# CITY OF PASO ROBLES

# CLIMATE ACTION PLAN

*Adopted by City Council Resolution*
*November 19, 2013*

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# City of Paso Robles
# Climate Action Plan

Adopted by the City Council
November 19, 2013
Resolution 13-153

Prepared for:

City of Paso Robles

Prepared by:

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Pacific Gas and Electric Company

Southern California Gas Company

SLO COUNTY apcd

## Legal Notice

# Acronyms

| | |
|---|---|
| AB | Assembly Bill |
| APCD | San Luis Obispo County Air Pollution Control District |
| Cal/EPA | California Environmental Protection Agency |
| CAL FIRE | California Department of Forestry and Fire Protection |
| CALGreen | California Green Building Standards Code |
| Caltrans | California Department of Transportation |
| CAFE | Corporate Average Fuel Economy |
| CAP | Climate Action Plan |
| CARB | California Air Resources Board |
| CEQA | California Environmental Quality Act |
| $CH_4$ | Methane |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| EPA | Environmental Protection Agency |
| GHG | Greenhouse gas |
| HFC | Hydrofluorocarbons |
| IPCC | Intergovernmental Panel on Climate Change |
| kWh | Kilowatt hours |
| LCFS | Low Carbon Fuel Standard |
| LED | Light-Emitting Diode |
| MPO | Metropolitan Planning Organization |
| MT | Metric tons |
| $N_2O$ | Nitrous oxide |
| $O_3$ | Ozone |
| PFCs | Perfluorocarbons |
| PG&E | Pacific Gas and Electric |
| PV | Photovoltaic |
| RTA | Regional Transit Authority |
| SB | Senate Bill |
| SLOCOG | San Luis Obispo Council of Governments |
| TDM | Transportation demand management |
| VMT | Vehicle miles traveled |

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# EXECUTIVE

## SUMMARY

# Executive Summary

The City of Paso Robles Climate Action Plan (CAP) is a long-range plan to reduce greenhouse gas (GHG) emissions from City government operations and community activities within Paso Robles and prepare for the anticipated effects of climate change. The CAP will also help achieve multiple community goals such as lowering energy costs, reducing air pollution, supporting local economic development, and improving public health and quality of life. Specifically this CAP is designed to:

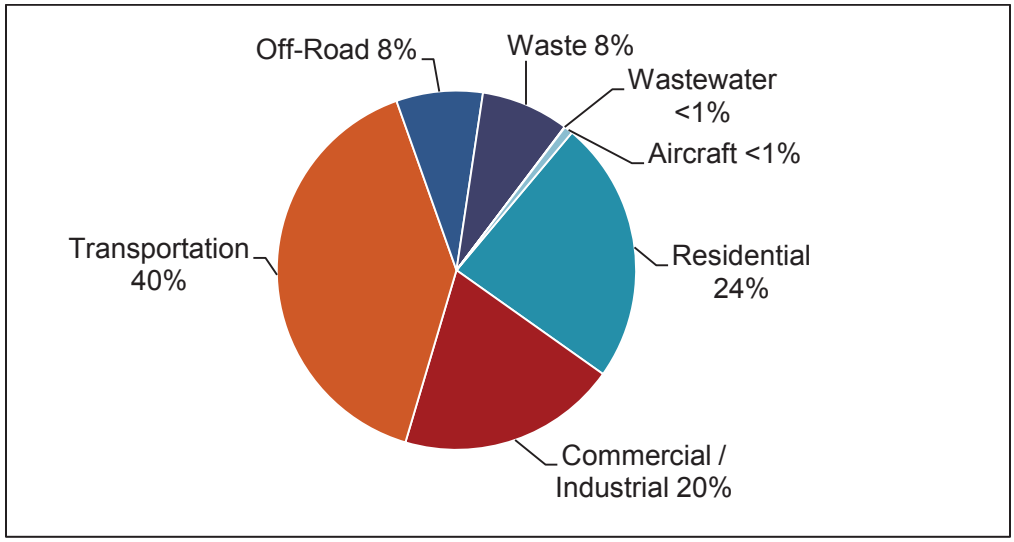
- Benchmark Paso Robles' 2005 baseline GHG emissions and 2020 projected emissions relative to the statewide emissions target established under California Assembly Bill (AB) 32 of 1990 levels by 2020 (approximately 15 percent below 2005 levels by the year 2020).
- Provide a roadmap for achieving the city's GHG emissions reduction target of 15 percent below 2005 levels by the year 2020 and help Paso Robles prepare for anticipated climate change impacts.
- Serve as a qualified and comprehensive plan for addressing the cumulative impacts of GHG emissions within Paso Robles (see California Environmental Quality Act [CEQA] Guidelines, Section15183.5, and the San Luis Obispo County Air Pollution Control District [APCD] CEQA Air Quality Handbook Sections 3.3 and 4.6).
- Support tiering and streamlining the analysis of GHG emissions for future projects within Paso Robles pursuant to State CEQA Guidelines Sections 15152 and 15183.5.

## Paso Robles' GHG Emissions

The *City of Paso Robles 2005 Greenhouse Gas Emissions Inventory Update* (2012) (GHG Emissions Inventory) was prepared to identify the major sources and quantities of GHG emissions produced in Paso Robles in 2005 and forecast how these emissions may change over time. The GHG Emissions Inventory provides information on the scale of emissions from various sources and where the opportunities to reduce emissions lie. It also provides a baseline against which the City can measure its progress in reducing GHG emissions.

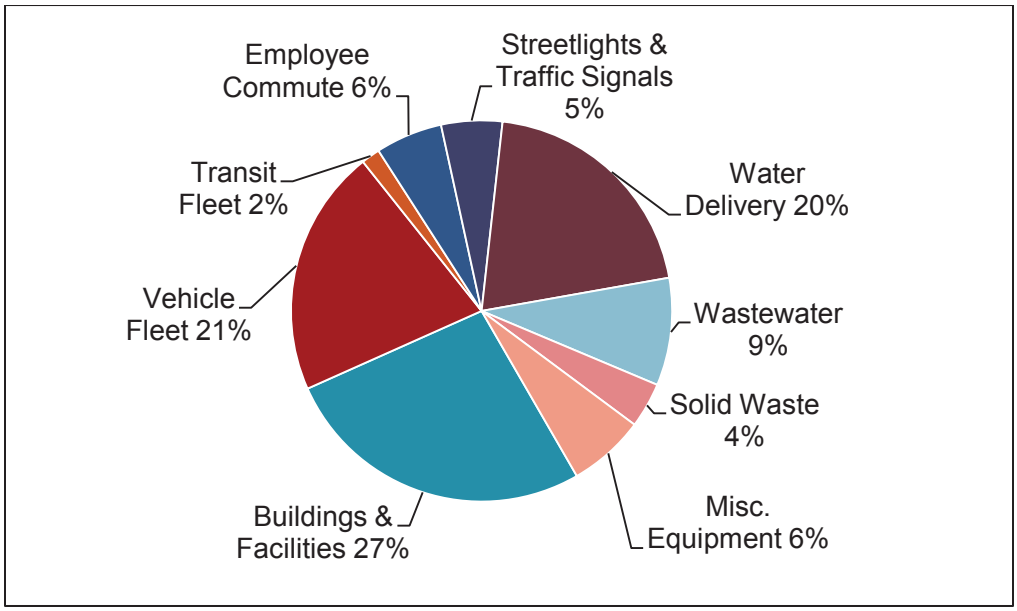
According to the GHG Emissions Inventory, in 2005, the Paso Robles community emitted approximately 169,557 metric tons of carbon dioxide equivalent GHG emissions (MT $CO_2e$), as a result of activities that took place within the transportation, residential energy use, commercial and industrial energy use, off-road vehicles and equipment, solid waste, aircraft and wastewater sectors. As shown in **Figure ES-1**, the largest contributors of GHG emissions were the transportation (40 percent), residential energy use (24 percent) and commercial/industrial energy use (20 percent) sectors. The remainder of emissions resulted from the solid waste (eight percent), off-road vehicles and equipment (8 percent), aircraft (less than one percent), and wastewater (less than one percent) sectors.

**Figure ES-1: Community-wide GHG Emissions by Sector (2005)**




The GHG Emissions Inventory also analyzed emissions from City government operations and facilities. The City government operations inventory is a subset of the community-wide inventory, and is included within the community-wide inventory. In 2005, City government operations generated approximately 6,022 MT $CO_2e$. This quantity represents approximately four percent of Paso Robles' total community-wide GHG emissions. As shown in **Figure ES-2**, the majority of these GHG emissions resulted from building and facility energy use (27 percent), the City's vehicle fleet (21 percent), and water delivery (20 percent).

**Figure ES-2: City Government Operations GHG Emissions by Sector (2005)**



The GHG emissions forecast is a projection of how GHG emissions will change in the future with projected changes in population and jobs.[1] The "business-as-usual scenario" provides a forecast of how GHG emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

Under the business-as-usual scenario, Paso Robles' GHG emissions are projected to grow approximately 20 percent above 2005 GHG emissions levels by the year 2020, from 169,557 MT $CO_2e$ to 203,448 MT $CO_2e$. Emissions associated with the transportation sector will experience the highest level of growth (37 percent). Emissions for the other sectors will range from a decrease of nine percent to an increase of 20 percent. **Table ES-1** shows the forecast results of the business-as-usual scenario.

**Table ES-1: 2020 Business-As-Usual GHG Emissions Forecast**

| Sector | 2005 (MT $CO_2e$) | 2020 (MT $CO_2e$) | Percent Change from 2005 to 2020 |
|---|---|---|---|
| **Residential** | 40,188 | 46,828 | 17% |
| **Commercial / Industrial** | 33,536 | 30,551 | -9% |
| **Transportation** | 67,801 | 92,913 | 37% |
| **Off-Road** | 13,205 | 15,878 | 20% |
| **Solid Waste** | 13,433 | 15,653 | 17% |
| **Wastewater** | 70 | 82 | 17% |
| **Aircraft** | 1,324 | 1,543 | 17% |
| **Total** | **169,557** | **203,448** | **20%** |

The *AB 32 Climate Change Scoping Plan* (2008) (AB 32 Scoping Plan), prepared by the California Air Resources Board (CARB) pursuant to AB 32, identifies several State measures that are approved, programmed, and/or adopted and would reduce GHG emissions within Paso Robles. These State measures require no additional local action. In addition to the State measures, the City of Paso Robles has implemented, adopted, and/or programmed a number of local measures since the 2005 baseline inventory year that will reduce the community's GHG emissions. Therefore, these measures were incorporated into the forecast and reduction assessment to create an "adjusted forecast scenario," which provides a more accurate picture of future emissions growth and the responsibility of the City once State and local measures to reduce GHG emissions have been implemented.

As shown in **Table ES-2**, state and local measures will reduce GHG emissions in Paso Robles by an estimated 39,473 MT $CO_2e$ by 2020. Under the adjusted forecast scenario GHG emissions are projected to decrease to 163,975 MT $CO_2e$ (approximately 19 percent below the business-as-usual scenario of 203,448 MT $CO_2e$).

[1] Population and job projections for the year 2020 were obtained from the San Luis Obispo Council of Governments (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011) (see Chapter 2).

**Table ES-2: Summary of Reductions from State and Local Measures and 2020 GHG Emissions**

| | GHG Emissions ($MT CO_2e$) |
|---|---|
| 2020 Business-as-Usual Forecast | 203,448 |
| 2020 Reduction from State Measures | -37,173 |
| 2020 Reduction from Local Measures | -2,300 |
| **Total Reduction from State and Local Measures** | **-39,473** |
| **2020 Adjusted Forecast** | **163,975** |

## GHG Emissions Reduction Target

The City is committed to reducing its GHG emissions by 15 percent below 2005 levels by 2020, consistent with AB 32. As shown in **Table ES-3**, based on the 15 percent reduction target Paso Robles would need to reduce its community-wide GHG emissions to 144,123 MT $CO_2e$ by 2020. To meet this target, Paso Robles will need to reduce its GHG emissions 12 percent below the adjusted forecast level (equivalent to 19,852 MT $CO_2e$) by 2020 through implementation of local measures and actions.

**Table ES-3: Paso Robles' GHG Emissions, Target, and Reduction Necessary to Meet Target**

| | GHG Emissions ($MT CO_2e$) |
|---|---|
| 2005 Baseline Emissions | 169,557 |
| 2020 Adjusted Forecast | 163,975 |
| Target (15% below 2005 levels by 2020) | 144,123 |
| **Remaining Gap Necessary to Meet Target** | **19,852** |

## Climate Action Measures

To achieve the State-recommended target of 15 percent below 2005 levels (144,123 MT $CO_2e$) by 2020 and prepare for the anticipated effects of climate change, the CAP identifies climate action measures. These measures are organized into the following focus areas: City government operations, energy, transportation and land use, off-road, water, solid waste, and tree planting. The measures were selected based on careful consideration of the emission reductions needed to achieve the target, the distribution of emissions revealed in the GHG Emissions Inventory, goals and policies identified in the City's General Plan, existing priorities and resources, policies and strategies of neighboring jurisdictions and regional agencies, and the potential costs and benefits of each measure. Collectively, the measures identified in the CAP have the potential to reduce GHG emissions within Paso Robles by 22,216 MT $CO_2e$ (16 percent below the 2005 baseline) by 2020 and meet the reduction target.

## Implementation and Monitoring

Implementation and monitoring are essential processes to ensure that Paso Robles reduces its GHG emissions and meets its target. To facilitate this, each climate action measure identifies implementation actions, departments responsible for implementation and monitoring, cost and savings estimates, the GHG reduction potential, a performance indicator to monitor progress, and an implementation time frame. Measure implementation is separated into three phases: near-term (by 2015), mid-term (2016-2017), and long-term (2018-2020).

In order to ensure that measures are implemented and their progress is monitored, upon adoption of the CAP, the City will establish a CAP Coordinator who will provide essential CAP oversight and coordination of a multi-departmental CAP Implementation Team comprised of key staff in each selected department. The CAP Implementation Team will meet at least one time per year to assess the status of CAP efforts. The City's CAP Coordinator will be responsible for developing an annual progress report to the City Council that identifies the implementation status of each measure, evaluates achievement of or progress toward performance indicators (where applicable), assesses the effectiveness of various measures and actions included in the CAP, and recommends adjustments to measures or actions, as needed. To evaluate the performance of the CAP as a whole, the City will update the community and City government GHG emissions inventories every five years, using the most up-to-date calculation methods, data, and tools.

# CHAPTER 1

## INTRODUCTION

# 1.0 Introduction

Although climate change is a global issue, the State of California recognizes that it poses risks to the public health, environment, economic well-being, and natural resources of California, and has taken an active approach to address climate change through the adoption of legislation and policies. In 2005, the governor issued Executive Order S-3-05 to reduce statewide GHG emissions to 1990 levels by 2020 (approximately 15 percent below 2005 levels) and to 80 percent below 1990 levels by 2050. Enactment of several related pieces of climate action legislation followed, including AB 32 (the Global Warming Solutions Act of 2006), which codified the 2020 target, and SB 97 (the CEQA and GHG Emissions bill of 2007), which requires lead agencies to analyze GHG emissions and mitigate climate change impacts under CEQA. These laws together create a framework for GHG emissions reductions and identify local governments as having a vital role to play in assisting the State in meeting these mandates. The AB 32 Scoping Plan, prepared by CARB pursuant to AB 32, notes that local governments have broad influence and, in some cases, exclusive authority over activities that result in GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and City government operations. In recognition of the important role local governments will play in the successful implementation of AB 32, the AB 32 Scoping Plan recommends a GHG emission reduction target for local governments of 15 percent below 2005 levels by 2020 to match the statewide reduction target and to mitigate their impacts on climate change.

Recognizing the important role and responsibility that local governments have in reducing GHG emissions and mitigating their potential climate change impacts, the City has prepared this CAP. This chapter describes the purpose, scope, and content of Paso Robles' CAP. This chapter also summarizes the scientific and regulatory framework under which this plan has been developed.

## 1.1 Purpose and Scope

The City's CAP is a long-range plan to reduce GHG emissions from community-wide activities and City government operations within Paso Robles to support the State's efforts under AB 32 and to mitigate the community's contribution to global climate change. Specifically, the CAP does the following:

- Summarizes the results of the *City of Paso Robles 2005 Greenhouse Gas Emissions Inventory Update*, which identifies the major sources and quantities of GHG emissions produced within Paso Robles and forecasts how these emissions may change over time.
- Identifies the quantity of GHG emissions that Paso Robles will need to reduce to meet the State-recommended target of 15 percent below 2005 levels by the year 2020.
- Sets forth City government and community-wide GHG reduction measures, including performance standards which, if implemented, would collectively achieve the specified emission reduction target.
- Identifies proactive strategies that can be implemented to help Paso Robles prepare for anticipated climate change impacts.

- Sets forth procedures to implement, monitor, and verify the effectiveness of the CAP measures and adapt efforts moving forward as necessary.

In addition to reducing Paso Robles' GHG emissions consistent with AB 32 and mitigating the community's contribution to global climate change, implementation of the CAP will help achieve multiple community-wide goals, such as lowering energy costs, reducing air pollution, supporting local economic development, and improving public health and quality of life. The CAP may also be utilized to tier and streamline the analysis of GHG emissions of future development within Paso Robles pursuant to State CEQA Guidelines Sections 15152 and 15183.5 (refer to Section 1.4, *Relationship to CEQA*).

## 1.2 Content

The CAP is organized into the following chapters:

**1.0 Introduction** – describes the purpose, scope, and content of Paso Robles' CAP. It also summarizes the scientific and regulatory framework under which this plan has been developed.

**2.0 GHG Emissions and Reduction Target** – identifies the sources of GHG emissions in Paso Robles, quantifies emissions for a baseline year (2005), and forecasts how emission levels would change through 2020. This chapter also quantifies the GHG emissions reduction target for the year 2020.

**3.0 Climate Action Measures** – organizes the CAP measures into the following focus areas: City government operations, energy, transportation and land use, off-road, solid waste, water, and tree planting. Each GHG reduction measure is presented with implementation actions, estimated GHG reductions in 2020, and estimated cost and future savings.

**4.0 Adaptation** – includes a discussion of modeled climate change predictions, an urban system assessment, a vulnerability assessment, and adaptation measures to prepare for and minimize the risk associated with anticipated climate change impacts.

**5.0 Implementation and Monitoring** – sets forth procedures to implement and monitor the individual CAP measures, evaluate the CAP's performance, and amend the plan if it is not achieving targeted reduction levels. It also identifies potential sources of funding to implement the CAP.

## 1.3 Background and Planning Process

In 2007, the San Luis Obispo County Air Pollution Control District (APCD) convened a committee of agency stakeholders (Stakeholder Committee) from the cities of Atascadero, Arroyo Grande, Grover Beach, Morro Bay, Paso Robles, Pismo Beach, and San Luis Obispo and the County of San Luis Obispo to initiate a discussion on climate change, including science, policy, funding, mitigation, adaptation, and public engagement. The APCD also coordinated the preparation of GHG emissions inventories for each of the jurisdictions. Both the City and County

of San Luis Obispo received federal stimulus funds to support the development of their CAPs. San Luis Obispo County approved its EnergyWise Plan in November 2011, and the City of San Luis Obispo adopted its Climate Action Plan in July 2012. The APCD worked with the remaining six cities to secure funds for individual CAPs, including the City of Paso Robles CAP, through the Pacific Gas and Electric Company (PG&E) Green Communities Program, Southern California Gas Company (SoCalGas), and APCD's mitigation grant funding.

City staff and its consultants worked with members of the community and elected officials to develop the CAP. The public outreach program involved two community workshops that introduced the project gathered input and ideas for the document and on potential GHG reduction measures. A virtual town hall also provided an opportunity for community members to evaluate a preliminary set of GHG reduction measures and suggest additional ideas. Public outreach also included posting project information and updates to the project website (www.centralcoastghgplanning.com) and eNewsletter announcements. Public comment was also considered during Planning Commission and City Council meetings.

## 1.4 Relationship to CEQA

According to the California Natural Resources Agency (2009) and the State's Office of the Attorney General (2009), GHG emissions may be best analyzed and mitigated at the programmatic level (i.e., in a GHG reduction plan/CAP). In 2009, the California Natural Resources Agency amended the State CEQA Guidelines to add a new provision, Section 15183.5, which provides a framework for programmatic GHG emissions reduction plans (i.e., a CAP). Section 15183.5 states a plan for the reduction of GHG emissions should:

- Quantify GHG emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;
- Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable;
- Identify and analyze the GHG emissions resulting from sources in the community;
- Identify a suite of specific, enforceable measures that, collectively, will achieve the emissions targets;
- Establish a mechanism to monitor the plan's progress and to require amendment if the plan is falling short; and
- Be adopted in a public process following environmental review.

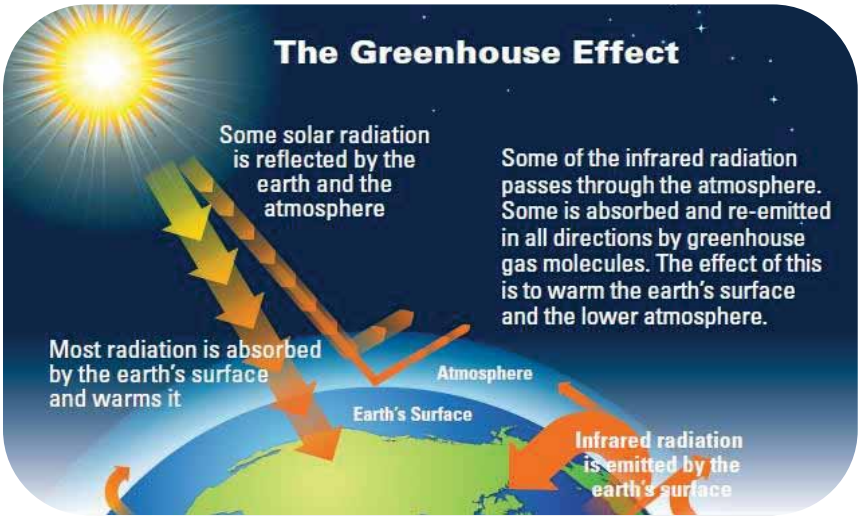
This CAP was developed to be consistent with State CEQA Guidelines Section 15183.5. Once the CAP is adopted following environmental review, a lead agency may determine that projects that are consistent with the CAP will not have significant GHG-related impacts, thereby shortening the CEQA process, which can save time and money for these projects. **Appendix C** contains a worksheet that project applicants may use to demonstrate project-level compliance. If a project is found to be inconsistent with the CAP, the APCD thresholds discussed in Section 1.8.3 should be applied.

## 1.5 Scientific Background

In order to make meaningful and effective decisions regarding the mitigation of GHG emissions and adaptation to anticipated changes in climate, it is important to understand the science under which this CAP has been developed. This section provides a brief introduction to the scientific research efforts to understand how climate change occurs and its implications.

Global climate change refers to changes in the average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation, and storms. Global warming, a related concept, is the observed increase in average temperature of the Earth's surface and atmosphere caused by increased GHG emissions, which can contribute to changes in global climate patterns. GHGs, such as water vapor, carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and ozone ($O_3$), are gases in the Earth's atmosphere that play a critical role in determining the Earth's surface temperature. Specifically, GHGs allow high-frequency solar radiation to enter the Earth's atmosphere, but trap the low frequency, long wave energy which is radiated back from the Earth to space, resulting in a warming of the atmosphere. The trapping of heat at the Earth's surface is known as the "greenhouse effect" (refer to **Figure 1-1**).

**Figure 1-1: The Greenhouse Effect**

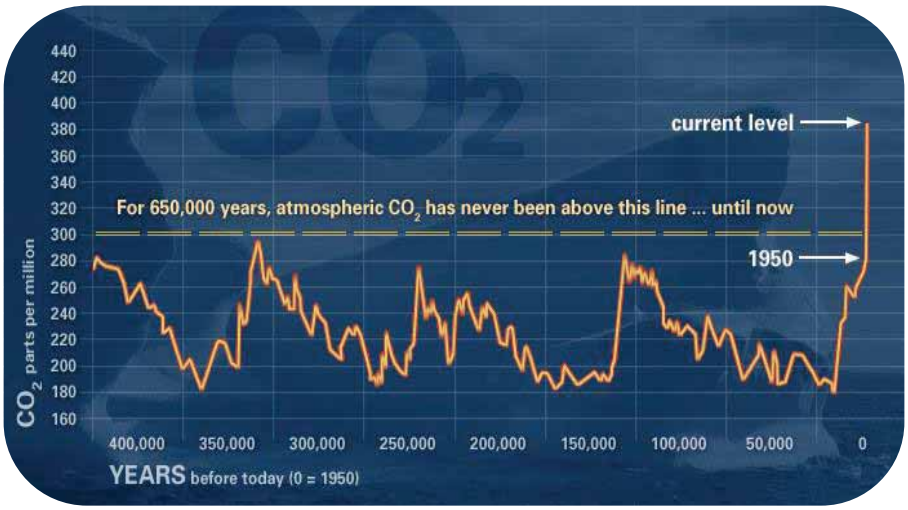



Source: National Oceanic & Atmospheric Administration (NOAA), 2009

GHGs are the result of both natural and anthropogenic activities. The consumption of fossil fuels for power generation and transportation, forest fires, decomposition of organic waste, and industrial processes are the primary sources of GHG emissions. Without human intervention, the Earth maintains an approximate long-term balance between the emission of GHGs into the atmosphere and its storage in oceans and terrestrial ecosystems. Following the industrial revolution, however, increased combustion of fossil fuels (e.g., gasoline, diesel, coal, etc.) and other industrial processes have contributed to the rapid increase in atmospheric levels of GHGs (refer to **Figure 1-2**) (NOAA, 2009). This increase in GHGs correlates with the recent increase

in global average temperature (which has risen approximately 1.4°F since the early 20th century) (IPCC, 2007; NOAA, 2009).

**Figure 1-2: Historic Fluctuations and Recent Increases in Atmospheric Carbon Dioxide**




This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric $CO_2$ has increased since the Industrial Revolution (NASA, 2011).

The principal GHGs that enter the atmosphere as a result of human activities are discussed below.

- **Carbon dioxide ($CO_2$)** is released into the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., cement production) and deforestation. Carbon dioxide is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- **Methane ($CH_4$)** is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from agricultural practices, such as the raising of livestock, and by the decomposition of organic waste in landfills.
- **Nitrous oxide ($N_2O$)** is emitted during agricultural and industrial activities, as well as during the burning of fossil fuels and solid waste.
- **Fluorinated gases** (i.e., hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) are synthetic GHGs that are emitted from a variety of industrial processes (e.g., aluminum production) and used in commercial, industrial, and consumer products (e.g., automobile air conditioners and refrigerants). These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as "high global warming potential" gases.

Each GHG has a different potential for trapping heat in the atmosphere, called global warming potential. For example, one pound of methane has 21 times more heat capturing potential than one pound of carbon dioxide. To simplify reporting and analysis of GHGs, GHG emissions are typically reported in metric tons of carbon dioxide equivalent (MT $CO_2e$) units. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes. The global warming potentials for common GHGs are shown in **Table 1-1**.

**Table 1-1: Global Warming Potential of GHGs**

| GHG | Global Warming Potential |
|---|---|
| Carbon Dioxide ($CO_2$) | 1 |
| Methane ($CH_4$) | 21 |
| Nitrous Oxide ($N_2O$) | 310 |
| Hydroflourocarbons (HFCs) | 140-11,700 |
| Perflourocarbons (PFCs) | 6,500-9,200 |
| Sulfur Hexaflouride ($SF_6$) | 23,900 |

Notes: Each of the GHGs listed above differs in its ability to absorb heat in the atmosphere, or in its global warming potential. The values presented above are based on the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report and United Nations Framework Convention on Climate Change reporting guidelines (IPCC, 1996). Although the IPCC Fourth Assessment Report presents different estimates, the current inventory standard relies on the Second Assessment Report's intensity factors to comply with reporting standards and consistency with regional and national inventories (USEPA, 2010).

## 1.6 Climate Change Impacts

Increases in the globally averaged atmospheric concentration of GHGs will cause the lower atmosphere to warm, in turn inducing a myriad of changes to the global climate system. These large-scale changes will have unique and potentially severe impacts in the western United States, California, and the central coast region. Current research efforts coordinated through CARB, California Energy Commission, California Environmental Protection Agency (EPA), University of California system, and other entities are examining the specific changes to California's climate that will occur as the Earth's surface warms.

The best available climate models indicate that climate change could impact the natural environment in California in the following ways, among others (California Natural Resources Agency, 2009):

- Rising sea levels along the California coastline caused by ocean expansion and glacier melt

- Extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent
- An increase in heat-related human deaths, infectious diseases, and a higher risk of respiratory problems caused by deteriorating air quality
- Reduced snow pack and stream flow in the Sierra Nevada Mountains, affecting winter recreation and water supplies
- Potential increase in the severity and historical pattern of winter storms, affecting peak stream flows and flooding
- Changes in growing season conditions that could affect California agriculture, causing variations in crop quality and yield
- Changes in distribution of plant and wildlife species brought about by changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects

## 1.7 Implications for Paso Robles

Rising temperatures affect local and global climate patterns, and these changes are forecasted to manifest themselves in a number of ways that may impact the central coast region. As further discussed in Chapter 4, *Adaptation*, according *ClimateWise: Integrated Climate Change Adaptation Planning in San Luis Obispo County in November 2010* (ClimateWise) potential climate changes that could occur in Paso Robles by the end of this century include:

- Increased temperatures
- Changed precipitation
- Increased frequency and severity of storm events
- Increased burn area from wildfires

## 1.8 Regulatory Background

This section summarizes the federal, state, and regional legislation, regulations, policies, and plans that have guided the preparation and development of this CAP.

### 1.8.1 FEDERAL

**Clean Air Act.** The U.S. EPA is the federal agency responsible for implementing the Clean Air Act. The U.S. Supreme Court ruled in its decision in *Massachusetts et al. v. Environmental Protection Agency et al*., issued on April 2, 2007, that carbon dioxide is an air pollutant as defined under the Clean Air Act and that the U.S. EPA has the authority to regulate emissions of GHGs as pollutants. In 2011, the U.S. EPA began regulating GHG emissions from new power plants and refineries through a set of New Source Performance Standards. These regulations are found in 40 CFR Part 60 and apply to new, modified and reconstructed affected facilities in

specific source categories such as manufacturers of glass, cement, rubber tires and wool fiberglass.

**Energy Independence and Security Act.** The Energy Independence and Security Act of 2007 includes several provisions that will increase energy efficiency and the availability of renewable energy, which in turn will reduce GHG emissions. First, the Act sets a Renewable Fuel Standard that requires fuel producers to use at least 36 billion gallons of biofuel by 2022. Second, it increased Corporate Average Fuel Economy (CAFE) Standards to require a minimum average fuel economy of 35 miles per gallon for the combined fleet of cars and light trucks by 2020. Third, it includes a variety of new standards for lighting and for residential and commercial appliance equipment, including residential refrigerators, freezers, refrigerator-freezers, metal halide lamps, and commercial walk-in coolers and freezers.

### 1.8.2 STATE OF CALIFORNIA

The State of California has been proactive in working to reduce emissions and has a long history of leadership in addressing energy and climate issues spanning the last 40 years. In 1988, AB 4420 (Sher, Chapter 1506, Statutes of 1988) designated the California Energy Commission as the lead agency for climate change issues in California. Since that time, numerous initiatives in California have addressed climate change and energy efficiency, the majority of legislation passed since 2000. These initiatives have strengthened the ability of entities in California to engage in accurate data collection and have created targets and regulations that will directly lead to reductions in GHG emissions. These initiatives are described below.

**Executive Order S-3-05.** Executive Order S-3-05, issued in 2005, was the first comprehensive state policy to address climate change. It established ambitious GHG reduction targets for the State: reduce GHG emissions to 2000 levels by 2010, to 1990 levels by 2020 and to 80 percent below 1990 levels by 2050. This Executive Order is binding only for State agencies and has no force of law for local governments. However, S-3-05 is important for two reasons. First, it obligated State agencies to implement GHG emission reduction strategies. Second, the signing of the Order sent a clear signal to the Legislature about the framework and content for legislation to reduce GHG emissions as a necessary step toward climate stabilization.

**Assembly Bill 32 (California Global Warming Solutions Act of 2006).** AB 32 codified the State's 2020 GHG emissions target by directing CARB to reduce California's statewide emissions to 1990 levels by 2020. AB 32 also required CARB to develop a policy plan for reaching the 2020 emissions target and to adopt and enforce regulations to implement the plan. The resulting AB 32 Scoping Plan was adopted by CARB in December 2008. Key elements of the plan for achieving the 2020 target include:

- Adopting and implementing measures pursuant to existing state laws and policies, including California's goods movement measures and the Low Carbon Fuel Standard
- Expanding energy efficiency programs and green building practices
- Reducing methane emissions at landfills

- Developing a California cap-and-trade program
- Establishing and seeking to achieve reduction targets for transportation-related GHG emissions
- Increasing waste diversion, composting, and commercial recycling toward zero-waste
- Strengthening water efficiency programs
- Preserving forests that sequester carbon dioxide

Although the AB 32 Scoping Plan does not identify specific reductions for local governments, it identifies overall reductions from local government operations and land use decisions as a strategy to meet the 2020 target. The AB 32 Scoping Plan states 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. It further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. However, the AB 32 Scoping Plan stopped short of identifying mandatory targets for local government compliance. Instead, it encourages local governments to adopt a target for City government and community-wide emissions that parallels the State's AB 32 target and reduces emissions by approximately 15 percent by 2020.

**Senate Bill 97.** SB 97 (2007) established that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis and required the Governor's Office of Planning and Research to develop guidelines to analyze GHG impacts under CEQA. The guidelines were adopted on December 31, 2009, requiring lead agencies to analyze GHG emissions and the effects of GHG emissions during CEQA review.

**Assembly Bill 1493 (Pavley Regulations).** AB 1493 (referred to as Pavley I) (2002) directed CARB to develop and adopt standards for vehicle manufacturers to reduce GHG emissions coming from passenger vehicles and light-duty trucks at a "maximum feasible and cost effective reduction" by January 1, 2005. Pavley I took effect for model years starting in 2009 to 2016 and Pavley II will cover 2017 to 2025. Fleet average emission standards would reach 22 percent reduction by 2012 and 30 percent by 2016.

**Executive Order S-1-07 (Low Carbon Fuel Standard).** This 2007 order requires fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020.

**Senate Bill 375.** SB 375 (2008) supports implementation of AB 32 by aligning regional transportation planning efforts with land use and housing allocations in order to reduce transportation-related GHG emissions. Specifically, SB 375 directed CARB to set regional GHG emissions targets for passenger vehicles and light trucks for the years 2020 and 2035 for each Metropolitan Planning Organization (MPO) region, which were adopted in February 2011. The San Luis Obispo Council of Governments (SLOCOG), Paso Robles' MPO, has adopted reduction targets for per capita emissions from passenger vehicles of 8 percent below baseline (2005) for the years 2020 and 2035 (CARB, 2011). These targets apply to the SLOCOG region

as a whole, and not to individual cities or sub-regions. In 2008, GHG emissions from passenger vehicles in the San Luis Obispo region were approximately 16.5 pounds $CO_2e$ per capita. Therefore, SLOCOG must reduce emissions to at least 15.18 pounds $CO_2e$ per capita by 2020 and maintain or further reduce that level through 2035 to meet the target. SLOCOG's 2010 Regional Transportation Plan and Preliminary Sustainable Communities Strategy (RTP-PSCS), adopted in 2010, details how the region will meet the target (refer to the discussion of SLOCOG's 2010 RTP-PSCS in Section 1.8.3 below).

**Senate Bill 1078, Senate Bill 107, and Senate Bill 2X (Renewables Portfolio Standard).** Established in 2002 under SB 1078, and accelerated in 2006 under SB 107, California's Renewables Portfolio Standard required investor-owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they achieved 20 percent by 2010. SB 2X raises the target from the current 20 percent, requiring private and public utilities to obtain 33 percent of their electricity from renewable energy sources by 2020.

**Senate Bill 1368.** SB 1368 (2006) directs the California Energy Commission and the California Public Utilities Commission to adopt a performance standard for GHG emissions for the future electricity used in California, regardless of whether it is generated in-state or purchased from other states.

**Assembly Bill 811.** AB 811 (2008) authorizes California cities and counties to designate districts within which willing property owners may enter into contractual assessments to finance the installation of renewable energy generation and energy efficiency improvements that are permanently fixed to the property. These financing arrangements would allow property owners to finance renewable energy generation and energy efficiency improvements through low-interest loans that would be repaid as an item on the property owner's property tax bill.

**California Green Building Code.** The California Green Building Code (2008) (the CALGreen Code) is the statewide green building code, which was developed to provide a consistent approach for green building within California. It lays out minimum requirements for newly constructed buildings in California, which will reduce GHG emissions through improved efficiency and process improvements. It requires builders to install plumbing that cuts indoor water use by as much as 20 percent, divert 50 percent of construction waste from landfills to recycling, and use low-pollutant paints, carpets, and floors.

**California Code of Regulations Title 24, Part 6.** Although it was not originally intended specifically to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficient technologies and methods. The California Energy Commission estimates that the 2008 standards reduce consumption by 10 percent for residential buildings and 5 percent for commercial buildings, relative to the previous standards. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 energy

efficiency standards will reduce consumption by 25 percent for residential buildings and 30 percent for commercial buildings, relative to the 2008 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses.

**Assembly Bill 341.** AB 341 (2011) establishes a new policy goal of the State of California to divert at least 75 percent of solid waste generated by the year 2020 in an effort to reduce GHG emissions. It also provides for mandatory commercial and multi-family residential recycling, and requires cities and counties to add a commercial and multi-family residential recycling element to their existing resource reduction plans.

