinary circumstances”, and then only for one year:

January 1, 2007: AB 32 goes into effect;

June 30, 2007: CARB must publish “a list of discrete early action GHG emission reduction measures” (Cal. Health & Safety Code § 38560.5(a)); this list is not just advisory - the measures must be implemented by regulations by 2010;

January 1, 2008: ARB must establish the 1990 baseline of statewide GHG emissions that will be the cap to be implemented by 2020 (*id.* at § 38550);

January 1, 2008: ARB must also adopt regulations requiring the monitoring and annual reporting of GHG emissions from all significant sources (*id.* at § 38530);

January 1, 2009: ARB must prepare and approve a “scoping plan” for “achieving the maximum technologically feasible and cost-effective reductions in GHG emissions from sources or categories of sources of GHG gases by 2020” (*id.* at § 38561); this scoping plan will be the template for the regulations that will be adopted by 2011;

January 1, 2010: ARB must “adopt regulations to implement” the list of reduction measures that it publishes by June 30, 2007 (*id.* at § 38560.5(b));

January 1, 2011: ARB must adopt regulations establishing “GHG emission limits and emission reduction measures” (*id.* at § 38562(a)); and

January 1, 2012: the 2011 regulations must become operative. (*Id.*)

As of this writing, the first two critical path items have occurred. AB 32 is in effect and the list of early action measures was adopted by the ARB on June 21, 2007 (Resolution 07-25). Three early action measures were identified: establishment of a low-carbon fuel standard, restrictions on the use of refrigerants, and the establishment of statewide standards for the installation and performance of landfill methane capture.

STATE OF CALIFORNIA EMISSION REDUCTION STRATEGIES

Several strategies to reduce vehicle emissions have been identified by the California Environmental Protection Agency’s Climate Action Team. These include, but are not limited to, the following:

VEHICLE CLIMATE CHANGE STANDARDS

With the passage of AB 1493, Pavley, Chapter 200, Statutes of 2002, California moved to the forefront of reducing vehicle climate change emissions. This bill required the state to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of climate change emissions emitted by passenger vehicles and light duty trucks. Regulations were adopted by the ARB in September 2004. The ARB analysis of this regulation indicates emissions savings of 1 million tons CO₂ equivalent (MMtCO_{2e}) by 2010 and 30 million tons CO₂ equivalent by 2020.

DIESEL ANTI-IDLING

Reduced idling times and the electrification of truck stops can reduce diesel use in trucks by about 4 percent, with major air quality benefits. In July 2004 the ARB adopted

a measure to limit diesel-fueled commercial motor vehicle idling. ARB 42 analysis indicates that anti-idling measures could reduce climate change emissions by 1.2 MMtCO₂e in 2020.

OTHER NEW LIGHT DUTY VEHICLE TECHNOLOGY IMPROVEMENTS

In September 2004 the California Air Resources Board approved regulations to reduce climate change emissions from new motor vehicles. The regulations apply to new passenger vehicles and light duty trucks beginning with the 2009 model year. The standards adopted by the Board phase in during the 2009 through 2016 model years. When fully phased in, the near term (2009–2012) standards will result in about a 22 percent reduction as compared to the 2002 fleet, and the mid-term (2013–2016) standards will result in about a 30 percent reduction.

New standards would be adopted to phase in beginning in the 2017 model year (following up on the existing mid-term standards that reach maximum stringency in 2016). Assuming that the new standards call for about a 50 percent reduction, phased in beginning in 2017, this measure would achieve about a 4 MMT reduction in 2020. The reduction achieved by this measure would significantly increase in subsequent years as clean new vehicles replace older vehicles in the fleet—staff estimates a 2030 reduction of about 27 MMT.

