6 CLIMATE CHANGE

6.1 INTRODUCTION

The following chapter provides a summary of applicable climate change regulations; a discussion of existing climate conditions, climate change science, and greenhouse gas (GHG) emissions sources in California and the City of Citrus Heights; and a description of potential effects of climate change on the City (i.e., adaptation).

6.2 REGULATORY SETTING

This section includes a summary of climate change-related legislation that is applicable to California and Citrus Heights. This framework identifies portions of GHG emissions sectors that will be regulated by legislation, and portions that will be under the purview of local government entities, such as the City. This section also provides the basis for the state-wide GHG reduction targets, as mandated in Assembly Bill (AB) 32.

FEDERAL

SUPREME COURT RULING

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

EPA ACTIONS

In response to the mounting issue of climate change, EPA has taken the following actions to regulate, monitor, and potentially reduce GHG emissions.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of CO_2 per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85% of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act

On December 7, 2009, EPA adopted its Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CAA (Endangerment Finding). The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of EPA) should regulate and develop standards for "emission[s] of air pollution from any class of classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., CO_2, methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and therefore the threat of climate change.

The Administrator found that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CAA. The Administrator also found that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare.

STATE

Because every nation emits GHGs and therefore makes an incremental cumulative contribution to global climate change, cooperation on a global scale will be required to reduce the rate of GHG emissions to a level that can help to slow or stop the increase in average global temperatures and associated changes in climatic conditions. Several state-wide initiatives that are relevant to land use planning are discussed below; however, this does not represent a complete list of climate change-related legislation in California. Other relevant legislation not specifically described in this section addresses renewable energy generation, energy efficiency, emissions from motor vehicles, and carbon intensity of fuels, among others.

EXECUTIVE ORDER S-3-05

Executive Order S-3-05, which was signed by Governor Schwarzenegger in 2005, proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the Executive Order established total greenhouse gas emission targets. Specifically, emissions are to be reduced to the 2000 level by 2010, the 1990 level by 2020, and to 80% below the 1990 level by 2050.

ASSEMBLY BILL 32, THE CALIFORNIA GLOBAL WARMING SOLUTIONS ACT OF 2006

In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Global Warming Solutions Act of 2006. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources.

AB 32 Climate Change Scoping Plan

In December 2008, ARB adopted its *Climate Change Scoping Plan*, which contains the main strategies California will implement to achieve reduction of approximately 169 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), or approximately 30% from the state's projected 2020 emission level of 596 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 42 MMT CO_2e, or almost 10%, from 2002–2004 average emissions). The *Scoping Plan* also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e),
- the Low-Carbon Fuel Standard (15.0 MMT CO_2e),
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e), and
- a renewable portfolio standard for electricity production (21.3 MMT CO_2e).

ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the *Scoping Plan* does state that land use planning and urban growth decisions will play an important role in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. (Meanwhile, ARB is also developing an additional protocol for communitywide emissions.) ARB further acknowledges that decisions on how land is used will have large effects on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The *Scoping Plan* states that the ultimate GHG reduction assignment to local government operations is to be determined (ARB 2008). With regard to land use planning, the *Scoping Plan* expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of SB 375, which is discussed further below.

SENATE BILL 97

Senate Bill (SB) 97, signed August 2007, acknowledges that climate change is a prominent environmental issue that requires analysis under the California Environmental Quality Act (CEQA). This bill directs the California Office of Planning and Research (OPR) to prepare, develop, and transmit to the Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA by July 1, 2009. The California Natural Resources Agency is required to certify or adopt those guidelines by January 1, 2010. On April 13, 2009, the California Office of Planning and Research submitted to the Secretary for Natural Resources its proposed amendments to the state CEQA Guidelines for GHG emissions, as required by SB 97. These proposed CEQA Guideline amendments provide guidance to public agencies regarding the analysis and mitigation of the effects of greenhouse gas emissions in draft CEQA documents.

SENATE BILL 375

SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS), which will prescribe land use allocation in that MPO's Regional Transportation Plan (RTP). ARB, in consultation with MPOs, will provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every eight years, but can be updated every four years if advancements in emissions technologies affect the reduction strategies to achieve the targets. ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG reduction targets, transportation projects would not be eligible for funding programmed after January 1, 2012.