### 1.8.3 REGIONAL

#### SAN LUIS OBISPO COUNTY AIR POLLUTION CONTROL DISTRICT

The APCD has primary responsibility for the development and implementation of rules and regulations designed to attain the National Ambient Air Quality Standards and California Ambient Air Quality Standards, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations within San Luis Obispo County, which is located within the South Central Coast Air Basin. The APCD regulates most air pollutant sources, except for mobile sources, which are regulated by CARB or California EPA. State and local government projects, as well as projects proposed by the private sector, are subject to APCD requirements if the sources are regulated by the APCD.

The AB 32 Scoping Plan does not provide an explicit role for local air districts in implementing AB 32, but it does state that CARB will work actively with air districts in coordinating emissions reporting, encouraging and coordinating GHG reductions, and providing technical assistance in quantifying reductions. The ability of air districts to control emissions (both criteria pollutants and GHGs) is provided primarily through permitting as well as through their role as CEQA lead or commenting agency, the establishment of CEQA thresholds, and the development of analytical guidance for CEQA documents.

In March 2012, the APCD adopted GHG thresholds in order to help lead agencies meet the GHG reduction goals of AB 32. The APCD's approach to developing a threshold of significance for GHG emissions was to identify the GHG emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions. Different thresholds were developed to accommodate various development types and patterns and are summarized below in **Table 1-2**.

**Table 1-2: SLOAPCD GHG Significance Thresholds**

| GHG Emission Source Category | Operational Emissions |
|---|---|
| Residential and Commercial Projects | Compliance with Qualified GHG Reduction Strategy<br>OR<br>Bright-Line Threshold of 1,150 MT $CO_2e$/yr<br>OR<br>Efficiency Threshold of 4.9 MT $CO_2e$/SP*/yr |
| (Industrial) Stationary Sources | 10,000 MT of $CO_2e$/yr |

*SP = Service Population (residents + employees). YR = Year
For projects other than stationary sources, compliance with either a Qualified GHG Reduction Strategy, or with the Bright-Line (1,150 $CO_2e$/yr) or Efficiency Threshold (4.9 MT CO2e/SP/yr) would result in an insignificant determination, and in compliance with the goals of AB 32. The construction emissions of projects will be amortized over the life of a project and added to the operational emissions. Emissions from construction-only projects (e.g. roadways, pipelines, etc.) will be amortized over the life of the project and compared to an adopted GHG Reduction Strategy or the Bright-Line Threshold only.

The APCD recommends that lead agencies within the county use the adopted GHG thresholds of significance when considering the significance of GHG impacts of new projects subject to CEQA. Further, projects with GHG emissions that exceed the thresholds will need to implement mitigation to reduce the impacts to a less than significant level, which can be accomplished through a Mitigated Negative Declaration or an Environmental Impact Report.

As identified in the APCD thresholds, if a project is consistent with an adopted Qualified GHG Reduction Strategy (e.g., CAP meeting criteria identified in Section 1.4 above) that addresses the project's GHG emissions, it can be presumed that the project will not have significant GHG emission impacts. This approach is consistent with CEQA Guidelines Section15183.5(b).

As discussed in Section 1.4 above, this CAP was developed to be consistent with CEQA Guidelines Section 15183.5 to mitigate emissions and climate change impacts and will therefore serve as a Qualified GHG Reduction Strategy for the City of Paso Robles.

### SAN LUIS OBISPO COUNCIL OF GOVERNMENTS

SLOCOG is the local Council of Governments with responsibility for regional planning for San Luis Obispo County. SLOCOG's planning efforts address regional issues relating to transportation, land use and urban form, housing, environment, economic development, regional public facilities, and climate change. Plans that SLOCOG has adopted that support GHG emissions reductions in Paso Robles are described below.

**Rideshare Program.** The Rideshare Program is a division of SLOCOG that focuses on outreach and events to promote bicycling, walking, carpooling, vanpooling, and riding the bus. Some of the major programs include:

- Bike month and Rideshare month.

- Transportation Choices Program – This is a free program in San Luis Obispo County offered to businesses and organizations that encourage their employees to use sustainable transportation. The goal of the Transportation Choices Program is to equip employers with the tools needed promote positive change in employee commuting habits.
- Mobility Management Program - The goal of the program is to bridge the communications gap between Public Transit Operators and Social Services Agencies.
- Safe Routes to School Program - Safe Routes to School is a national and international movement to enable and encourage students to walk and bicycle to school. Through the use of education, encouragement, enforcement, engineering and evaluation, programs and projects are being developed to create a safe, healthy and fun environment for walking and biking to school.
- Senior Transportation Choices Program - Rideshare works hand-in-hand with seniors throughout the county, providing tools and education on how to use public transportation and community transportation services. Through our Senior Transportation Choices Program, we provide transportation information, Transit Field Trips and personalized trip planning.

**Planning for Alternative Modes.** SLOCOG focuses planning efforts to support the use of the following alternative modes of transportation:

- **Bikes –** SLOCOG supports and promotes bicycling as a viable transportation choice. SLOCOG staff attend Bicycle Advisory Committees in the City of San Luis Obispo and San Luis Obispo County. SLOCOG staff also review and advise jurisdictions on approval of BTA eligible Bicycle Plans.
- **Pedestrians –** SLOCOG is in the process of developing the Northern San Luis Obispo County Salinas River Corridor Anza Trail Master Plan.
- **Bus –** SLOCOG works with all transit providers to coordinate services. The Transit Operators Group is an Ad Hoc committee of transit operators, contractors, and SLOCOG staff. Coordinating projects include the Coordinated Human Services Public Transportation Plan, the Region Wide Fare Improvement Study, and the Long Range Transit Plan.
- **Rail –** SLOCOG coordinates and prepares agendas for the Coast Rail Coordinating Council (CRCC). The purpose of the CRCC is to improve the frequency and speed of passenger trains on the coast route between San Francisco and Los Angeles.

**Community 2050 Regional Blueprint.** Community 2050 is a collaborative planning effort that utilizes scenario planning to study long-range regional growth. Community 2050 outlines a program to improve multimodal mobility through a combination of strategies and investments to accommodate growth in transportation demand and reduce congestion that will contribute to a strong economy.

**2010 Regional Transportation Plan – Preliminary Sustainable Communities Strategy (RTP-PSCS).** The RTP-PSCS, most recently updated in 2010, is a comprehensive plan guiding transportation policy for the region and makes recommendations concerning improvements to the existing transportation network of highways, transit, air, water, rail and bicycling. The plan helps position the region to achieve smarter, more sustainable growth that meets the transportation needs of the growing population and changing region. The primary purpose of the RTP-SCS is to integrate sustainable communities strategies developed under the Community 2050 Regional Blueprint and continue progress in accomplishing the intermodal mix of policies, programs and projects in the adopted RTP, Vision 2025, adopted in 2005. The 2010 RTP-PSCS contains a "Preliminary" Sustainable Communities Strategy consistent with the purpose and intent of state bills related to GHG emissions GHGs and climate change, including AB 32 and the SB 375.

**2012 SCS-compliant RTP Update.** SLOCOG is currently working to prepare a 2012 SCS-complaint RTP. This update will build upon and further refine the efforts of the 2010 RTP-PSCS to adjust alternatives to satisfy State requirements of SB 375. SLOCOG must reduce per capita GHG emissions from passenger vehicles by 8 percent relative to 2005 levels in 2020 and 2030.

### 1.8.4 LOCAL GOVERNMENT ROLES AND RESPONSIBILITIES

The AB 32 Scoping Plan establishes a framework for achieving statewide GHG reductions required by AB 32. Specifically, the AB 32 Scoping Plan describes a list of measures that the State will undertake, and the anticipated GHG reductions associated by these measures, by 2020. Because the State does not have jurisdictional control over all of the activities that produce GHG emissions in California, the AB 32 Scoping Plan articulates a unique role for local governments in helping to achieve the statewide GHG reduction target, noting their broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and City government operations. As such the AB 32 Scoping Plan recommends that local governments reduce GHG emissions from both their City government operations and community at large.

# CHAPTER 2

## GHG EMISSIONS AND REDUCTION TARGET

# 2.0 GHG Emissions and Reduction Target

A GHG emissions inventory identifies the major sources and quantities of GHG emissions produced by community-wide activities and City government facilities and operations within a jurisdiction's boundaries for a given year. Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, set targets for future reductions, and create an informed mitigation strategy based on this information.

This chapter summarizes the results of the GHG Emissions Inventory (2012). The GHG Emissions Inventory includes a 2005 baseline inventory of GHG emissions resulting from community-wide activities and City government facilities and operations within Paso Robles. It also includes a 2020 business-as-usual forecast of how emissions would change over time as a result of population and job growth if consumption trends and efficiencies remained at their 2005 levels, absent of any new policies or actions that would reduce emissions. Since 2005, there have been several State regulations and local initiatives that have been implemented that will reduce Paso Robles' GHG emissions. Therefore, this chapter also presents a 2020 adjusted forecast to account for the impact of these measures to provide a more accurate picture of future emissions growth in 2020. In addition, this chapter identifies the City's GHG emissions reduction target for the year 2020 consistent with AB 32. Appendix A contains the complete GHG Emissions Inventory and supporting documentation.

## 2.1 2005 Baseline GHG Emissions

This section summarizes the methodology used to complete the 2005 baseline inventory of community-wide activities and City government facilities and operations, and the results.

### 2.1.1 METHODOLOGY

The 2005 baseline inventory quantifies the amount of GHG emissions that occurred within the City's jurisdictional boundary in the year 2005. It includes a community-wide inventory that details the sources and quantities of GHG emissions resulting from activities from the Paso Robles community as a whole, and a City government operations inventory that identifies the sources and quantities of emissions resulting from the City of Paso Robles' operations and facilities. The City government operations inventory is a subset of the community-wide inventory, such that the City government's emissions are included within the community-wide inventory.

The community-wide inventory is divided into the following sectors, or categories of emissions sources: residential energy use, commercial and industrial energy use, transportation, off-road vehicles and equipment, solid waste, wastewater, and aircraft. The City government operations inventory provides a more detailed analysis of emissions resulting from City-owned or -operated buildings and facilities, fleet vehicles, transit vehicles, and streetlights and traffic signals; water delivery; wastewater; solid waste; employee commute travel; and other miscellaneous equipment.

The City government operations inventory follows the *Local Government Operations Protocol* (version 1.1), which was adopted in 2010 by CARB and serves as the national standard for quantifying and reporting GHG emissions from local government operations. The community-wide inventory follows the *Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol)* (June 2011) and *ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP)* (October 2009). These protocols provide standard accounting principles, boundaries, quantification methods, and procedures for reporting GHG emissions. Like all emissions inventories, this inventory must rely on the best-available data and calculation methodologies, and therefore, represents a best estimate of GHG emissions following standard methodologies. As protocols are updated, as better data and calculation methodologies become available, the inventory can be updated and improved. Nevertheless, the findings of this analysis provide a solid basis upon which Paso Robles can begin planning and taking action to reduce its GHG emissions.

### 2.1.2 COMMUNITY-WIDE GHG EMISSIONS

In 2005, the Paso Robles community emitted approximately 169,557 MT $CO_2e$ as a result of activities that took place within the residential energy use, commercial and industrial energy use, transportation, off-road, and solid waste sectors. As shown in **Figure 2-1** and **Table 2-1**, the transportation sector was the largest contributor of GHG emissions, generating approximately 67,801 MT $CO_2e$, or 40 percent of total 2005 emissions. Transportation sector emissions are the result of diesel and gasoline fuel used in on-road vehicles traveling to and/or from locations within Paso Robles.[1] Electricity and natural gas consumption within the residential sector was the second largest contributor, generating 40,188 MT $CO_2e$, or 24 percent of the total emissions. Electricity and natural gas consumption in Paso Robles' commercial and industrial sector produced 33,536 MT $CO_2e$, or 20 percent of total community-wide emissions. Emissions from solid waste sent to landfills (13,433 MT $CO_2e$, or eight percent), off-road vehicles and equipment (13,205 MT $CO_2e$, or eight percent), aircraft (1,324 MT $CO_2e$, or less than one percent), and wastewater (70 MT $CO_2e$, or less than one percent) accounted for the remainder of community-wide emissions.

[1] Excludes pass-through trips that do not have an origin or destination within the city. Emissions take into account the regional mix of vehicle classes and model years, as well as ambient conditions and travel speeds that determine fuel efficiency. Types of emissions accounted for include: running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak. Refer to **Appendix A** for further information.

**Figure 2-1: Community-wide GHG Emissions by Sector (2005)**

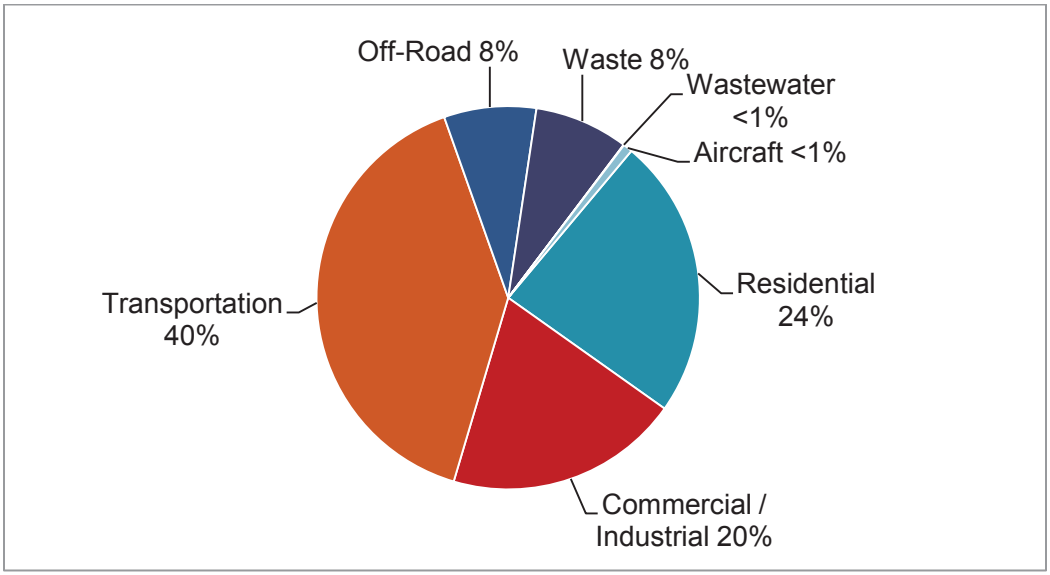



**Table 2-1: Community-wide GHG Emissions by Sector (2005)**

| Sector | Description | GHG Emissions (MT $CO_2e$) | Percent of Total |
|---|---|---|---|
| **Residential** | Electricity and natural gas used in homes | 40,188 | 24% |
| **Commercial/Industrial** | Electricity and natural gas used in commercial and industrial buildings | 33,536 | 20% |
| **Transportation** | Gasoline and diesel used in on-road vehicles | 67,801 | 40% |
| **Off-Road Vehicles and Equipment** | Gasoline, diesel, and compressed natural gas used in off-road vehicles and equipment | 13,205 | 8% |
| **Solid Waste** | Methane from the decomposition of landfilled solid waste | 13,433 | 8% |
| **Wastewater** | Methane and nitrous oxide released in the wastewater treatment process | 70 | <1% |
| **Aircraft** | Emissions from aircraft takeoffs and landings, calculated as part of a separate analysis | 1,324 | <1% |
| **Total** | | **169,557** | **100%** |

### 2.1.3 CITY GOVERNMENT OPERATIONS GHG EMISSIONS

In 2005, City government operations generated approximately 6,022 MT $CO_2e$. This quantity represents approximately four percent of Paso Robles' total community-wide GHG emissions. As shown in **Figure 2-2** and **Table 2-2**, electricity and natural gas used at City buildings (27 percent) was the largest contributor to the City's emissions. Emissions from the City's vehicle fleet (21 percent) and water delivery (20 percent) were also significant sources of emissions.

Emissions from the transit fleet (two percent), employee commute (six percent), emissions from electricity used streetlights and traffic signals (five percent), wastewater facilities (nine percent), solid waste (four percent), and other miscellaneous equipment (six percent) accounted for the remainder of the City's emissions.

**Figure 2-2: City Government GHG Emissions by Sector (2005)**

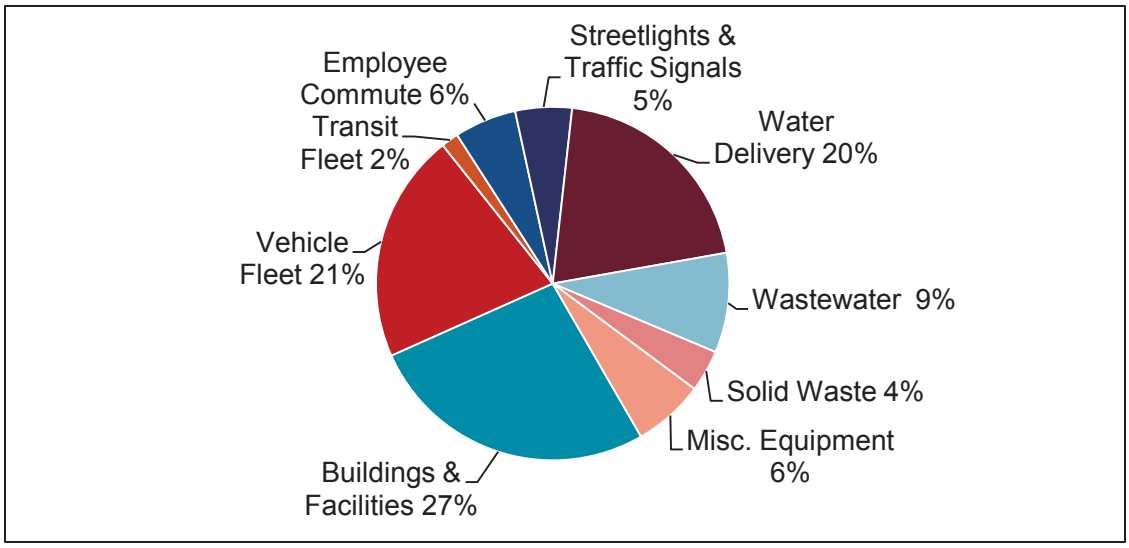



**Table 2-2: City Government GHG Emissions by Sector (2005)**

| Sector | Description | GHG Emissions (MT $CO_2e$) | Percent of Total |
|---|---|---|---|
| **Vehicle Fleet** | Diesel and gasoline consumption and vehicle type | 1,264 | 21% |
| **Transit Fleet** | Diesel and gasoline consumption | 96 | 2% |
| **Employee Commute** | Annual vehicle miles travelled (VMT) from sample of employee commuting patterns | 342 | 6% |
| **Buildings and Facilities** | Electricity and natural gas consumption in City-owned or –operated buildings and facilities | 1,605 | 27% |
| **Streetlights &Traffic Signals** | Electricity used to power streetlights, traffic signal lights, and other public outdoor lighting | 312 | 5% |
| **Solid Waste** | Annual waste tonnage sent to landfill | 231 | 4% |
| **Water Delivery** | Electricity used for water transport resulting from City operations | 1,231 | 20% |
| **Wastewater Facilities** | Electricity consumption from wastewater facilities | 550 | 9% |
| **Other – Misc. Equipment** | Fuel consumption by equipment type | 391 | 6% |
| **Total** | | **6,022** | **100%** |

## 2.2 2020 GHG Emissions Forecast

### 2.2.1 METHODOLOGY

The GHG emissions forecast provides a "business-as-usual estimate," or scenario, of how emissions will change in the year 2020 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32.

The GHG emissions forecast is based on projected growth trends in population, jobs, and VMT and the assumption that the emissions per sector will change over time in proportion to population, jobs, and VMT. The forecast relies on the San Luis Obispo Council of Governments' (SLOCOG) *San Luis Obispo County 2040 Population, Housing & Employment Forecast* (August 2011) for year 2020 population and job projections and VMT estimates from SLOCOG's regional travel demand model for the year 2020 provided by Fehr & Peers. The "mid-range" cases for population and job growth were used for this forecast. .

### 2.2.2 2020 BUSINESS-AS-USUAL FORECAST

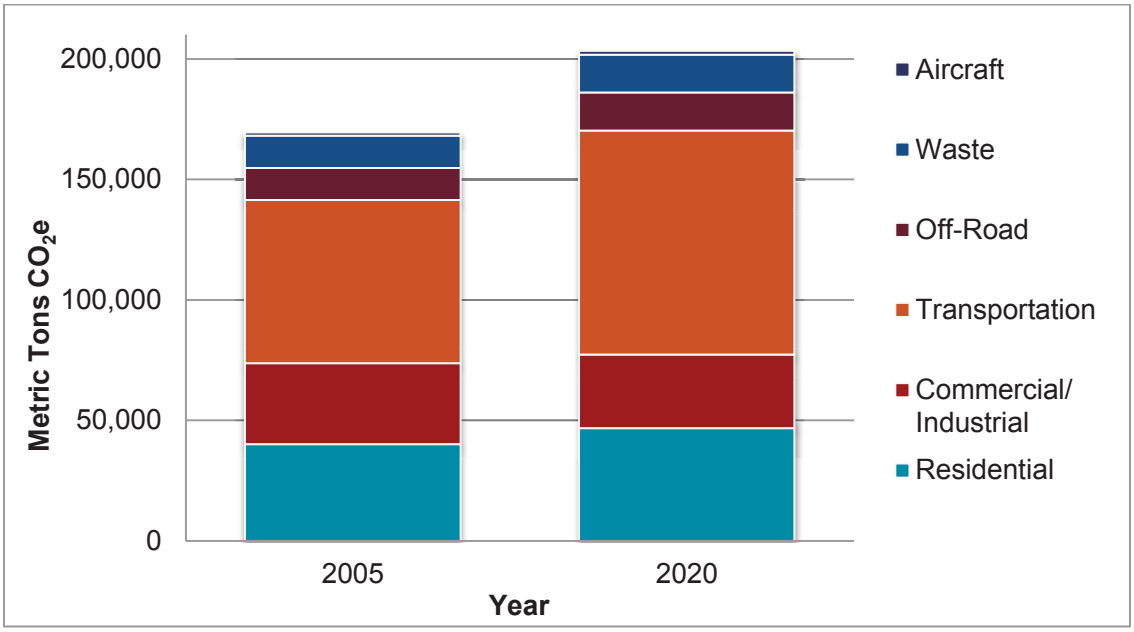
Under a business-as-usual scenario, Paso Robles' GHG emissions are projected to grow by approximately 20 percent by the year 2020, from 169,557 MT $CO_2e$ to 203,448 MT $CO_2e$. Emissions associated with the transportation sector are projected to experience the highest level of growth (37 percent). **Table 2-3** and **Figure 2-3** show the results of the forecast.

**Table 2-3: 2020 Business-As-Usual GHG Emissions Forecast**

| Sector | 2005 (MT $CO_2e$)* | 2020 (MT $CO_2e$)* | Percent Change from 2005 to 2020 |
|---|---|---|---|
| **Residential** | 40,188 | 46,828 | 17% |
| **Commercial / Industrial** | 33,536 | 30,551 | -9% |
| **Transportation** | 67,801 | 92,913 | 37% |
| **Off-Road** | 13,205 | 15,878 | 20% |
| **Solid Waste** | 13,433 | 15,653 | 17% |
| **Wastewater** | 70 | 82 | 17% |
| **Aircraft** | 1,324 | 1,543 | 17% |
| **Total** | **169,557** | **203,448** | **20%** |

*Refer to **Appendix A** for details

**Figure 2-3: 2020 Business-As-Usual GHG Emissions Forecast**




## 2.2.3 2020 ADJUSTED FORECAST

### A. INCORPORATION OF STATE REDUCTIONS INTO FORECAST

The AB 32 Scoping Plan identifies several State measures that are approved, programmed, and/or adopted and will reduce GHG emissions within Paso Robles. These State measures require no additional local action. Therefore, these measures were incorporated into the forecast and reduction assessment to create an "adjusted forecast," which provides a more accurate picture of future emissions growth and the responsibility of the City once State measures to reduce GHG emissions have been implemented. A brief description of each of these measures is provided below and the calculation details are located in **Appendix B**, of this document. **Table 2-4** summarizes the reduction in local emissions that is anticipated to result.

**Table 2-4: Summary of State Reductions**

| State Measure | 2020 Reduction (MT $CO_2e$)* |
|---|---|
| Clean Car Standards, AB 1493 (Pavley I) | -12,339 |
| Low-Carbon Fuel Standard (on-road transportation) | -8,057 |
| Low-Carbon Fuel Standard (off-road vehicles) | -1,588 |
| Title 24 | -822 |
| Renewable Portfolio Standard | -14,367 |
| **Total State Reduction** | **-37,173** |

*Refer to **Appendix B** for calculation details

### Clean Car Standards, AB 1493 (Pavley I)

Signed into law in 2002, AB 1493 (Pavley I standard) requires vehicle manufactures to reduce GHG emissions from new passenger vehicles and light trucks from 2009 through 2016. The CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016. The Pavley I standard is expected to reduce transportation sector emissions in Paso Robles by approximately 12,339 MT $CO_2e$, or 13 percent, in 2020 compared to business-as-usual levels.

### Low Carbon Fuel Standard

The Low Carbon Fuel Standard requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. Measured on a lifecycle basis, the carbon intensity represents the $CO_2e$ emitted from each stage of producing, transporting, and using the fuel in a vehicle. This translates to an approximately nine percent (or 8,057 MT $CO_2e$) reduction in Paso Robles' on-road transportation sector emissions and a 10 percent (or 1,588 MT $CO_2e$) reduction in its off-road sector emissions in 2020 compared to business-as-usual levels.

### Title 24

Although it was not originally intended specifically to reduce GHG emissions, California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated periodically to allow consideration and possible incorporation of new energy-efficient technologies and methods. The updates that have occurred since the 2005 baseline year and, therefore, were not included in the business-as-usual forecast, include the 2008 and 2013 Title 24 Energy Efficiency Standards. The California Energy Commission estimates that the 2008 standards reduce consumption by 10 percent for new residential buildings and five percent for new commercial buildings, relative to the 2005 standards. For projects implemented after January 1, 2014, the California Energy Commission estimates that the 2013 Title 24 Energy Efficiency Standards will reduce consumption by 25 percent for new residential buildings and 30 percent for new commercial buildings, relative to the 2008 standards. The 2008 and 2013 Title 24 requirements would reduce emissions in Paso Robles by approximately 822 MT $CO_2e$ in 2020.[2]

### Renewable Portfolio Standard

The State of California Renewable Portfolio Standard requires investor-owned utilities, electric service providers, and community choice aggregators to increase the portion of energy that comes from renewable sources to 20 percent by 2010 and 33 percent by 2020. PG&E is the electricity provider in Paso Robles. In order to calculate future emissions that take into account the Renewable Portfolio Standard, PG&E's 2020 emissions factor was applied (PG&E, 2011).

[2] The AB 32 Scoping Plan calls for the continuation of ongoing triennial updates to Title 24 that will yield regular increases in the mandatory energy and water savings for new construction. Future updates to Title 24 standards for residential and non-residential alterations are not taken into consideration due to lack of data and certainty about the magnitude of energy savings that will be realized with each subsequent update.

As shown in **Table 2-4**, the Renewable Portfolio Standard would reduce Paso Robles' GHG emissions by approximately by 14,367 MT $CO_2e$, or 40 percent, in 2020.

### Sustainable Communities and Climate Protection Act – Senate Bill 375

SB 375, the Sustainable Communities and Climate Protection Action of 2008, enhances California's ability to reach its AB 32 target by aligning regional transportation planning efforts with land use and housing allocations in order to reduce transportation-related GHG emissions. As mentioned in Chapter 1, SLOCOG must reduce per capita GHG emissions from passenger vehicles by eight percent relative to 2005 levels in 2020 and 2030.

While the outcome of SB 375 in terms of a reduction in VMT per capita is specified by the State, achievement of the target is dependent on regional and local actions and activities that are not regulated by the State. Many of these actions and activities are inextricably linked to local actions which rely on implementation assumptions that will need to be monitored to ensure effectiveness. Therefore, GHG reductions resulting from implementation of SB 375 have not been included as a State measure that would reduce GHG emissions within Paso Robles.

## B. INCORPORATION OF LOCAL REDUCTIONS INTO FORECAST

In addition to the State measures described above, the City of Paso Robles has implemented, adopted, and/or programmed a number of local measures since the 2005 baseline inventory year that will reduce the community's GHG emissions. It is important to note that local measures which rely on future implementation actions and assumptions are included in Chapter 3, *Climate Action Measures,* as they will need to be monitored to ensure effectiveness. A brief description of each of these local measures is provided below by topic area and the local reduction in GHG emissions in 2020 is summarized in **Table 2-5** (see **Appendix B** for supporting details).

**Table 2-5: Summary of Local Reductions**

| Local Measure | 2020 Reduction (MT $CO_2e$) |
|---|---|
| **Energy** | |
| Solar Energy Installations (Residential, Commercial, City government) | -1,239 |
| Energy Efficient Street Lights and Traffic Signals | -38 |
| **Transportation and Land Use** | |
| Increase Density and Diversity of Land Uses | Included in Chapter 3 as a CAP measure[1] |
| Bicycle Network Improvements | -16 |
| Utilize Electric or Hybrid Vehicles | -2 |
| **Waste** | |
| Green Waste Diversion | Included in Chapter 3 as a CAP measure[1] |
| Construction and Demolition Debris Diversion | -908 |
| **Water** | |
| Water Conservation Programs to Meet SB X7-7 Target | -97 |
| **Total Reduction from Local Measures** | **-2,300** |

[1] The reductions associated with this measure are quantified and included as part of the CAP measures identified in Chapter 3.

### Energy Measures

Between 206 and 1012, approximately 4,770 kilowatts (kW) of solar photovoltaic systems and solar hot water heaters were installed on or in homes, businesses and City-owned buildings in Paso Robles. Residential installation accounted for 1,050 kW of electricity generated, which will reduce GHG emissions by approximately 279 MT $CO_2e$ in 2020. Commercial installation totaled 3,719 kW, which will reduce GHG emissions by 960 MT $CO_2e$ in 2020.

Along with renewable energy generation, the City has completed a number of energy efficiency lighting fixtures upgrades. These projects are expected to reduce electricity use by approximately 277,315 kilowatt hours (kWh) annually, and reduce GHG emissions by approximately 38 MT $CO_2e$ in 2020. City government solar installations accounted for one kW of electricity generated, which will reduce GHG emissions by less than 1 MT $CO_2e$ in 2020.

### Transportation and Land Use Measures

New bicycle network improvements installed between 2006 and 2012 and the purchase of two hybrid City fleet vehicles are projected to reduce emissions by approximately 18 MT $CO_2e$ in 2020.

### Solid Waste Measures

As of 2010, the California Green Building Code requires that all local jurisdictions ensure that 50 percent of all non-hazardous construction and demolition solid waste is diverted from landfills. Within Paso Robles, this is estimated to reduce emissions by 908 MT $CO_2e$ in 2020. Paso Robles also maintains a “green waste” recycling program with a locally contracted trash hauler; however, the data necessary to estimate the GHG emission reduction potential from this measure is not currently available.

### Water Measures

The City has implemented a number of programs to reduce per capita water consumption by 20 percent, pursuant to SB X7-7, including programs for plumbing retrofits, turf removal, low-flow fixtures, and smart irrigation systems. Water conservation programs are expected to reduce GHG emissions by 97 MT $CO_2e$ in 2020.

## C. ADJUSTED FORECAST

As shown in **Table 2-6**, State and local measures will reduce GHG emissions in Paso Robles by an estimated 39,473 MT $CO_2e$ in 2020. Under the adjusted scenario GHG emissions are projected to decrease to 163,975 MT $CO_2e$ (approximately 19 percent below the business-as-usual scenario of 203,448 MT $CO_2e$).

**Table 2-6: Summary of Reductions from State and Local Measures and 2020 GHG Emissions**

| | GHG Emissions (MT $CO_2e$) |
|---|---|
| 2020 Business-as-Usual Forecast | 203,448 |
| 2020 Reduction from State Measures | -37,173 |
| 2020 Reduction from Local Measures | -2,300 |
| **Total Reduction from State and Local Measures** | **-39,473** |
| **2020 Adjusted Forecast** | **163,975** |

## 2.3 GHG Emissions Reduction Target

The City is committed to reducing its share of GHG emissions consistent with AB 32. The AB 32 Scoping Plan encourages local governments to establish a reduction target that "parallels the State's commitment to reduce GHG emissions by approximately 15 percent from current levels by 2020." Therefore, this CAP establishes a reduction target of 15 percent below 2005 levels by 2020 in conformance with the State's recommended reduction target. The 2005 baseline GHG emissions inventory and 2020 GHG emissions forecast under the adjusted scenario provide the necessary background for the City to identify the reduction in emissions needed from local measures to meet this target.

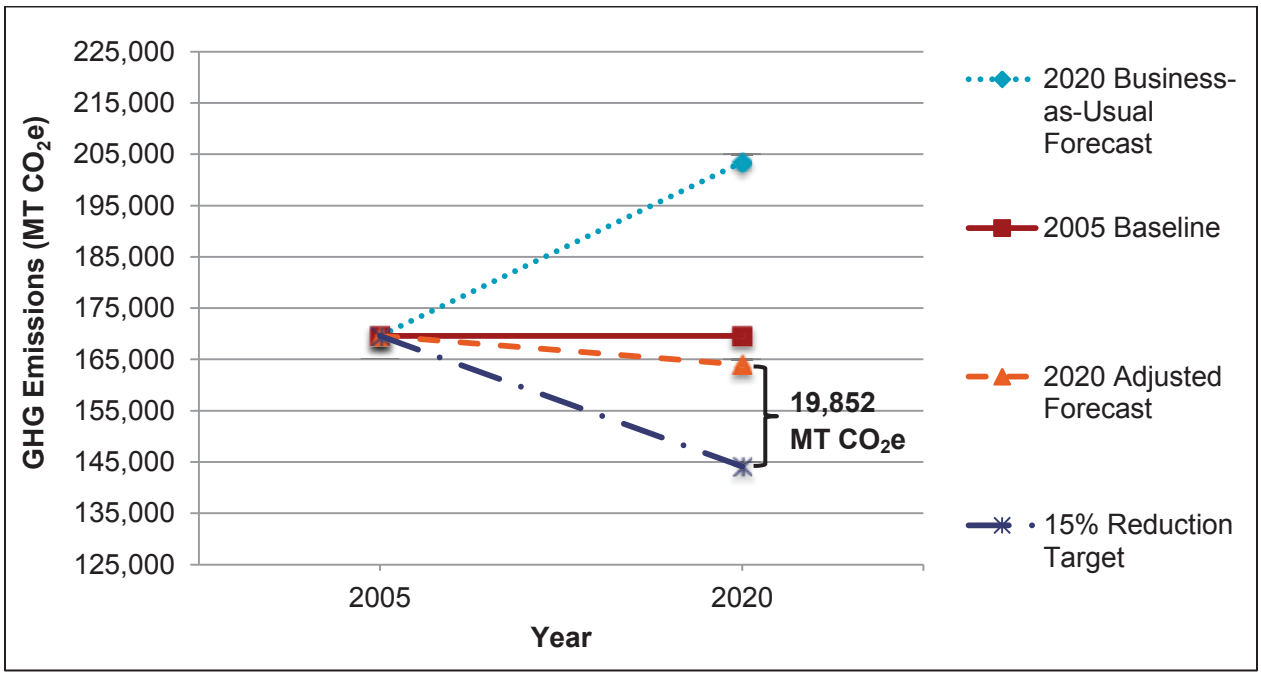
As shown in **Table 2-7** and **Figure 2-4**, based on the 15 percent reduction target, Paso Robles would need to reduce its community-wide emissions to 144,123 MT $CO_2e$ by 2020. To meet this target, Paso Robles will need to reduce its GHG emissions 12 percent below the adjusted forecast levels[3] (equivalent to 19,852 MT $CO_2e$) by 2020 through implementation of local measures and actions.

**Table 2-7: Paso Robles' GHG Emissions, Target, and Reduction Necessary to Meet Target**

| | GHG Emissions (MT $CO_2e$) |
|---|---|
| 2005 Baseline Emissions | 169,557 |
| 2020 Adjusted Forecast | 163,975 |
| Target (15% below 2005 levels by 2020) | 144,123 |
| **Remaining Gap Necessary to Meet Target** | **19,852** |

[3] As described in Section 2.3, the adjusted 2020 forecast accounts for approved, programmed, and/or adopted State- and local-level measures that will reduce local GHG emissions. Therefore, it is used to determine the necessary reductions to meet the City's reduction target as it provides a more accurate picture of future emissions growth and the proportionate share of emissions the City must reduce once State measures to reduce GHG emissions have been implemented.

**Figure 2-4: GHG Emissions in Relation to Target**



# CHAPTER 3

## CLIMATE ACTION MEASURES

# 3.0 Climate Action Measures

This chapter identifies the measures that the City will implement to achieve its GHG emissions reduction target of 15 percent below 2005 levels by 2020. The City has identified a set of measures based on careful consideration of the reductions in GHGs needed to achieve the target, the sources and distribution of emissions identified in the GHG emissions inventory, existing priorities and resources, and the potential costs and benefits of each measure. Many of the CAP measures are also consistent with the measures of neighboring jurisdictions and regional agencies which is important for feasible and effective implementation of GHG reduction measures. Detailed analyses of the GHG reduction potential and estimated costs and savings for each measure are located in **Appendix B**.

## 3.1 Chapter Organization

The climate action measures, which represent ways to reduce GHG emissions, are organized into the following focus areas: City government, energy, transportation and land use, off-road, water, solid-waste, and tree planting. The discussion of each focus area begins with an introduction, followed by a summary table listing the measures within the focus area and the associated GHG reduction potential, where applicable. Following the introduction to each focus area, each measure is presented with the following information:

- **Existing or Completed Efforts**: a list of efforts the City has implemented or is in the process of implementing since the baseline year (2005) to accomplish the measure.
- **Implementation Actions:** the specific steps the City will take to achieve the GHG emission reduction and outcome of the measure.
- **GHG Reduction Potential:** the estimated reduction in GHG emissions anticipated in 2020.
- **Costs and Savings:** potential costs and savings to the City or community (private) are categorized as none, very low, low, medium, and high. **Table 3-1** summarizes these category definitions. Costs account for the expense that would occur beyond conducting business-as-usual (i.e., without implementation of the CAP).