EXECUTIVE ORDER S-01-07

This Executive Order was signed by Governor Schwarzenegger on January 18, 2007 and directed the Climate Action Team to determine whether the items in the Order could be established as an early action measure pursuant to AB 32 – which the Climate Action Team has now done. The Executive Order states that the State of California relies on petroleum-based fuels for 96% of its transportation needs, there were more than 24 million motor vehicles registered in California, and statewide gasoline consumption was almost 16 billion gallons in 2005. To address the carbon emitted by this use of fuel, the Executive Order states that a statewide goal must be established to reduce the “carbon intensity of California’s transportation fuels” by at least 10% by the year 2020 and that a Low Carbon Fuel Standard for transportation fuels be established. The Low Carbon Fuel Standard applies to all “refiners, blenders, producers or importers of transportation fuels in California”.

SACRAMENTO COUNTY EMISSION REDUCTION EFFORTS

CHICAGO CLIMATE EXCHANGE

In February 2007, the County joined the Chicago Climate Exchange. The Chicago Climate Exchange is the world’s first and North America’s only voluntary, legally binding rules-based greenhouse gas (GHG) emission reduction and trading system. Chicago

Climate Exchange Phase I members commit to reduce GHG emissions 1% per year over the years 2003 through 2006 relative to a 1998 through 2001 average baseline. Members agree to reduce GHG emissions by a total of 4% below the baseline by 2006.

Chicago Climate Exchange Phase II members commit to reduce GHG emissions from 1¼% to ½% per year through the years 2007 through 2010 for grand total of 6% below the baseline.

Those members that reduce their emissions annually beyond the committed level can sell surplus emission allowances on the Chicago Climate Exchange or bank them. A member that cannot achieve the annual reduction target within its organization can meet its commitment by purchasing emissions allowances through the Chicago Climate Exchange from other Chicago Climate Exchange members that reduce their emissions beyond the reduction target.

The goals of Chicago Climate Exchange are:

1. To facilitate the transaction of GHG emissions allowance trading with price transparency, design excellence and environmental transparency.
2. To build the skills and institutions needed to cost-effectively manage GHG emissions.
3. To facilitate capacity-building in both public and private sector to facilitate mitigation.
4. To strengthen the intellectual framework required for cost effective and valid reduction.
5. To help inform the public debate on managing the risk of global climate change.

Chicago Climate Exchange members make a commitment to:

1. Measure, report, and reduce GHG emissions.
2. Establish an emission reduction schedule.
3. Implement GHG emissions management.
4. Participate in annual emissions audits.

ENERGY CONSERVATION/ENERGY EFFICIENCY PROGRAM

For years, the County of Sacramento has taken a leadership role in implementing policies and programs to conserve energy in County facilities and reduce emissions from the County fleet of vehicles.

The Board of Supervisors approved an Energy Conservation/Energy Efficiency Program in 2001. The essence of the program is to reduce electrical energy usage during peak periods of the day. The program contains ten measures such as participating in Sacramento Municipal Utility Districts Voluntary Emergency Curtailment Program,

setting building temperatures to 78° F to decrease cooling demand and dual switching of lights.

The County converted 108 of 150 trucks to liquid natural gas (LNG) in the Refuse Collection Fleet. The Heavy Rental Fleet now includes 18 propane powered vehicles. The Light Fleet includes 95 hybrid vehicles and 3 Compressed Natural Gas (CNG) vehicles. Replacement vehicles to the Light Fleet will be hybrid vehicles. The Sacramento International Airport operates LNG Shuttle buses.

GHG emissions from County operations are either direct emissions or indirect emissions. Direct emissions result from on-site direct combustion by the County of fossil fuels such as natural gas to heat facilities and gasoline to fuel vehicles. Therefore, increasing the number of vehicles, which use alternative fuels, reduces GHG emissions.

Indirect emissions result from the purchase of energy, such as electricity, and the corresponding emissions associated with that generation. Therefore, purchasing electricity from green energy sources, or reducing energy use reduces GHG emissions. Direct and indirect emissions are the GHG emissions, expressed in metric tons of carbon dioxide (CO₂) equivalent.

The County provided Chicago Climate Exchange current and historical energy and fuel purchase data for fiscal years 2000, 2001, 2002, 2003, 2004, and 2005. The data submitted is for County-owned facilities and vehicles. The County's commitment to join does not apply to businesses, other government agencies or residents within the County boundary, only to emissions generated by Sacramento County as an organization. Preliminary review by the Chicago Climate Exchange indicates the County could be in a position to sell surplus emission allowances for the period of 2003 through 2010. This data will be subject to an audit before a formal Baseline is established and exact credits can be calculated.