This bill also extends the minimum time period for the Regional Housing Needs Allocation (RNHA) cycle from 5 years to 8 years for local governments located within an MPO that meets certain requirements. City or County land use policies (including General Plans) are not required to be consistent with the RTP (and associated SCS or APS). However, new provisions of CEQA would incentivize qualified projects that are consistent with an approved SCS or APS, categorized as "transit priority projects."

REGIONAL/LOCAL

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

The Sacramento Metropolitan Air Quality Management District (SMAQMD) is currently in the process of updating its Air Quality CEQA Guidelines, which includes a chapter on program-level analysis of general plans pursuant to CEQA (SMAQMD 2009). With respect to GHG emissions, SMAQMD recommends that a general

plan include a GHG emissions inventory and incorporate development policies, standards, and mitigation measures achieving GHG reductions that comport with the goals of AB 32 (SMAQMD 2009).

6.3 EXISTING CONDITIONS

REGIONAL CLIMATE CHARACTERISTICS

Climate is the accumulation of daily and seasonal weather events over a long period of time, whereas weather is defined as the condition of the atmosphere at any particular time and place (Ahrens 2003). The planning area is located in a climatic zone characterized as dry-summer subtropical or Mediterranean (abbreviated Cs) on the Köppen climate classification system. The Köppen system's classifications are primarily based on annual and monthly averages of temperature and precipitation.

The Sacramento Valley Air Basin (SVAB) is relatively flat, bordered by mountains to the east, west, and north. The climate is characterized by hot, dry summers and cool, rainy winters. Periods of dense and persistent low-level fog that are most prevalent between storms are characteristic of SVAB winter weather. The extreme summer aridity of the Mediterranean climate is caused by sinking air of subtropical high pressure regions. In the case of the SVAB, the ocean has less influence than in the coastal areas, giving the interior Mediterranean climate (abbreviated Csa on the Köppen climate system) more seasonal temperature variation (Ahrens 2003).

Most precipitation in the area results from air masses that move in from the Pacific Ocean during the winter months. These storms usually move from the west or northwest. More than half the total annual precipitation falls during the winter rainy season (November–February); the average winter temperature is a moderate 49 degrees Fahrenheit (°F). During the summer, daily temperatures range from 50°F to more than 100°F. The inland location and surrounding mountains shelter the area from much of the ocean breezes that keep the coastal regions moderate in temperature.

CLIMATE CHANGE – THE PHYSICAL SCIENTIFIC BASIS

THE GREENHOUSE EFFECT

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for

maintaining a habitable climate on Earth. Without the greenhouse effect, Earth would not be able to support life as we know it.

Prominent GHGs contributing to the greenhouse effect are CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the greenhouse effect and have led to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is *extremely unlikely* that global climate change of the past 50 years can be explained without the contribution from human activities (IPCC 2007).

CLIMATE CHANGE

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

Similarly, effects of GHGs are borne globally, as opposed to localized air quality effects of criteria air pollutants and TACs. The quantity of GHGs that it takes to ultimately result in climate change is not precisely known; suffice it to say, the quantity is enormous, and no single project alone would measurably contribute to a noticeable incremental change in the global average temperature, or to global, local, or micro climate. From the standpoint of CEQA, GHG impacts to global climate change are inherently cumulative.