**Table 3-1: Measure Cost and Savings**

| Aggregated City Government Costs/Savings | Per Unit Community Cost/Savings |
|---|---|
| Very Low: $1 - $10,000<br>Low: $10,001 - $50,000<br>Medium: $50,001 - $100,000<br>High: $100,001 or greater | Very Low: $1 - $500<br>Low: $501 - $1,000<br>Medium: $1,001 - $5,000<br>High: $5,001 or greater |

Details related to measure implementation and monitoring, including responsible parties, performance criteria, implementation time frames, and potential funding sources are located in Chapter 5, *Implementation and Monitoring*.

## 3.2 City Government Operations Measures

The City has already taken a number of steps that have resulted in GHG emissions reductions, as identified in Chapter 2, *GHG Emissions and Reduction Target*, and is committed to building on those efforts by implementing actions such as increasing energy efficiency and conservation in City-owned buildings, reducing solid waste, and expanding the City's zero and low emissions vehicle fleet. This focus area identifies measures and actions the City can implement to further reduce GHG emissions from City government operations and facilities. Although the GHG emissions that result from City government operations and facilities account for less than four percent of Paso Robles' community emissions, as an employer, property-owner, and regulatory entity, the City can set an example of GHG emissions reduction practices for the community and demonstrate additional benefits of the measures beyond reducing GHG emissions, such as cost savings in buildings and operations and improved operational efficiency. As shown in **Table 3-2**, the City government operations measures have the potential to reduce Paso Robles' GHG emissions by 950 MT $CO_2e$ by 2020.

In addition to reducing GHG emissions, the City government measures described in this section have the potential to provide other important benefits to the community. These benefits include:

- City leadership
- Reduced operating and maintenance costs
- Improved public health
- Improved air and water quality
- Resource conservation
- City beautification
- Lower maintenance costs and extended equipment lives

**Table 3-2: City Government Operations GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| C-1 | City Government Energy Efficiency Retrofits and Upgrades | 746 |
| C-2 | City Government Energy Efficient Public Realm Lighting | 14 |
| C-3 | Renewable Energy Systems on City Property | 22 |
| C-4 | Transportation Demand Management Program for City Employees | 49 |
| C-5 | Zero and Low Emission City Fleet Vehicles | 66 |
| C-6 | City Government Solid Waste Reduction | 47 |
| C-7 | City Government Tree Planting Program | 6 |
| **City Government Operations Total** | | **950** |

## C-1: City Government Energy Efficiency Retrofits and Upgrades

**GHG Reduction Potential:**
746 MT $CO_2e$
**City Cost:**
Varies
**City Savings:**
High
**Private Cost:**
None
**Private Savings:**
None

**Establish a target to reduce City government energy use by 50 percent by 2020 and implement cost-effective improvements and upgrades to achieve that target.**

*Implementation Actions*:

- **C-1.1:** Adopt the 50 percent City government energy use reduction target.
- **C-1.2:** Complete energy audits and benchmarking of all City-owned or -operated facilities, leveraging existing programs, such as PG&E's Automated Benchmarking Service or the U.S. EPA's ENERGY STAR Challenge program.
- **C-1.3:** Maintain a regular maintenance schedule for heating and cooling, ventilation and other building functions.
- **C-1.4:** Establish a prioritized list of energy efficiency upgrade projects and implement them as funding becomes available.

## C-2: City Government Energy Efficient Public Realm Lighting

**GHG Reduction Potential:**
14 MT $CO_2e$
**City Cost:**
Low
**City Savings:**
Low
**Private Cost:**
None
**Private Savings:**
None

**Continue to replace City-owned or -operated street, traffic signal, park, and parking lot lights with higher efficiency lamp technologies.**

*Implementation Actions*:

- **C-2.1:** Conduct an inventory of existing outdoor public light fixtures.
- **C-2.2:** Identify and secure funding to replace inefficient City-owned or -operated public lighting.

## C-3: Renewable Energy Systems on City Property

**Pursue on-site small-scale renewable energy generation at City government facilities.**

**GHG Reduction Potential:**
22 MT $CO_2e$
**City Cost:**
High
**City Savings:**
Low
**Private Cost:**
None
**Private Savings:**
None

*Existing and/or Completed Efforts in Support of Measure*:

- The City has completed a feasibility study on the installation of solar or other renewable energy projects at select City facilities.

*Implementation Actions*:

- **C-3.1:** Continue to install renewable energy projects at select City facilities where feasible.
- **C-3.2:** Identify funding sources and opportunities for City government renewable energy generation.
- **C-3.3:** Replace inefficient hot water heaters with those powered by solar energy.

## C-4: Transportation Demand Management Program for City Employees

**Implement a Transportation Demand Management (TDM) program to reduce annual vehicle miles traveled (VMT) associated with City employee commutes.**

**GHG Reduction Potential:**
49 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
Medium
**Private Cost:**
None
**Private Savings:**
None

*Implementation Actions*:

- **C-4.1:** Develop a program to meet City employee commute trip VMT reduction targets by offering one or more services from a menu of options, including: encourage the use of carpools; provide ride matching services and assistance; allow flexible work schedules and telecommuting; provide end of trip facilities (parking, showers, lockers); provide subsidized transit passes; hire a transportation coordinator to manage TDM programs; or others at the employer's discretion.

## C-5: Zero- and Low-Emission City Fleet Vehicles

**Continue to replace City vehicles and equipment with more efficient and/or alternatively fueled vehicles.**

*Implementation Actions*:

- **C-5.1:** Develop and adopt a low- and zero- emissions replacement/purchasing policy for City vehicles and equipment. This would not apply to vehicles with special performance requirements.
- **C-5.2:** Work with the Central Coast Clean Cities Coalition to obtain funding to purchase low-emission and zero-emission fleet vehicles.
- **C-5.3:** Identify fleet vehicles near replacement and replace with lower emission vehicles.

**GHG Reduction Potential:**
66 MT $CO_2e$
**City Cost:**
Medium
**City Savings:**
Very Low
**Private Cost:**
None
**Private Savings:**
None

## C-6: City Government Solid Waste Reduction

**Establish a 25 percent solid waste diversion rate over 2005 baseline levels and identify steps to meet that rate by 2020.**

*Implementation Actions*:

- **C-6.1:** Develop and adopt a City purchasing policy that emphasizes recycled and recyclable materials.
- **C-6.2:** Install recycling receptacles at City-owned or -operated buildings and facilities.
- **C-6.3:** Coordinate with the City's waste hauler annually to track the total amount of City-generated and landfilled solid waste.

**GHG Reduction Potential:**
47 MT $CO_2e$
**City Cost:**
Low
**City Savings:**
None
**Private Cost:**
None
**Savings:**
None

## C-7: City Government Tree Planting Program

**Establish a tree planting program to increase the number of native, drought-tolerant trees on City-owned property, parks and streetscapes.**

*Implementation Actions*:

- **C-7.1:** Develop and adopt a formal tree planting policy or program and plant at least 500 trees by 2020.
- **C-7.2:** Identify and secure grant funding to plant trees on City properties.

**GHG Reduction Potential:**
6 MT $CO_2e$
**City Cost:**
Medium
**City Savings:**
None
**Private Cost:**
None
**Savings:**
None

## 3.3 Community-wide Measures

### 3.3.1 ENERGY MEASURES

Energy use accounted for 44 percent of Paso Robles' total 2005 GHG emissions. These emissions result from the combustion of fossil fuel, primarily coal, oil, and natural gas, which is used to heat, cool, and provide power to residential, commercial, and industrial buildings and other facilities. Factors affecting energy-related emissions in buildings include building design and the efficiency of technology and electronics in buildings. GHG emissions reductions can be achieved both by changes to the energy demand (e.g., improving energy efficiency and reducing consumption) and energy supply (e.g., switching from a high-carbon to a low- or zero-carbon technology or fuel). The energy measures listed in **Table 3-3** focus on these strategies and have the potential to reduce Paso Robles' GHG emissions by 5,116 MT $CO_2e$ by 2020.

In addition to reducing GHG emissions, the energy measures described in this section have the potential to provide other important benefits to the community, including:

- Reduced energy and operating costs
- Lower maintenance costs and extended equipment lives
- Increased building re-sale value
- Strengthened local economy
- Resource conservation
- Increased electricity reliability
- Improved air quality

**Table 3-3: Energy GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| E-1 | Energy Efficiency Outreach and Incentive Programs | 426 |
| E-2 | Energy Audit and Retrofit Program | 1,497 |
| E-3 | Income-Qualified Energy Efficient Weatherization Programs | 130 |
| E-4 | Incentives for Exceeding Title 24 Building Energy Efficiency Standards | 114 |
| E-5 | Energy Efficient Public Realm Lighting Requirements | 34 |
| E-6 | Small-Scale Solar Photovoltaic (PV) Incentive Program | 2,732 |
| E-7 | Income-Qualified Solar PV Program | 183 |
| **Energy Total** | | **5,116** |

## Measure E-1: Energy Efficiency Outreach and Incentive Programs

**GHG Reduction Potential:**
426 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Very Low - Low
**Private Savings:**
Very Low - Low

**Expand participation in and the promotion of existing energy efficiency programs, such as Energy Upgrade California and San Luis Obispo County Energy Watch, to increase community awareness of existing energy efficiency rebates and financial incentives, and no- and low-cost actions community members can take to increase energy efficiency.**

*Implementation Actions*:

- **E-1.1:** Conduct additional outreach and promotional activities, either individually or in collaboration with San Luis Obispo County Energy Watch, targeting specific groups or sectors within the community (e.g., homeowners, renters, businesses, etc.).
- **E-1.2:** Designate one week per year to conduct an energy efficiency outreach campaign targeting a specific group or sector within the community. The campaign week can also be used to recognize and encourage programs and educational outreach conducted by industry organizations, non-governmental entities, government agencies, and other community groups.
- **E-1.3:** Direct community members to existing program websites, such as Energy Upgrade California and San Luis Obispo County Energy Watch.

## Measure E-2: Energy Audit and Retrofit Program

**GHG Reduction Potential:**
1,497 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Medium - High
**Private Savings:**
Very Low - Medium

**Facilitate voluntary energy assessments, retrofits, and retrocommissioning of residential and commercial buildings within Paso Robles.**

*Implementation Actions*:

- **E-2.1:** Collaborate with San Luis Obispo County Energy Watch, local utilities, and/or local jurisdictions to develop and promote a residential and commercial energy audit program.
- **E-2.2:** Conduct outreach and promotional activities targeting specific groups (e.g., owners of buildings built prior to Title 24 [1980]) in order to promote the audit and retrofit program.
- **E-2.3:** As part of the business licensing and renewal process, encourage businesses to participate in the program and receive an energy audit.
- **E-2.4:** Participate in and promote an energy efficiency financing program to encourage investment in energy efficiency upgrades.

- **E-2.5:** Work with Energy Upgrade California, local utilities, and/or community businesses and organizations, to annually conduct a "do-it-yourself" workshop for building energy retrofits.
- **E-2.6:** Highlight the effectiveness of energy audits and retrofits by showcasing the success of retrofit projects (e.g., on the City's website or in its newsletter).

## Measure E-3: Income-Qualified Energy Efficient Weatherization Programs

**GHG Reduction Potential:**
130 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Low

**Facilitate energy efficient weatherization of low- and middle-income housing through promotion of existing programs.**

*Implementation Actions*:

- **E-3.1:** Facilitate and promote existing income-qualified weatherization programs, such as PG&E's Middle Income Direct Install program, either individually or by partnering with a local organization, such as Community Action Partnership of San Luis Obispo County (CAPSLO).

## Measure E-4: Incentives for Exceeding Title 24 Energy Efficiency Building Standards

**GHG Reduction Potential:**
114 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Medium - High
**Private Savings:**
Very Low - Medium

**Encourage new development to voluntarily exceed State energy efficiency standards.**

*Implementation Actions*:

- **E-4.1:** Collaborate with community organizations and businesses, local utilities, and other local jurisdictions in the region to develop and promote a technical assistance and best practices program that aids developers in selecting and implementing energy efficiency measures that exceed State standards.
- **E-4.2:** Identify, provide and promote incentives (e.g., public recognition) for applicants whose project exceeds State requirements by 20 percent.
- **E-4.3:** Update building permit process to incentivize higher building performance (e.g., buildings that integrate and optimize major high-performance building attributes, including energy efficiency, durability, and life-cycle performance).
- **E-4.4:** Launch an educational campaign for builders, permit applicants, and the general public to promote best practices and incentive programs; provide information and assistance about energy efficiency options online and at permit counter.

### Measure E-5: Energy Efficient Public Realm Lighting Requirements

**Require the use of high efficiency lights in parking lots, streets, and other public areas.**

**GHG Reduction Potential:**
34 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
Very Low
**Private Cost:**
Very Low
**Private Savings:**
Very Low

*Implementation Actions*:

- **E-5.1:** Develop and adopt an ordinance that requires new development to utilize high efficiency lights in parking lots, streets, and other public areas.

### Measure E-6: Small-Scale On-Site Solar PV Incentive Program

**Facilitate the voluntary installation of small-scale on-site solar PV systems and solar hot water heaters in the community through expanded promotion of existing financial incentives, rebates, and financing programs, and by helping residents and business owners overcome common regulatory barriers.**

**GHG Reduction Potential:**
2,732 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
High
**Private Savings:**
Medium - High

*Implementation Actions*:

- **E-6.1:** Conduct a comprehensive review of the City's solar permitting process based on the Governor's Office of Planning and Research's (OPR) *California Solar Permitting Guidebook* (June 2012), identifying any existing barriers to facility implementation.
- **E-6.2:** Improve the permit review and approval process for small solar PV systems by implementing recommendations for streamlined permitting identified in the *California Solar Permitting Guidebook* (e.g., use standardized forms, provide clear written instructions on the permitting process and a checklist of required application materials, make information available on the City's website and at the permit counter, etc.).
- **E-6.3:** Collaborate with other local jurisdictions in the region to standardize requirements across jurisdictions, by using common promotion and permit materials, such as checklists and standard plans, to reduce permit submittal errors among contractors working throughout a region.
- **E-6.4:** Participate in and promote a residential and commercial/industrial renewable energy financing program (e.g., through CaliforniaFIRST, a joint powers authority with neighboring jurisdictions, or other mechanisms).

- **E-6.5:** Expand education on and promotion of existing incentive, rebate, and financing programs for small-scale on-site solar PV systems and solar hot water heaters targeting specific groups or sectors within the community.
- **E-6.6:** Designate one week per year to conduct a renewable energy outreach campaign targeting a specific group or sector within the community. The campaign week can also be used to recognize community members that have implemented noteworthy or unique renewable energy projects.

### Measure E-7: Income-Qualified Solar PV Program

**GHG Reduction Potential:**
183 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Medium

**Facilitate the installation of small-scale on-site solar PV systems on and solar hot water heaters in income-qualified housing units by promoting existing programs offered through the California Solar Initiative and New Solar Homes Partnership and by collaborating with organizations, such as Grid Alternatives, on outreach and eligibility.**

*Implementation Actions*:

- **E-7.1:** Collaborate with Grid Alternatives and/or other community organizations to provide targeted education and outreach to developers and homeowners about incentives offered through the Single Family Affordable Solar Homes (SASH) Program and the Multifamily Affordable Solar Homes Program (MASH).
- **E-7.2:** Provide targeted outreach regarding solar water heating incentives offered through the California Solar Initiative.

### 3.3.2 TRANSPORTATION AND LAND USE MEASURES

Transportation-related emissions made up the 40 percent of Paso Robles' 2005 GHG emissions inventory. Factors affecting GHG emissions from transportation include the number of VMT, fuel economy, and the type of fuel used. The number of VMT is directly influenced by the geographic distribution of people and places, especially the density of development and zoning. Therefore, land use measures are included as reduction policies in this section. The transportation and land use measures listed in **Table 3-4** focus on these strategies and have the potential to reduce Paso Robles' GHG emissions by 11,167 MT $CO_2e$ by 2020.

The transportation and land use measures in this section will not only help reduce GHG emissions, but also provide multiple other benefits to the community. These include:

- Reduced transportation costs
- Reduced traffic congestion
- Improved public health
- Strengthened local economy
- Improved infrastructure
- Increased equity
- Increased housing and travel options
- Resource conservation
- Reduced noise, air, and water pollution

**Table 3-4: Transportation and Land Use GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| TL-1 | Bicycle Network | 771 |
| TL-2 | Pedestrian Network | 544 |
| TL-3 | Expand Transit Network | 221 |
| TL-4 | Increase Transit Service Frequency/Speed | 363 |
| TL-5 | Transportation Demand Management Incentives | 823 |
| TL-6 | Parking Supply Management | 641 |
| TL-7 | Electric Vehicle Network and Alternative Fueling Stations | 3,448 |
| TL-8 | Infill Development | 4,356 |
| **Transportation and Land Use Total** | | **11,167** |

## Measure TL-1: Bicycle Network

**GHG Reduction Potential:**
771 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Very Low

**Continue to improve and expand the city's bicycle network and infrastructure.**

*Existing and/or Completed Efforts in Support of Measure*:

- The City currently pursues public and private funding to expand and link the city's bicycle network in accordance with the General Plan and Bicycle Plan.
- The City annually identifies and schedules street improvement and maintenance projects to preserve and enhance the bicycle network.
- The City incorporates bicycle facility improvements into pavement resurfacing, restriping, and signalization operations where the safety and convenience of users can be improved within the scope of work.
- The City coordinates with and supports SLOCOG in the implementation of bicycle plans to facilitate non-auto travel within and between communities.
- The City requires new development to provide for all modes of travel and include sidewalks, bicycle lanes, and transit stop amenities, where appropriate.

*Implementation Actions*:

- **TL-1.1:** Continue to pursue public and private funding to expand and link the city's bicycle network in accordance with the General Plan and Bicycle Plan.
- **TL-1.2:** Collaborate with the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month.
- **TL-1.3:** Continue to enforce mandatory California Green Building Standards Code bicycle parking standards for non-residential development.

## Measure TL-2: Pedestrian Network

**GHG Reduction Potential:**
544 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Varies

**Continue to improve and expand the City's pedestrian network.**

*Existing and/or Completed Efforts in Support of Measure*:

- The City annually identifies and schedules sidewalk improvement and maintenance projects to preserve and enhance the pedestrian circulation network.
- The City incorporates pedestrian facilities improvements into pavement resurfacing, restriping, and signalization operations where the safety and convenience of users can be improved within the scope of work.

- The City requires, through conditions of approval, that new development projects provide a pedestrian access network that internally links all uses and connects all existing or planned external streets and pedestrian facilities contiguous with the project site. Also require through conditions of approval that the new development projects minimize barriers to pedestrian access and interconnectivity.
- The City has a Traffic Calming Program and requires new development to implement traffic calming improvements as appropriate (e.g., marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, median islands, mini-circles, tight corner radii, etc.) through conditions of approval.

*Implementation Actions*:

- **TL-2.1:** Continue to pursue public and private funding to expand and link the city's pedestrian network.
- **TL-2.2:** Expand and promote the Safe Routes to School program.

### Measure TL-3: Expand Transit Network

**Work with the Regional Transit Authority (RTA) and transit service providers to expand the local transit network (i.e., additional routes or stops, and/or expanded hours of operation) based on the greatest demand for service.**

**GHG Reduction Potential:**
221 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Very Low
**Private Savings:**
Medium

*Existing and/or Completed Efforts in Support of Measure*:

- The City coordinates with RTA to implement the Short Range Transit Plan, provide fixed route and/or commuter bus service as appropriate, improve information available on transit options, and support advertising/outreach programs for transit.
- The City works with RTA and local transit agency to identify and map existing and future bus lines (routes) and transit corridors.
- Through the development review process, the City requires new development to provide safe and convenient access to public transportation within the project area as feasible.

*Implementation Actions*:

- **TL-3.1:** Support the addition of transit routes that provide intercity express services.
- **TL-3.2:** Continue to research federal and local funding for transit service upgrade projects.

### Measure TL-4: Increase Transit Service Frequency/Speed

**GHG Reduction Potential:**
363 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Very Low
**Private Savings:**
High

**Work with the RTA and transit services providers to increase transit service frequency (i.e., reducing headways) by identifying routes where increased bus frequency would improve service.**

*Existing and/or Completed Efforts in Support of Measure*:

- The City works with RTA and transit service providers to implement the Short Range Transit Plan.

*Implementation Actions*:

- **TL-4.1:** Work with RTA and transit service providers to shorten regional service headways (e.g., by purchasing additional buses, re-routing existing buses, etc.) to 30 minutes or shorter at commute peaks subject to passenger load demand.
- **TL-4.2:** Support streamlined transit services and infrastructure that create a bus rapid transit network on main commute corridors.

### Measure TL-5: TDM Incentives

**GHG Reduction Potential:**
823 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Very Low

**Work with San Luis Obispo Regional Ride Share and Ride-On to conduct additional outreach and marketing of existing TDM programs and incentives to discourage single-occupancy vehicle trips and encourage alternative modes of transportation, such as carpooling, taking transit, walking, and biking.**

*Implementation Actions*:

- **TL-5.1:** Collaborate with San Luis Obispo Ride Share and Ride-On to conduct additional outreach through event promotions and publications, targeting specific groups or sectors within the community (e.g., employers, employees, students, seniors, etc.).
- **TL-5.2:** Provide information on and promote existing employer based TDM programs as part of the business licensing and renewal process.
- **TL-5.3:** Continue to collaborate with San Luis Obispo Ride Share and the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month and Rideshare month.
- **TL-5.4:** Direct community members to existing program websites (e.g., Ride Share, Ride-On) by providing links on the City's website.

## Measure TL-6: Parking Supply Management

**GHG Reduction Potential:**
641 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Medium

**Amend the Municipal Code to reduce parking requirements in areas such as the downtown where a variety of uses and services are planned in close proximity to each other and to transit.**

*Existing and/or Completed Efforts in Support of Measure*:

- The Zoning Code allows payment of an optional in-lieu fee in place of parking for projects located within a parking district.
- In January 2013, the City adopted a City-wide Zoning Code Amendment which reduces parking requirements.
- The City has reduced parking requirements in the Uptown/Town Center Specific Plan Area (adopted June 2011).

*Implementation Actions*:

- **TL-6.1:** Continue to establish parking districts, allowing the payment of in-lieu fees in place of minimum parking requirements where appropriate.

## Measure TL-7: Electric Vehicle Network and Alternative Fueling Stations

**GHG Reduction Potential:**
3,448 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
None

**Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan.**

*Existing and/or Completed Efforts in Support of Measure*:

- The City is currently working with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create the electric vehicle readiness plan.

*Implementation Actions*:

- **TL-7.1:** Continue to develop and implement the electric vehicle readiness plan through expanding the use of alternative fuel vehicles and fueling stations in the community (e.g., through identifying and zoning locations for fueling stations, offering incentives for alternative fuel vehicles, etc.).
- **TL-7.2:** Continue to pursue funding for plug-in electric vehicle charging stations.
- **TL-7.3:** Provide streamlined installation and permitting procedures for vehicle charging facilities, utilizing tools provided in the electric vehicle readiness plan.
- **TL-7.4:** Promote existing financial incentives for low- and zero-emissions vehicles, either individually or in collaboration with the Central Coast Clean Cities Coalition.

### Measure TL-8: Infill Development

**GHG Reduction Potential:**
4,356 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Varies
**Private Savings:**
High

**Identify incentives to encourage mixed-use, higher density, and infill development near existing or planned transit stops in existing community centers/downtown and other designated areas.**

*Existing and/or Completed Efforts in Support of Measure*:

- A key feature of the existing General Plan is its focus on "infill development" in the form of both mixed-use and higher density multi-family development areas. Infill locations are designed to distribute the locations of increased multi-family residential densities and to place these land uses in proximity to arterial streets, public transit, and, when possible, convenience shopping.
- The City developed a form-based zoning code for the central business district/downtown. Form-based codes emphasize building form rather than use. This increases flexibility for a variety of complementary uses to be permitted in the same area, and the potential for mixed-use development, which helps to reduce vehicle miles traveled.
- The City requires new specific plans to include a mix of housing and different types of uses that are well connected for all modes of travel and encourages building at higher densities to help minimize the number of single occupant vehicle trips and reduce vehicle miles traveled.
- The City's Circulation Element includes an action item that calls on the City to maintain a general plan that provides for a reasonable, ongoing balance between jobs and housing units of various types to maximize the potential for residents to live in the community in which they work.

*Implementation Actions*:

- **TL-8.1:** Provide and promote incentives (e.g., parking reductions, priority permitting, etc.) for mixed-use and medium- and high-density land use categories located within ¼-mile of a transit stop or park and ride facility with regularly scheduled, daily service.
- **TL-8.2:** Develop and adopt incentives for live/work developments, such as deferred permit fees, expedited permits, or waiving business license fees for residents in live/work units. Live/work developments allow residents to live at their place of work and thereby reduce vehicle miles traveled and associated GHG emissions.

### 3.3.3 OFF-ROAD MEASURE

Emissions in the off-road sector result from the combustion of fuel, primarily diesel, gasoline, and compressed natural gas, which is used to power off-road equipment and vehicles. Off-road equipment and vehicles include those used in construction, agriculture, commercial, industrial, and landscaping operations as well as recreational vehicles. Factors affecting off-road emissions include the age, type, and usage of the vehicle or equipment.

GHG emissions reductions can be achieved by reducing off-road equipment and vehicle usage and idling or by using equipment that runs on electricity or alternative fuels. The off-road equipment measure listed in **Table 3-5** has the potential to reduce Paso Robles' GHG emissions by 1,912 MT $CO_2e$ by 2020.

The off-road measures in this section will not only help reduce GHG emissions, but will also provide multiple other benefits to the community. These include:

- Improved air and water quality
- Reduced noise pollution
- Improved public health

**Table 3-5: Off-Road GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| O-1 | Off-Road Equipment Upgrades, Retrofits, and Replacements | 1,912 |
| **Off-Road Total** | | **1,912** |

### Measure O-1: Off-Road Equipment Upgrades, Retrofits, and Replacements

**GHG Reduction Potential:**
1,912 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
Varies

**Continue to work with the APCD and promote existing programs that fund off-road equipment and vehicle upgrades, retrofits, and replacement through the Carl Moyer heavy-duty vehicle and equipment program or other funding mechanisms.**

*Implementation Actions*:

- **O-1.1:** Conduct additional outreach and promotional activities targeting specific groups (e.g., agricultural operations, construction companies, homeowners, etc.).
- **O-1.2:** Direct community members to existing program websites (e.g., APCD, Carl Moyer Grant page).

### 3.3.4 WATER MEASURE

The conveyance, treatment, and distribution of water can result in significant GHG emissions depending on the water source, distances and topography traversed in conveyance, and the treatment processes that occur before and after the end-use phase.

Emissions from water use can decrease by reducing overall water consumption, and therefore the energy used to convey, treat and distribute water. The water measure listed in **Table 3-6** focuses on this strategy and has the potential to reduce Paso Robles' GHG emissions by 41 MT $CO_2e$ by 2020.

The water measure in this section will not only help reduce GHG emissions, but also provide multiple other benefits to the community. These include:

- Reduced costs
- Improved air quality
- Reduced water consumption
- Reduced energy consumption
- Improved public health

**Table 3-6: Water GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| W-1 | Exceed the SB X7-7 Water Conservation Target | 41 |
| **Water Total** | | **41** |

## Measure W-1: Exceed the SB X7-7 Water Conservation Target

**GHG Reduction Potential:**
41 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
Varies
**Private Savings:**
Varies

**The City would adopt a water conservation target that exceeds the SB X7-7[1] (Water Conservation Act of 2009) target and identify and implement additional water efficiency and conservation measures to meet that target by 2020.**

*Implementation Actions*:

- **W-1.1:** Adopt a water conservation ordinance to exceed SB X7-7 by 10 percent and work with the City's water purveyors to develop and/or help implement additional water conservation and efficiency programs (e.g., water efficiency audits, replacement/retrofit programs, etc.) to meet the target.
- **W-1.2:** Enhance retrofit programs for existing residences and commercial buildings by providing additional resources, assistance, and incentives to home and business owners.
- **W-1.3:** Adopt CALGreen Tier 1 or Tier 2 standards for water efficiency and conservation in new development. To meet Tier 1 or Tier 2, designers, builders, or property owners must increase the number of green building measures and further reduce percentages of water use in order to meet the threshold levels for each tier.
- **W-1.4:** Expand the use of grey water or recycled water infrastructure by working with the City's water purveyors and educating the community on dual plumbing, and state-of-the-art irrigation systems, including the use of grey water systems and rainwater catchment.

[1] The Water Conservation Act of 2009 (SB X7-7) requires all water suppliers to increase water use efficiency. The legislation sets an overall goal of reducing per capita urban water use by 20 percent by 2020, with an interim target of 10 percent reduction by 2015. By July 2011, urban water retailers were required to determine baseline and target daily per capita water use. Urban water retail suppliers who do not meet the water conservation requirements will not be eligible for state water grants or loans (California Department of Water Resources, 2013).

### 3.3.5 SOLID WASTE MEASURE

As solid waste decomposes in landfills, it releases methane, a GHG 21 times more potent than carbon dioxide (USEPA, 2012). In 2005, Paso Robles community sent approximately 37,575 tons of waste to landfills.

Waste management is an important action that the community can take to reduce GHG emissions. Waste management can be achieved by reducing the amount of trash and other waste that is discarded; reusing containers, products, and building materials; and recycling as many materials as possible, including green waste and construction materials. The solid waste measure listed in **Table 3-7** has the potential to reduce Paso Robles' GHG emissions by 3,012 MT $CO_2e$ by 2020.

In addition to reducing GHG emissions, the solid waste measure described in this section has the potential to provide other important benefits to the community. These include:

- Improved air quality
- Resource conservation

**Table 3-7: Solid Waste GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| S-1 | Solid Waste Diversion Rate | 3,012 |
| **Solid Waste Total** | | **3,012** |

### Measure S-1: Solid Waste Diversion Rate

**The City would adopt a solid waste diversion rate that exceeds the state-mandated rate of 50 percent and identify programs to meet the identified rate by 2020.**

**GHG Reduction Potential:**
3,012 MT $CO_2e$
**City Cost:**
Very Low
**City Savings:**
None
**Private Cost:**
None
**Private Savings:**
None

*Implementation Actions*:

- **S-1.1:** Adopt a solid waste diversion rate that exceeds the state-mandated rate by a 25 percent (e.g., California's AB 341 identifies a 75 percent diversion goal for 2020).
- **S-1.2:** Develop an education and outreach program in support of the diversion rate.
- **S-1.3:** Develop a program for the expanded collection of organic waste.
- **S-1.4:** Establish a community-wide organics composting program and develop a marketing campaign to educate the community about the program.
- **S-1.5:** Adopt an ordinance requiring that 65 percent of construction and demolition debris from development projects be diverted from landfills.
- **S-1.6:** Develop and adopt an administrative policy requiring the provision of recycling receptacles at all events requiring a permit or held on City-owned or -operated property.

### 3.3.6 TREE PLANTING MEASURE

Trees and other vegetation absorb and capture the GHG carbon dioxide from the atmosphere in a process called carbon sequestration. By maintaining a healthy urban forest, prolonging the life of trees, and continually increasing the number of trees, Paso Robles can increase its net carbon storage over the long term. Trees and other vegetation also reduce local air and surface temperatures by shading buildings, streets, and sidewalks.

The tree measure listed in **Table 3-8** has the potential to reduce Paso Robles' GHG emissions by 18 MT $CO_2e$ by 2020.

In addition to reducing GHG emissions, the tree planting measure described in this section has the potential to provide other important benefits to the community. These include:

- City beautification
- Increased property values
- Improved air quality
- Improved water quality
- Improved public health
- Reduced surface and air temperatures
- Reduced noise pollution

**Table 3-8: Tree Planting GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reductions (MT $CO_2e$) |
|---|---|---|
| T-1 | Tree Planting Program | 18 |
| **Tree Planting Total** | | **18** |

## Measure T-1: Tree Planting Program

**Develop a program to facilitate voluntary tree planting within the community, working with local non-profit organizations and community partners. Develop and adopt tree planting guidelines that address tree and site selection.**

**GHG Reduction Potential:**
18 MT $CO_2e$
**City Cost:**
Low
**City Savings:**
None
**Private Cost:**
Very Low
**Private Savings:**
None

*Implementation Actions*:

- **T-1.1:** Develop a tree planting assistance program, which provides resources, labor, and subsidies to participating community members.
- **T-1.2:** Develop and adopt tree planting guidelines that address tree and site selection. Emphasis should be placed on native, drought-tolerant trees.
- **T-1.3:** Require through conditions of approval that new development projects require planting of additional trees beyond those required as mitigation.
- **T-1.4:** Track the number of trees planted annually.

## 3.4 GHG Reduction Summary

As discussed in Chapter 2, *GHG Emissions and Reduction Target*, Paso Robles will need to reduce its GHG emissions by 19,852 MT $CO_2e$ by 2020 to meet its 15 percent reduction target. The GHG reduction measures in this CAP are estimated to reduce Paso Robles' GHG emissions by 22,216 MT $CO_2e$ by 2020, as summarized in **Table 3-9**. Therefore, the implementation of the measures identified in this chapter would enable Paso Robles meets its 15 percent reduction target by 2020.

**Table 3-9: Summary of GHG Reductions by Measure**

| Measure Number | Measure | 2020 GHG Reduction (MT $CO_2e$) |
|---|---|---|
| **City Government Operations** | | |
| C-1 | City Government Energy Efficiency Retrofits and Upgrades | 746 |
| C-2 | City Government Energy Efficient Public Realm Lighting | 14 |
| C-3 | Renewable Energy Systems on City Property | 22 |
| C-4 | Transportation Demand Management Program for City Employees | 49 |
| C-5 | Zero- and Low-Emission City Fleet Vehicles | 66 |
| C-6 | City Government Solid Waste Reduction | 47 |
| C-7 | City Government Tree Planting Program | 6 |
| | *City Government Operations Subtotal* | *950* |
| **Energy** | | |
| E-1 | Energy Efficiency Outreach and Incentive Programs | 426 |
| E-2 | Energy Audit and Retrofit Program | 1,497 |
| E-3 | Income-Qualified Energy Efficient Weatherization Programs | 130 |
| E-4 | Incentives for Exceeding Title 24 Building Energy Efficiency Standards | 114 |
| E-5 | Energy Efficient Public Realm Lighting Requirements | 34 |
| E-6 | Small-Scale On-Site Solar PV Incentive Program | 2,732 |
| E-7 | Income-Qualified Solar PV Program | 183 |
| | *Energy Subtotal* | *5,116* |
| **Transportation and Land Use** | | |
| TL-1 | Bicycle Network | 771 |
| TL-2 | Pedestrian Network | 544 |
| TL-3 | Expand Transit Network | 221 |
| TL-4 | Increase Transit Service Frequency/Speed | 363 |
| TL-5 | Transportation Demand Management Incentives | 823 |
| TL-6 | Parking Supply Management | 641 |
| TL-7 | Electric Vehicle Network and Alternative Fueling Stations | 3,448 |
| TL-8 | Infill Development | 4,356 |
| | *Transportation and Land Use Subtotal* | *11,167* |
| **Off-Road** | | |
| O-1 | Off-Road Equipment Upgrades, Retrofits, and Replacements | 1,912 |
| | *Off-Road Subtotal* | *1,912* |
| **Water** | | |
| W-1 | Exceed the SB X7-7 Water Conservation Target | 41 |
| | *Water Subtotal* | *41* |
| **Solid Waste** | | |
| S-1 | Solid Waste Diversion Rate | 3,012 |
| | *Solid Waste Subtotal* | *3,012* |
| **Tree Planting** | | |
| T-1 | Tree Planting Program | 18 |
| | *Tree Planting Subtotal* | *18* |
| **TOTAL REDUCTION** | | **22,216** |

# CHAPTER 4

## ADAPTATION

# 4.0 Adaptation

There are two responses to climate change available to local governments: mitigation and adaptation. The previous chapter addressed climate change mitigation, by identifying measures to reduce GHG emissions. This chapter identifies measures to prepare for and minimize the risks associated with anticipated climate change impacts and increase resiliency to those changes. Drawing on a recent climate adaptation planning process that took place in San Luis Obispo County, this chapter identifies climate change predictions for the region and specific to Paso Robles. This chapter also provides an assessment of populations and infrastructure within Paso Robles that are particularly vulnerable to the identified impacts and identifies measures to increase community resilience to those effects.

*"Adaptation planning at the local, state, and national levels can limit the damage caused by climate change, as well as reduce the long-term costs of responding to the climate related impacts that are expected to grow in number and intensity in the decades to come"* (PEW Center on Global Climate Change, 2011).

## 4.1 Climate Change Predictions and Vulnerability

Climate change is a global phenomenon that has the potential to impact local health, agriculture, natural resources, infrastructure, emergency response, tourism, and many other facets of society. As climate change continues to progress, increased stress to vulnerable populations and sectors of society are expected. In 2010, key stakeholders, elected officials, city and county planners, land managers, public health officials, concerned citizens, scientists, and the Local Government Commission initiated a process to address climate change adaptation in San Luis Obispo County. As part of this process, scientists from Geos Institute identified anticipated climate change impacts in the region and threats to socioeconomic and natural systems. The range of potential impacts presented in the document *ClimateWise: Integrated Climate Change Adaptation Planning in San Luis Obispo County in November 2010* (ClimateWise) are based on projections of climate change in the San Luis Obispo region using three of the best-available models (MIROC, HadCM, and CSIRO) and an emissions scenario drawn from those used by the Intergovernmental Panel on Climate Change (IPCC).