It is expected, based on information available and preliminary review by the Chicago Climate Exchange, that the County will receive potential financial reward from participation in the Chicago Climate Exchange. The County may be eligible to sell excess allowances for 2003, 2004 and 2005. Fiscal year 2006 is half-complete and it would appear the County would again be in a sell position. Fiscal years 2007 through 2010 will be dependent on the County's continued commitment to energy conservation and fleet conversion. The preliminary baseline for direct and indirect emissions for the County is 226,700 metric tons of CO₂.

CALIFORNIA CLIMATE ACTION REGISTRY

The County joined the California Climate Action Registry (Registry) in December 2006. The Registry is non-profit public/private partnership that serves as a voluntary GHG registry to protect, encourage and promote early actions to reduce GHG emissions. Registry participants agree to calculate, certify and publicly report GHG emissions. The Registry provides a reporting tool, standards and protocol for reporting GHG emissions.

AB32 recognizes participation in the Registry in a number of ways. First, AB 32 requires the ARB to incorporate the standards and protocols developed by the Registry in the rulemaking process. Second, AB 32 provides that entities that join the Registry prior to December 31, 2006 and report their emissions according to the Registry protocols will not be required to significantly alter their reporting program.

CITIES FOR CLIMATE PROTECTION (ICLEI)

Sacramento County joined ICLEI in 2007. The Cities for Climate Protection is administered under the International Council for Local Environmental Initiatives (ICLEI). The following is a brief description of the program from their website (www.iclei.org):

The Cities for Climate Protection™ (CCP) Campaign enlists cities to adopt policies and implement measures to achieve quantifiable reductions in local greenhouse gas emissions, improve air quality, and enhance urban livability and sustainability. More than 650 local governments participate in the CCP, integrating climate change mitigation into their decision-making processes.

The campaign is based on an innovative performance framework structured around five milestones that local governments commit to undertake. The milestones allow local governments to understand how municipal decisions affect energy use and how these decisions can be used to mitigate global climate change while improving community quality of life. The CCP methodology provides a simple, standardized way of acting to reduce greenhouse gas emissions and of monitoring, measuring, and reporting performance.

BENEFITS OF PARTICIPATION

Communities that participate in the CCP benefit from the actions that they take to reduce greenhouse gas emissions through:

- Financial savings in reduced utility and fuel costs to the local government, households, and businesses.
- Improved local air quality, contributing to the general health and well being of the community. Economic development and new local jobs as investments in locally produced energy products and services keep money circulating in the local economy.
- ICLEI provides regionally specific tools and technical assistance to assist local governments in reducing their greenhouse gas emissions.

Cities for Climate Protection® (CCP) is ICLEI's flagship campaign. The program is designed to educate and empower local governments worldwide to take action on climate change. CCP is a performance-oriented campaign that offers a framework for local governments to reduce greenhouse gas emissions and improve livability within their municipalities. This campaign would give Sacramento County a framework and

tools to develop a plan for greenhouse emissions. The basic framework is called the 5 Milestones and consists of the following steps:

1. Conduct a baseline emissions inventory and forecast. Based on energy and waste data, the member calculates greenhouse gas emissions for a base year (e.g., 2000) and for a forecast year (e.g., 2015). The inventory and the forecast capture emissions from all municipal operations (e.g., city owned and/or operated buildings, streetlights, transit systems, wastewater treatment facilities) and from all community-related activities (e.g., residential and commercial buildings, motor vehicles, waste streams, industry). The inventory and forecast provide a benchmark against which the city can measure progress.
2. Adopt an emissions reduction target for the forecast year. The city passes a council resolution establishing an emission reduction target for the city. The target is essential both to foster political will and to create a framework to guide the planning and implementation of measures.
3. Develop a Local Action Plan. The local government develops a Local Action Plan that describes or lists the policies and measures that the local government will take to reduce greenhouse gas emissions and achieve its emissions reduction target. Most plans include a timeline, a description of financing mechanisms, and an assignment of responsibility to departments and staff. In addition to direct greenhouse gas reduction measures, most plans also incorporate public awareness and education efforts. The development of the Local Action Plan should include strong public input and involvement in order to build the consensus among stakeholders required to implement measures.
4. Implement policies and measures. The city implements the policies and measures contained in their Local Action Plan. Typical policies and measures implemented by CCP participants include energy efficiency improvements to municipal buildings and water treatment facilities, streetlight retrofits, public transit improvements, installation of renewable power applications, and methane recovery from waste management.
5. Monitor and verify results. Monitoring and verifying progress on the implementation of measures to reduce or avoid greenhouse gas emissions is an ongoing process. Monitoring begins once measures are implemented and continues for the life of the measures, providing important feedback that can be used to improve the measures over time. ICLEI's software provides a uniform methodology for cities to report on measures.

The County is presently gathering the information to conduct the baseline emission inventory and expects to complete this step in fall 2007.

GREEN FLEETS

The City and County of Sacramento have adopted a heavy-duty low-emission vehicle (LEV) acquisition policy. The policy goal is to reduce oxides of nitrogen (NOx) emissions

from heavy-duty fleet vehicles to meet the year 2005 standard for ozone in the Sacramento Federal Ozone Non-attainment area.

The foundation statements for this project are:

1. We recognize that the region has an air quality problem which is related to vehicle operations, especially the operation of heavy-duty vehicles;
2. We recognize that public agencies in Sacramento County operate large vehicle fleets which have significant numbers of heavy-duty vehicles.
3. We recognize that public agencies have a significant role to play in improving air quality by reducing the emissions from their fleet operations, especially their heavy-duty vehicles.

The commitments of this program are to show how fleets can aggressively incorporate low-emission vehicles into fleet operations, and how fleets can overcome training, facility and operational issues with resolve. The efforts will focus on the conversion of the on-road, heavy-duty equipment fleets to certified low-emission vehicles as these vehicles are replaced as part of regular systematic replacement programs. As of 2004 the County has committed to replace 50% off the fleet to low-emission vehicles.

IMPACTS AND MITIGATION MEASURES

The following section discloses the potential impacts of the proposed project on global climate change, and the potential impacts of global climate change on the proposed project. Mitigation measures have been identified where feasible.

SIGNIFICANCE CRITERIA

None of the Air Districts in California have identified a significance threshold for GHG emissions or a methodology for making a finding. As described in prior sections, the ARB has adopted Statewide emissions targets and it is clear that emissions throughout the state must be reduced in order to meet these targets. The ARB is continuing to compile data necessary to establish the 1990 emissions level that would form the baseline for compliance with AB 32, **but this process will not be completed until January 1, 2008.** Even after this inventory is complete, it is recognized that for most projects there is no clear or established method to determine if a particular project will negatively impact the ability of the state to meet the emissions goals. At the time of this writing, a host of white papers on the subject have been published, and many conferences and workshops are being held each month. While all conclude that actions must be taken, the subject of significance criteria is a matter of great debate.

There are air quality models available that allow the lead agency to measure, in a rough way, the potential GHG emissions of a particular project. However, the emission of CO₂

into the atmosphere is not in itself an adverse impact to the environment. As stated, it is the increased concentration of CO₂ and other GHG into the atmosphere, its effects on global climate and the associated implications for the existing environment that are of concern. How does a lead agency determine whether the emissions of one particular project will result in a physical effect on global climate change? Each project is on the micro-scale, while climate change is a macro-scale issue. Put differently, how does one determine whether a 25-lot subdivision will result in significant impacts to a global phenomenon?