GREENHOUSE GAS EMISSION SOURCES

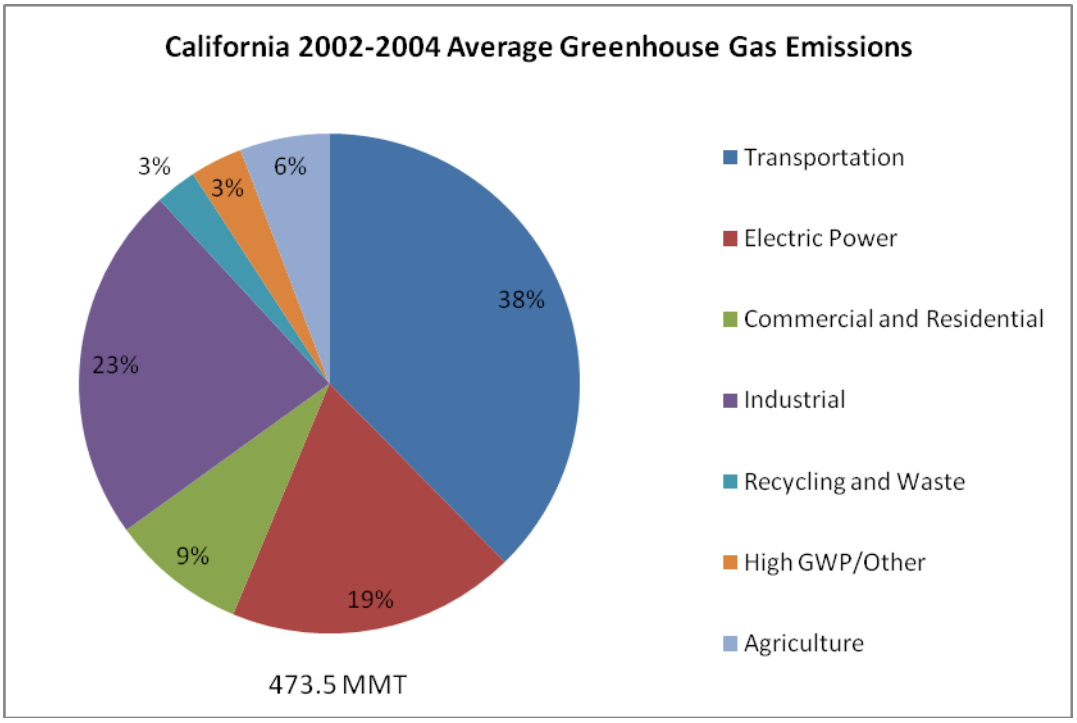
Land use decisions and development projects are not their own GHG emissions sectors. In other words, land use development projects can generate GHG emissions from several sectors (e.g., transportation, electricity, and waste) as described in more detail below. Therefore, land use decisions and development projects can affect the generation of GHG emissions from multiple sectors that result from their implementation. Development projects can result in direct or indirect GHG emissions that would occur on- or off-site. For example, electricity consumed in structures within a project would indirectly cause GHGs to be emitted by a utility provider. The people who reside in and the visitors to a development project would drive vehicles that generate off-site GHG emissions, which are associated with the transportation sector. The following sections describe the major GHG emission

sectors that can and cannot be affected by local government actions. In addition, a description of the existing state of climate change science is provided for informational purposes.

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors (ARB 2009). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (ARB 2009). Emissions of CO_2 are byproducts of fossil fuel combustion. CH_4, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) is largely associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, respectively, two of the most common processes of CO_2 sequestration.

California is the 12th to 16th largest emitter of CO_2 in the world (CEC 2006a). California produced 484 million gross metric tons of CO_2e in 2004 (ARB 2009). CO_2e is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential (GWP) of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, as described in Appendix C, "Calculation References," of the General Reporting Protocol of the California Climate Action Registry (CCAR 2009), 1 ton of CH_4 has the same contribution to the greenhouse effect as approximately 21 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2. Expressing emissions in CO_2e takes the contributions of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 38% of total GHG emissions in the state (ARB 2009). This sector was followed by the electric power sector (including both in-state and out-of-state sources) (19%) and the industrial sector (23%) (ARB 2008). See Figure 6-1 below.



Source: ARB 2008

California's Greenhouse Gas Emissions by Economic Sector (2002–2004 Average) **Figure 6-1**

CITRUS HEIGHTS GREENHOUSE GAS EMISSIONS INVENTORY

OVERVIEW

A GHG emissions inventory was conducted for each incorporated city in Sacramento County, including the City of Citrus Heights, and the unincorporated area of Sacramento County (County) for the year 2005. The inventory estimated that communitywide GHG emissions in Citrus Heights totaled approximately 578,134 metric tons of CO_2e in 2005. Citrus Heights contributed approximately 4.2% of the GHG emissions generated in Sacramento County. On-road transportation emissions composed 42.8% of communitywide GHG emissions, followed by 27.7% from residential sources, and 10.8% from commercial/industrial sources (Sacramento County 2009).

The inventory includes communitywide (i.e., those emissions attributable to all sources in Citrus Heights) and government-related operations (i.e., those emissions directly attributable to the City government operations). The GHG emissions associated with government operations are a subset of the total community-wide emissions. There is no available adopted or widely accepted methodology for evaluating GHG emissions from land use development. In the case of the City's inventory, GHG emissions associated with energy, transportation and waste (i.e., solid waste and wastewater), were modeled using the Local Governments for Sustainability (founded as the International Council for Local Environmental Initiatives (ICLEI)), Clean Air and Climate Protection (CACP)

software, and other calculation methodologies that involved scaling of the statewide GHG emissions inventory prepared by ARB.