According to ClimateWise, climate change could lead to the following potential changes in the San Luis Obispo County region and the City of Paso Robles:

- Increased temperatures
- Changed precipitation
- Increased frequency and severity of storm events
- Increased burn area from wildfires

Based on these climate changes, a vulnerability assessment was completed to determine the degree to which physical, socioeconomic, and natural factors are susceptible to, or unable to

accommodate, the anticipated effects of climate change. The assessment was comprised of three primary components of vulnerability to climate change:

- Exposure – the nature and degree to which a system experiences a stress or hazard.
- Sensitivity – the degree to which the system is impacted by a given stressor, change or disturbance.
- Adaptive Capacity – the ability to cope with extreme events, to make adaptive changes, or to transform to a greater extent, including the ability to moderate potential damages and to take advantage of opportunities.

Together these components help contribute to understanding the overall vulnerability of a systems most vulnerable to climate change (Snover, 2007). Climate change will most impact those individuals and systems that have both the greatest exposure and sensitivity to climate change impacts, in addition to the lowest adaptive capacity (see **Table 4-1**). For each climatic hazard, the population and economic sector most vulnerable depends on the unique combination of these three factors (ClimateWise, 2010).

**Table 4-1: Climate Change Vulnerability**

| Components of Vulnerability | Climatic Risks | Populations or Infrastructure Particularly at Risk |
|---|---|---|
| **Exposure** | Floods<br>Heat<br>Drought<br>Wildfire | Floodplain residents<br>Outdoor workers<br>Farmers, all water users<br>Homes at the wildland-urban interface |
| **Sensitivity** | Heat<br>Air pollution<br>Drought | Infants, elderly<br>Asthma sufferers, children<br>Farmers |
| **Adaptive Capacity** | Floods<br>Heat | Institutionalized populations, low-income households<br>Low-income residents |

Source: ClimateWise, 2010

### 4.1.1 INCREASED TEMPERATURES

Average temperatures in San Luis Obispo County are expected to become 2 to 4 degrees warmer by mid-century and possibly 4 to 8 degrees warmer by late century, depending on emission levels (ClimateWise, 2010). Greater warming is expected to occur in the summer months compared to winter. Paso Robles should also anticipate more extreme-heat conditions (i.e., heat waves, which are defined as five or more consecutive days over 99 degrees to 101 degrees Fahrenheit), which could last longer and become three to four times more frequent by 2050.

Public health may be negatively impacted by a changing climate as a result of changing environmental conditions (e.g., extreme weather events; changes in temperature and rainfall that decrease water supply; worsening air quality; increases in allergens and air pollutants). *ClimateWise* states that “in the case of extreme heat, some of the most vulnerable populations include: the elderly, infants, and outdoor workers [especially in the hotter inland areas such as

Paso Robles].” This vulnerability assessment is consistent with California’s Adaptation Strategy in the identification of population segments that will be the most at risk from climate change impacts.[1] In addition, California’s Adaptation Strategy also identifies “individuals suffering from chronic heart or lung disease, persons with mental disabilities, the socially and/or economically disadvantaged as being vulnerable populations” (California Natural Resources Agency, 2009).

More than 10 percent of all Paso Robles residents live below the poverty line (U.S. Census, 2010). With anticipated increases in temperature, these economically disadvantaged persons may find it more difficult to afford the additional costs of cooling their homes. Consequently, many low-income households, especially those of seniors and the disabled may become physically vulnerable to the effects of extreme heat events.

Increases in temperature could also have a substantial impact to the City’s economy, as agriculture and construction comprise 22 percent of the sector’s output. Damaged crops and reduced crop yields would lower revenues as well as shrink the demand for agricultural workers. Additionally, increased temperatures and reductions in air quality can lead to hazardous conditions, such as heat stroke and respiratory ailments for agricultural and construction laborers working outdoors.

### 4.1.2 CHANGED PRECIPITATION

Precipitation, except during winter months, is anticipated to change little in the near future. However, climate models forecast drier conditions throughout San Luis Obispo County by 2075. As a result, droughts may become more frequent, longer and more severe. It is also projected that when rainfall does occur, it may be more likely to come in the form of intense downpours.

Paso Robles currently relies on groundwater from the Paso Robles Ground Water Basin and from Salinas River underflow for 100 percent of its water supply. Paso Robles has recently become a participant in the Lake Nacimiento Water Project and has secured a 4,000 acre-feet per year water entitlement, which is planned to be online by 2015. The use of Lake Nacimiento water will enable the City to reduce its dependency on the Paso Robles Groundwater Basin, and provide a reliable long-term water supply for the City. City wells furnish nearly all of the water supply for urban use, and a limited number of private wells serve agricultural uses within the city limits. Storage also serves as an emergency source of water for firefighting and periods when pumping facilities are out of service (City of Paso Robles, 2011). While climate models predict little change in rainfall patterns for the near future, they do forecast a drier climate during the last half of this century. This may result in longer and more severe periods of drought, therefore impacting the livestock industry, which relies on annual precipitation for reliable grazing and pasturing. Likewise, the local and regional agricultural industry will be vulnerable to decreased availability of water resources through the lowering of groundwater levels used for irrigation and industrial processes.

[1] California’s Adaptation Strategy was developed in 2009 by the California Natural Resources Agency, working through the Climate Action Team. Seven sector-specific working groups led by 12 state agencies, boards and commissions, and numerous stakeholders were convened for this effort. The strategy proposes a comprehensive set of recommendations designed to inform and guide California decision makers as they begin to develop policies that will protect the state, its residents and its resources from a range of climate change impacts.

### 4.1.3 INCREASED FREQUENCY AND SEVERITY OF STORM EVENTS

As mentioned above, the severity of storm events could increase, even if precipitation levels do not. This is an important differentiation to recognize. More rain falling in a shorter time frame increases the risk of flooding. The prevalence of impermeable paving materials and drainage systems that prevent quick absorption back into the ground water will serve to exacerbate the problem.

Businesses, residents, and infrastructure located within floodplains (e.g., adjacent to the Salinas River) would be more susceptible to damage or disruption by larger than average precipitation events. The region may see more severe (but not necessarily more frequent) rainfall events, leading to quick pulses of runoff. Currently, there is insufficient infrastructure to harness that momentary surplus of water, and large amounts of impervious pavement prevent much of the rain from infiltrating into the ground. There is also a possibility of septic systems and sewage treatment plants being unable to handle increases in intense rainfall events and associated runoff. This could impede the proper functioning of onsite septic systems or overwhelm sewers and centralized sewage treatment plants. As a result, untreated water, with a full load of toxics and organic waste, could enter streams and coastal waters (Koopman et al., 2010).

### 4.1.4 INCREASED BURN AREA FROM WILDFIRES

Rural areas within and surrounding Paso Robles may become more prone to wildfires due to higher temperatures and stress to vegetation. By the end of the century, San Luis Obispo County could experience two to three times larger area burned annually by wildfires (ClimateWise, 2010).

The Insurance Service Office (ISO), a national rating service sponsored by fire insurance carriers to measure fire-fighting capability in order to reduce structural fire losses, provides rankings of fire-fighting capability on a scale of 1-10 with 1 being best level of service and 10 being no service at all. The ISO assigned the Paso Robles community a class 5 rating for property within 1,000 feet of a fire hydrant and a class 9 rating for all other property.

As the population and urban areas of the state continue to grow, much of California is experiencing an exponential increase in its vulnerability to wildfire damages and loss. This increase is especially true in outlying (rural) suburbs that are situated in forested or brush covered areas seen as more desirable than higher density developments. Because rural properties are more likely to be more than 1,000 feet from a hydrant, firefighting capabilities are not as effective for such properties.

## 4.2 Adaptation Measures

The following measures focus on items the City of Paso Robles can implement in adapting to climate change. The goal of these measures is to reduce impacts to the community, the economy, and local natural resources. Recognizing the link between public health and climate adaptation, this chapter recommends adaptation measures that are designed to reduce the negative impacts of climate change on sensitive populations and communities. Measures were developed from those identified in the ClimateWise program, the World Bank Primer on Reducing Vulnerabilities to Disaster, ICLEI, and the California Natural Resources Agency's Climate Adaptation Strategy.

### Measure A-1: Climate Change Vulnerability

**Periodically reassess regional climate change vulnerabilities.**

*Implementation Actions:*

- **A-1.1:** Participate in inter-agency and or inter-jurisdictional meeting and planning activities to periodically reassess regional climate change vulnerabilities.
- **A-1.2:** Incorporate newly identified adaptation measures into planning documents as appropriate.

### Measure A-2: Public Health and Emergency Preparedness

**Prepare for anticipated climate change effects on public health, the local economy, and populations that may bear a disproportionate burden of the climate change effects.**

*Implementation Actions:*

- **A-2.1:** Collaborate with community-based organizations (such as health care providers, public health advocates, fire prevention organizations, etc.) to disseminate public preparedness and emergency response information related to climate change.
- **A-2.2:** Conduct training exercises at public forums as well as distribute publicly available information on emergency exit routes and methods.
- **A-2.3:** Identify and focus planning and outreach programs on vulnerable populations including neighborhoods that currently experience social or environmental injustice or bear a disproportionate burden of potential public health impacts.
- **A-2.4:** Prepare a heat wave response plan that focuses on responding to the increased propensity for heat-related death and illness.

- **A-2.5:** Coordinate and promote cooling centers for residents who may require refuge from hot days, particularly low-income households, senior citizens, and homeless individuals.[2]
- **A-2.6:** Coordinate with the City's Fire and Police Departments to bolster wildfire preparedness and defensiveness for residents and businesses through providing information on the City's website and conducting trainings promoting mechanical fuel management and increasing the area of defensible space around structures.

### Measure A-3: Water Management

**Implement new policies and programs to limit community exposure to threats such as flooding, and support those that encourage water use conservation and efficiency.**

*Implementation Actions:*

- **A-3.1:** Collaborate with other jurisdictions to address water supply threats, flooding, and wastewater management.
- **A-3.2:** Continue to seek grants and other sources of funding, including the State Integrated Regional Water Management Grant Program and mitigation opportunities, to enhance flood control and improve water quality.
- **A-3.3:** Implement Measure W-1 to facilitate water conservation and the use of recycled water.

### Measure A-4: Infrastructure

**Work to improve the resilience of systems that provide the resources and services critical to community function.**

*Implementation Actions:*

- **A-4.1:** Assess the potential impact of climate change as part of the update of plans that manage community infrastructure systems.
- **A-4.2:** Complete an assessment, including economic impacts and threats to public health and safety, for projected climate change impacts on local transportation, water, wastewater, stormwater, energy, and communication systems.
- **A-4.3:** Develop mitigation plans for protection of the wastewater treatment facility, the high school, and the relocation or elevation of vulnerable infrastructure.

[2] A cooling center is a place where residents can go to cool off on high heat days. Cooling centers are often located in local government-run facilities such as senior centers or neighborhood parks and recreation sites and are open to all. Typical locations include community centers, fairgrounds, libraries, and other public facilities (California Adaptation Planning Guide, 2012).

# CHAPTER 5

# IMPLEMENTATION AND MONITORING

# 5.0 Implementation and Monitoring

Implementation and monitoring are essential components of the CAP to ensure that Paso Robles reduces its GHG emissions and meets its target. This chapter identifies key steps that the City will take to implement the CAP and monitor the progress in reducing its GHG emissions consistent with AB 32. It also describes potential funding sources and mechanisms available to implement the CAP.

## 5.1 Implementation Matrix

Ensuring that the CAP measures translate into measurable reductions in GHG emissions is critical to the success of the CAP. To facilitate this, each measure and its corresponding implementation actions identified in Chapter 3, *Climate Action Measures*, and Chapter 4, *Adaptation*, is listed in the implementation matrix in **Table 5-1** along with the following items:

- **Responsible Department(s):** The City department that will be primarily responsible for implementing, monitoring, and reporting on the progress of the selected measure and corresponding actions.
- **Implementation Time Frame:** The phase in which this measure should begin implementation. Please note that measures already underway with existing or recently completed efforts in support of the measure are categorized as near-term. Time frames include:
    - Near-Term – By 2015
    - Mid-Term – 2016-2017
    - Long-Term – 2018-2020
- **City Cost and Savings Estimates:** For each measure, potential costs and savings to the City are categorized as none ($0), very low ($1-$10,000), low ($10,001-$50,000), medium ($50,001-$100,000), and high ($100,001 or greater). Supporting information on costs and savings is provided in **Appendix B**.
- **GHG Reduction Potential:** The GHG reduction potential value identifies the estimated annual emission reductions anticipated in 2020, measured in MT $CO_2e$. Supporting information pertaining to the GHG reduction calculations is provided in **Appendix B**.
- **Performance Indicator:** Performance indicators enable the City to generally monitor measure progress.

**Table 5-1: Implementation Matrix**

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **Near-Term** | | | | | | | |
| **C-1: City Government Energy Efficiency Retrofits and Upgrades.** Establish a target to reduce City government energy use by 50 percent by 2020 and implement cost-effective improvements and upgrades to achieve that target. | **C-1.1:** Adopt the 50 percent City government energy use reduction target.<br>**C-1.2:** Complete energy audits and benchmarking of all City-owned or -operated facilities, leveraging existing programs, such as PG&E's Automated Benchmarking Service or the U.S. EPA's ENERGY STAR Challenge program.<br>**C-1.3:** Maintain a regular maintenance schedule for heating and cooling, ventilation and other building functions.<br>**C-1.4:** Establish a prioritized list of energy efficiency upgrade projects and implement them as funding becomes available. | Public Works, Building Services, Community Development | Varies | High | 746 | 50 percent energy savings from City government operations by 2020 | Near-Term |
| **C-2: City Government Energy Efficient Public Realm Lighting.** Continue to replace City-owned or -operated street, traffic signal, | **C-2.1:** Conduct an inventory of existing outdoor public light fixtures.<br>**C-2.2:** Continue to identify and secure funding to replace inefficient City-owned or -operated public lighting. | Public Works | Low | Low | 14 | 50 LED street lights, 10 LED traffic signals, 35 high efficiency airport lights, and 50 LED or CFL other | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| park, and parking lot lights with higher efficiency lamp technologies. | | | | | | outdoor lights installed by 2020 | |
| **C-4: Transportation Demand Management Program for City Employees.** Implement a Transportation Demand Management (TDM) program to reduce annual vehicle miles traveled (VMT) associated with City employee commutes. | **C-4.1:** Develop a program to meet City employee commute trip VMT reduction targets by offering one or more services from a menu of options, including: encourage the use of carpools; provide ride matching services and assistance; allow flexible work schedules and telecommuting; provide end of trip facilities (parking, showers, lockers); provide subsidized transit passes; hire a transportation coordinator to manage TDM programs; or others at the employer's discretion. | Community Development, Planning/ Transportation, Public Works | Very Low | Medium | 49 | 20 percent of City employees participating by 2020 | Near-Term |
| **C-5: Zero- and Low-Emission City Fleet Vehicles.** Continue to replace City vehicles and equipment with more efficient and/or alternatively | **C-5.1**: Develop and adopt a low- and zero- emissions replacement/purchasing policy for City vehicles and equipment. This would not apply to vehicles with special performance requirements.<br>**C-5.2:** Work with the Central Coast Clean Cities Coalition to | Public Works | Medium | Very Low | 66 | 20 municipal City vehicles replaced by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| fueled vehicles. | obtain funding to purchase low-emission and zero-emission fleet vehicles.<br>**C-5.3:** Identify fleet vehicles near replacement and replace with lower emission vehicles. | | | | | | |
| **C-6: City Government Solid Waste Reduction.** Establish a 25 percent solid waste diversion rate over 2005 baseline levels and identify steps to meet that rate by 2020. | **C-6.1:** Develop and adopt a City purchasing policy that emphasizes recycled and recyclable materials.<br>**C-6.2:** Install recycling receptacles at City-owned or -operated buildings and facilities.<br>**C-6.3:** Coordinate with the City's waste hauler annually to track the total amount of City-generated and landfilled solid waste. | Administrative Services, Public Works | Low | None | 47 | 25 percent diversion above 2005 baseline in City solid waste, and 15 new recycling receptacles by 2020 | Near-Term |
| **E-1: Energy Efficiency Outreach and Incentive Programs.** Expand participation in and the promotion of existing energy efficiency programs, such as Energy Upgrade California and San | **E-1.1:** Conduct additional outreach and promotional activities, either individually or in collaboration with San Luis Obispo County Energy Watch, targeting specific groups or sectors within the community (e.g., homeowners, renters, businesses, etc.).<br>**E-1.2:** Designate one week per year to conduct an energy efficiency outreach campaign | Community Development, Public Works | Very Low | None | 426 | 35 percent of households participating with 5 percent energy savings and 35 percent of businesses participating with 6 percent energy savings by | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| Luis Obispo County Energy Watch, to increase community awareness of existing energy efficiency rebates and financial incentives, and no- and low-cost actions community members can take to increase energy efficiency. | targeting a specific group or sector within the community. The campaign week can also be used to recognize and encourage programs and educational outreach conducted by industry organizations, non-governmental entities, government agencies, and other community groups.<br>**E-1.3:** Direct community members to existing program websites, such as Energy Upgrade California and San Luis Obispo County Energy Watch. | | | | | 2020 | |
| **E-3: Income-Qualified Energy Efficient Weatherization Programs.** Facilitate energy efficient weatherization of low- and middle-income housing through promotion of existing programs. | **E-3.1:** Facilitate and promote existing income-qualified weatherization programs, such as PG&E's Middle Income Direct Install program, either individually or by partnering with a local organization, such as Community Action Partnership of San Luis Obispo County (CAPSLO). | Community Development | Very Low | None | 130 | 100 residential units upgraded by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **E-5: Energy Efficient Public Realm Lighting Requirements.** Require the use of high efficiency lights in parking lots, streets, and other public areas. | **E-5.1:** Develop and adopt an ordinance that requires new development to utilize high efficiency lights in parking lots, streets, and other public areas. | Public Works, Community Development, Planning | Very Low | Very Low | 34 | 100 private LED streetlights and 400 LED or CFL other outdoor lights installed by 2020 | Near-Term |
| **E-6: Small-Scale On-Site Solar PV Incentive Program.** Facilitate the voluntary installation of small-scale on-site solar PV systems and solar hot water heaters in the community through expanded promotion of existing financial incentives, rebates, and financing programs, and by helping residents and business owners overcome common regulatory | **E-6.1:** Conduct a comprehensive review of the City's solar permitting process based on the Governor's Office of Planning and Research's (OPR) *California Solar Permitting Guidebook* (June 2012), identifying any existing barriers to facility implementation.<br>**E-6.2:** Improve the permit review and approval process for small solar PV systems by implementing recommendations for streamlined permitting identified in the *California Solar Permitting Guidebook* (e.g., use standardized forms, provide clear written instructions on the permitting process and a checklist of required application | Public Works, Building Services, Community Development, Planning | Very Low | None | 2,732 | 180 commercial solar PV systems installed, 350 residential solar PV systems installed, and 167 residential solar water heaters installed by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| barriers. | materials, make information available on the City's website and at the permit counter, etc.).<br>**E-6.3:** Collaborate with other local jurisdictions in the region to standardize requirements across jurisdiction, by using common promotion and permit materials, such as checklists and standard plans, to reduce permit submittal errors among contractors working throughout a region.<br>**E-6.4:** Participate in and promote a residential and commercial/industrial renewable energy financing program (e.g., through CaliforniaFIRST, a joint powers authority with neighboring jurisdictions, or other mechanisms).<br>**E-6.5:** Expand education on and promotion of existing incentive, rebate, and financing programs for small-scale on-site solar PV systems and solar hot water heaters targeting specific groups or sectors within the community.<br>**E-6.6:** Designate one week per | | | | | | |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| | year to conduct a renewable energy outreach campaign targeting a specific group or sector within the community. The campaign week can also be used to recognize community members that have implemented noteworthy or unique renewable energy projects. | | | | | | |
| **E-7: Income-Qualified Solar PV Program.** Facilitate the installation of small-scale on-site solar PV systems on and solar hot water heaters in income-qualified housing units by promoting existing programs offered through the California Solar Initiative and New Solar Homes Partnership and by collaborating with organizations, such as Grid | **E-7.1:** Collaborate with Grid Alternatives and/or other community organizations to provide targeted education and outreach to developers and homeowners about incentives offered through the Single Family Affordable Solar Homes (SASH) Program and the Multifamily Affordable Solar Homes Program (MASH).<br>**E-7.2:** Provide targeted outreach regarding solar water heating incentives offered through the California Solar Initiative. | Public Works, Building Services, Community Development | Very Low | None | 183 | 120 low-income residential solar PV systems installed and 25 low-income residential solar water heaters installed by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| Alternatives, on outreach and eligibility. | | | | | | | |
| **TL-1: Bicycle Network.** Continue to improve and expand the city's bicycle network and infrastructure. | **TL-1.1:** Continue to pursue public and private funding to expand and link the city's bicycle network in accordance with the General Plan and Bicycle Plan.<br>**TL-1.2:** Collaborate with the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month.<br>**TL-1.3:** Continue to enforce mandatory California Green Building Standards Code bicycle parking standards for non-residential development. | Public Works, Building Services, Community Development | Very Low | None | 771 | 20 miles of bike lanes added by 2020 | Near-Term |
| **TL-2: Pedestrian Network.** Continue to improve and expand the city's pedestrian network. | **TL-2.1:** Continue to pursue public and private funding to expand and link the city's pedestrian network.<br>**TL-2.2:** Continue to expand and promote the Safe Routes to School program. | Planning, Public Works | Very Low | None | 544 | 20 miles of sidewalk added by 2020 | Near-Term |
| **TL-3: Expand Transit Network.** Work with the | **TL-3.1:** Support the addition of transit routes that provide intercity express services. | Administrative Services | Very Low | None | 221 | 30 percent increase in transit service | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| Regional Transit Authority (RTA) and transit service providers to expand the local transit network (i.e., additional routes or stops, and/or expanded hours of operation) based on the greatest demand for service. | **TL-3.2:** Continue to research federal and local funding for transit service upgrade projects. | | | | | by 2020 | |
| **TL-4: Increase Transit Service Frequency/ Speed.** Work with the RTA and transit services providers to increase transit service frequency (i.e., reducing headways) by identifying routes where increased bus frequency would improve service. | **TL-4.1:** Work with RTA and transit service providers to shorten regional service headways (e.g., by purchasing additional buses, re-routing existing buses, etc.) to 30 minutes or shorter at commute peaks subject to passenger load demand.<br>**TL-4.2:** Support streamlined transit services and infrastructure that create a bus rapid transit network on main commute corridors. | Administrative Services | Very Low | None | 363 | 10 percent reduction in headways (increase in frequency) by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **TL-5: TDM Incentives.** Work with San Luis Obispo Regional Ride Share and Ride-On to conduct additional outreach and marketing of existing TDM programs and incentives to discourage single-occupancy vehicle trips and encourage alternative modes of transportation, such as carpooling, taking transit, walking, and biking. | **TL-5.1:** Collaborate with San Luis Obispo Ride Share and Ride-On to conduct additional outreach through event promotions and publications, targeting specific groups or sectors within the community (e.g., employers, employees, students, seniors, etc.).<br>**TL-5.2:** Provide information on and promote existing employer based TDM programs as part of the business licensing and renewal process.<br>**TL-5.3:** Continue to collaborate with San Luis Obispo Ride Share and the San Luis Obispo Bicycle Coalition to assist with event promotions and publications to increase awareness and ridership during Bike Month and Rideshare month.<br>**TL-5.4:** Direct community members to existing program websites (e.g., Ride Share, Ride-On) by providing links on the City's website. | Community Development, Administrative Services | Very Low | None | 823 | 75 percent of employees eligible to participate in TDM programs resulting in a 5.4 percent reduction in VMT associated with employee commute trip | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **TL-7: Electric Vehicle Network and Alternative Fueling Stations.** Continue to work with the APCD, Central Coast Clean Cities Coalition, and neighboring jurisdictions to create and implement the electric vehicle readiness plan. | **TL-7.1:** Continue to develop and implement the electric vehicle readiness plan through expanding the use of alternative fuel vehicles and fueling stations in the community (e.g., through identifying and zoning locations for fueling stations, offering incentives for alternative fuel vehicles, etc.).<br>**TL-7.2:** Continue to pursue funding for plug-in electric vehicle charging stations.<br>**TL-7.3:** Provide streamlined installation and permitting procedures for vehicle charging facilities, utilizing tools provided in the electric vehicle readiness plan.<br>**TL-7.4:** Promote existing financial incentives for low- and zero-emissions vehicles, either individually or in collaboration with the Central Coast Clean Cities Coalition. | Community Development | Very Low | None | 3,448 | 5 percent increase in electric vehicles by 2020 | Near-Term |
| **TL-8: Infill Development.** Identify incentives to encourage mixed-use, higher | **TL-8.1:** Provide and promote incentives (e.g., parking reductions, priority permitting, etc.) for mixed-use and medium- and high-density land use | Community Development | Very Low | None | 4,356 | 50 percent of new residential units and new jobs located within ¼-mile | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| density, and infill development near existing or planned transit stops in existing community centers/ downtown and other designated areas. | categories located within ¼-mile of a transit stop or park and ride facility with regularly scheduled, daily service.<br>**TL-8.2:** Develop and adopt incentives for live/work developments, such as deferred permit fees, expedited permits, or waiving business license fees for residents in live/work units. Live/work developments allow residents to live at their place of work and thereby reduce vehicle miles traveled and associated GHG emissions. | | | | | of transit, and a 67 percent increase from base density | |
| **T-1: Tree Planting Program.** Develop a program to facilitate voluntary tree planting within the community, working with local non-profit organizations and community partners. Develop and adopt tree planting guidelines that address tree and site selection. | **T-1.1:** Develop a tree planting assistance program, which provides resources, labor, and subsidies to participating community members.<br>**T-1.2:** Develop and adopt tree planting guidelines that address tree and site selection. Emphasis should be placed on native, drought-tolerant trees.<br>**T-1.3:** Require through conditions of approval that new development projects require planting of additional trees beyond those required as | Community Development, Public Works | Low | None | 18 | 1,500 net new trees planted by 2020 | Near-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| | mitigation.<br>**T-1.4:** Track the number of trees planted annually. | | | | | | |
| **A-3: Water Management.** Implement new policies and programs to limit community exposure to threats such as flooding, and support those that encourage water use conservation and efficiency. | **A-3.1:** Collaborate with other jurisdictions to address water supply threats, flooding, and wastewater management.<br>**A-3.2:** Continue to seek grants and other sources of funding, including the State Integrated Regional Water Management Grant Program and mitigation opportunities, to enhance flood control and improve water quality.<br>**A-3.3:** Implement Measure W-1 to facilitate water conservation and the use of recycled water. | Community Development, Public Works | Very Low | None | NA | NA | Near-Term |
| **Mid-Term** | | | | | | | |
| **C-3: Renewable Energy Systems on City Property.** Pursue on-site small-scale renewable energy generation at City government facilities. | **C-3.1:** Continue to install renewable energy projects at select City facilities where feasible.<br>**C-3.2:** Identify funding sources and opportunities for City government renewable energy generation.<br>**C-3.3:** Replace inefficient hot water heaters with those powered by solar energy. | Public Works, Community Development | High | Low | 22 | 100 kW solar PV systems and 4 solar water heaters installed by 2020 | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **C-7: City Government Tree Planting Program.** Establish a tree planting program to increase the number of native, drought-tolerant trees on City-owned property, parks and streetscapes. | **C-7.1:** Develop and adopt a formal tree planting policy or program and plant at least 500 trees by 2020.<br>**C-7.2:** Identify and secure grant funding to plant trees on City properties. | Public Works, Parks and Recreation | Medium | None | 6 | 500 net new trees planted on City-owned property by 2020 | Mid-Term |
| **Measure E-2: Energy Audit and Retrofit Program.** Facilitate voluntary energy assessments, retrofits, and retrocommissioning of residential and commercial buildings within Paso Robles. | **E-2.1:** Collaborate with San Luis Obispo County Energy Watch, local utilities, and/or local jurisdictions to develop and promote a residential and commercial energy audit program.<br>**E-2.2:** Conduct outreach and promotional activities targeting specific groups (e.g., owners of buildings built prior to Title 24 [1980]) in order to promote the audit and retrofit program.<br>**E-2.3:** As part of the business licensing and renewal process, encourage businesses to participate in the program and receive an energy audit. | Building Services, Community Development | Very Low | None | 1,497 | 750 households and 600 businesses audited by 2020, with an average energy savings of 30 percent per retrofit | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| | **E-2.4:** Participate in and promote an energy efficiency financing program to encourage investment in energy efficiency upgrades.<br>**E-2.5:** Work with Energy Upgrade California, local utilities, and/or community businesses and organizations, to annually conduct a "do-it-yourself" workshop for building energy retrofits.<br>**E-2.6:** Highlight the effectiveness of energy audits and retrofits by showcasing the success of retrofit projects (e.g., on the City's website or in its newsletter). | | | | | | |
| **E-4: Incentives for Exceeding Title 24 Energy Efficiency Building Standards.** Encourage new development to voluntarily exceed State energy efficiency standards. | **E-4.1:** Collaborate with community organizations and businesses, local utilities, and other local jurisdictions in the region to develop and promote a technical assistance and best practices program that aids developers in selecting and implementing energy efficiency measures that exceed State standards.<br>**E-4.2:** Identify, provide and | Building Services, Community Development | Very Low | None | 114 | 50 new residences and 75 new non-residential buildings exceeding State standards by 20 percent by 2020 | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| | promote incentives (e.g., public recognition) for applicants whose project exceeds State requirements by 20 percent.<br>**E-4.3:** Update building permit process to incentivize higher building performance (e.g. buildings that integrate and optimize major high-performance building attributes, including energy efficiency, durability, and life-cycle performance).<br>**E-4.4:** Launch an educational campaign for builders, permit applicants, and the general public to promote best practices and incentive programs; provide information and assistance about energy efficiency options online and at permit counter. | | | | | | |
| **TL-6: Parking Supply Management.** Reduce parking requirements in areas such as the downtown where a variety of uses and services are | **TL-6.1:** Continue to establish parking districts, allowing the payment of in-lieu fees in place of minimum parking requirements where appropriate. | Planning/ Transportation, Public Works | Very Low | None | 641 | Net reduction of 800 parking spaces by 2020 | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| planned in close proximity to each other and to transit. | | | | | | | |
| **O-1: Off-Road Equipment Upgrades, Retrofits, and Replacements.** Continue to work with the APCD and promote existing programs that fund off-road equipment and vehicle upgrades, retrofits, and replacement through the Carl Moyer heavy-duty vehicle and equipment program or other funding mechanisms. | **O-1.1:** Conduct additional outreach and promotional activities targeting specific groups (e.g., agricultural operations, construction companies, homeowners, etc.). **O-1.2:** Direct community members to existing program websites (e.g., APCD, Carl Moyer Grant page). | Community Development | Very Low | None | 1,912 | 15 percent of off-road vehicles/ equipment replaced with electric vehicles/ equipment and 15 percent of off-road equipment replaced with alternatively fueled vehicles and equipment by 2020 | Mid-Term |
| **W-1: Exceed the SB X7-7 Water Conservation Target.** The City would adopt a water conservation target that exceeds the SB X7-7 (Water | **W-1.1:** Adopt a water conservation ordinance to exceed SB X7-7 by 10 percent and work with the City's water purveyors to develop and/or help implement additional water conservation and efficiency programs (e.g. water efficiency | Public Works | Very Low | None | 41 | Exceed SB X7-7 water conservation target by 10 percent by 2020 | Mid-term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| Conservation Act of 2009) target and identify and implement additional water efficiency and conservation measures to meet that target by 2020. | audits, replacement/retrofit programs, etc.) to meet the target.<br>**W-1.2:** Enhance retrofit programs for existing residences and commercial buildings by providing additional resources, assistance, and incentives to home and business owners.<br>**W-1.3:** Adopt CALGreen Tier 1 or Tier 2 standards for water efficiency and conservation in new development. To meet Tier 1 or Tier 2, designers, builders, or property owners must increase the number of green building measures and further reduce percentages of water use in order to meet the threshold levels for each tier.<br>**W-1.4:** Expand the use of grey water or recycled water infrastructure by working with the City's water purveyors and educating the community on dual plumbing, and state-of-the-art irrigation systems, including the use of grey water systems and rainwater catchment. | | | | | | |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **S-1: Solid Waste Diversion Rate.** The City would adopt a solid waste diversion rate that exceeds the state-mandated rate of 50 percent and identify programs to meet the identified rate by 2020. | **S-1.1:** Adopt a solid waste diversion rate that exceeds the state-mandated rate by a 25 percent (e.g., California's AB 341 identifies a 75 percent diversion goal for 2020).<br>**S-1.2**: Develop an education and outreach program in support of the diversion rate.<br>**S-1.3:** Develop a program for the expanded collection of organic waste.<br>**S-1.4:** Establish a community-wide organics composting program and develop a marketing campaign to educate the community about the program.<br>**S-1.5:** Adopt an ordinance requiring that 65 percent of construction and demolition debris from development projects be diverted from landfills.<br>**S-1.6:** Develop and adopt an administrative policy requiring the provision of recycling receptacles at all events requiring a permit or held on City-owned or -operated property. | Public Works | Very Low | None | 3,012 | 75 percent solid waste diversion by 2020 | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **Measure A-1: Climate Change Vulnerability.** Periodically reassess regional climate change vulnerabilities. | **A-1.1:** Participate in inter-agency and or inter-jurisdictional meeting and planning activities to periodically reassess regional climate change vulnerabilities. **A-1.2:** Incorporate newly identified adaptation measures into planning documents as appropriate. | Community Development | Very Low | None | NA | NA | Mid-Term |
| **Measure A-2: Public Health and Emergency Preparedness.** Prepare for anticipated climate change effects on public health, the local economy, and populations that may bear a disproportionate burden of the climate change effects. | **A-2.1:** Collaborate with community-based organizations (such as health care providers, public health advocates, fire prevention organizations, etc.) to disseminate public preparedness and emergency response information related to climate change. **A-2.2:** Conduct training exercises at public forums as well as distribute publicly available information on emergency exit routes and methods. **A-2.3:** Identify and focus planning and outreach programs on vulnerable populations including neighborhoods that currently experience social or environmental injustice or bear | Community Development | Very Low | None | NA | NA | Mid-Term |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| | a disproportionate burden of potential public health impacts.<br>**A-2.4:** Prepare a heat wave response plan that focuses on responding to the increased propensity for heat-related death and illness.<br>**A-2.5:** Coordinate and promote cooling centers for residents who may require refuge from hot days, particularly low-income households, senior citizens, and homeless individuals.<br>**A-2.6:** Coordinate with the City's Fire and Police Departments to bolster wildfire preparedness and defensiveness for residents and businesses through providing information on the City's website and conducting trainings promoting mechanical fuel management and increasing the area of defensible space around structures. | | | | | | |

| Measure | Actions | Responsible Department | City Cost | City Savings | 2020 GHG Reduction (MT $CO_2e$) | Performance Indicator | Implementation Time Frame |
|---|---|---|---|---|---|---|---|
| **Long-Term** | | | | | | | |
| **A-4: Infrastructure.** Work to improve the resilience of systems that provide the resources and services critical to community function. | **A-4.1:** Assess the potential impact of climate change as part of the update of plans that manage community infrastructure systems.<br>**A-4.2:** Complete an assessment, including economic impacts and threats to public health and safety, for projected climate change impacts on local transportation, water, wastewater, stormwater, energy, and communication systems.<br>**A-4.3:** Develop mitigation plans for protection of the wastewater treatment facility, the high school, and the relocation or elevation of vulnerable infrastructure. | Community Development, Public Works | Very Low | None | NA | NA | Long-Term |

## 5.2 Implementation and Monitoring Policies

CAP implementation and monitoring will require City leadership to execute CAP measures and actions, report on the progress of implementation and performance, and if necessary, alter or amend the CAP in the future to ensure that the plan remains effective and on track toward meeting its target. The following policies and actions were developed to guide CAP implementation and monitoring.

### I-1: CAP Implementation Team

**Establish a CAP Coordinator and multi-departmental CAP Implementation Team to implement, monitor, and report on the status of measures and actions identified in the CAP. The CAP Implementation Team will meet at least one time per year to assess the status of City efforts.**

*Implementation Actions*:

- **I-1.1:** Form a multi-departmental CAP Implementation Team that meets annually to implement, monitor, and report on the status of measures and actions identified in the CAP.
- **I-1.2:** Designate a City staff member on the CAP Implementation Team to have lead responsibilities for overseeing CAP implementation and monitoring. Duties of this position include coordinating the CAP Implementation Team meetings, preparing the annual CAP progress report to City Council, and coordinating the GHG emissions inventory and CAP updates, as specified in this chapter.
- **I-1.3:** Provide CAP implementation and GHG reduction training to staff.

### I-2: CAP Measure Evaluation

**Annually monitor and report on the implementation and performance of the CAP measures and actions.**[1]

*Implementation Actions*:

- **I-2.1:** Prepare an annual progress report for City Council review and consideration. The progress report should:
    - Identify the implementation status of each measure (including how new development projects have been implementing CAP measures);

[1] While a full GHG emissions inventory is necessary to assess community-wide and local government progress toward the 2020 goal, the City can track progress between inventories and provide insight on the effectiveness of specific actions. By evaluating whether the implementation of a measure is on track to achieve its performance criteria, the City can identify successful measures, and re-evaluate or replace under-performing measures.

- Evaluate achievement of or progress toward performance criteria;[2]
- Assess the effectiveness of measures included in the CAP;
- Report on the State's implementation of state-level measures included in the CAP; and
- Recommend adjustments to actions or tactics, as needed.

### I-3: GHG Emissions Inventory and CAP Updates

**Re-inventory GHG Emissions every five years to evaluate the performance of the CAP as a whole, and if necessary, alter or amend the CAP to ensure that the plan remains on track.[3]**

*Implementation Actions*:

- **I-3.1:** Conduct a GHG inventory every five years and evaluate CAP performance.
- **I-3.2:** Update the CAP as necessary based on the results of the inventory, and to reflect new programs or policies to reduce GHG emissions.