There are many potential routes to take. One extreme that has been adopted by some lead agencies is to determine that the entire issue is a speculative matter, and pursuant to Section 15145 all discussion of the potential impact is terminated. Various environmental protection groups, law firms and the Attorney General's office have taken a dim view of this approach, and there are several lawsuits pending in the court system on the subject. The other extreme approach that has been suggested, but that no lead agency (to the writer's knowledge) has adopted, is to determine that on a cumulative basis all new development projects have significant impacts. Using this method, even an application for a single new home would require preparation of an Environmental Impact Report. CEQA was designed to have several different types of documents in order to make clear to the public and approving agencies that some projects have minimal effects and some have more serious effects – pursuing this strategy would eliminate these distinctions and would ill serve the intent of CEQA, which is to disclose and inform. Therefore, some medium approach must be taken where all possible information is disclosed, and a good faith effort is made at making a reasonable finding of significance.

Sacramento County is in the process of preparing a GHG emissions inventory as part of preparation of the Environmental Impact Report for the General Plan Update project (Control Number 02-GPB-0105). It is the intent of this process to identify reductions targets for the County that would mirror those of AB 32, and as to recommend mitigation policies that new development must follow in order to allow achievement of the reductions. Once this is in place, a significant finding can be made based on whether the project does or does not comply with the adopted policies. Even in absence of the completion of the inventory and the General Plan Update, the basic premise of the above strategy can be implemented.

A strict quantitative significance measure is not proposed for projects in Sacramento County. In general terms, a project's incremental contribution to global climate change would be considered significant if due to the size or nature of the project it would generate a substantial increase in GHG emissions relative to existing conditions or if it has the potential to jeopardize the ability of the State to meet the adopted emissions targets. To the extent possible, a project's GHG emissions will be quantified. These emissions will be compared, in the form of a percentage, to current ARB estimates of statewide emissions and 1990 emissions. Project emissions will also be examined in light of existing statewide or County emissions reductions strategies, to determine whether the project would significantly offset anticipated reductions. Finally, there are published white papers and other documents (including a letter published by the

Attorney General's office) that list potential means of reducing emissions. The project will be examined to determine whether a reasonable number of these strategies have been incorporated, or need to be incorporated through mitigation.

ESTIMATED PROJECT EMISSIONS

IMPACTS OF THE PROJECT ON CLIMATE CHANGE

MITIGATION MEASURES

IMPACTS TO THE PROJECT FROM CLIMATE CHANGE

Under construction

Although current forecasts vary (see, e.g., DWR 2006), the effects of global climate change on precipitation and temperature regimes in California could lead to significant challenges in securing an adequate water supply for a growing population and California's agricultural industry. An increase in precipitation falling as rain rather than snow could also lead to increased potential for floods because water that would normally be held in the Sierra Nevada until spring could flow into the Central Valley concurrently with winter storm events. This scenario would place more pressure on California's levee/flood control system.

A word will be said about the statement that there is "no consensus" on the existence of climate change. Although individual persons who identify as scientists have stated either that climate change may not be occurring or that it is not being driven by human behavior, the preponderance of peer-reviewed research published in recognized professional journals indicates that average global temperatures are rising and that there is a human-inducement component to this temperature rise. The following discussions relate the current status of knowledge accepted by recognized professionals and professional organizations in the field.

Global climate change is a complex phenomenon that is influenced by many environmental factors. There are also many different climate or hydrologic modeling tools available, each with strengths and weaknesses. While changes to the existing climate landscape can be demonstrated by looking at the historic record, it becomes challenging to predict future trends. The process must be simplified to some extent. Climatologists and others who model climate change must make certain assumptions, such as establishing a fixed rate of temperature change, in order to proceed with modeling. Therefore, scientists involved in these modeling efforts do not try to be absolutely predictive, but instead use different model types with different sets of

assumptions to capture a range of possible scenarios. Areas where all models have close agreement are considered very likely outcomes. It is also necessary to update the model with the latest available data on a regular basis in order to sync the models with current conditions. Therefore, there is no single, certain prediction related to probably environmental effects. The sections below rely on information from several different published sources and provide a qualitative analysis of potential impacts as they affect North America, California, Sacramento County, and the project area.

WATER SUPPLY

According to the Intergovernmental Panel on Climate Change (IPCC) 2007 report, the annual mean warming in North America is likely to exceed the global mean warming in most areas. Snow season length and snow depth are very likely to decrease in most of North America.

FLOODING

MITIGATION MEASURES