COMMUNITY-WIDE INVENTORY

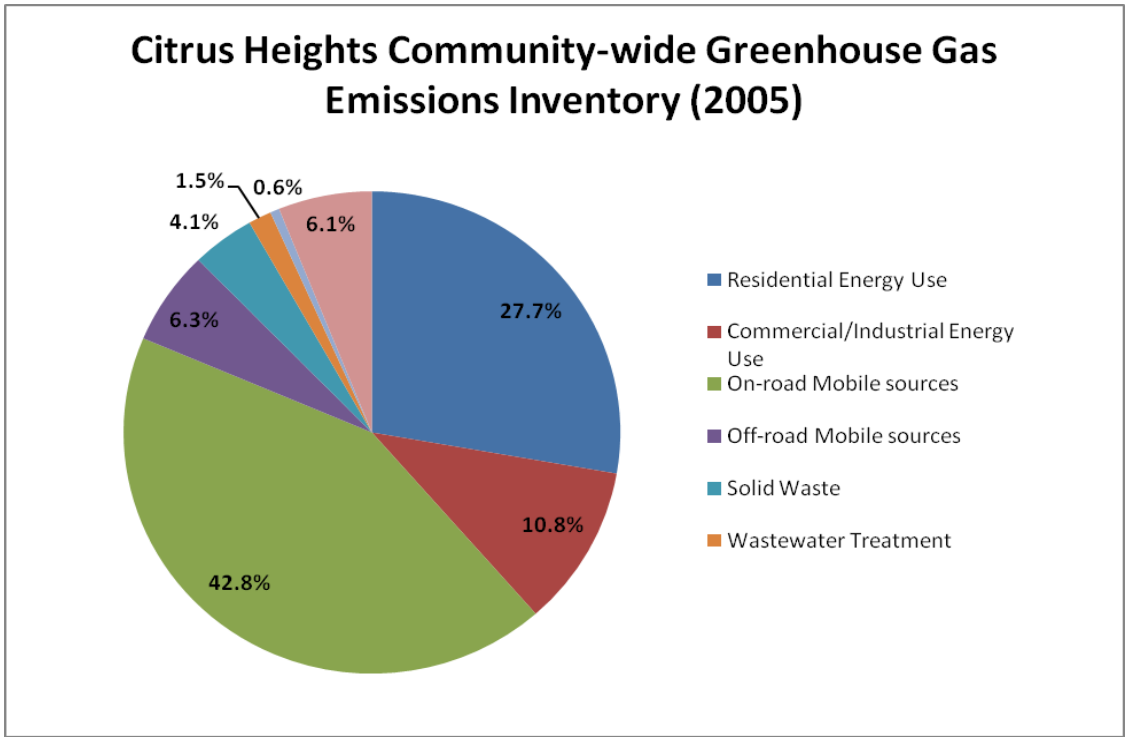
The purpose of the GHG emissions inventory is to assist policy makers and planners to identify the current emission sources, the relative contribution from each source, and the overall magnitude of the City's GHG emissions. This aids in development of more specific and effective policies and emissions control strategies to reduce GHG emissions consistent with State mandates (i.e., AB 32). The GHG emissions inventory is divided into the following GHG emission sectors: residential, commercial/industrial, industrial specific, on-road mobile sources, off-road mobile sources, waste, wastewater treatment, water-related, agriculture, and high GWP GHGs. All GHG emissions were presented in units of MT CO_2e/yr, which allows emissions of other GHGs such as CH_4 and N_2O to be normalized to a single unit of measure that accounts for GWP.

Table 6-1 and Figure 6-2 summarize the 2005 GHG emissions inventory.

Table 6-1
2005 Community-wide Greenhouse Gas Emissions

Community Sector	Inventory Emissions	
	MT CO_2e	Percent
Residential Energy Use	160,429	27.7%
Commercial/Industrial Energy Use	62,553	10.8%
On-road Mobile sources	247,463	42.8%
Off-road Mobile sources	36,627	6.3%
Solid Waste	23,679	4.1%
Wastewater Treatment	8,425	1.5%
Water Use-related	3,525	0.6%
High GWP	35,433	6.1%
Total	**578,134**	**100%**

Source: Data compiled by AECOM 2009 from the City of Citrus Heights' Greenhouse Gas Emissions Inventory.
Notes: CO_2e = carbon dioxide equivalent; DMV = Department of Motor Vehicles; GHG = Greenhouse Gas; GWP = global warming potential; MT= metric tons.