At this time, the State has not created a mandate for further reductions beyond the 2020 target. It has identified a long-term goal for State agencies of reducing emissions to 80 percent below 1990 emissions levels by 2050 (in Executive Order S-3-05), but has not adopted the target and does not plan for meeting this goal. As such, this CAP does not identify a target beyond 2020. As the year 2020 approaches, the State is likely to adopt a target for later years and, at that time Paso Robles will adopt a reduction target for a later year consistent with the State's longer-term target. However, if the State has not adopted a reduction target by 2020, the City will set a reduction target based on the State's long-term reduction trajectory.

## 5.3 Funding Sources

One of the main barriers to an implementation and monitoring plan is lack of available funds. There are multiple grant and loan programs through state, federal, and regional sources to reduce GHG emissions. This section identifies potential funding sources that Paso Robles could pursue to offset the financial cost of implementing the CAP measures.

The spectrum of public and private funding options for the measures outlined in this CAP is ever evolving. The programs listed below represent the current (2013) status of those options that are most relevant to the CAP. These funding sources could quickly become out-of-date; therefore, it is important to evaluate the status of a given program before seeking funding, as availability and application processes are updated periodically. In addition, there are general sources of funding that provide the most up-to-date information and should be reviewed on a regular basis, including:

[2] The performance indicators, provided for each quantified measure, identify the level of participation or performance required to achieve the estimated level of GHG emissions reductions by 2020.

[3] Inventory updates provide the best indication of CAP effectiveness as they will allow for comparison to the 2005 baseline. If an update reveals that the plan is not making progress toward meeting the GHG reduction target, the City will adjust the measures as necessary.

- U. S. Department of Energy
- U.S. Environmental Protection Agency
- U.S. Department of Housing and Urban Development
- California Energy Commission
- California Strategic Growth Council
- California Public Utilities Commission
- Caltrans
- CAL FIRE
- California Statewide Communities Development Authority
- Foundation for Renewable Energy and Environment
- SLOCOG
- SoCalGas
- PG&E

To reduce costs and improve the CAP's effectiveness, actions should be pursued concurrently whenever possible. Funding sources the City decides to pursue will be identified as implementation occurs.

The City can, in part, provide funding for various measures outlined in this CAP. This can be accomplished through the City's annual budgeting and Capital Improvement Program process which provides an opportunity for citizen input and guides decision-makers while helping them set priorities. The City can also partner with SLOCOG, local jurisdictions within San Luis Obispo County, community-based organizations, and private companies for joint programs.

### 5.3.1 ENERGY-RELATED FUNDING SOURCES

Many of the financing and incentive programs relevant to the CAP concern energy infrastructure and conservation. Some of these programs are tied to the American Recovery Reinvestment Act economic stimulus package enacted by Congress in February 2009. Access to these funds will be available for a limited period. The City should seek the most up-to-date information regarding the programs listed below.

#### Energy Efficiency and Conservation Block Grant Program

*U.S. Department of Energy*

The Energy Efficiency and Conservation Block Grant program, funded by the American Recovery and Reinvestment Act of 2009, provides local government grants to reduce fossil-fuel emissions, reduce total energy use, and improve energy efficiency and conservation in the transportation and building sectors. Grants originate from U.S. Department of Energy and are released from both the U.S. Department of Energy and California Energy Commission.

#### Strategic Growth Council Sustainable Communities Planning Grant Program

*California Strategic Growth Council*

On behalf of the Strategic Growth Council, the Department of Conservation manages competitive grants to cities, counties, and designated regional agencies to promote sustainable community planning and natural resource conservation. The grant program supports development, adoption, and implementation of various planning elements. The Sustainable Communities Planning Grant Program offers a unique opportunity to improve and sustain the

wise use of infrastructure and natural resources through a coordinated and collaborative approach.

### Urban Greening for Sustainable Communities Grant Program

*California Strategic Growth Council*

Because of the built-out nature of California's urban areas, the Urban Greening for Sustainable Communities Program provides funds to preserve, enhance, increase, or establish community green areas such as urban forests, open spaces, wetlands, and community spaces (e.g., community gardens). The goal is for these greening projects to incrementally create more viable and sustainable communities throughout the state. This program has both an Urban Greening Planning Program, which provides funds to assist entities in developing a master urban greening plan, and an Urban Greening Project Program, which provides funds for projects that preserve, enhance, increase or establish community green areas.

### Urban and Community Forestry Grant Program

*CAL FIRE*

The CAL FIRE Urban and Community Forestry Program works to expand and improve the management of trees and related vegetation in communities throughout California. This program offers funding through a variety of grants. The Urban Forest Management Plan Grant funds the development and implementation of a management plan to be used by a jurisdiction to manage its urban forest. Such plans will be holistic and long-term, must include the entire jurisdiction and take an ecosystem management approach, and may include a minimum level of a training or educational component. Local jurisdictions may request between $30,000 and $100,000 and matching contributions totaling 25 percent of the total project cost is required. The Green Trees for the Golden State Grant provides funding for urban tree planting projects and up to two years of initial maintenance. Local jurisdictions may request between $30,000 and $100,000. Matching contributions totaling 25 percent of the total project cost is required.

### California Investor Owned Utilities (IOUs) Programs

*PG&E*

California IOUs, such as PG&E, are required by the CPUC to offer energy efficiency programs to their customers. Each IOU program is unique; generally the programs offer rebates, financing assistance, design assistance, educational seminars, and other forms of assistance. PG&E's rebates may be calculated based on the amount of energy savings or, alternatively, may be fixed rate financial assistance for specific energy efficiency technology.

In conjunction with its rebates and incentives programs, PG&E offers an Energy-Efficiency Retrofit Loan Program, also known as On-Bill Financing. The program for public agencies includes: zero-percent financing on qualifying measures for up to ten years; offsets to energy-efficient upgrade costs after rebates and incentives through PG&E; loans ranging from a minimum of $5,000 up to $250,000 per meter; and loan installments added to monthly PG&E bills.

PG&E also offers the Green Communities and Innovator Pilots energy efficiency programs, which are administrated by PG&E, using funds from the Public Goods Charge (PGC) authorized by the California Public Utility Commission (CPUC). Customers of California's three largest

investor-owned utility companies pay the PGC through their electric utility bills. Customers pay the surcharge per unit of consumption (kilowatt-hours). Money raised by the PGC are spent on services and programs deemed to be in the public interest, including energy efficiency initiatives such as Green Communities and Innovator Pilots.

*SoCalGas*

Southern California Gas Company offers On-Bill Financing with rebates for energy efficient natural gas equipment. For institutional customers, such as the City of Paso Robles, zero-percent financing is available from $5,000 to $250,000 per meter, with a maximum payback period of 10 years. Monthly loan payments are added directly to the customer's energy bill.

### Energy Conservation Assistance Account Program (ECAA) Energy Efficiency Financing

*California Energy Commission*

The California Energy Commission offers low-interest loans (1-3 percent) to help local jurisdictions and other public agencies finance energy-efficient projects as part of the ECAA Program. Projects with proven energy and/or capacity savings are eligible, provided they meet the eligibility requirements. Examples of projects include: lighting systems, pumps and motors, energy efficient streetlights and traffic signals, automated energy management systems/controls, building insulation, renewable energy generation and combined heat and power projects, heating and air conditioning modifications, and wastewater treatment equipment. The maximum loan amount is $3 million per application for 15 years. There is no minimum loan amount.

### California Solar Initiative State Rebate Program

*California Energy Commission & California Public Utilities Commission*

California Solar Initiative will provide over $2 billion in statewide incentives over the next decade for solar photovoltaic systems, as well as other solar thermal generating technologies, such as water heaters, on existing residential homes, and existing and new commercial, industrial, and agricultural properties. Photovoltaic incentives are available for systems up to one megawatt in size for homeowners, commercial/industrial, government and non-profit customers. The program pays solar consumers an incentive based on system performance.

### California Feed-In Tariff

The California feed-in tariff allows eligible customer-generators to enter into 10-, 15- or 20-year standard contracts with their utilities to sell the electricity produced by small renewable energy systems -- up to three megawatts -- at time-differentiated market-based prices. Time-of-use adjustments will be applied by each utility and will reflect the increased value of the electricity to the utility during peak periods and its lesser value during off-peak periods. These tariffs are not available for facilities that have participated in the California Solar Initiative, Self-Generation Incentive Program, Renewables Portfolio Standard, or other ratepayer funded generation incentive programs, including net-metering tariffs. For customers generating renewable energy not covered by the California Solar Initiative or Self-Generation Incentive Program (e.g., biomass or geothermal) the feed-in tariff is applicable. If customers prefer a long-term contract at a fixed price over a financial incentive paid in the short term, feed-in tariffs may be a beneficial financing tool.

### 5.3.2 TRANSPORTATION-RELATED FUNDING SOURCES

Many federal, state, and regional grant programs are available to fund transportation and infrastructure improvements. The programs listed below represent the current status of the most relevant of these programs.

**Livability Grant Programs**
*Federal Transportation Authority*

The Federal Transportation Authority provides resources on sustainable communities and transit oriented development. This includes access to transit oriented development resources and training free of charge to local government employees. The Federal Transportation Authority's Livable and Sustainable Communities program supports initiatives that demonstrate ways to improve the link between public transit and communities. The Federal Transportation Authority offers a broad selection of Livability Grant Programs that fund projects for accessible, livable, and sustainable communities. In particular, the Bus and Bus Facilities Discretionary Program provides capital assistance for new buses and intermodal transit centers. The New Starts and Small Starts Program supports transit "guideway" capital investments, such as rapid rail, light rail, commuter rail, automated guideway transit, people movers, bus rapid transit, and other high occupancy vehicles. Additionally, the Intercity Bus Program supports transit access to residents in non-urbanized areas.

**Alternative and Renewable Fuel and Vehicle Technology Program**
*California Energy Commission*

Assembly Bill 118 created the Alternative and Renewable Fuel and Vehicle Technology Program, within the California Energy Commission. The statute authorizes the Energy Commission to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's GHG reduction goals and reduce our dependence on foreign oil. The statute allows the Energy Commission to use grants, loans, loan guarantees, revolving loans, and other appropriate measures. Eligible recipients include: public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters, and academic institutions. The Energy Commission must prepare and adopt an Investment Plan and convene an Advisory Committee to assist in preparing the Investment Plan. The Energy Commission has an annual program budget of approximately $100 million.

**Community-Based Transportation Planning Grant Program**
*Caltrans*

The Community-Based Transportation Planning Grant Program is primarily used to seed planning activities that encourage livable communities. Grants assist local agencies to better integrate land use and transportation planning, to develop alternatives for addressing growth, and to assess efficient infrastructure investments that meet community needs. These planning activities are expected to help leverage projects that foster sustainable economies, increase available affordable housing, improve housing/jobs balance, encourage transit oriented and

mixed use development, expand transportation choices, reflect community values, and include non-traditional participation in transportation decision making.

### Local Assistance Program

*Caltrans*

Caltrans' Local Assistance Program oversees more than one billion dollars in federal and state funds annually available to over 600 cities, counties, and regional agencies for the purpose of improving their transportation infrastructure or providing transportation services.

### Safe Routes to School Programs

*Caltrans*

Caltrans administers two separate Safe Routes to School Programs—one state program and one federal program. Both programs are intended to achieve the same basic goal of increasing the number of children walking and bicycling to school by making it safer for them to do so. Both programs fund qualifying infrastructure projects.

### Bicycle Transportation Account

*Caltrans*

The Bicycle Transportation Account is an annual program providing state funds for city and county projects that improve safety and convenience for bicycle commuters. Caltrans expects to appropriate $7.2 million annually for projects, on a matching basis with local jurisdictions. A wide variety of projects are eligible, including but not limited to new bikeways serving major transportation corridors, new bikeways removing travel barriers, and secure bicycle parking.

### Environmental Enhancement and Mitigation Program

*Caltrans*

The Environmental Enhancement and Mitigation Program offers a total of $10 million each year for grants to local, state, and federal government agencies and to nonprofit organizations for projects to mitigate the environmental impacts caused by new or modified public transportation facilities. Eligible projects must be directly or indirectly related to the environmental impact of the modification of an existing transportation facility or construction of a new transportation facility. Two of the grant categories include Highway Landscaping and Urban Forestry Projects, which are designed to offset vehicular emissions of carbon dioxide through the planting of trees and other suitable plants, and Roadside Recreation Projects, which provide for the acquisition and/or development of roadside recreational opportunities.

### Highway Safety Improvement Program

*Caltrans*

The Highway Safety Improvement Program provides federal funding for work on any public road or publicly owned bicycle/pedestrian pathway or trail that corrects or improves the safety for its users. The program is intended to reduce traffic fatalities and serious injuries on all public roads. Local jurisdictions, such as counties and cities, may apply to Caltrans for funding ranging from $100,000 to $900,000 per project. Federal reimbursements cover up to 90 percent of total

project costs. Eligible projects include, but are not limited to, improvements for pedestrian or bicyclist safety, intersection safety improvements, and shoulder widening.

### Community Development Block Grant

*California Department of Housing and Community Development*

The Community Development Block Grant (CDBG) program funds projects and programs that develop viable urban communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income. Federal CDBG Grantees may use funds for activities that include, but are not limited to, acquiring real property; building public facilities and improvements, such as streets, sidewalks, and recreational facilities; and planning and administrative expenses, such as costs related to developing a consolidated plan and managing CDBG funds. The State makes funds available to eligible agencies (cities and counties) through a variety of different grant programs.

### Infill Infrastructure Grant Program

*California Department of Housing and Community Development*

The Infill Infrastructure Grant Program assists in the new construction and rehabilitation of infrastructure that supports higher-density affordable housing and mixed-income housing in locations designated as infill. Eligible applicants include, but are not limited to, localities and public housing authorities.

### National Recreational Trails Program

*California Department of Parks and Recreation*

In California, the National Recreational Trails Program is administered by Department of Parks and Recreation to provide funding to develop recreational trails and related facilities for uses such as bicycling and hiking.

### Federal Transportation Improvement Program for the San Luis Obispo County Region

*SLOCOG*

The Federal Transportation Improvement Program (FTIP) is a comprehensive listing of federally funded surface transportation projects in San Luis Obispo County. SLOCOG prepares and adopts the FTIP every two years in close cooperation with stakeholders such as cities and counties. As part of the FTIP, SLOCOG plans for the spending of flexible funding from the federal Surface Transportation Program, which applies to the following types of projects: enhanced transit services, expanding technology, freeway express bus stops, ridesharing, vanpooling, parallel routes along major transportation corridors, and Park-n-Ride lots. SLOCOG selects projects that promote the strategies and policies of the Regional Transportation Plan.

The FTIP also includes the allocation of funding under the state Transportation Development Act (TDA). Each year, SLOCOG disburses approximately $10 million in funding from the TDA toward bicycle and pedestrian infrastructure, traffic calming, and other planning and capital improvement projects in the region.

#### Infrastructure State Revolving Fund Program

*California Infrastructure and Economic Development Bank*

The Infrastructure State Revolving Fund Program provides low-cost financing to public agencies for a wide variety of infrastructure projects. Program funding is available in amounts ranging from $250,000 to $10 million, with loan terms of up to 30 years. Interest rates are set on a monthly basis. Eligible project categories include city streets, county highways, state highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, and power and communications facilities.

### 5.3.3 SOLID WASTE-RELATED FUNDING SOURCES

#### Beverage Container Recycling Grant and Payment Programs

*California Department of Resources Recycling and Recovery (CalRecycle)*

CalRecycle administers funding programs to assist organizations with establishing convenient beverage container recycling and litter abatement projects, and to encourage market development and expansion activities for beverage container materials. The Beverage Container Recycling Grant provides funding to local governments, businesses, individuals, and non-profit organizations for projects that implement new programs or enhance existing programs to provide convenient beverage container recycling opportunities in various locations statewide. Eligible projects include, but are not limited to, the following locations: parks and recreational areas, sporting complexes, community events, office buildings, multifamily dwellings, entertainment/hospitality venues, curbside, restaurants, and schools and colleges. CalRecycle issues up to $1.5 million annually for this program. The City/County Payment Program provides a total of $10.5 million in grant funds annually to eligible cities and counties for beverage container recycling and litter abatement activities. Each city is eligible to receive a minimum of $5,000 or an amount calculated by the Department based on per capita, whichever is greater.

### 5.3.4 OTHER FUNDING SOURCES

#### Community Assistance Grant

*Bureau of Land Management*

Funds are available to assist with hazardous fuels treatments, community wildfire protection planning, and education addressing wildfire safety and hazard risk reduction within the wildland-urban interface. Treatments may be focused on both Federal (with prior approval from local Bureau of Land Management field staff) and non-federal lands and aimed toward protecting communities at risk and resource values identified within a Community Wildfire Protection Plan and/or Community Fire Plans with an interdisciplinary and interagency collaborative process.

### Wildland Urban Interface Grant

*Fish and Wildlife Service*

Wildland Urban Interface funds are available for hazard mitigation projects that protect communities at risk of wildfire by reducing hazardous fuels (non-federal lands), developing Community Wildfire Protection Plans (includes associated planning and compliance documents), and implementing wildfire education and outreach initiatives.

### Partnerships with Other Jurisdictions and Community Organizations

Partnering with neighboring jurisdictions and community organizations is a key implementation strategy supporting the CAP. Various jurisdictions and organizations within the County could serve as potential partners in implementing the CAP strategies. The City should seek to partner with appropriate local governments, as identified within CAP measures.

# CHAPTER 6

## REFERENCES AND PREPARERS

# 6.0 References and Preparers

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This CAP was prepared by Rincon Consultants, Inc. under contract to the APCD and City of Paso Robles. Persons involved in research, analysis, report preparation, project management, and quality control include:

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# GLOSSARY

## OF TERMS

# Glossary of Terms

**Actions:** The steps that will be taken to implement the Climate Action Plan measures.

**Adaptation:** The ability to adjust to, or minimize, the potential impacts of climate change or other environmental disturbances.

**Baseline Emissions:** The amount of GHG emissions released in a designated year against which future changes in emissions levels are measured.

**Business-as-Usual:** A scenario used for the projection of GHG emissions at a future date based on current technologies and regulatory requirements in absence of other reductions.

**California Environmental Quality Act (CEQA):** A statute that requires state and local agencies to evaluate the environmental impacts of private or public proposed projects they undertake or permit and to avoid or mitigate potentially impacts, if feasible. If a proposed action has the potential for a significant environmental impact, an environmental impact report (EIR) must be prepared and certified before action can be taken.

**Carbon Dioxide ($CO_2$):** A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic GHG that affects the Earth's radiative balance. It is the reference gas against which other GHGs are measured and therefore has a Global Warming Potential of 1.

**Carbon Dioxide Equivalent ($CO_2e$):** A metric used to compare the emissions from various greenhouse gases based upon their global warming potential, or potency. Carbon dioxide equivalents are commonly expressed as "metric tons of carbon dioxide equivalents" (MT $CO_2e$). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated global warming potential. For example, the global warming potential for methane is 21. This means that one metric ton of methane is equivalent to 21 metric tons of carbon dioxide.

**Carbon Sequestration:** The process through which agricultural and forestry practices remove carbon dioxide from the atmosphere. The term “carbon sinks” is also used to describe agricultural and forestry lands that absorb carbon dioxide.

**Chlorofluorocarbons (CFCs):** A family of inert, nontoxic, and easily liquefied chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere, they drift into the upper atmosphere, where their chlorine components destroy ozone.

**Climate:** Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is three decades, as defined by the World Meteorological Organization. These quantities

are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

**Climate Action Plan:** A description of the measures and actions that a local government will take to reduce GHG emissions and achieve an emissions reduction target. Most plans include a description of existing and future year emissions; a reduction target; a set of measures, including performance standards, that will collectively achieve the target; and a mechanism to monitor the plan and require amendment if it is not achieving specified levels. Interchangeable with GHG Reduction Plan.

**Climate Change:** Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from: natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun; natural processes within the climate system (e.g. changes in ocean circulation); human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.).

**Co-Benefit:** Additional benefits that occur as a result of GHG reduction measures. These include financial savings, improved air quality, increased health or safety, natural resource conservation, reduced energy use, etc.

**Connectivity:** A well connected circulation system with minimal physical barriers that provides continuous, safe, and convenient travel for all users of streets, roads, and highways.

**Emissions:** The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

**Emissions Factor:** A set of coefficients used to convert data provided on energy use and energy use reductions to emissions. These emission factors are the ratio of emissions of a particular pollutant (e.g., carbon dioxide) to the quantity of the fuel used (e.g., kilograms of coal). For example, when burned, 1 ton of coal = 2.071 tons of $CO_2$.

**Emissions Forecast:** The projected emissions that would occur in a future year based on growth multipliers applied to the baseline year.

**Energy Conservation:** Reducing energy consumption. Energy conservation can be achieved through energy efficiency (getting the most productivity from each unit of energy) or by reduced use of energy such as turning off appliances when not in use.

**Energy Efficiency:** Using less energy to provide the same level of service or complete the same task. For example, a more efficient light will use less electricity to provide the same amount of illumination.

**Fossil Fuel:** A general term for combustible geologic deposits of carbon, including coal, oil, natural gas, oil shale, and tar sands. These fuels emit carbon dioxide into the atmosphere when burned, thus significantly contributing to the enhanced greenhouse effect.

**Fuel Efficiency:** The distance a vehicle can travel on an amount of fuel. This is most often measured in miles traveled per gallon of fuel. A higher-efficiency vehicle travels farther on a gallon of fuel than similar vehicles.

**Global Warming:** Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of GHGs.

**Green Building:** Green, or sustainable, building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.

**Greenhouse Effect:** Trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the Earth's surface. If the atmospheric concentrations of these GHGs rise, the average temperature of the lower atmosphere will gradually increase.

**Greenhouse Gas (GHG):** Any gas that absorbs infrared radiation in the atmosphere. GHGs include, but are not limited to, water vapor, carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone ($O_3$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride ($SF_6$).

**Greenhouse Gas Emissions Inventory:** A GHG emissions inventory provides estimates of the amount of GHGs emitted to and removed from the atmosphere by human activities. A city or county that conducts an inventory looks at both community emission sources as well as emissions from government operations. A base year is chosen and used to gather all data from that year. Inventories include data collection from such things as vehicle miles traveled (VMTs), energy usage from electricity and gas, and waste. Inventories include estimates for carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), sulfur hexafluoride ($SF_6$), hydroflourocarbons (HFCs), and perflourocarbons (PFCs), which are referred to as the "six Kyoto gases."

**Hydrofluorocarbons (HFCs):** Man-made compounds containing hydrogen, fluorine, and carbon, many of which have been developed as alternatives to ozone-depleting substances for industrial, commercial, and consumer products, that have a range of global warming potentials. HFCs do not have the potential to destroy stratospheric ozone, but they are still powerful GHGs.

**Infill Site:** A site in an urbanized area that meets criteria defined in Public Resources Code Section 21061.3.

**Intergovernmental Panel on Climate Change (IPCC):** The IPCC was established jointly by the United Nations Environment Program and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientists as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national GHG emission inventories.

**Kilowatt (kW):** One thousand watts.

**Kilowatt-hour (kWh):** an amount of electricity equivalent to the use of one kilowatt for one hour. A hundred watt light bulb that is on for 10 hours uses one kilowatt-hour of electricity (100 watts x 10 hours = 1,000 watt-hours = 1 kilowatt-hour). Electricity production or consumption is often expressed as kilowatt- or megawatt-hours produced or consumed during a period of time.

**Methane ($CH_4$):** A hydrocarbon that is a GHG with a global warming potential estimated at 21 times that of carbon dioxide ($CO_2$). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

**Measure:** A way to reduce GHG emissions.

**Metric Ton (MT):** Common international measurement for the quantity of GHG emissions. A metric ton is equal to 2,205 pounds or 1.1 short tons.

**Mitigation:** An action to either reduce the amount of GHGs being emitted into the atmosphere or remove previously emitted gases from the atmosphere.

**Mixed-Use:** Mixed Use development means combining a variety of compatible land uses in a single development, and can be creatively used to create vibrant centers for living, working, and shopping. The primary purpose of the Mixed-Use land use designations is to implement the principals of smart growth by applying the designation to certain areas along the City's main transportation corridors that could successfully support a combination of uses (multi-family residential, retail, office uses, etc.) within a single development plan.

**Natural Gas:** Underground deposits of gases consisting of 50 to 90 percent methane and small amounts of heavier gaseous hydrocarbon compounds such as propane and butane.

**Perfluorocarbons (PFCs):** Potent GHGs that accumulate in the atmosphere and remain there for thousands of years. Aluminum production and semiconductor manufacture are the largest known man-made sources of perfluorocarbons.

**Recycling:** Collecting and reprocessing a resource so it can be used again. An example is collecting aluminum cans, melting them down, and using the aluminum to make new cans or other aluminum products.

**Renewable Energy:** Energy generated from sources that are naturally replenished or not used up in the course of providing power (e.g., wind, solar, biomass, and geothermal).

**Retrofit:** The addition of new technology or features to older systems. For example, adding new energy-efficient lamps to existing lighting fixtures.

**Sector:** A term used to describe GHG emission inventory source categories for GHGs based on broad economic sectors.

**Smart Growth:** A compact, efficient, and environmentally sensitive pattern of development that provides people with additional travel, housing, and employment choices by focusing future growth closer to existing and planned job centers and public facilities, while preserving open space and natural resources.

**Solar Photovoltaic (PV):** A system that converts sunlight directly into electricity using cells made of silicon or other conductive materials. When sunlight hits the cells, a chemical reaction occurs, resulting in the release of electricity.

**Source:** Any process or activity that releases a GHG into the atmosphere.

**Target Year:** The year by which the GHG emissions reduction target should be achieved.

**Transportation Demand Management (TDM):** A general term for strategies that increase overall system efficiency by encouraging a shift from single-occupant vehicle trips to non-single-occupant vehicle modes, or shifting auto trips out of peak periods. TDM seeks to facilitate this shift by increasing travel options, by providing incentives and information, or by reducing the physical need to travel through transportation-efficient land uses.

**Vehicle-Miles Traveled (VMT):** One vehicle traveling the distance of one mile. Total vehicle miles is the aggregate mileage traveled by all vehicles. VMT is a key measure of overall street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve air quality goals.

# APPENDIX A

## GHG EMISSIONS INVENTORY

# CITY OF PASO ROBLES

## Community-Wide and Government Operations Greenhouse Gas Emissions Inventory Update

***Prepared for:***

SAN LUIS OBISPO COUNTY AIR POLLUTION CONTROL DISTRICT
ON BEHALF OF THE CITY OF PASO ROBLES

***Prepared by:***

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UPDATED NOVEMBER 2012

## Credits and Acknowledgements

Report prepared by PMC in August 2010 and updated by Rincon Consultants, Inc. in November 2012 for the San Luis Obispo County Air Pollution Control District on behalf of the City of Paso Robles.

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## Executive Summary

A greenhouse gas (GHG) emissions inventory identifies the major sources and quantities of GHG emissions produced by community activities and City government facilities and operations within a jurisdiction"s boundaries for a given year. Estimating GHG emissions enables local governments to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, set targets for future reductions, and create an informed mitigation strategy based on this information.

This Inventory includes a 2005 baseline inventory of GHG emissions from community activities and City government facilities and operations within the city[1], and a 2020 and 2025 business-as-usual forecast of how emissions in Paso Robles would change if no further actions are implemented to reduce those emissions. It is important to note that the City government operations inventory is a subset of the community inventory, meaning that the city government"s emissions are included within the community inventory.

The community inventory is divided into six sectors, or sources of emissions: transportation, residential energy use, commercial and industrial energy use, solid waste, off-road vehicles and equipment, and wastewater. The City government inventory provides a more detailed analysis of emissions resulting from City-owned or -operated buildings, fleet vehicles, and lighting; water and sewage transport; City-generated solid waste; and employee commute travel.

**What are GHG Emissions?**

Gases that trap heat in the earth"s atmosphere are called GHGs. GHGs include carbon dioxide, methane, nitrous oxide, and fluorinated gases. While many of these gases occur naturally in the atmosphere, modern human activity has led to a steep increase in the amount of GHGs released into the atmosphere over the last 100 years. Collectively, these gases intensify the natural greenhouse effect, thus causing global average surface temperatures to rise, which in turn affects global climate patterns. GHGs are often quantified in terms of $CO_2$ equivalent, or $CO_2e$, a unit of measurement that equalizes the potency of GHGs.

Source: Intergovernmental Panel on Climate Change (IPCC), 2007

### GHG EMISSIONS INVENTORY UPDATE

In 2010, PMC prepared an inventory of Paso Robles" 2005 community-wide and City government emissions. Changes to GHG accounting protocols have prompted an update to the

[1] In this report, the term "city" refers to the area inside the jurisdictional boundary of the City of Paso Robles, whereas "City government" refers to those activities which are under the operational control of City agencies.

emissions inventory and in 2012 Rincon Consultants conducted a peer-review and update to the Inventory. This Inventory is the updated assessment of GHG emissions in Paso Robles.

Rincon updated the Inventory methodology, emissions coefficients, and data for consistency with current protocols, including the Local Government Operations Protocol (LGOP) version 1.1 (May 2010), for the city government inventory, and the Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011) and ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009), for the community-wide inventory. Rincon also updated the Inventory to include all emissions sectors within the discretionary action authority of the City. The additions and revisions to the updated Inventory include the following:

- Calculation of emissions from additional off-road vehicle and equipment categories (lawn and garden equipment, construction equipment, industrial equipment, and light commercial equipment) for the community-wide inventory.
- Incorporation of improved emissions factors from the LGOP version 1.1.
- Incorporation of a refined methodology for on-road transportation emissions. The 2012 methodology estimates vehicle miles traveled (VMT) based on an origin-destination approach using the regional travel demand model and excludes vehicle trips that pass through the city. Transportation-related GHG emissions were then calculated using the California Air Resources Board Emissions Factor 2011 (EMFAC2011) software.
- Corrections to baseline electricity and natural gas consumption data, and waste stream profile data.
- Inclusion of updated population and employment projections using the San Luis Obispo Council of Governments‟ (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011).[2]
- Identification of methane emissions from wastewater treatment processes for the community-wide inventory.

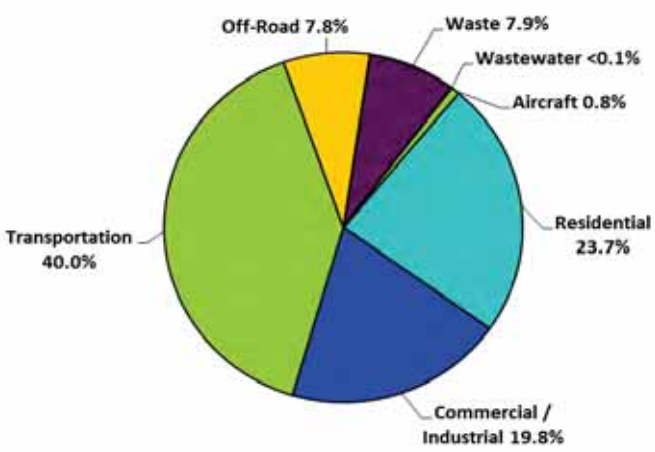
[2] SLOCOG‟s 2040 Population, Housing & Employment Forecast includes population, housing, and employment projections developed based on an analysis of historic growth and economic trends. See *San Luis Obispo County 2040 Population, Housing & Employment Forecast* (August 2011) for details.

As a result of the Inventory update, Paso Robles" community-wide 2005 baseline emissions increased by 14,451 metric tons CO2e and 2020 forecast increased by 4,099 metric tons CO2e compared to the August 2010 inventory.

## COMMUNITY-WIDE GHG INVENTORY RESULTS

The community of Paso Robles emitted approximately 169,557 metric tons of carbon dioxide equivalent ($CO_2e$) emissions in the baseline year 2005. As shown in **Figure ES-1** and **Table ES-1**, the transportation sector was the largest contributor to emissions (40.0%), producing approximately 67,801 metric tons of $CO_2e$ in 2005. Transportation sector emissions are the result of diesel and gasoline fuel used in vehicles traveling on local roads and state highways within the jurisdictional boundaries of Paso Robles. Emissions from electricity and natural gas consumed in the residential sector were the next largest contributor (23.7%), producing approximately 40,188 metric tons of $CO_2e$. Electricity and natural gas consumed in the commercial and industrial sector accounted for a combined 19.8% of the total. Emissions from landfilled solid waste comprised 7.9% of the total. Emissions from off-road vehicles and equipment (7.8%), aircraft (0.8%) and methane emissions from wastewater treatment processes (<0.1%) comprised the remainder of the total.

### FIGURE ES-1: 2005 COMMUNITY GHG EMISSIONS BY SECTOR



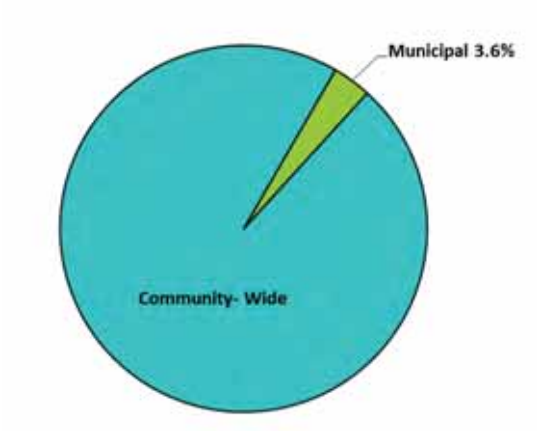

### TABLE ES-1: 2005 COMMUNITY GHG EMISSIONS BY SECTOR

| 2005 Community Emissions by Sector | Residential | Commercial/ Industrial | Transportation | Off-Road | Waste | Waste water | Aircraft | TOTAL |
|---|---|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 40,188 | 33,536 | 67,801 | 13,205 | 13,433 | 70 | 1,324 | 169,557 |
| Percentage of Total $CO_2e$ | 23.7% | 19.8% | 40.0% | 7.8% | 7.9% | 0.0% | 0.8% | 100.0% |

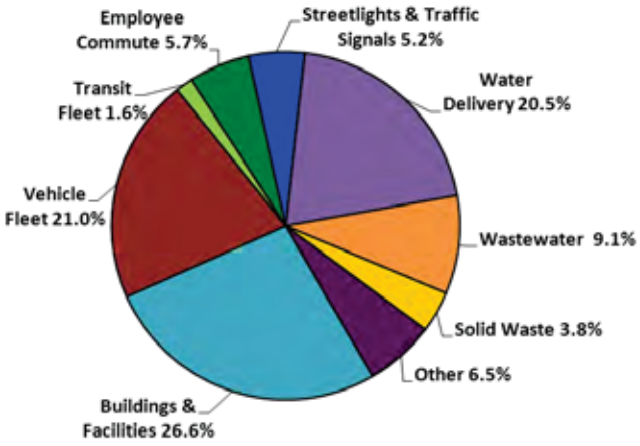
## CITY GOVERNMENT OPERATIONS GHG INVENTORY RESULTS

City government operations and facilities produced approximately 6,022 metric tons $CO_2e$ in 2005. As displayed in **Figure ES-2**, this represents approximately 3.6% of total community-wide emissions in the city. City government emissions result from waste, energy consumption from water and wastewater facilities, buildings, streetlights and other facilities, fuel consumption by the vehicle and transit fleet and employee commutes, water treatment processes, and miscellaneous equipment. The largest contributor (26.6%) was from energy consumption in buildings and facilities. Fuel consumption by the City vehicle fleet was the second largest contributor to the City"s emissions (21.0%), producing 1,264 metric tons $CO_2e$. City government operations emissions are a subset of the total community-wide emissions as outlined above.

### FIGURE ES-2: CITY GOVERNMENT PORTION OF COMMUNITY-WIDE GHG EMISSIONS




### FIGURE ES-3: 2005 CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SECTOR




However, similar to the way in which businesses and factories perform their own facility-scale GHG Inventories, this Inventory analyzes City emissions separately to identify opportunities for cost-savings and emissions-reductions in the future. The methodology for estimating emissions from local government operations is guided specifically by the LGOP version 1.1 (May 2010) developed by the California Air Resources Board, ICLEI – Local Governments for Sustainability, and the California Climate Registry.

## TABLE ES-2: 2005 CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SECTOR

| 2005 Emissions by Sector | Buildings & Facilities | Vehicle Fleet | Transit Fleet | Employee Commute | Streetlights & Traffic Signals | Water Delivery | Wastewater | Solid Waste | Aircraft | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 1,605 | 1,264 | 96 | 342 | 312 | 1,231 | 550 | 231 | 391 | 6,022 |
| Percentage of $CO_2e$ | 26.6% | 21.0% | 1.6% | 5.7% | 5.2% | 20.5% | 9.1% | 3.8% | 6.5% | 100% |

### DATA LIMITATIONS

This Inventory captures the major sources of GHGs caused by activities within the city per standard practice. However, it is important to note that some likely emission sources were not included in the Inventory, either because of privacy laws, lack of data, or a lack of reasonable methodology for calculating emissions. It is estimated that the sources not included in the inventory comprise less than 5.0% of total emissions in the city. It is likely that as GHG inventories become more common, methodology and accessibility to data will improve.

The sources that could not be included due to privacy laws, lack of data availability, and/or a reasonable methodology include the following:

- Refrigerants from City government operations facilities and vehicles, and the community-at-large
- Freight and passenger trains;
- Propane, wind, or solar energy consumed by the community at large; and
- Recreational off-road equipment and vehicles.

These limitations are explained further in this document.