Source: Sacramento County 2009.

Citrus Heights Community-wide Greenhouse Gas Emissions Inventory (2005) **Figure 6-2**

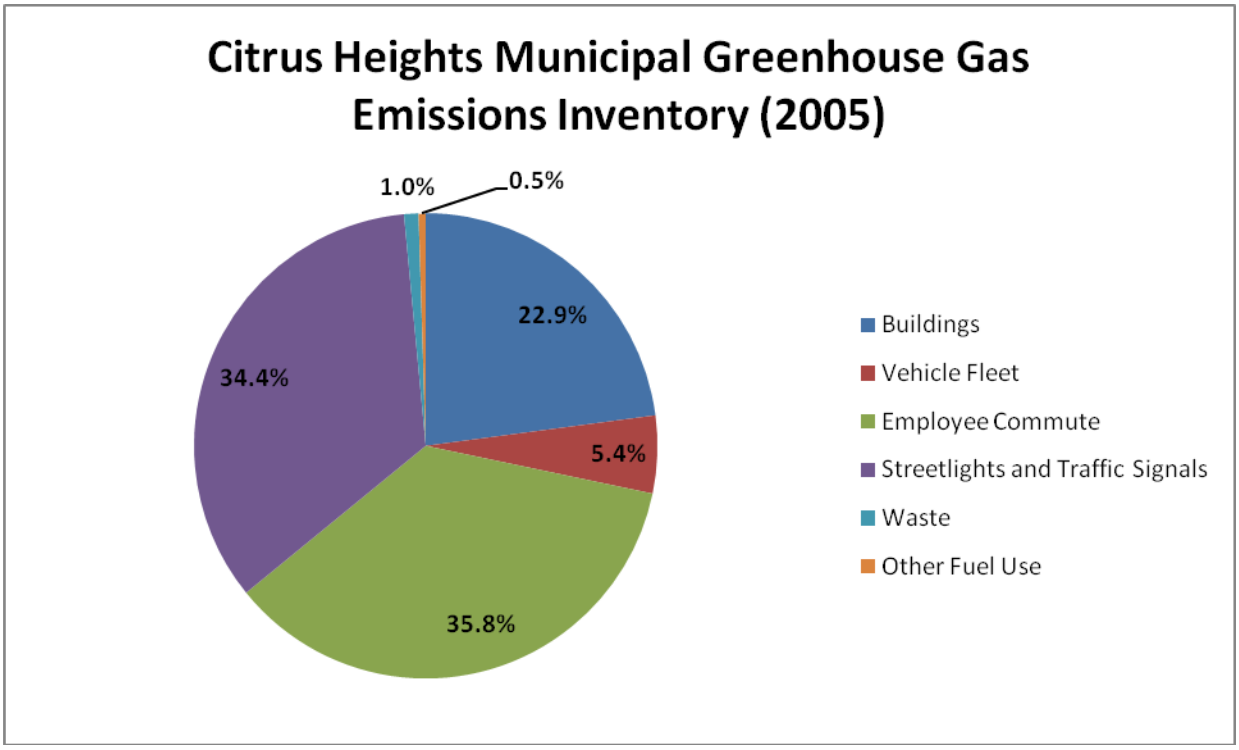
GOVERNMENT OPERATIONS INVENTORY

Government operations include buildings, facilities, vehicle fleets, employee commutes, streetlights and traffic signals, and solid waste disposal that are under the jurisdiction of the City. The City's contribution to all GHG emissions sectors is captured in the community-wide inventory summarized in Table 6-1. Table 6-2 and Figure 6-3 summarize Citrus Heights' municipal GHG emissions for 2005.

Table 6-2
2005 Government-Related Greenhouse Gas Emissions

Government Sector	MT CO_2e	Percent
Buildings	603	22.9%
Vehicle Fleet	143	5.4%
Employee Commute	945	35.8%
Streetlights and Traffic Signals	908	34.4%
Waste	25	1.0%
Other Fuel Use	14	0.5%
Total	**2,637**	**100%**

Notes: CO_2e = carbon dioxide equivalent; MT= metric tons.
Source: Data compiled by AECOM 2009 from the City of Citrus Heights' Greenhouse Gas Emissions Inventory.



Source: Sacramento County 2009.

Citrus Heights Municipal Greenhouse Gas Emissions Inventory (2005) **Figure 6-3**

CITRUS HEIGHTS GREENHOUSE GAS EMISSIONS BASELINE

It is important to note that there is currently no agency-adopted or recommended protocol to follow for preparation of community-wide GHG emissions inventories. Thus, this field of practice and available tools and methods continue to evolve in the absence of standardized guidance. The City chose to refine certain aspects of the 2005 GHG emissions inventory that could potentially influence the General Plan decision-making process and development of the City's GHG Reduction Program. Thus, the GHG data presented in this section represents the emissions baseline for the City that will be relied upon during development of GHG-reduction policies and programs.

Sectors of the 2005 emissions inventory that were refined included on-road and off-road mobile-related emissions, wastewater treatment, and high GWP GHGs. Each is discussed in greater detail below and summarized in Table 6-3 and Figure 6-4.

ON-ROAD MOBILE SOURCES

On-road mobile-source GHG emissions were calculated using a bottom-up method based on VMT data obtained from Fehr & Peers Transportation Consultants, which used select zone assignment of SACOG's current SACMET regional travel demand forecasting (TDF) model to calculate VMT for the City of Citrus Heights under

existing conditions. Vehicle trips and associated VMT were categorized according to three types of trips: Internal–Internal (I-I) trips, which begin and end in Citrus Heights; Internal–External (I-X) trips, which begin in Citrus Heights and end outside Citrus Heights; and External–Internal (X-I) trips, which begin outside Citrus Heights and end inside Citrus Heights.

The methodology used to calculate VMT associated with City activities assigns 100 percent responsibility for all I-I trips and 50 percent I-X and X-I trips to the City. This methodology is consistent with the recommendations of the Regional Targets Advisory Committee, which is the body charged with making recommendations to ARB on implementation of SB 375. On-road mobile-source GHG emissions were estimated using emission factors from the ARB's Mobile Source Emission Factor Model (EMFAC 2007) using VMT by speed bin.

The revised on-road mobile-source GHG emissions estimates account for locally (City)-generated VMT on state highways (e.g., Interstate-80) and do not include emissions associated with trips that originate and terminate outside of Citrus Heights. The original GHG emissions inventory did not distinguish between locally-generated or pass-through VMT. In addition, the original inventory did not calculate emissions according to speed bin. Thus, this refined calculation enables the City to more accurately identify the subset of mobile-source emissions that General Plan polices can influence.

OFF-ROAD MOBILE SOURCES

Off-road mobile-source GHG emissions were calculated using a top-down method. ARB's OFFROAD emissions model contains factors for types of off-road motor vehicles such as boats, agricultural equipment, off-highway vehicles, lawn and garden equipment, and rail. The OFFROAD model aggregates off-road emissions for all of Sacramento County. Under the current inventory calculation, the total off-road GHG emissions for all of Sacramento County were apportioned using the population of each jurisdiction (incorporated cities and unincorporated areas). This approach to allocating off-road mobile-source GHG emissions is not necessarily representative of the jurisdictions in which off-road emissions sources would exist. For example, under this method, some portion of agricultural equipment-related GHG emissions would be allocated to Citrus Heights, when most of this type of equipment would be located in the unincorporated area of the County. However, this approach may be appropriate for lawn and garden equipment emissions.

The revised off-road mobile-source GHG estimates removed emissions that are not applicable to Citrus Heights (e.g., use of agricultural equipment, boats, off-highway vehicles) from the countywide OFFROAD model, but retained emissions associated with equipment that is likely used within the City (e.g., landscape and construction equipment, air compressors, generators). These emissions were then apportioned by population to Citrus Heights.

WASTEWATER EMISSIONS

Domestic wastewater treatment emissions were calculated using a bottom-up calculation method for GHG emissions generated by the Sacramento Regional Wastewater Treatment Plant (WWTP). The Sacramento Regional WWTP service area includes the cities of Citrus Heights, Elk Grove, Folsom Rancho Cordova, Sacramento, West Sacramento, and a portion of unincorporated Sacramento County. Wastewater is treated at the plant using secondary treatment processes, which results in methane formation. Emission factors for methane published by the IPCC for wastewater treatment and discharge were used, along with facility-specific information on average annual flow and influent biological oxygen demand (BOD). The GHG emissions from the Sacramento Regional WWTP were distributed on a per-capita basis for the entire Sacramento Regional County Sanitation District service area, and then allocated to Citrus Heights based on the City's population. This method more accurately estimates GHG emissions from the wastewater treatment process specific to Citrus Heights.