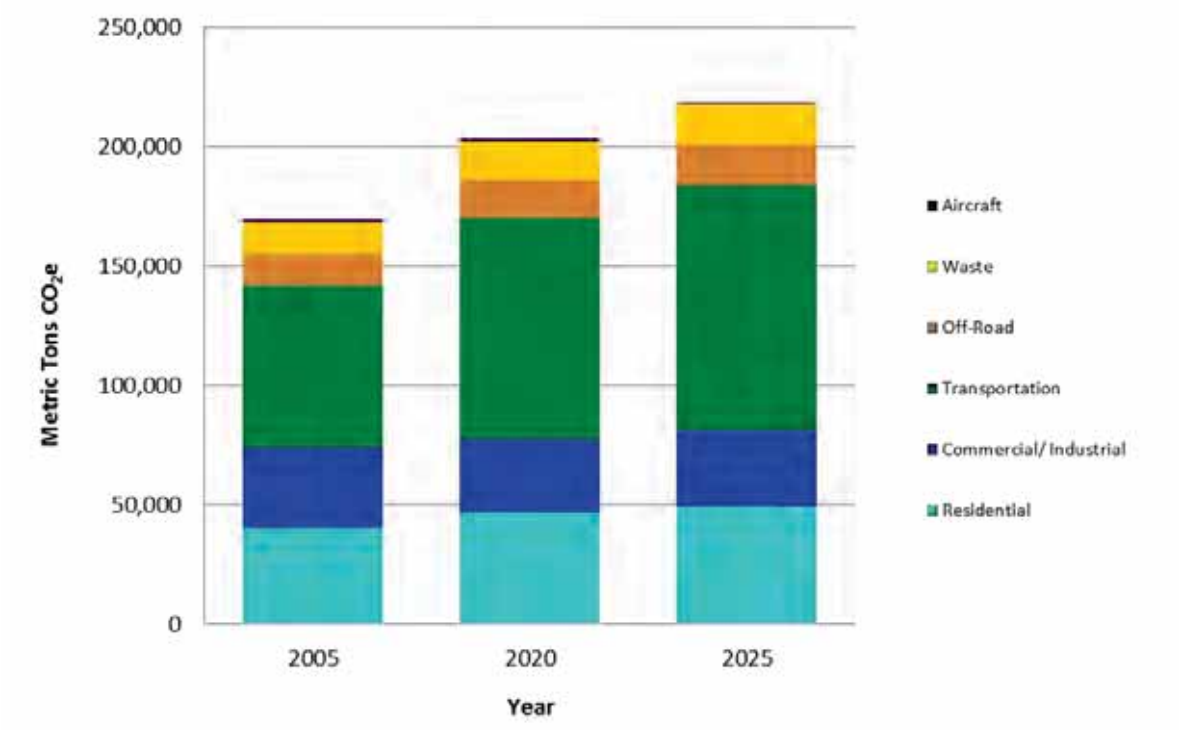
### BUSINESS-AS-USUAL FORECAST

The GHG emissions forecast provides a “business-as-usual estimate,” or scenario, of how emissions will change in the year 2020 and 2025 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain

consistency with AB 32, while the year 2025 is consistent with the General Plan planning horizon.

As shown in **Figure ES-4** and **Figure ES-5,** if consumption trends continue the pattern observed in 2005 (i.e., under business-as-usual conditions), emissions will reach 203,448 metric tons of $CO_2e$ by 2020, or a 20.0% increase over 2005 baseline levels (projections based on population and employment growth). By 2025, emissions will reach 219,129 metric tons of $CO_2e$, or a 29.2% increase over 2005 baseline levels.

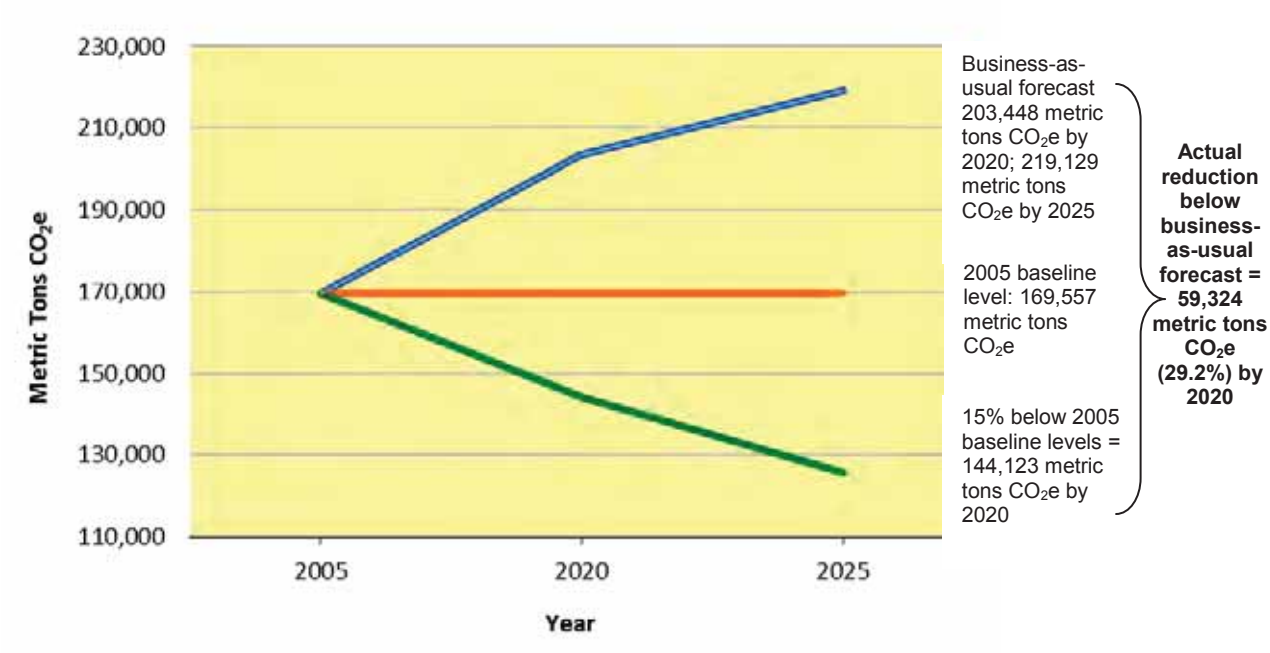
## FIGURE ES-4: 2020 AND 2025 CITY OF PASO ROBLES BUSINESS-AS-USUAL GHG EMISSIONS FORECAST




With this information, the City can make an informed determination regarding a reduction target. Conformance with the State of California"s recommended reduction of 15% below present levels by 2020 would require a 29.5% reduction below the city"s business-as-usual emissions. (refer to **Figure ES-5**).[3]

[3] AB 32 Scoping Plan, page 27, states that the California Air Resources Board encourages local governments to "move toward establishing similar goals for community emissions that parallel the State

## FIGURE ES-5: BUSINESS-AS-USUAL FORECAST IN RELATION TO STATE-RECOMMENDED REDUCTION TARGET




commitment to reduce GHG emissions by approximately 15 percent from current levels by 2020." http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm

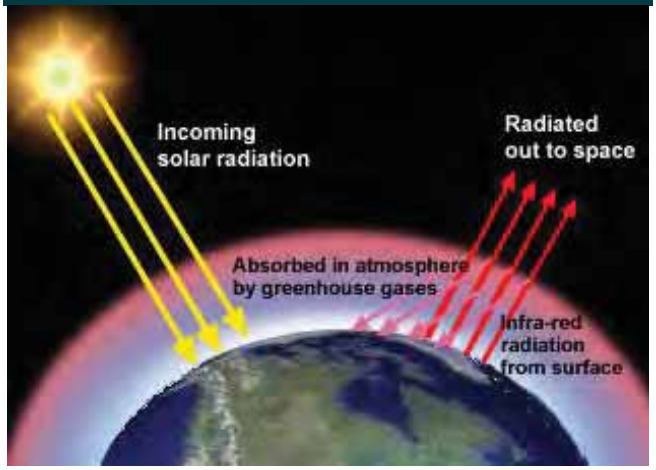
# 1. Introduction

This section introduces the Inventory, defines key terms used throughout the Inventory, and provides an overview of climate change science and regulation in California.

## 1.1 PURPOSE OF A GHG INVENTORY

This Inventory represents completion of the first step in the City's climate protection process. Quantifying recent-year emissions is essential to establish: (1) a baseline against which to measure future emission levels, and (2) an understanding of where the highest percentages of emissions are coming from and therefore the greatest opportunities for emissions reductions. This Inventory presents estimates of GHG emissions in 2005 resulting from the community as a whole.

FIGURE 1-1:
THE GREENHOUSE GAS EFFECT




Source: Tufts University

### *Climate Change – Scientific Background*

Scientific consensus holds that the world's population is releasing GHGs faster than the earth's natural systems can absorb them. These gases are released as byproducts of fossil fuel combustion, waste disposal, energy use, land-use changes, and other human activities. This release of gases, such as carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$), creates a blanket around the earth that allows light to pass through but traps heat at the surface preventing its escape into space (**Figure 1-1**). Known as the greenhouse effect, models show that this phenomenon could lead to a $2^oF$ to $10^oF$ temperature increase over the next 100 years. The Intergovernmental Panel on Climate Change (IPCC) warns that most of the warming observed over the last 50 years is attributable to human activities.[4]

Although used interchangeably, there is a difference between the terms “climate change” and “global warming.” According to the State, climate change refers to “any long-term change in

[4] Intergovernmental Panel on Climate Change. Fourth Assessment Report, Working Group I. 2007. Climate Change 2007: The Physical Science Basis, Summary for Policy Makers.

average climate conditions in a place or region, whether due to natural causes or as a result of human activity."[5] Global warming, on the other hand, is an average increase in the temperature of the atmosphere caused by increased GHG emissions from human activities.[6] The use of the term climate change is becoming more prevalent because it encompasses all changes to the climate, not just temperature. Additionally, the term climate change conveys temporality, implying that climate change can be slowed with the efforts of local, regional, state, national, and world entities.

Changes in the earth"s temperature will have impacts for residents and businesses in the City of Paso Robles. Some of the major impacts to the Central Coast expected to occur include the following, separated by sector.[7, 8]

- Coastline: The San Luis Obispo County coastline could face inundation as a result of sea level rise and global warming. As temperatures rise, the ocean waters rise as well due to thermal expansion and the melting of glaciers and snowpack. The state"s 2009 Climate Change Impacts Assessment (the 2009 Scenarios Project) estimates that sea levels will rise by 12 to 18 inches by 2050 and 21 to 55 inches by 2100. This level of sea rise has the potential to negatively affect groundwater salination as well as the size and attractiveness of local beaches, which could affect property values and the tourism industry in the county.

- Reduced Water Supply: The 2009 Scenarios Project estimates a decrease in precipitation of 12 to 35% by 2050. In addition, more precipitation will fall as rain rather than snow, which will cause snow to melt earlier in the year and not in the warmer, drier months when water is in higher demand.

- Agriculture: Climate change could cause a shift in the type and location of agriculture in the area. As saltwater intrudes into coastal aquifers and groundwater resources decrease, it is possible that some crops will be forced out of the area, which affects the

[5] California Natural Resources Agency. 2009 California Climate Adaptation Strategy Discussion Draft. August 2009.

[6] U.S. Environmental Protection Agency, Climate Change website. http://www.epa.gov/climatechange/, accessed August 5, 2009.

[7] California Climate Change Center. Our Changing Climate: Assessing the Risks to California (2006), www.climatechange.ca.gov.

[8] Governor"s Office of Planning and Research (OPR). Proposed CEQA Guideline Amendments for Greenhouse Gas Emissions. April 2009.

local economy and food supply. Water supplies to agriculture may be 20 to 23% below demand targets between 2020 and 2050.

- Public Health: Climate change could potentially threaten the health of residents of Paso Robles. Heat waves are expected to have a major impact on public health. There is also expected to be an increase in allergenic plant pollen and an increase in the frequency of wildfires. Although one city cannot resolve the issue of climate change, local governments can make a positive impact through cumulative local action. Cities and counties have the ability to reduce GHG emissions through effective land use and transportation planning, wise waste management, and the efficient use of energy. The City can achieve multiple benefits including lower energy bills, improved air quality, economic development, reduced emissions, and better quality of life through:

- Energy efficiency in City facilities and vehicle fleet;

- Sustainable purchasing and waste reduction efforts;

- Land use and transportation planning; and

- Efficient management of water resources.

This Inventory serves as a baseline measurement for implementing and tracking the effectiveness of these efforts.

## 1.2 CLIMATE CHANGE – LEGISLATIVE BACKGROUND

California continues to be a leader in addressing climate change in the United States and in the world. In June of 2005, Governor Schwarzenegger issued a landmark Executive Order establishing progressive GHG emissions targets for the entire state. Executive Order (EO) S-3-05 establishes the following goals:

- By 2010, reduce GHG emissions to 2000 levels;

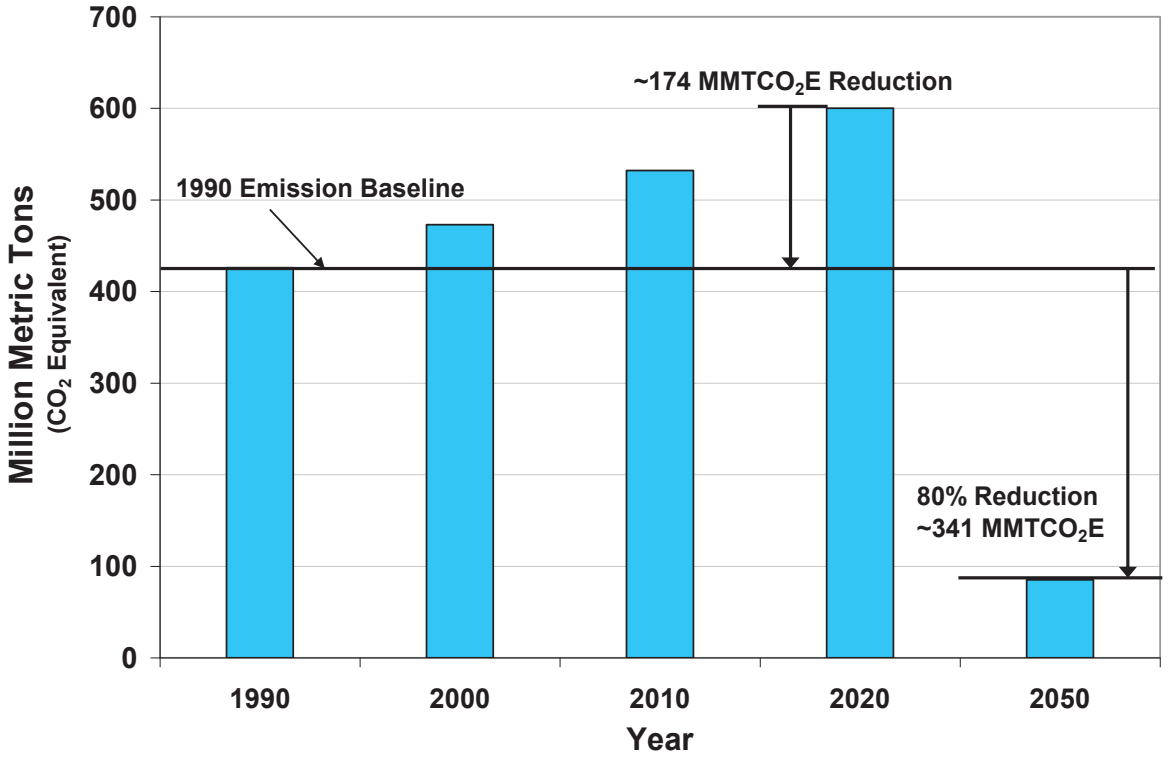
- By 2020, reduce GHG emissions to 1990 levels;

- By 2050, reduce GHG emissions to 80% below 1990 levels.

To support these reduction targets, the California legislature adopted the California Global Warming Solutions Act of 2006, also known as Assembly Bill (AB) 32. The law requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce GHG emissions to 1990 levels by 2020 as shown in **Figure 1-2** below. To achieve this

goal, CARB developed a set of early action measures in 2007 for priority implementation in 2010. These early action measures became part of the AB 32 implementation plan, or Scoping Plan, approved in December 2008. The Scoping Plan identifies a variety of GHG reduction activities including direct regulations, monetary and non-monetary incentives, voluntary actions, market-based mechanisms such as a cap-and-trade, and an implementation fee regulation to fund the program. The Scoping Plan also identifies local governments as "essential partners" and calls for cities and counties to adopt GHG reduction targets consistent with AB 32.

## FIGURE 1-2: CALIFORNIA CLIMATE CHANGE GHG EMISSIONS AND TARGETS




In support of the AB 32 reduction targets, California adopted Senate Bill (SB) 97 in August 2007, which formally acknowledges that climate change is an important environmental issue that requires analysis under the California Environmental Quality Act (CEQA). In response to SB 97, the Governor‟s Office of Planning and Research (OPR) submitted their proposed amendments to the CEQA Guidelines for GHG emissions in April 2009. The amendments provide guidance to public agencies regarding the analysis of mitigation and the effects of GHG

emissions in CEQA documents. The Natural Resources Agency certified and adopted the amendments in December 2009.[9]

At the same time, the State is working to form regional approaches to reducing GHG emissions in response to the passage of Senate Bill 375. SB 375 aims to reduce GHG emissions by linking transportation funding to land use planning. It also requires Metropolitan Planning Organizations, including the San Luis Obispo Council of Governments, to include a Sustainable Communities Strategy (SCS) in their Regional Transportation Plans (RTPs) for reducing suburban sprawl. The bill also creates incentives for implementation of sustainable communities strategies and sustainable transportation plans.

Additional efforts are under way for the overall transportation sector by mandating fewer emissions from vehicles, including Assembly Bill 1493 signed into law in 2002, which will require carmakers to reduce emissions from new passenger cars and light trucks beginning in 2009. The U.S. Environmental Protection Agency (EPA) approved the new emissions standards in June 2009.

The State is also preparing for climate change resiliency in order to adapt to the inevitable effects of climate change. In November 2008, Governor Schwarzenegger signed Executive Order S-13-08 which asked the Natural Resources Agency to identify how state agencies can respond to rising temperature, changing precipitation patterns, sea level rise, and extreme natural events. The order requires the Natural Resources Agency to develop a Climate Adaptation Strategy (CAS) to analyze climate change impacts to the state and recommend strategies to manage those threats. The Natural Resources Agency released a discussion draft of the CAS in August 2009.

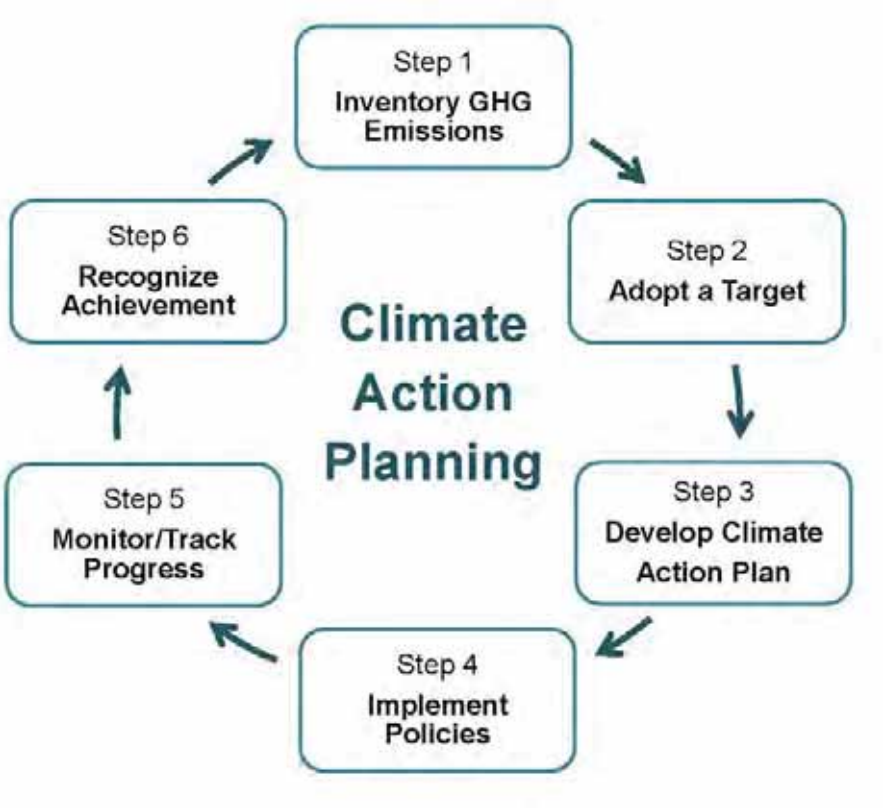
## 1.3 PLANNING PROCESS

The California Air Resources Board provides a framework for local communities to identify and reduce GHG emissions, organized along six steps as represented in **Figure 1-3** below.[10]

[9] Governor"s Office of Planning and Research (OPR). Proposed CEQA Guideline Amendments for Greenhouse Gas Emissions. April 2009.

[10] California Air Resources Board. Local Government Toolkit, http://www.coolcalifornia.org/local-government

## FIGURE 1-3: CLIMATE ACTION PLANNING PROCESS




This report represents the completion of the first step and provides a foundation for future work to reduce GHG emissions in the City of Paso Robles.

### 1.4 LOCAL SUSTAINABILITY AND CLIMATE CHANGE MITIGATION ACTIVITIES

Many of the air pollution programs already in place throughout San Luis Obispo County reduce ozone-forming pollutants and toxic emissions, but they also have ancillary benefits and reduce GHG emissions. The County, cities, and the Air Pollution Control District (APCD) implement rules and regulations, clean fuels programs, CEQA mitigation measures, grants, the Transportation Choices Program, pollution prevention activities, energy efficiency and conservation measures, water conservation programs, partnerships, and general public outreach that directly or indirectly address climate change and reduce GHG emissions.

The APCD Board approved the first report or plan to address climate change in the county. The plan, Options for Addressing Climate Change in San Luis Obispo County (2005), identifies the

following seven actions that could be implemented to specifically address GHGs (GHG) at the local level:

1) Prepare a countywide inventory of GHG emissions;

2) Target a percentage of mitigation grant funds for GHG emission reductions;

3) Evaluate and quantify the GHG reduction benefits from existing district programs;

4) Develop public education and outreach campaigns on climate change;

5) Encourage and provide support for local governments to join the Cities for Climate Protection program;

6) Develop partnership with Cal Poly for addressing climate change; and

7) Join the California Climate Registry and encourage local industry participation.

As of November 2008, the APCD has initiated, promoted, or supported all of the implementation actions to address climate change and reduction of GHG emissions in the county. The APCD joined the California Climate Registry and conducted its GHG emissions inventory in the fall of 2008. The APCD facilitates regular meetings of Climate Change Stakeholders, a local group of city and county representatives that shares resources to address climate change. To encourage and support local GHG emissions inventories, the APCD is providing technical assistance to all of the incorporated cities to assist or perform GHG government operations and community-wide emissions inventories, similar to this Inventory, for all of the incorporated cities in San Luis Obispo County.

The APCD also coordinates the Central Coast Clean Cities Coalition (C5). C5 is a partnership of public/private entities whose goal is to promote the use of alternative fuels vehicles (AFV) on the Central Coast. By working with area fleet operators, C5 sponsors training seminars, public events, and grant funding workshops related to use of alternative fuels.

The City of Paso Robles has been pursuing energy efficiencies through such measures as:

- Adoption of a Mixed-Use Ordinance (2005) encouraging infill and mixed-use development on the west side of Paso Robles;

- Preparation of several specific plans based on traditional neighborhood development and New Urbanist principles, including form-based codes for the Uptown/Town Center and Olsen Ranch/Beechwood area (ongoing);

- Adoption of a Traffic Calming Program (2004) to protect local streets from traffic congestion by maintaining traffic flow on arterials and design measures to reduce speeds and increase safety on local streets;
- Update of the City Circulation Element (ongoing) to include requirement for facilitating multi-modal transportation;
- Update of the Bicycle Master Plan (ongoing) to encourage bike riding for commuting, school students, and local recreation;
- Development of Gateway Design Standards (2008) supporting community separators;
- Creation of the Paso Robles Purple Belt Program (2009) to retain the rural, open space and agricultural areas surrounding the city;
- Use of Energy Efficiency and Conservation Block Grants (EECBG) funds to retrofit City-owned streetlights and City Hall/Library exterior lights, and to install new energy-efficient fixtures in the council chamber (ongoing);
- Preparation of a Low Impact Development Code (ongoing) to facilitate aquifer recharge and increase water quality through nontraditional methods;
- Development of a Landscape Water Conservation Ordinance (ongoing) to reduce water consumption; and
- Partnerships with the SLO Green Build Organization and U.S. Green Building Council (USGBC) to encourage energy efficiency in new construction.

## 1.5 GHG EMISSIONS INVENTORY UPDATE

In 2010, PMC prepared an inventory of Paso Robles‟ 2005 community-wide and City government emissions. Changes to GHG accounting protocols have prompted an update to the emissions inventory and in 2012 Rincon Consultants conducted a peer-review and update to the Inventory. This Inventory is the updated assessment of GHG emissions in Paso Robles.

Rincon updated the Inventory methodology, emissions coefficients, and data for consistency with current protocols, including the LGOP version 1.1 (May 2010), for the city government inventory, and the Association of Environmental Professionals (AEP) California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011) and ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009), for the community-wide inventory. Rincon also updated the Inventory to include all emissions sectors

within the discretionary action authority of the City. The primary additions and revisions to the updated Inventory include the following:

- Calculation of emissions from additional off-road vehicle and equipment categories (lawn and garden equipment, construction equipment, industrial equipment, and light commercial equipment) for the community-wide inventory.
- Incorporation of improved emissions factors from the LGOP version 1.1.
- Incorporation of a refined methodology for on-road transportation emissions. The 2012 methodology estimates vehicle miles traveled (VMT) based on an origin-destination approach using the regional travel demand model and excludes vehicle trips that pass through the city. Transportation-related GHG emissions were then calculated using the California Air Resources Board Emissions Factor 2011 (EMFAC2011) software.
- Corrections to baseline electricity and natural gas consumption data, and waste stream profile data.
- Inclusion of updated population and employment projections using the San Luis Obispo Council of Governments‟ (SLOCOG) 2040 Population, Housing & Employment Forecast (August 2011).
- Identification of methane emissions from wastewater treatment processes for the community-wide inventory

As a result of the Inventory update, Paso Robles‟ community-wide 2005 baseline emissions increased by 20,619 metric tons $CO_2e$ and 2020 forecast increased by 12,637 metric tons $CO_2e$ compared to the August 2010 inventory.

## 2. Community and Government Operations Inventory Methodology

The first step toward reducing GHG emissions is to identify baseline levels and sources of emissions in the city. This information can later inform the selection of a reduction target and possible reduction measures to be included in a climate action plan.

This section outlines the methodology used to calculate the community and City government operations[11] inventories, including the difference between the two inventories, and the data

[11] In this report, the term "city" refers to the incorporated area (the jurisdictional boundary of the City of Paso Robles), whereas "City" refers to those activities that are under the operational control of City

collection process, data sources, GHG emission scopes, data limitations, and means of calculation.

## 2.1 BASELINE AND FORECAST YEARS

The year 2005 was selected as the baseline year for the Inventory due to the availability of reliable data and consistency with other cities in San Luis Obispo County. The State of California uses 1990 as a reference year to remain consistent with the Kyoto Protocol and also because it has well-kept records of transportation trends and energy consumption in that year. However, cities and counties throughout California typically elect to use 2005 or 2006 as a baseline year because of the more reliable recordkeeping from those years and because of the large amount of growth that has occurred since 1990.

This Inventory uses a forecast year of 2020 to be consistent with the State of California GHG Inventory[12] forecast year and AB 32 target, both of which reference 2020. In addition, it is likely that any forecast considerably beyond 2020 would have a significant margin of error because of unknown population growth rates and new technology. The business-as-usual forecast has also been extended to 2025 in consideration of the City"s General Plan Horizon.

## 2.2 THE TWO INVENTORIES: COMMUNITY-WIDE AND CITY GOVERNMENT OPERATIONS

This Inventory is separated into two sections, community-wide and City government operations. It is important to note that the City government operations inventory is a subset of the community inventory, meaning that all City government operations are included in the commercial/industrial, transportation, waste, or "other" categories of the community-wide inventory. The City"s government operations inventory should not be added to the community analysis; rather it should be looked at as a slice of the complete picture as illustrated in **Figure 2-1**. Although City operations are a small contributor to the community"s overall emissions levels, an inventory allows the City to track its individual facilities and vehicles and to evaluate the effectiveness of its emissions reduction efforts at a more detailed level.

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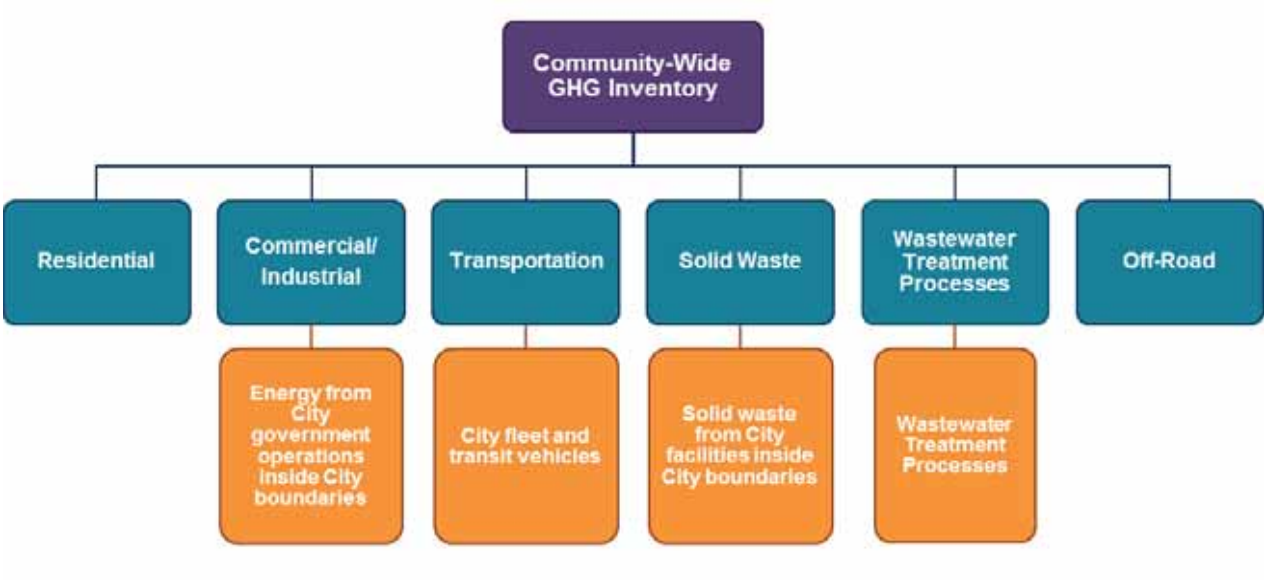
agencies. "Community-wide" or "community" refers to all activities within the city (as defined above), including those from businesses, industrial processes, residents, vehicles, and City government operations.

[12] California Greenhouse Gas Inventory, http://www.arb.ca.gov/cc/inventory/inventory.htm.

FIGURE 2-1: THE RELATIONSHIP BETWEEN COMMUNITY-WIDE AND CITY GOVERNMENT INVENTORIES




Once completed, these inventories provide the basis for policy development, the quantification of emissions reductions associated with proposed measures, the creation of an emissions forecast, and the establishment of an informed emissions reduction target.

## 2.3 DATA COLLECTION AND METHODOLOGY

Creating the community and City government operations emissions inventories required the collection of information from a variety of sources. Sources for community data included the Pacific Gas and Electric Company (PG&E), the Southern California Gas Company, Caltrans, and the California Integrated Waste Management Board. City government operations data sources included PG&E, the Southern California Gas Company, the Paso Robles Municipal Airport and Landfill, and documentation from multiple City departments including Planning, Public Works, Fleet Maintenance, Accounts Receivable, and more. Data from the year 2005 were used in both inventories, with the following exceptions:

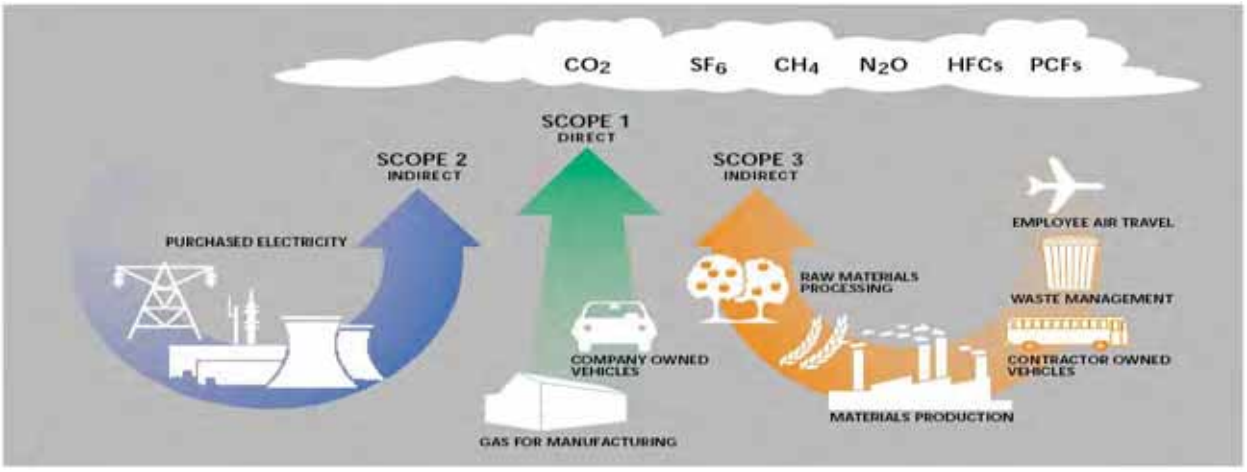
- A subset of waste data by type was not available for 2005; therefore this study utilizes a California statewide waste characterization study conducted in 2003–2004;
- City employee commuting trips were calculated using an employee survey conducted in 2009;

- Complete City vehicle fleet data was not available for 2005; therefore this study utilized 2008, the first full calendar year for which data was available;
- Aircraft emissions were calculated using a 2008 report prepared by the Air Pollution Control Board; and
- Propane, wind, and solar power used in the community.

For community activities and City operations, emissions sources are categorized by scope. Scopes help us identify where emissions originate from and what entity retains regulatory control and the ability to implement efficiency measures. The scopes are illustrated in **Figure 2-2** and defined as follows:

- **Scope 1.** Direct emissions sources located within the community, mostly from the combustion of fuels. Examples of Scope 1 sources include use of fuels such as gasoline and natural gas.
- **Scope 2.** Indirect emissions that result because of activities within the community, limited to electricity, district heating, steam, and cooling consumption. An example of a Scope 2 source is purchased electricity used within the community. These emissions should be included in the community-wide analysis, as they are the result of the community's electricity consumption.
- **Scope 3.** All other indirect emissions that occur as a result of activity within the community. Examples of Scope 3 emissions include methane emissions from solid waste generated within the community which decomposes at landfills either inside or outside of the community.

## FIGURE 2-2: GHG EMISSION SCOPES




Source: NZBCSD (2002), The Challenge of GHG Emissions: the "why" and "how" of accounting and reporting for GHG emissions: An Industry Guide, New Zealand Business Council for Sustainable Development, Auckland

**Appendices A** and **B** of this report separate the community and City government operations emissions by scope. Each sector is labeled with a 1, 2, or 3 that corresponds to the scopes above.

### 2.4 DATA SOURCES

The data used to complete this Inventory came from multiple sources, as summarized in **Tables 2-1** and **2-2**. Utility providers supplied electricity and natural gas consumption data associated with commercial, industrial, residential, and City government buildings in 2005. Vehicle miles traveled (VMT) information was provided by Fehr and Peers and calculated using SLOCOG's Regional Travel Demand model. These data sources are further explained in the sector-specific discussions of this document.

## TABLE 2-1: 2005 DATA SOURCES FOR COMMUNITY ANALYSIS

| Sector | Information | Unit of Measurement | Data Source |
|---|---|---|---|
| Residential | Electricity consumption | kWh | PG&E |
| | Natural gas consumption | Therms | Southern California Gas Company |
| Commercial/Industrial | Electricity consumption | kWh | PG&E |
| | Natural gas consumption | Therms | Southern California Gas |
| Transportation | VMT excluding pass through trips | Average Weekday Daily VMT | Fehr & Peers |
| Solid Waste | Solid waste tonnage sent to landfill from activities in City of Paso Robles | Short tons | San Luis Obispo Integrated Waste Management Board |
| Wastewater Treatment Facilities | Methane and nitrous oxide released in the wastewater treatment process | Tons | Paso Robles Wastewater Treatment Plant Manager |
| Off-Road Vehicles and Equipment | Emissions from off-road equipment | Tons/year of $N_2O$, $CO_2$, and $CH_4$ | California Air Resources Board OFFROAD2007 model |
| Aircraft | Emissions from aircraft takeoffs and landings, calculated as part of a separate analysis | Tons $CO_2$, $N_2O$, and $CH_4$ | Air Pollution Control Board |

TABLE 2-2: 2005 DATA SOURCES FOR CITY GOVERNMENT OPERATIONS ANALYSIS

| Sector | Information | Unit of Measurement | Data Source |
|---|---|---|---|
| Buildings & Facilities | Electricity consumption | kWh | PG&E |
| | Natural gas consumption | Therms | Southern California Gas Company |
| Vehicle Fleet | Diesel consumption and corresponding vehicle type | Gallons | Vehicle Aging Report<br>Fuel Use Report |
| | Gasoline consumption and corresponding vehicle type | Gallons | Vehicle Aging Report<br>Fuel Use Report |
| Employee Commute | Sample of employee commuting patterns | Annual VMT | Commuter Survey (June 2009) |
| Streetlights | Electricity consumption | kWh | PG&E |
| Water/Sewage | Electricity consumption | kWh | Billing Records |
| | Methane and nitrous oxide released in the wastewater treatment process | Tons | Paso Robles Wastewater Treatment Plant Manager |
| Waste | Annual waste tonnage sent to landfill | Tons | Paso Robles Waste Disposal |
| Other – Misc. equipment | Fuel consumption of various types of equipment | Gallons | Billing Records |

## 2.5 DATA LIMITATIONS

It is important to note that calculating community-wide GHG emissions with precision is a complicated task. The ICLEI Clean Air and Climate Protection (CACP) software relies on numerous assumptions and is limited by the quantity and quality of available data. Because of these limitations, it is useful to think of any specific number generated by the model as an approximation of reality, rather than an exact value. The city"s actual 2005 GHG emissions are likely to be *slightly* greater than what are reported in this document due to three main factors: (1) data limitations, (2) privacy laws, and (3) a lack of a reasonable methodology to collect or model

emissions data. The following paragraphs highlight emissions that cannot be included in a GHG Inventory under current science and policy direction or due to lack of reliable data.