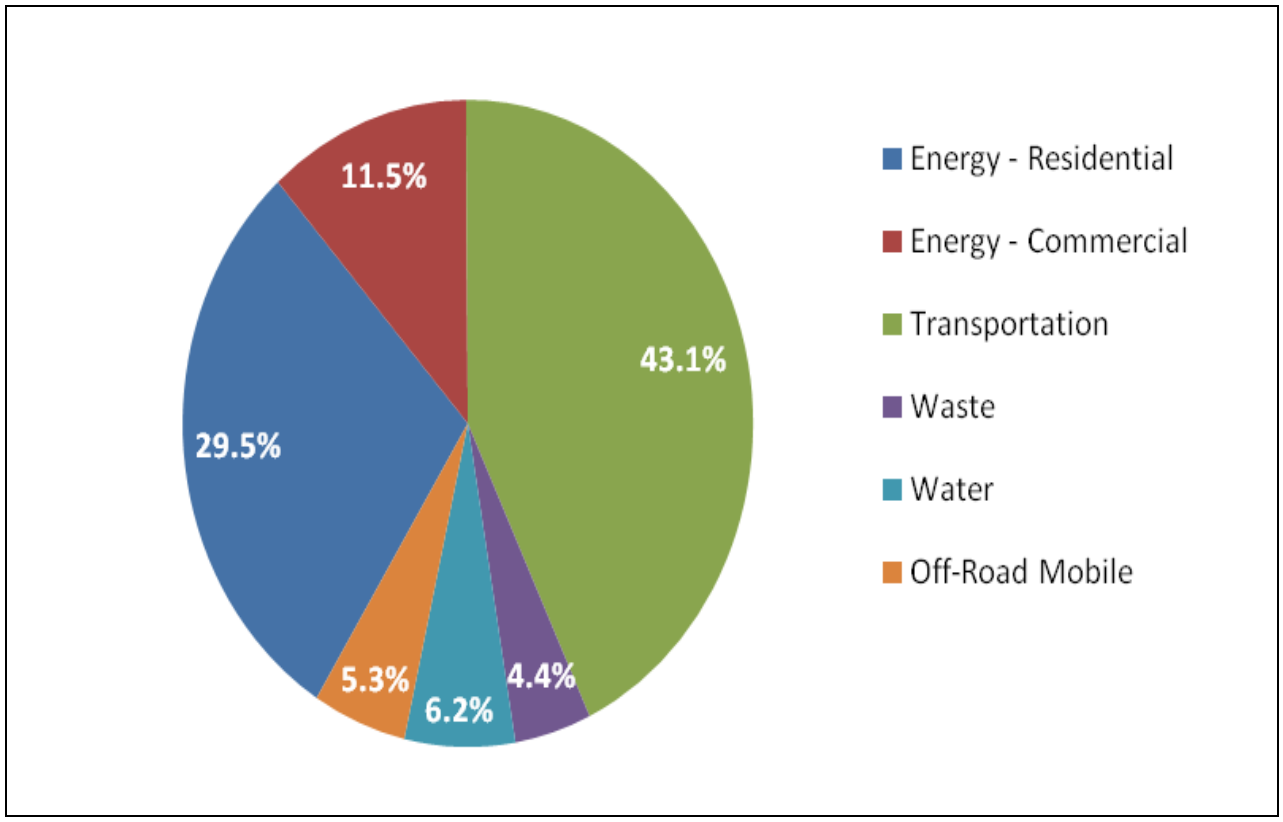
HIGH GLOBAL WARMING POTENTIAL GREENHOUSE GASES

High GWP GHGs are associated with industrial processes, refrigerants, semi-conductor manufacturing, and electrical transmission. According to the City's inventory, there are no industrial-specific GHG emissions in Citrus Heights, which would indicate that there are likely few, if any, high GWP GHG emissions in the City. Thus, high GWP emissions were removed from the emissions baseline in Citrus Heights.

Table 6-3
2005 Community-wide Greenhouse Gas Emissions Baseline

Community Sector	Baseline Emissions	
	MT CO_2e	Percent
Residential Energy Use	160,429	29.5%
Commercial/Industrial Energy Use	62,553	11.5%
On-road Mobile sources	234,231	43.1%
Off-road Mobile sources	28,877	5.3%
Solid Waste	23,679	4.4%
Wastewater Treatment	30,433	5.6%
Water Use-related	3,525	0.6%
Total	**543,727**	**100%**

Source: Data compiled by AECOM 2010 from the City of Citrus Heights' Greenhouse Gas Emissions Inventory.
Notes: CO2e = carbon dioxide equivalent; MT= metric tons.



Source: Sacramento County 2009, AECOM 2010.

Citrus Heights Community-wide Greenhouse Gas Emissions Baseline (2005) **Figure 6-4**

CLIMATE CHANGE ADAPTATION – BASELINE CONDITIONS

FORESEEABLE INDICATORS AND CONSEQUENCES

Despite the level of action taken on the part of the world's governments to reduce GHG emissions, the earth is already committed to a certain level of climate change due to GHG emissions that have occurred over the last 150 years. Thus, a certain degree of climate change effects can be considered foreseeable and part of the baseline. The City will want to plan for resilience in light of the foreseeable effects of climate change on California and recognizes the need to adapt to a changing environmental baseline.

According to the IPCC, which was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, global average temperature is expected to increase by 3–7°F by the end of the century, depending on future GHG emission scenarios (IPCC 2007). Resource areas other than air quality and global average temperature could be indirectly affected by the accumulation of GHG emissions. For example, an increase in the global average temperature is expected to result in a decreased volume of precipitation falling as snow in California and an overall reduction in snowpack in the Sierra Nevada. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of supply for the state (including the project site). According to the California Energy Commission (CEC 2006b), the

snowpack portion of the water supply could potentially decline by 30–90% by the end of the 21st century. A study cited in a report by the California Department of Water Resources (DWR) projects that approximately 50% of the statewide snowpack will be lost by the end of the century (Knowles and Cayan 2002). Although current forecasts are uncertain, it is evident that this phenomenon could lead to significant challenges in securing an adequate water supply for a growing population. An increase in precipitation falling as rain rather than snow also could 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 (DWR 2006).

Another outcome of global climate change is sea level rise. Sea level rose approximately 7 inches during the last century and it is predicted to rise an additional 7–22 inches by 2100, depending on the future levels of GHG emissions (IPCC 2007). If this occurs, resultant effects could include increased coastal flooding, saltwater intrusion (especially a concern in the low-lying Sacramento–San Joaquin River Delta, where pumps delivering potable water could be threatened), and disruption of wetlands (CEC 2006b). As the existing climate throughout California changes over time, the ranges of various plant and wildlife species could shift or be reduced, depending on the favored temperature and moisture regimes of each species. In the worst cases, some species would become extinct or be extirpated from the state if suitable conditions are no longer available.

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DWR. *See* California Department of Water Resources.

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Exhibits

Tables

Acronyms

greenhouse gas (GHG
Assembly Bill (AB
U.S. Environmental Protection Agency (EPA
Federal Clean Air Act (CAA
carbon dioxide (CO_2
methane [CH_4
nitrous oxide [N_2O
hydrofluorocarbons [HFCs
perfluorocarbons [PFCs
sulfur hexafluoride [SF_6
million metric tons (MMT
carbon dioxide equivalent (CO_2e
Senate Bill (SB
California Environmental Quality Act (CEQA
California Office of Planning and Research (OPR
Metropolitan Planning Organizations (MPOs
Sustainable Communities Strategy (SCS
Alternative Planning Strategy (APS
Regional Transportation Plan (RTP
Regional Housing Needs Allocation (RNHA
Sacramento Metropolitan Air Quality Management District (SMAQMD
Sacramento Valley Air Basin (SVAB
Fahrenheit (°F
toxic air contaminants (TACs
global warming potential (GWP
Sacramento County (County
Clean Air and Climate Protection (CACP
International Council for Local Environmental Initiatives (ICLEI
travel demand forecasting (TDF

Wastewater Treatment Plant (WWTP
biological oxygen demand (BOD
California Department of Water Resources (DWR

Citations

Sections/Chapter

Appendices

Impacts

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Mitigation Measures

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Miscellaneous