### *Data Limitations*

Lack of available data prevented the calculation of emissions from community-wide freight and passenger trains, propane use, and City government operations refrigerants. For rail and port, as well as equipment emissions, the California Air Resources Board OFFROAD 2007 software provides emissions data; however, these numbers are aggregated for the entire San Luis Obispo County area, including incorporated, unincorporated, and state or federally owned land.

Lack of data availability also prevents the calculation of emissions from propane (liquefied petroleum gas, or LPG) created within the city"s boundaries. Propane is basically an unregulated fuel in California (except for storage and safety issues, which are regulated). Because it is an unregulated commodity, no data is collected by the state on propane sales or usage. Another sector that was excluded from the inventory is City government operations refrigerants.

The City of Paso Robles made a best effort to gather data on the amount of refrigerants consumed by fleet vehicles, HVAC systems, and City government operations facilities; however City records were not suited to this purpose. It is recommended that the City look into amending its record-keeping so that the amount of refrigerants purchased and consumed within a year is recorded.

### *Privacy Laws*

This Inventory does not separately analyze site-level emissions from specific sources such as refineries or large industrial emitters. The emissions from industrial energy consumption and related transportation are included under the commercial/industrial category, but will not be analyzed independently as part of this Inventory for two reasons:

1) State privacy laws prevent us from obtaining site-level energy consumption data from utility providers. Notably the California Public Utilities Commission 15/15 rule[13] prevents us from analyzing industrial emissions separately from commercial emissions.

2) It is the responsibility of the emitter, whether it is a large refinery or household, to perform their own energy audit and subsequent reduction process. Efforts to require site-

[13] Commercial and Industrial Electricity and Natural Gas were combined into one section due to the California 15/15 rule. The 15/15 rule was adopted by the California Public Utilities Commission in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality.

level energy audits and GHG emissions reporting are being continually expanded and required by the California Climate Action Registry, U.S. Environmental Protection Agency, and California Air Resources Board.

*Lack of a Reasonable Methodology*

There is a lack of reasonable methodology for estimating life cycle emissions for the community. Life cycle emissions are emissions associated with the production and disposal of items consumed by a community. For instance, a life cycle assessment would estimate the emissions associated with the planning, production, delivery, and disposal of each car currently in the city. In contrast, this analysis only captures how much that car drives within the city.

Despite these limitations, the Clean Air and Climate Protection (CACP) software 2009[14] and ICLEI methodology provide the best-available snapshot of the city's GHG emissions. Additionally, the CACP tool is utilized to promote consistency among municipalities throughout the country and the world. Sector-specific data limitations or methodological issues are explained thoroughly in **Appendices C** and **D.**

However, it is important to note that the emissions identified in this report are primarily GHGs that the community has directly caused and has the ability to reduce through implementation of conservation actions, a Climate Action Plan, or corresponding efforts.

## 2.6 CLEAN AIR AND CLIMATE PROTECTION SOFTWARE 2009

The City government operations and community-wide inventories use the Clean Air and Climate Protection 2009 (CACP) software package developed by ICLEI in partnership with the National Association of Clean Air Agencies (NACAA) and Torrie Smith Associates. This software calculates emissions resulting from energy consumption, vehicle miles traveled, and waste generation. The CACP software calculates emissions using specific factors (or coefficients) according to the type of fuel used.

CACP aggregates and reports the three main GHG emissions ($CO_2$, $CH_4$, and $N_2O$) and converts them to equivalent carbon dioxide units, or $CO_2e$. Equalizing the three main GHG emissions as $CO_2e$ allows for the consideration of different GHGs in comparable terms. For example, methane ($CH_4$) is 21 times more powerful than carbon dioxide on a per weight basis in

[14] The Clean Air and Climate Protection (CACP) software 2009 was developed by the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (SAPPA/ALAPCO), the International Council for Local Environmental Issues (ICLEI), and Torrie Smith Associates.

its capacity to trap heat, so the CACP software converts one metric ton of methane emissions to 21 metric tons of carbon dioxide equivalents.[15]

The emissions coefficients and quantification method employed by the CACP software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary GHG Reporting Guidelines (EIA form 1605).

[15] The potency of a given gas in heating the atmosphere is defined as its Global Warming Potential, or GWP. For more information on GWP, see IPCC Fourth Assessment Report, Working Group I, Chapter 2, Section 2.10.

# 3. Community GHG Inventory Results

The City of Paso Robles contains primarily residential, commercial, and industrial land uses. In the 2005 baseline year, there were approximately 27,580 people, 14,270 jobs, and 10,640 households in the city.[16] The following section provides an overview of the emissions caused by activities within the City's jurisdictional boundary and analyzes the emissions.

## 3.1 COMMUNITY-WIDE EMISSIONS BY SCOPE

Although there are countless items that can be included in a community-wide emissions inventory, as discussed in Chapter 2, this Inventory includes Scope 1, Scope 2, and Scope 3 sources from the following sectors, consistent with the ICLEI protocol:

- Residential
- Commercial/Industrial
- Transportation
- Waste
- Wastewater
- Off-Road Vehicles and Equipment
- Aircraft Emissions

**What are Scopes?**

The key principles to remember are that Scope 1 emissions are caused by activities within the city and emitted within the city (fuel combustion), while Scope 2 emissions are caused by activities within the city, but most likely are emitted outside of the city (electricity). Scope 3 emissions are indirect emissions, such as waste decomposition.

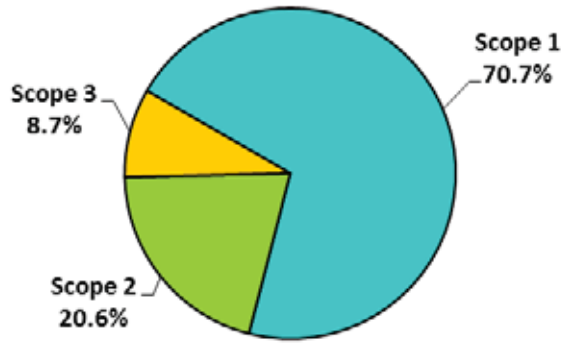
**Table 3-1** summarizes the scopes of each sector in this analysis.

[16] Baseline population, household, and job data for the year 2005 was obtained from SLOCOG's Long Range Socio-Economic Projections (Year 2030), prepared by Economics Research Associates (July 2006 Revision).

## TABLE 3-1: 2005 GHG EMISSION SOURCES INCLUDED IN COMMUNITY INVENTORY BY SCOPE AND SECTOR

| Sector | Scope 1 | Scope 2 | Scope 3 |
|---|---|---|---|
| Residential | Natural Gas | Electricity | --- |
| Commercial/Industrial | Natural Gas | Electricity | --- |
| Transportation | Gasoline & Diesel | --- | --- |
| Waste | --- | --- | Methane from Decomposition |
| Wastewater | Methane from Wastewater Treatment Processes | --- | --- |
| Off-Road | Gasoline, Diesel and Compressed Natural Gas | | |
| Aircraft | --- | --- | Aircraft Emissions |

## FIGURE 3-1: 2005 COMMUNITY GHG EMISSIONS BY SCOPE




Including all sectors and scopes, the community emitted approximately 169,557 metric tons of $CO_2e$ in 2005. As shown in **Figure 3-1** and **Table 3-2,** the majority of community GHG emissions were Scope 1 (70.7%), with Scope 2 (20.6%) and Scope 3 (8.7%) constituting the remainder.

The largest portion of Scope 1 emissions came from the transportation sector (refer to **Table 3-2** and **Figure 3-1**). These emissions qualify as Scope 1 because they involve the direct combustion of fuel within the jurisdictional boundary of the city. The second largest source of Scope 1 emissions was residential natural gas use. Commercial/Industrial uses generated the largest percentage of Scope 2 emissions. Emissions from waste operations account for the majority of Scope 3 emissions, with aircraft emissions contributing a minor portion.

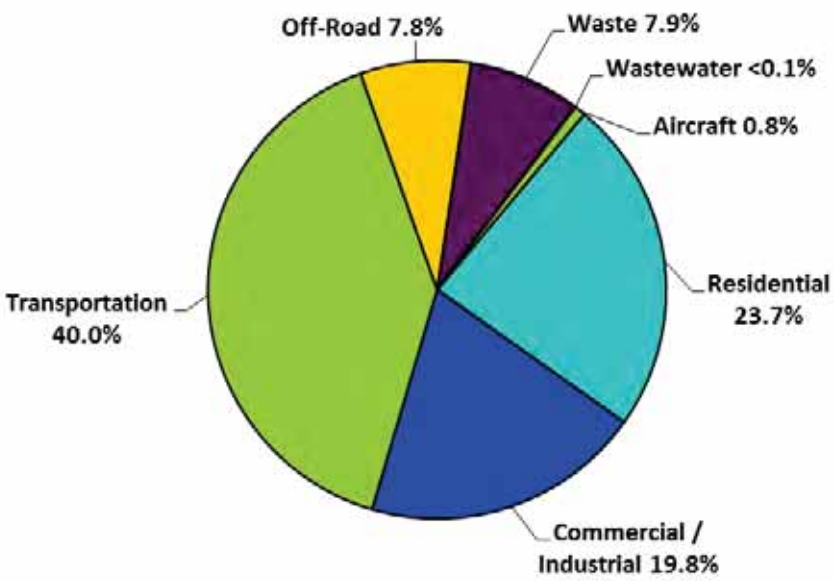
TABLE 3-2: COMMUNITY GHG EMISSION PER SECTOR PER SCOPE

| Sector | Scope 1 | Scope 2 | Scope 3 | Total |
|---|---|---|---|---|
| Residential | 25,037 | 15,151 | | 40,188 |
| Commercial/Industrial | 13,752 | 19,784 | | 33,536 |
| Transportation | 67,801 | | | 67,801 |
| Off-Road | 13,205 | | | 13,205 |
| Waste | | | 13,433 | 13,433 |
| Wastewater Processes | 70 | | | 70 |
| Aircraft | | | 1,324 | 1,324 |
| TOTAL | 119,865 | 34,935 | 14,757 | 169,557 |
| Percentage of Total $CO_2e$ | 70.7% | 20.6% | 8.7% | 100% |

## 3.2 ALL SCOPE EMISSIONS BY SECTOR

As noted above, the community emitted approximately 169,557 metric tons of $CO_2e$ in calendar year 2005. In addition to analyzing the data by scope, it can also be aggregated by sector. As depicted in **Figure 3-2** and **Table 3-3** below, the transportation sector was the largest emitter (40.0%) in 2005. Emissions from the residential sector were the next largest contributor (23.7%), while the commercial and industrial sectors accounted for a combined 19.8% of the total. Emissions from solid waste comprised 7.9% of the total, and emissions from other sources such as off-road vehicles and equipment, methane from wastewater treatment processes, and aircraft comprised the remaining 8.6%.

## FIGURE 3-2: 2005 COMMUNITY GHG EMISSIONS BY SECTOR




## TABLE 3-3: 2005 COMMUNITY GHG EMISSIONS BY SECTOR

| 2005 Community Emissions by Sector | Residential | Commercial/ Industrial | Transportation | Off-Road | Waste | Waste-water | Aircraft | TOTAL |
|---|---|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 40,188 | 33,536 | 67,801 | 13,205 | 13,433 | 70 | 1,324 | 169,557 |
| Percentage of Total $CO_2e$ | 23.7% | 19.8% | 40.0% | 7.8% | 7.9% | 0.0% | 0.8% | 100.0% |

## 3.3 TRANSPORTATION

Transportation sector emissions are the result of diesel and gasoline fuel used in vehicles traveling on local roads and state highways within the jurisdictional boundaries of Paso Robles. Consistent with the majority of California communities, travel by on-road motorized vehicles constitutes the greatest percentage of GHG emissions in the city (40.0%). Of the total emissions in the transportation sector, an estimated 93.2% was due to gasoline consumption, with the remaining 6.8% coming from diesel use (see **Figure 3-3** and **Table 3-4**).

### FIGURE 3-3: COMMUNITY GHG EMISSIONS BY FUEL TYPE


### TABLE 3-4: TRANSPORTATION GHG EMISSIONS BY FUEL SOURCE

| Transportation Fuel Emissions Sources 2005 | Gasoline | Diesel | TOTAL |
|---|---|---|---|
| $CO_2e$ (metric tons) | 63,204 | 4,597 | 67,801 |
| Percentage of Total $CO_2e$ | 93.2% | 6.8% | 100% |

Using origin-destination analysis and the SLOCOG Regional Travel Demand Model, three types of vehicle trips were tracked in the city:

1. Internal-Internal: Vehicle trips that remained inside the city
2. Internal-External and External-Internal: Vehicle trips that have an ending or a beginning in the city
3. External-External: Vehicle trips that pass through the city without originating or ending in the city

Fehr & Peers calculated VMT for each of the three types of vehicle trips using the recommendation of the Regional Target Advisory Committee (RTAC), the body responsible for Senate Bill 375 target setting. VMT from trips of type 1, 2, and 3 (see above) were counted 100%, 50%, and 0% respectively toward jurisdiction-generated VMT. The VMT results are summarized in Appendix C. Annual VMT was then analyzed to determine GHG emissions from

vehicle travel using the EMFAC2011 software developed by the California Air Resources Board. EMFAC2011 uses emissions rates for different types of vehicles in conjunction with travel activity statistics to calculate vehicle based emissions in metric tons per day. For a detailed description of the methodology used to estimate transportation-related emissions, please see Appendix C.

EMFAC2011 uses emissions rates for different types of vehicles in conjunction with travel activity statistics to calculate vehicle based emissions in metric tons per day. For a detailed description of the methodology used to estimate transportation-related emissions, please see Appendix C.

## 3.4 THE BUILT ENVIRONMENT (RESIDENTIAL, COMMERCIAL, INDUSTRIAL)

With all scopes aggregated, 43.5% of total community-wide emissions in the year 2005 came from the "built environment." The built environment comprises residential, commercial, and industrial natural gas and electricity consumption. This analysis does not include emissions from other types of energy such as propane, solar, and wind due to lack of reliable sales, construction, or consumption data. The commercial and industrial sectors are combined in this Inventory due to the mandatory aggregating of commercial and industrial data by PG&E previously referenced.

In 2005, the majority of emissions from the built environment were from the residential sector (54.5%), with the commercial/industrial sector contributing the remaining 45.5% (see **Figure 3-4**). All of the emissions calculated from the built environment were the result of local natural gas consumption (Scope 1) and local consumption of electricity generated outside of the city (Scope 2). Overall, natural gas consumption caused 52.6% of emissions from the built environment in 2005, as shown in **Figure 3-5**.

FIGURE 3-4: BUILT ENVIRONMENT GHG EMISSIONS BY SECTOR

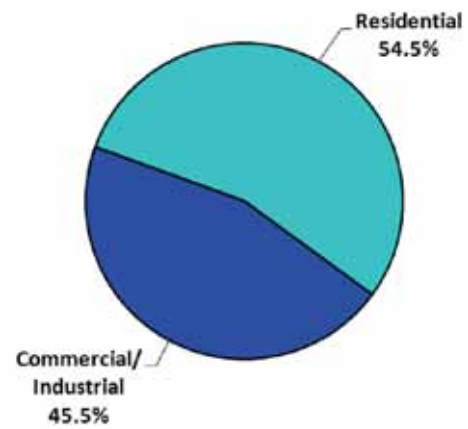
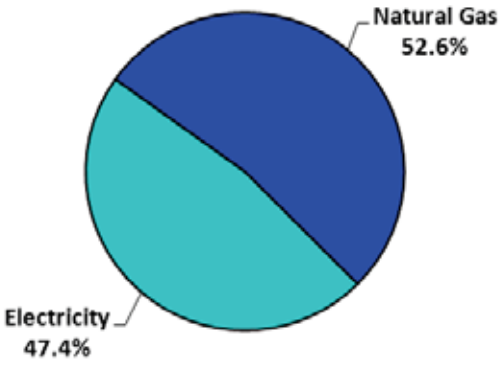
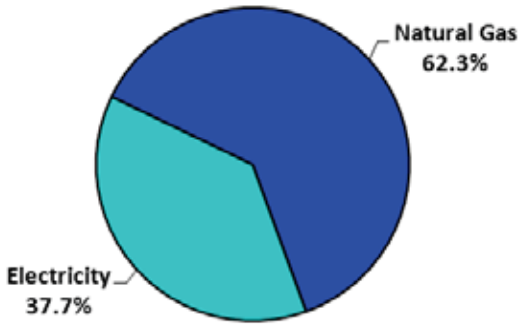



FIGURE 3-5: BUILT ENVIRONMENT GHG EMISSIONS BY SOURCE

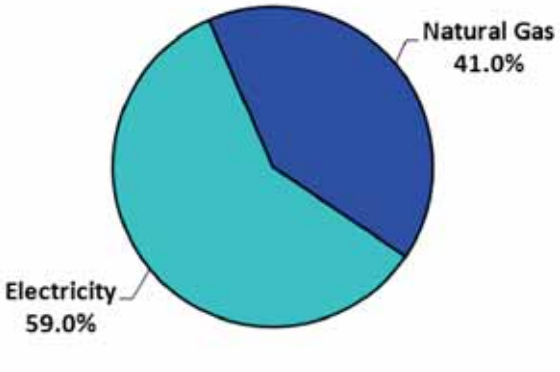


Approximately 62.3% of emissions in the residential sector resulted from combustion of natural gas for heating and cooking (see **Figure 3-6** and **Table 3-5**), while only 41.0% of emissions in the commercial/industrial sector came from natural gas usage (see **Figure 3-7** and **Table 3-6**).

## FIGURE 3-6: RESIDENTIAL GHG EMISSIONS BY SOURCE




## FIGURE 3-7: COMMERCIAL/ INDUSTRIAL GHG EMISSIONS BY SOURCE




## TABLE 3-5: RESIDENTIAL GHG EMISSIONS BY SOURCE

| Residential Emissions Sources 2005 | Electricity | Natural Gas | TOTAL |
|---|---|---|---|
| $CO_2e$ (metric tons) | 15,151 | 25,037 | 40,188 |
| Percentage of Total $CO_2e$ | 37.7% | 62.3% | 100% |
| Energy Use (MMBtu) | 231,219 | 470,650 | 701,869 |

TABLE 3-6: COMMERCIAL/INDUSTRIAL GHG EMISSIONS BY SOURCE

| Commercial/Industrial Emissions Sources 2005 | Electricity | Natural Gas | TOTAL |
|---|---|---|---|
| $CO_2e$ (metric tons) | 19,784 | 13,752 | 33,536 |
| Percentage of Total $CO_2e$ | 59.0% | 41.0% | 100% |
| Energy Use (MMBtu) | 301,930 | 258,523 | 560,453 |

## 3.5 WASTE

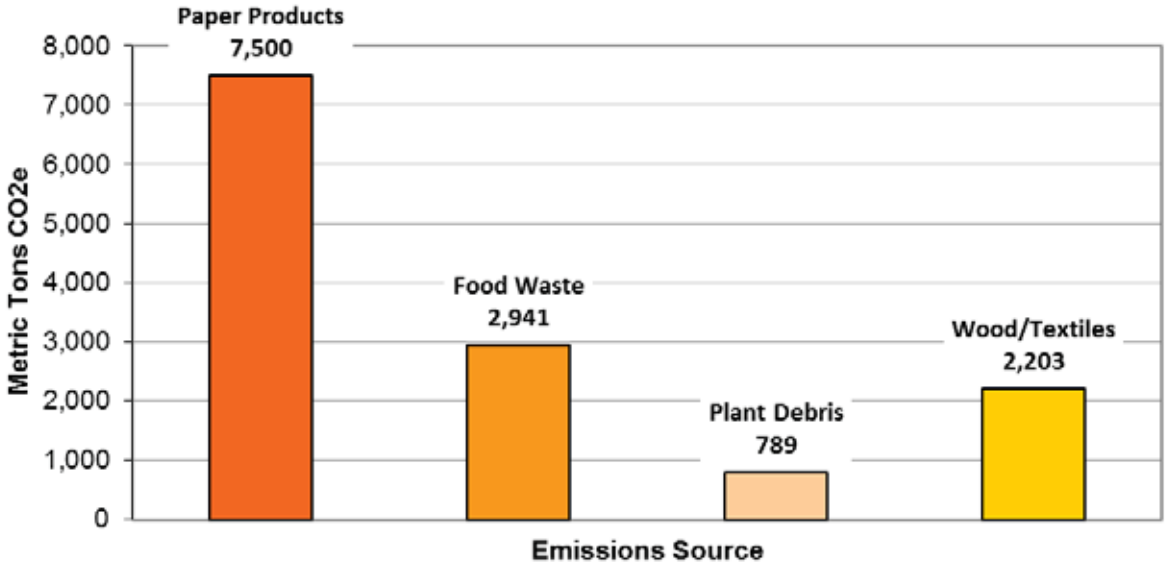
Waste disposed of at managed landfills was responsible for 7.9% of total emissions for the community. The CACP software calculates methane generation from waste sent to landfills in 2005 and accounts for the reported methane recovery factors among the three utilized landfills (Cold Canyon, Chicago Grade, and Paso Robles), which have a 51.0% weighted average. Paso Robles Municipal Landfill accepted approximately 91.0% of the community's solid waste, while approximately 9.0% went to Chicago Grade and less than 1.0% went to Cold Canyon. The methane recovery factors of the landfills are well documented by the San Luis Obispo County Air Pollution Control District based on the system operations at that time. For more information, please see detailed methodology in **Appendix C**.

Waste emissions are considered Scope 3 emissions because they are not generated in the base year, but will result from the decomposition of waste generated in 2005 over the full 100-year+ cycle of its decomposition. In 2005, the community sent approximately 37,574.57 tons of waste to landfills. The 2004 California Statewide Waste Characterization Study provides standard waste composition for the State of California.[17] Identifying the different types of waste in the general mix is necessary because during decomposition, some materials generate methane within the anaerobic environment of landfills whereas others do not. Carbonaceous materials such as paper and wood actually sequester[18] the methane released in managed landfills, thereby offsetting some or all of the emissions from food and plant waste. **Figure 3-8** and **Table 3-7** show the estimated percentage of emissions coming from the various types of organic, methanogenic waste.

[17] http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

[18] Sequestration involves the storage of carbon dioxide in a solid material through biological or physical processes.

## FIGURE 3-8: WASTE GHG EMISSIONS BY TYPE




## TABLE 3-7: WASTE GHG EMISSIONS BY WASTE TYPE

| Waste Emissions Sources 2005 | Paper Products | Food Waste | Plant Debris | Wood/ Textiles | All Other Waste | TOTAL |
|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 7,500 | 2,941 | 789 | 2,203 | 0 | 13,433 |
| Percentage of Total $CO_2e$ | 55.8% | 21.9% | 5.9% | 16.4% | 0.0% | 100% |

### 3.6 WASTEWATER

Methane emissions released during wastewater treatment processes were responsible for less than 0.1% of total emissions for the community. Natural gas and electricity emissions associated with wastewater treatment facilities operations are accounted for within the commercial/industrial sector.

### 3.7 OFF-ROAD VEHICLES EQUIPMENT

Gasoline, diesel, and compressed natural gas fuel are used to power off-road equipment in the City of Paso Robles. Off-road equipment incorporated in this inventory includes agriculture, lawn and garden, construction and mining, light commercial equipment, and industrial equipment. Off-road vehicles and equipment accounted for 7.8% of the City's emissions in 2005. The

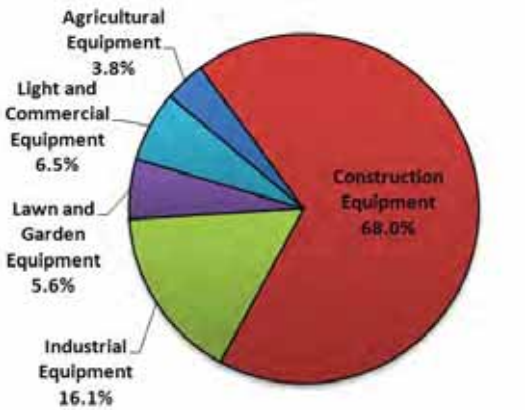
California Air Resources Board"s OFFROAD 2007 software provides emissions data for off-road equipment by county. The countywide data was attributed to city based on the indicators presented in **Table 3-8.**

## TABLE 3-8: COUNTY-WIDE EQUIPMENT TYPE INDICATORS

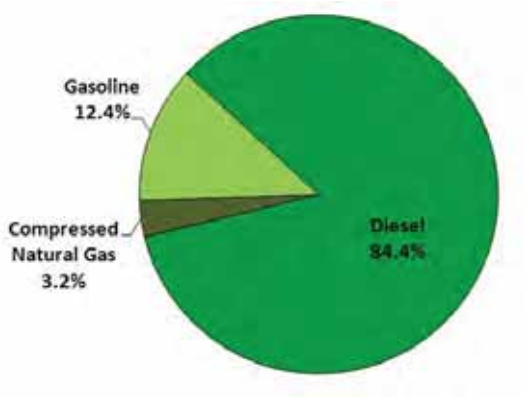
| Equipment Type | Allocation Indicator |
|---|---|
| Agricultural Equipment | Acres of cropland |
| Construction and Mining Equipment | Construction and mining jobs |
| Industrial Equipment | Industrial jobs |
| Lawn and Garden Equipment | Households |
| Light Commercial Equipment | Service and commercial jobs |

Approximately 68.0% of off-road equipment emissions in 2005 came from construction and mining equipment, while 16.1% were the result of industrial equipment. The remaining off-road equipment activities included in this Inventory include light and commercial equipment, lawn and garden equipment, and agricultural equipment, making up the remaining 15.9% of emissions collectively (see **Table 3-9** and **Figure 3-9**). Total emissions from off-road equipment for 2005 are estimated to be approximately 13,205 MT CO2e. Of the total emissions in the off-road sector, an estimated 84.4% was due to diesel consumption, with the remaining 15.6% coming from gasoline and compressed natural gas use (see **Table 3-10** and **Figure 3-10**).

## FIGURE 3-9: OFF-ROAD GHG EMISSIONS BY EQUIPMENT TYPE




## FIGURE 3-10: OFF-ROAD GHG EMISSIONS BY FUEL TYPE



## TABLE 3-9: OFF-ROAD GHG EMISSIONS BY EQUIPMENT TYPE

| Equipment Type Emissions Sources 2005 | Agricultural Equipment | Construction Equipment | Industrial Equipment | Lawn and Garden Equipment | Light and Commercial Equipment | TOTAL |
|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 504 | 8,979 | 2,125 | 735 | 862 | 13,205 |
| Percentage of Total $CO_2e$ | 3.8% | 68.0% | 16.1% | 5.6% | 6.5% | 100% |

## TABLE 3-10: OFF-ROAD GHG EMISSIONS BY FUEL TYPE

| Off-Road Fuel Emissions Sources 2005 | Gasoline | Diesel | Compressed Natural Gas | TOTAL |
|---|---|---|---|---|
| $CO_2e$ (metric tons) | 1,634 | 11,143 | 428 | 13,205 |
| Percentage of Total $CO_2e$ | 12.4% | 84.4% | 3.2% | 100% |

### 3.8 EMISSIONS FROM AIRCRAFT TAKEOFFS AND LANDINGS

This emissions sector accounts for emissions associated from aircraft landing and takeoff operations at the airport located within the City of Paso Robles (excluding agricultural crop dusting). Aircraft accounted for 0.8% of the City"s emissions in 2005. The Airport Cooperative Research Program (ACRP) released the "Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories" in 2009. This report provides a methodology for inventorying GHG emissions related to aircraft and airport operations. While this report is meant to provide a facility scale emissions inventory, the methodology can be adjusted to calculate Community-wide Scope 3 emissions from aircraft Landing and Takeoff Operations (LTO). The information required to calculate aircraft emissions includes the make and model of aircraft, engine type, and number of annual LTOs. This information was provided by an engineering report prepared by the Air Pollution Control Board in 2008. The report was a special project analyzing 2007 airport activity and provided the most complete data set available. No significant change in airport activity or aircraft type distribution occurred during this time interval.

The number of LTOs for each aircraft arriving and departing the airport in Paso Robles was entered into the Federal Aviation Administration"s (FAA) Emission Dispersion Modeling System (EDMS 5.1.2) to calculate $CO_2$ emissions and fuel consumed within the LTO. The LTO is also defined as less than 3,000 feet elevation and is often considered the inversion layer where emissions have a direct impact to a community"s air quality. Methane and nitrogen dioxide where calculated using fuel coefficients provided by the ACRP guidebook and entered into CACP2009 to calculate total $CO_2e$. Calculating emissions from aircraft LTOs resulted in 1,324 metric tons of $CO_2e$ or 0.9% of Community-wide emissions.

It should be noted that using the ACRP guidebook to conduct a facility scale inventory of the airport would result in higher overall emissions then presented in this inventory because it recommends all emissions occurring during flight be attributed to the departing city to avoid double counting. A significant portion of the emissions associated with air travel occur outside of the geopolitical boundaries of the community, and it is difficult to determine which portion occurred on one side of the boundary or the other. For the purposes of this Inventory, aircraft emissions are reported as Scope 3 emissions, which are indirect emissions that occur as a result of activity within the community.

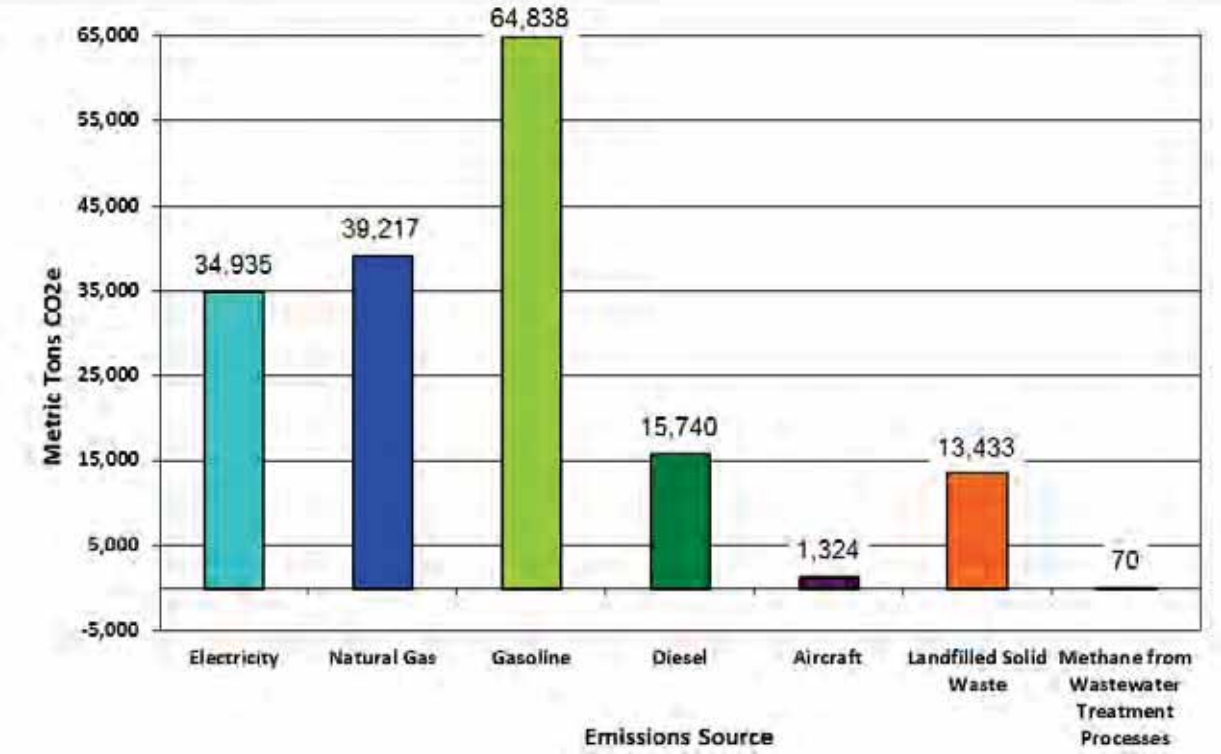
TABLE 3-11: AIRCRAFT EMISSIONS FOR PASO ROBLES MUNICIPAL AIRPORT

| Description | $CO_2$ | $CH_4$ | $N_2O$ | Total $CO_2e$ |
|---|---|---|---|---|
| Commercial/Civil | 1,029 | 7 | 2 | 1,038 |
| Military | 280 | 5 | 1 | 286 |
| **Totals** | **1,309** | **12** | **3** | **1,324** |

## 3.9 COMMUNITY EMISSIONS BY SOURCE

In addition to viewing emissions by sector and by scope, policy and programs development can benefit from an analysis of emissions according to their raw fuel or waste source. **Figure 3-11** and **Table 3-12** below demonstrate that 38.3% of all community emissions come from the consumption of gasoline on local roads and highways. Natural gas (23.1%) and electricity (20.6%) consumption from the built environment are the next most significant figures, with the remainder coming from various waste products, aircraft, and methane emissions from wastewater treatment processes.

## FIGURE 3-11: 2005 COMMUNITY GHG EMISSIONS BY SOURCE




## TABLE 3-12: 2005 COMMUNITY GHG EMISSIONS BY SOURCE

| Community Emissions 2005 by Source | $CO_2e$ (metric tons) | $CO_2e$ (percentage of total) |
|---|---|---|
| Electricity | 34,935 | 20.6% |
| Natural Gas | 39,217 | 23.1% |
| Gasoline | 64,838 | 38.3% |
| Diesel | 15,740 | 9.3% |
| Aircraft | 1,324 | 0.8% |
| Landfilled Solid Waste | 13,433 | 7.9% |
| Methane from Wastewater Treatment Processes | 70 | 0.0% |
| TOTAL | 169,557 | 100% |

## 3.9 PER CAPITA EMISSIONS

Per capita emissions can be a useful metric for measuring progress in reducing GHGs and for comparing one community"s emissions with neighboring cities and against regional and national averages. Currently it is difficult to make meaningful comparisons between local inventories because of variations in the scope of inventories conducted. For instance, this Inventory takes into account emissions from agricultural equipment which many inventories do not. Additionally, inventories at the county, state or national level have access to aggregate data sets that are not available at the local level, allowing additional emission sources to be inventoried. Only when ICLEI, the California Air Resources Board, and other organizations adopt universal reporting standards will local inventories be prepared in a consistent manner and therefore be comparable.

Simply dividing total community GHG emissions by city population in 2005 (27,964) yields a result of 6.06 metric tons $CO_2e$ per capita.[19] It is important to understand that this number is not the same as the carbon footprint of the average individual living in the City of Paso Robles, which reflects a wider scope of emissions. It is also important to note that the per capita emissions number for the city is not directly comparable to every per capita number produced by other emissions studies because of differences in emissions inventory methods.

[19] Baseline population data for the year 2005 was obtained from SLOCOG"s Long Range Socio-Economic Projections (Year 2030), prepared by Economics Research Associates (July 2006 Revision).

# 4. City Government Operations GHG Emissions Inventory Results

In 2005, the City of Paso Robles government employed 157 full-time and 64 part-time individuals and was comprised of ten departments, including Administrative Services, the City Clerk"s and City Manager"s offices, Community Development, Emergency Services, Human Resources, Library Services, Recreation Services, Police, and Public Works. This chapter reviews the results of the City government operations inventory by sector, including employee commuting emissions.

## 4.1 CITY GOVERNMENT OPERATIONS INVENTORY RESULTS

City government operations and facilities produced approximately 6,022 metric tons of GHG emissions in 2005. As displayed in **Figure 4-1**, this represents approximately 3.6% of total community-wide emissions. City government emissions result from waste, energy consumption from water and wastewater facilities, buildings, streetlights and other facilities, fuel consumption by the vehicle and transit fleet, employee commutes, and miscellaneous equipment, and water treatment processes. The largest contributor (26.6%) was from the buildings and facilities with 1,605 metric tons of carbon dioxide equivalent. The vehicle fleet was the second largest contributor to the City"s emissions (21.0%), with 1,264 metric tons of carbon dioxide equivalent. (Refer to **Figure 4-2** and **Table 4-1** below.)

FIGURE 4-1: CITY GOVERNMENT OPERATIONS CONTRIBUTION TO COMMUNITY-WIDE GHG EMISSIONS

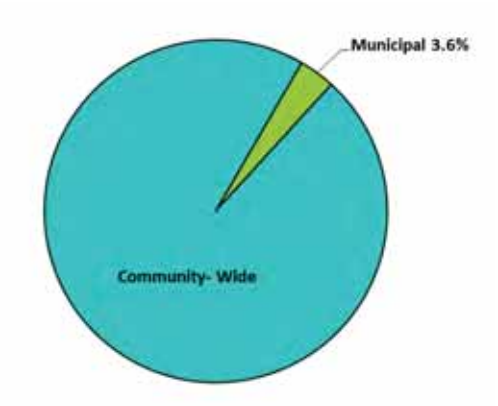
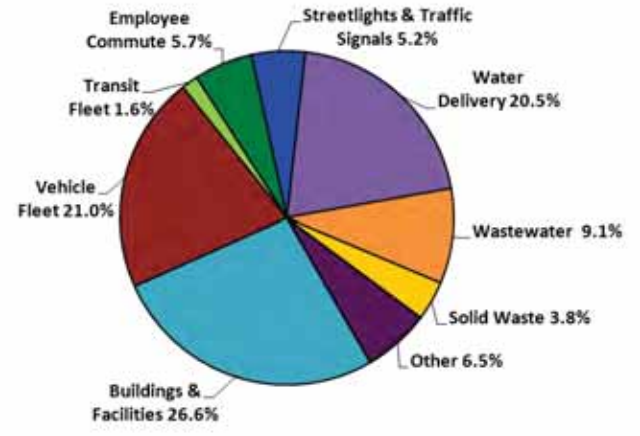



FIGURE 4-2: 2005 CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SECTOR



As mentioned in the Introduction, these emissions are a subset of the community emissions inventory discussed in Chapter 3. The City's government operations emissions are separately analyzed in this section in a manner that is similar to the way in which industry or business would produce a facility-scale GHG audit. The LGOP version 1.1 (May 2010) developed by the California Air Resources Board, The Climate Registry, the California Climate Action Registry, and ICLEI guides the methodology for estimating emissions from local government operations.

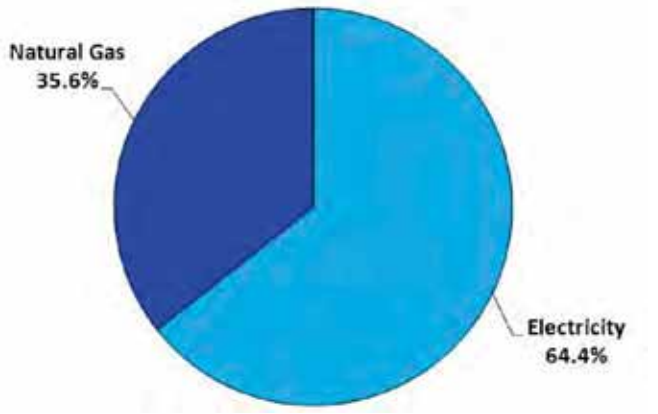
## TABLE 4-1: 2005 CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SECTOR

| 2005 Emissions by Sector | Buildings & Facilities | Vehicle Fleet | Transit Fleet | Employee Commute | Streetlights & Traffic Signals | Water Delivery | Wastewater | Solid Waste | Aircraft | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| $CO_2e$ (metric tons) | 1,605 | 1,264 | 96 | 342 | 312 | 1,231 | 550 | 231 | 391 | 6,022 |
| Percentage of $CO_2e$ | 26.6% | 21.0% | 1.6% | 5.7% | 5.2% | 20.5% | 9.1% | 3.8% | 6.5% | 100.0% |

### 4.2 BUILDING SECTOR

The building sector includes GHG emissions from energy consumption in facilities owned and operated by a municipality. This inventory calculates electricity and natural gas consumption in City-owned and -operated facilities. The facilities included in this analysis include City Hall, Fire Station, Senior Facilities & Veterans Hall, Train Depot, City Pool, Municipal Airport, The Paso Robles Municipal Landfill, parks, and numerous other facilities. Streetlights and traffic signals, and facilities associated with the treatment and conveyance of water are analyzed separately. As depicted in **Figure 4-3** and **Table 4-2**, the majority of emissions resulted from electricity consumption (64.4%).

## FIGURE 4-3: BUILDING GHG EMISSIONS BY SOURCE



## TABLE 4-2: 2005 BUILDING SECTOR GHG EMISSIONS BY SOURCE

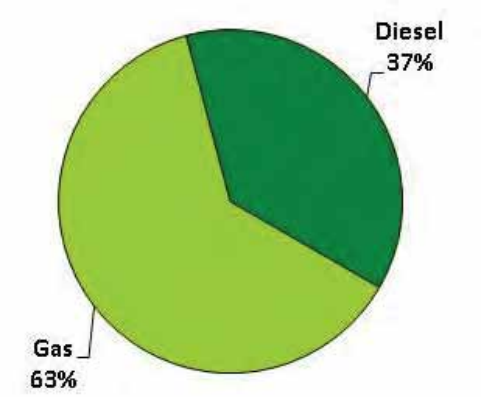
| 2005 City Government Operations Emissions by Sector | Electricity | Natural Gas | Total |
|---|---|---|---|
| $CO_2e$ (metric tons) | 1,033 | 572 | 1,605 |
| Percentage of Total $CO_2e$ | 64.4% | 35.6% | 100% |
| Energy Use (MMBtu) | 15,761 | 10,752 | 26,513 |

These emissions and associated consumption data will be useful in designating priority facilities for energy efficiency retrofits and conservation outreach.

### 4.3 VEHICLE AND TRANSIT FLEET

City-owned and -operated vehicles emitted approximately 1,360 metric tons of $CO_2e$, or 22.6% of total City government emissions. This sector includes gasoline and diesel consumption from all departments in the City operating vehicles, including the Fire and Police departments, Parks and Recreation, and Community Development. This sector also includes the transit fleet operated by the City. This estimate is based on 2008 data, the earliest calendar year for which complete data is available. No significant changes in the vehicle fleet or operating practices occurred during this time interval.

## FIGURE 4-4: VEHICLE FLEET FUEL CONSUMPTION PER YEAR BY TYPE




The majority of fuel used by the City is gasoline (63.0%), with the rest diesel (37.0%) (see **Figure 4-4**). When compared to the total emissions per fuel type, diesel emissions actually produce less $CO_2e$ for the vehicle types used by the City. However, there are other, non-$CO_2e$ emissions from diesel-like particulate matter that make such a comparison misleading to the reader. The trend for diesel to emit less $CO_2e$ in this case does not necessarily mean that the City should aim to convert more vehicles to conventional diesel. There are multiple clean and alternative fuel options available, including biodiesel conversion, electric vehicles, hybrid vehicles, smaller vehicles, and shared vehicles.

## 4.4 EMPLOYEE COMMUTE

This sector estimates GHG emissions from City employees traveling to and from work in 2005. The estimate is based on a June 2009 online survey conducted by the City, a blank version of which is included as **Appendix F**. Approximately 111 employees responded to the survey with usable information, meaning that all essential questions were answered, for an approximate 60% response rate, the results of which were applied to the City employment total for 2005.

The online survey found that most City employees travel to and from work by car. Employees were asked how many days of the week they travel by each commute mode, including driving alone (which includes motorcycles), carpooling, vanpooling, public transit, bicycling, walking, telecommuting, and other. The results show that employees get to and from 86% of their workdays by personal vehicle. The second most popular mode of transportation was carpooling (6%), followed by walking and biking with a combined 6% of the total.

### TABLE 4-3: DAYS OF CITY EMPLOYEE TRAVEL BY COMMUTE MODE

| Mode of Travel | Days Traveled by Commute Mode | % of Total |
|---|---|---|
| Drive Alone | 18,824 | 86.2% |
| Carpool | 1,300 | 6.0% |
| Vanpool | 0 | 0% |
| Public Transit | 416 | 1.9% |
| Bicycle | 624 | 2.9% |
| Walk | 676 | 3.1% |
| Telecommute | 0 | 0% |
| Total | 21,840 | 100% |

These figures for commute mode were combined with each respondent‟s travel distance to work, car model (if any), and fuel type (if any). The results show vehicle miles traveled (VMT) annually per vehicle type and fuel type (see **Table 4-4**). These VMT numbers were then adjusted for the total employee population in 2005 and entered into the CACP software to obtain $CO_2e$.

Driving patterns were assumed to be constant for the purposes of this study; therefore, the 2009 sample was applied directly to the 2005 employee population. Only one modification to the sample data was made in order to account for the large increase in hybrid car sales between

2005 and 2009. The proportion of hybrid to traditional vehicles was roughly two-thirds less in 2005 than in 2009, according to state sales data.[20]

The 2009 survey results, adjusted for 2005 employee totals, resulted in an estimated 343 metric tons $CO_2e$ in 2005 from commuter travel to and from work. This figure comprises approximately 5.7% of total GHG emissions released from City government operations. The calculation does not include employee business travel or travel during lunchtime hours.

TABLE 4-4: EMPLOYEE COMMUTE VMT BY VEHICLE AND FUEL TYPE

| Vehicle Group | 2009 Survey Results | | Adjusted for 2005 | |
|---|---|---|---|---|
| | Annual VMT | Fuel Type | Annual VMT | Fuel Type |
| Light Truck/SUV/Pickup | 54,038.65 | Gasoline | 107,536.92 | Gasoline |
| | 3,339.52 | Diesel | 6,645.64 | Diesel |
| Large Truck | 9,924.62 | Gasoline | 56,432.67 | Gasoline |
| | 17,480.30 | Diesel | 34,785.80 | Diesel |
| Passenger Vehicle | 242,657.87 | Gasoline | 482,889.17 | Gasoline |
| Total | 327,440.98 | Gasoline | 651,607.56 | Gasoline |

Employee business travel is usually included in a City government GHG Inventory per protocol; however, we could not include it in this baseline analysis due to data limitations. The City maintains financial records of when employees travel by air or vehicle to conferences and other events; however, it does not keep records of business travel destinations. As such, this Inventory could not accurately account for GHG emissions from employee business travel. A minor adjustment to City record-keeping would allow the data to be included in the next City government operations GHG inventory.

## 4.5 STREETLIGHTS AND TRAFFIC SIGNALS

The electricity consumed by City streetlights and traffic signals in calendar year 2005 resulted in approximately 312 metric tons of $CO_2e$, or approximately 5.2% of total City government emissions. This Inventory accounts for approximately 273 streetlights and traffic signals; billing records for five accounts, and the associated streetlights and traffic signals, were not available and are not included in this Inventory.

[20] www.hybridcars.com

## 4.6 WATER AND WASTEWATER

In 2005, electricity consumption from water and wastewater facilities operated by the City emitted approximately 1,711 metric tons of $CO_2e$, or 28.7% of total emissions. This category includes energy use at the wastewater treatment facilities and water yard, as well as the numerous lift stations, pumps, transfer stations and wells that are necessary to convey water to serve all city residents. Point-source emissions that arise from the wastewater treatment system due to temporary aerobic conditions or incomplete combustion of captured biogas from anaerobic digesters resulted in an additional 70 metric tons of $CO_2e$, increasing the percentage of total emissions attributed to water and wastewater facilities to 29.5%.

## 4.7 SOLID WASTE

Similar to the Community-Wide analysis, waste produced by City facilities was calculated using the methane commitment method. The CACP software calculates the methane expected to be released from this landfilled waste over the course of its lifetime. In 2005, City facilities sent a total of 646.9 tons of waste to landfills, producing 231 metric tons of $CO_2e$, or 3.8% of total emissions. Unlike other sectors analyzed, the emissions from waste disposed of in 2005 will occur over multiple years as the waste breaks down over time. This category includes only those emissions generated by waste produced at City facilities and does not include the total emissions released from the Paso Robles Municipal Landfill.[21] Emissions from waste generated in other jurisdictions will be accounted for in the baseline inventories of the communities responsible for the waste. Emissions from the energy and fuel use for the Paso Robles Municipal Landfill facilities are included in the building sector (**Section 4.2**).

## 4.8 OTHER – MISCELLANEOUS EQUIPMENT

The “other” category encompasses emissions from miscellaneous equipment such as general service equipment and equipment used at park facilities and the Paso Robles Municipal Landfill. This equipment resulted in 391 metric tons of carbon dioxide and approximately 6.5% of total emissions.

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[21] A Landfill Master Plan was prepared for the City in 2009-2010. The plan included analysis of both facility-level emissions and those generated by landfill processes, with a 2006 baseline. The purpose and scope of the two inventories differ in that while this Government Operations Inventory also analyzes facility-level emissions (included with Buildings and Facilities), it focuses on the lifetime emissions of waste generated by government operations in the baseline year using the methane commitment method. In contrast, the Landfill Master Plan uses the waste-in-place method to identify the emissions generated from all waste deposited in the landfill, no matter the source, in a single calendar year. Considering the differing data inputs and time horizon, the two emissions estimates cannot be compared.

Emissions from miscellaneous City equipment were analyzed outside of the CACP software using the California Air Resources Board protocol for inventorying local GHGs. Emissions were then put into the CACP software in the "other" category, which allows for direct inputs when CACP automation is not feasible.

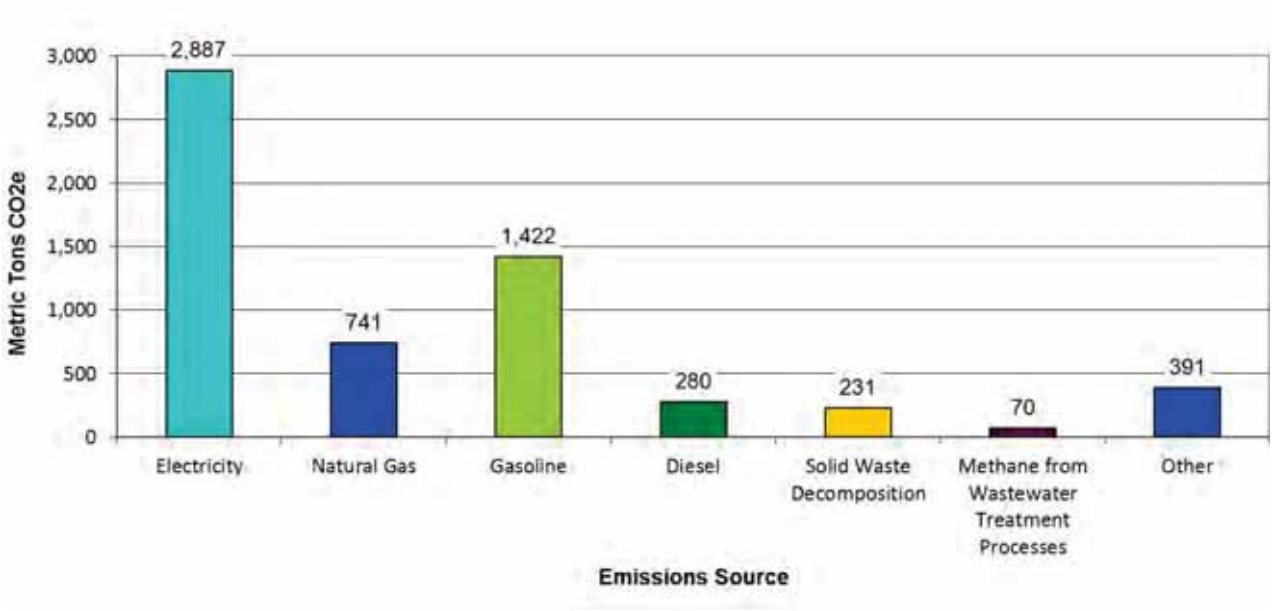
## 4.9 CITY EMISSIONS BY SOURCE

It can also be helpful to view overall City government emissions by source. As shown in **Table 4-5** and **Figure 4-5**, the majority of emissions are from electricity (47.9%) consumption in City-owned buildings, streetlights, and water/sewage facilities, and gasoline (23.6%) consumed by the vehicle and transit fleets, equipment and employee commute. Natural gas, diesel, solid waste decomposition and wastewater treatment processes contributed in decreasing amounts to the remaining 28.5% of the overall City GHG emissions.

### TABLE 4-5: 2005 CITY GOVERNMENT GHG EMISSIONS BY SOURCE

| City Emissions 2005 by Source | $CO_2e$ (metric tons) | $CO_2e$ (percentage of total) |
|---|---|---|
| Electricity | 2,887 | 47.9% |
| Natural Gas | 741 | 12.3% |
| Gasoline | 1,422 | 23.6% |
| Diesel | 280 | 4.7% |
| Solid Waste Decomposition | 231 | 3.8% |
| Methane from Wastewater Treatment Process | 70 | 1.2% |
| Other | 391 | 6.5% |
| **TOTAL** | **6,022** | **100.0%** |

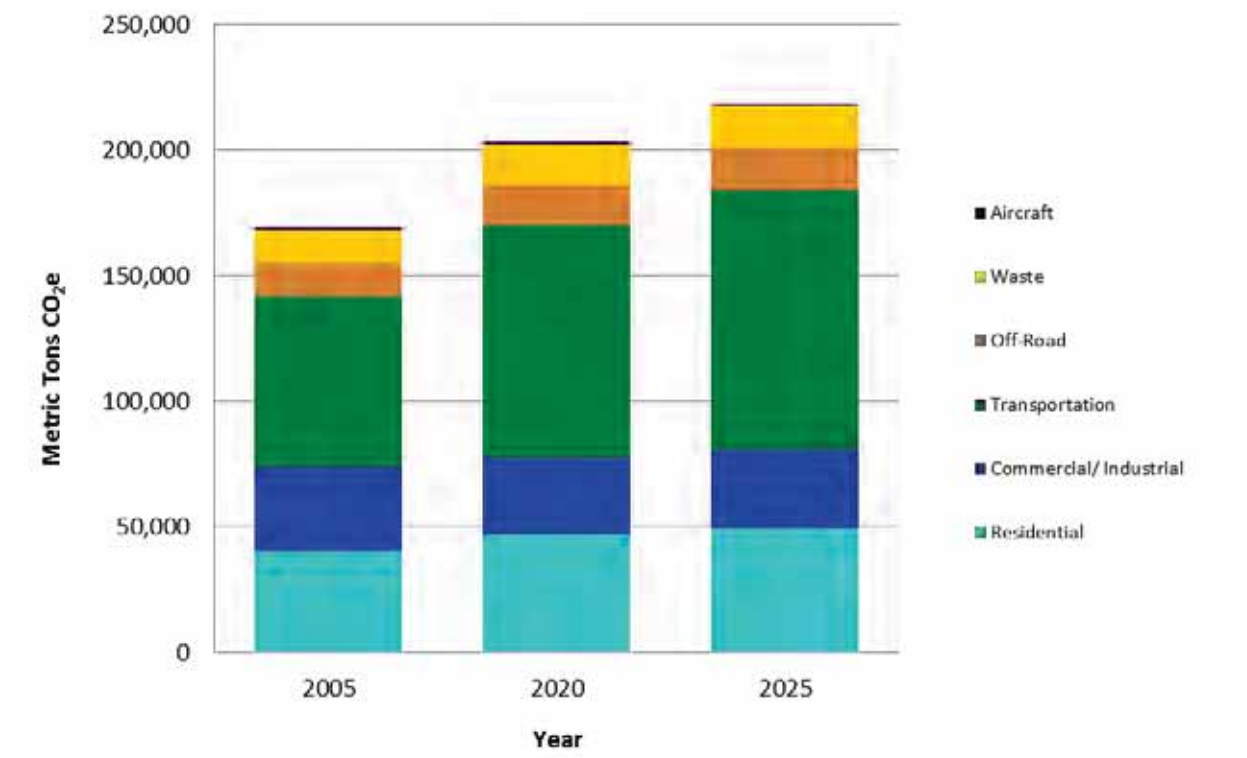
## FIGURE 4-5: 2005 CITY GOVERNMENT OPERATIONS GHG EMISSIONS BY SOURCE



## 5. Forecast

The emissions forecast for the City of Paso Robles represents a business-as-usual prediction of how community-wide GHG levels will change over time if consumption trends and behavior continue as they did in 2005. These predictions are based on the community inventory results included in this report and statistics on job and population growth from the 2040 Regional Growth Forecast. The analysis (**Figure 5-1** below) shows that if behavior and consumption trends continue as business-as-usual, emissions will reach 203,448 metric tons of $CO_2e$ by 2020, or a 20.0% increase over 2005 baseline levels. By 2025, emissions will reach 219,129 metric tons of $CO_2e$, or a 29.2% increase over 2005 baseline levels.

### FIGURE 5-1: 2020 AND 2025 BUSINESS-AS-USUAL PROJECTED GROWTH IN COMMUNITY-WIDE GHG EMISSIONS




The forecast does not quantify emissions reductions from state or federal activities including AB 32, the renewable portfolio standard, and SB 375. Additionally, it does not take into account reduction activities already under way or completed since 2005, the results of which likely put the community"s emissions on a track well below the business-as-usual linear projection.

Forecasts were performed by applying job and population growth rates to 2005 community-wide GHG emissions levels. Baseline data and estimated growth were obtained from the San Luis Obispo Council of Governments report, "San Luis Obispo County 2040 Population, Housing & Employment Forecast" prepared by AECOM in August 2011. The “mid-range” cases for population and job growth were used in this forecast estimation. Baseline data from this report is consistent with the San Luis Obispo Air Pollution Control District"s GHG thresholds.

City government operations emissions are not separately analyzed as part of this forecast due to a lack of reasonable growth indicators for the City government sector. However, an increase in emissions is not expected for existing facilities and operations in the City government operations sector. If anything, the City expects that emissions within the scope of the 2005 City government operations inventory will decrease because of energy efficiency improvements and fleet upgrades. At the same time, it is likely the City will have to expand services and infrastructure to accommodate the expected growth in the region, which could add new sources of emissions to the City government operations inventory that did not exist in 2005.

# 6. Conclusion and Next Steps

The City of Paso Robles has made a formal commitment to reduce its GHG emissions. This report lays the groundwork for those efforts by estimating baseline emission levels against which future progress can be demonstrated.

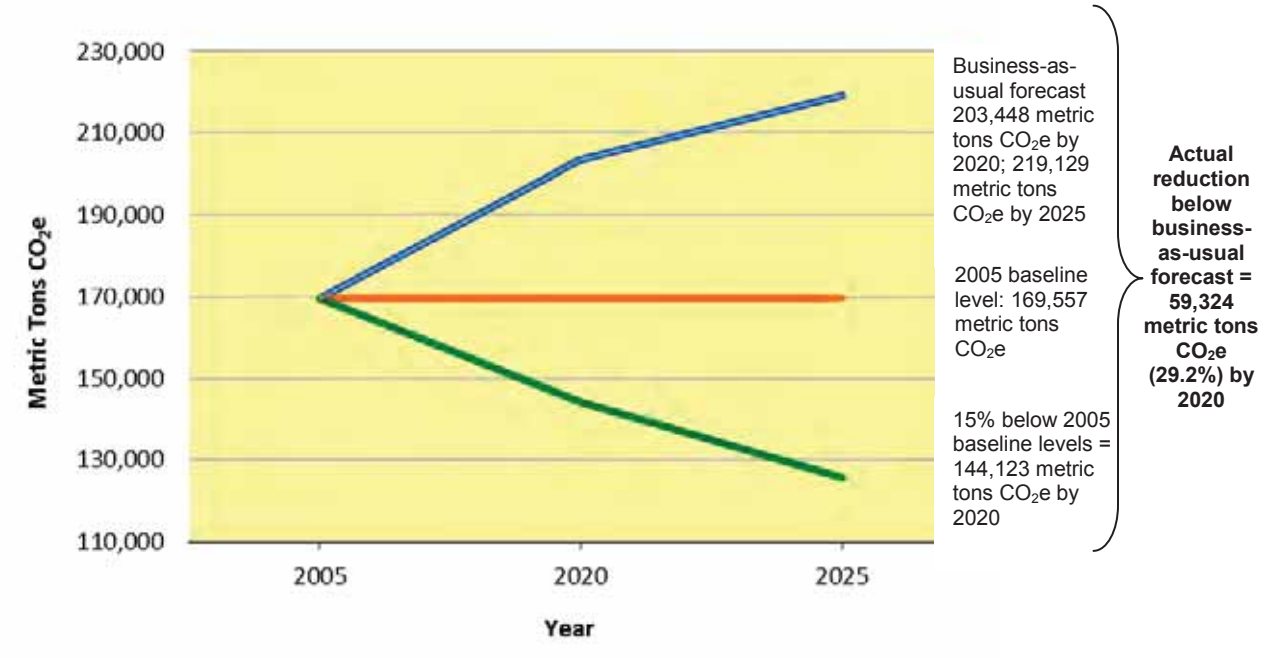
This analysis found that the community was responsible for emitting 169,557 metric tons of $CO_2e$ in the base year 2005, with the transportation sector contributing the most (40.0%) to this total. As a component of the community-wide analysis, City government operations produced 6,022 metric tons of $CO_2e$, or 3.6% of the total. In addition to establishing the baseline for tracking progress over time, this report serves to identify the major sources of city emissions and therefore the greatest opportunities for emissions reductions. In this regard, the emissions inventory will inform the focus of the City"s climate action planning. If no action is taken, this report found that business-as-usual emissions will likely rise by 20.0% by 2020 and 29.2% by 2025.

It is important to note that in order to remain consistent with GHG reduction methodology, all future quantifications of reduction activities must be subtracted from this „business-as-usual line. Not doing so would be assuming that emissions remain at constant 2005 levels while reduction activities are under way. In reality, the City"s climate action efforts will be working against a rising emissions level due to job, population, and household growth. **Figure 6-1** below shows the business-as-usual emissions forecast in relation to 2005 baseline levels and the 15% reduction below 2005 levels recommended by the California Attorney General and Air Resources Board. [22]

The difference between the business-as-usual forecast and the reduction targets is 29.2% in 2020. As noted in the Forecast section of this report, it is likely that the City"s sustainability efforts have already caused emissions to fall below the business-as-usual linear projection line, thus making the 59,324 metric tons $CO_2e$ reduction by 2020 achievable.

[22] The AB 32 Climate Change Scoping Plan Document prepared by the California Air Resources Board calls for reducing GHG emissions to 1990 levels by cutting approximately 30% from business-as-usual emission levels projected for 2020, or about 15% from today"s levels.

## FIGURE 6-1: GHG FORECAST IN RELATION TO REDUCTION TARGET




As the City moves forward to the next milestones in the process, including designation of emissions reduction targets and development of a Climate Action Plan, the City should identify and quantify the emissions reduction benefits of projects that have already been implemented since 2005, as well as the emissions reduction benefits of existing General Plan policies. The benefits of both existing strategies can be tallied against the baseline established in this report to determine the appropriate set of strategies that will deliver the City to its chosen emissions reduction goal.

# APPENDIX A:
# CACP DETAILED REPORT FOR COMMUNITY-WIDE EMISSIONS, 2005

# Community Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) |
|---|---|---|---|---|---|---|
| **Residential** | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | |
| *1 Residential - Natural Gas* | | | | | | |
| Natural Gas | 24,973 | 47 | 2,353 | 25,037 | 14.2 | 470,650 |
| *Subtotal 1 Residential - Natura* | 24,973 | 47 | 2,353 | 25,037 | 14.2 | 470,650 |

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com, May 2012.

CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

| | | | | | | |
|---|---|---|---|---|---|---|
| *2 Residential - Electricity* | | | | | | |
| Electricity | 15,027 | 338 | 922 | 15,151 | 8.6 | 231,219 |
| *Subtotal 2 Residential - Electric* | 15,027 | 338 | 922 | 15,151 | 8.6 | 231,219 |

Electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Subtotal Residential** | 39,999 | 385 | 3,275 | 40,188 | 22.9 | 701,868 |
| **Commercial** | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | |
| *1 Commercial/Industrial - Natural Gas* | | | | | | |
| Natural Gas | 13,717 | 26 | 1,293 | 13,752 | 7.8 | 258,523 |
| *Subtotal 1 Commercial/Industri* | 13,717 | 26 | 1,293 | 13,752 | 7.8 | 258,523 |

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com, May 2012. CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

| | | | | | | |
|---|---|---|---|---|---|---|
| *2 Commercial/Industrial - Electricity* | | | | | | |
| Electricity | 19,622 | 441 | 1,204 | 19,784 | 11.3 | 301,930 |
| *Subtotal 2 Commercial/Industri* | 19,622 | 441 | 1,204 | 19,784 | 11.3 | 301,930 |

Electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1.

# Community Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) |
|---|---|---|---|---|---|---|

Commercial and Industrial electricity are combined due to the 15/15 Rule, which was adopted by the CPUC in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 rule requires that any aggregated information provided by the Utilities must be made up of at least 15 customers and a single customer's load must be less than 15 percent of an assigned category. If the number of customers in the complied data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released. The Rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened once already using the 15/15 Rule, the customer be dropped from the information provided. In addition to the 15/15 Rule, the CPUC further determined that no information about customers with demands above 500 kW should be included in the distributed information.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Subtotal Commercial** | 33,339 | 467 | 2,496 | 33,537 | 19.1 | 560,453 |

**Waste**

**San Luis Obsipo APCD, CA**

*3 Community Solid Waste - Chicago Grade Landfill* — *Disposal Method - Managed Landfill*

| | | | | | |
|---|---|---|---|---|---|
| Paper Products | 0 | 0 | 33,407 | 702 | 0.4 |
| Food Waste | 0 | 0 | 13,102 | 275 | 0.2 |
| Plant Debris | 0 | 0 | 3,516 | 74 | 0.0 |
| Wood or Textiles | 0 | 0 | 9,815 | 206 | 0.1 |
| *Subtotal 3 Community Solid W* | 0 | 0 | 59,839 | 1,257 | 0.7 |

1. Total waste tonnage for the City in 2005 provided by the 2005 Disposal Quarterly Reports prepared by San Luis Obispo County Integrated Waste Management Authority on 6/17/05, 9/27/05, 12/27/05 and 3/6/06, provided by Peter Cron, pcron@iwma.com.

2. Percentages of waste share by type for landfill tonnage provided by CIWMB 2004 Statewide Waste Characterization Study. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

Notes:
1. Waste Type data not collected by landfill. State average waste characterization data is used for residential, commercial and self haul waste.

2. Methane recovery rates as follows were used:
- Chicago Grade landfill reports a methane recovery factor of 60%. Chicago Grade total gas generated = 157.47 mmcf/yr. Total gas transferred = 94.48 mmcf/yr.
- Cold Canyon landfill reports a methane recovery factor of 60%. Cold Canyon total gas generated = 700 mmcf/yr. Total gas transferred = 420 mmcf/yr.
- Paso Robles landfill reports a methane recovery factor of 50%. Paso Robles total gas generated = 129mmcf/yr. Total gas transferred = 64.5 mmcf/yr.

3. A weighted average of 50.94% is used for this calculation.

*3 Community Solid Waste - Cold Canyon Landfill* — *Disposal Method - Managed Landfill*

| | | | | | |
|---|---|---|---|---|---|
| Paper Products | 0 | 0 | 163 | 3 | 0.0 |
| Food Waste | 0 | 0 | 64 | 1 | 0.0 |

# Community Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | Equiv $CO_2$ (%) | Energy (MMBtu) |
|---|---|---|---|---|---|---|
| Plant Debris | 0 | 0 | 17 | 0 | 0.0 | |
| Wood or Textiles | 0 | 0 | 48 | 1 | 0.0 | |
| *Subtotal 3 Community Solid W* | 0 | 0 | 292 | 6 | 0.0 | |

1. Total waste tonnage for the City in 2005 provided by the 2005 Disposal Quarterly Reports prepared by San Luis Obispo County Integrated Waste Management Authority on 6/17/05, 9/27/05, 12/27/05 and 3/6/06, provided by Peter Cron, pcron@iwma.com.

2. Percentages of waste share by type for landfill tonnage provided by CIWMB 2004 Statewide Waste Characterization Study. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

Notes:
1. Waste Type data not collected by landfill. State average waste characterization data is used for residential, commercial and self haul waste.

2. Methane recovery rates as follows were used:
- Chicago Grade landfill reports a methane recovery factor of 60%. Chicago Grade total gas generated = 157.47 mmcf/yr. Total gas transferred = 94.48 mmcf/yr.
- Cold Canyon landfill reports a methane recovery factor of 60%. Cold Canyon total gas generated = 700 mmcf/yr. Total gas transferred = 420 mmcf/yr.
- Paso Rrobles landfill reports a methane recovery factor of 50%. Paso Robles total gas generated = 129mmcf/yr. Total gas transferred = 64.5 mmcf/yr.

3. A weighted average of 50.94% is used for this calculation.

*3 Community Solid Waste - Paso Robles Landfill* — *Disposal Method - Managed Landfill*

| | | | | | | |
|---|---|---|---|---|---|---|
| Paper Products | 0 | 0 | 323,577 | 6,795 | 3.9 | |
| Food Waste | 0 | 0 | 126,902 | 2,665 | 1.5 | |
| Plant Debris | 0 | 0 | 34,053 | 715 | 0.4 | |
| Wood or Textiles | 0 | 0 | 95,067 | 1,996 | 1.1 | |
| *Subtotal 3 Community Solid W* | 0 | 0 | 579,598 | 12,172 | 6.9 | |

Source(s):
1. Total waste tonnage for the City in 2005 provided by the 2005 Disposal Quarterly Reports prepared by San Luis Obispo County Integrated Waste Management Authority on 6/17/05, 9/27/05, 12/27/05 and 3/6/06, provided by Peter Cron, pcron@iwma.com.

2. Percentages of waste share by type for landfill tonnage provided by CIWMB 2004 Statewide Waste Characterization Study. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

Notes:
1. Waste Type data not collected by landfill. State average waste characterization data is used for residential, commercial and self haul waste.

2. Methane recovery rates as follows were used:
- Chicago Grade landfill reports a methane recovery factor of 60%. Chicago Grade total gas generated = 157.47 mmcf/yr. Total gas

# Community Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) |
|---|---|---|---|---|---|---|

transferred = 94.48 mmcf/yr.
- Cold Canyon landfill reports a methane recovery factor of 60%. Cold Canyon total gas generated = 700 mmcf/yr. Total gas transferred = 420 mmcf/yr.
- Paso Rrobles landfill reports a methane recovery factor of 50%. Paso Robles total gas generated = 129mmcf/yr. Total gas transferred = 64.5 mmcf/yr.

3. A weighted average of 50.94% is used for this calculation.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Subtotal Waste** | 0 | 0 | 639,729 | 13,434 | 7.6 | |

**Other**

**San Luis Obsipo APCD, CA**

*1 - On-Road Transportation*

| | | | | | | |
|---|---|---|---|---|---|---|
| Carbon Dioxide | 67,801 | 0 | 0 | 67,801 | 38.6 | |
| *Subtotal 1 - On-Road Transpor* | 67,801 | 0 | 0 | 67,801 | 38.6 | |

Sources:
- Average weekday vehicle miles traveled (VMT) were provided by Fehr & Peers, July 2012, using the San Luis Obispo Regional Travel Demand model.
- Transportation-related GHG emissions (carbon dioxide, methane, and nitrous oxide) were calculated using California Air Resources Board's Emissions Factor (EMFAC2011) software and converted to CO2e.

Notes:
- Using origin-destination analysis, three types of vehicle trips were tracked separately for AM and PM peak periods in the City:
  1. Internal-Internal: Vehicle trips that remained inside the city
  2. Internal-External and External-Internal: Vehicle trips that have an ending or a beginning in the city
  3. External-External: Vehicle trips that pass through the city without originating or ending in the city
- Using the recommendation of the Regional Target Advisory Committee (RTAC), the body responsible for Senate Bill 375 target setting, vehicle miles traveled (VMT) from trips of type 1, 2, and 3 were counted 100%, 50%, and 0% respectively toward jurisdiction-generated VMT.
- Transportation-related greenhouse gas emissions were calculated using the EMFAC2011 software. EMFAC2011 provides carbon dioxide, methane, and nitrous oxide emissions according to the unique vehicle composition of each county in California. Of the total on-road transportation emissions 93.2% are the result of gasoline consumption and 6.8% are the result of diesel fuel consumption.

*3 - Airport Emissions - Civilian Aircraft*

| | | | | | | |
|---|---|---|---|---|---|---|
| Carbon Dioxide | 1,029 | 0 | 0 | 1,029 | 0.6 | |
| Methane | 0 | 0 | 348 | 7 | 0.0 | |
| Nitrous Oxide | 0 | 5 | 0 | 2 | 0.0 | |
| *Subtotal 3 - Airport Emissions* | 1,029 | 5 | 348 | 1,038 | 0.6 | |

*3 Airport Emission - Military Aircraft*

| | | | | | | |
|---|---|---|---|---|---|---|
| Carbon Dioxide | 280 | 0 | 0 | 280 | 0.2 | |
| Methane | 0 | 0 | 222 | 5 | 0.0 | |

# Community Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) |
|---|---|---|---|---|---|---|
| Nitrous Oxide | 0 | 3 | 0 | 1 | 0.0 | |
| *Subtotal 3 Airport Emission - M* | 280 | 3 | 222 | 285 | 0.2 | |

Emissions related to aircraft were calculated using the Emissions Dispersion Modeling Software (EDMS) provided by the FAA and following the Airport Cooperative Research Program's Guidebook on Preparing Aiport Greenhouse Gas Emissions Inventories. The emissions were calculated for Landing and Takeoff Operations (LTO) or emissions occuring below 3,000 feet, only. The number of operations and types of aircraft at the Paso Robles Airport were provided in a 2007 report prepared by the Air Pollution Control District.

*3 Off-Road Vehicles & Equipment*

| | | | | | | |
|---|---|---|---|---|---|---|
| Carbon Dioxide | 13,208 | 0 | 0 | 13,208 | 7.5 | |
| Methane | 0 | 0 | 103 | 2 | 0.0 | |
| Nitrous Oxide | 0 | 6 | 0 | 2 | 0.0 | |
| *Subtotal 3 Off-Road Vehicles &* | 13,208 | 6 | 103 | 13,212 | 7.5 | |

1. Emissions calculated using the California Air Resources Board OFFROAD2007 modeling tool.

2. Emissions were calculated for construction equipment based on the city's share of countywide construction jobs, lawn & garden equipment based on the city's share of countywide households, industrial equipment based on the city's share of countywide industrial sector jobs, light commercial equipment based on the city's share of countywide commercial sector jobs, and agricultural equipment based on the city's share of countywide agricultural land. Household and job data obtained from the U.S. Census Bureau and agricultural data obtained from County GIS files.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Subtotal Other** | 82,318 | 15 | 672 | 82,337 | 46.8 | |
| **Total** | 155,657 | 867 | 646,173 | 169,495 | 96.4 | 1,262,322 |

# APPENDIX B:
# CACP DETAILED REPORT FOR CITY GOVERNMENT OPERATIONS EMISSIONS, 2005

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|
| **Buildings and Facilities** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *All Buildings and Facilities* | | | | | | | |
| Electricity | 1,024 | 23 | 63 | 1,033 | 17.4 | 15,761 | 0 |
| Natural Gas | 571 | 1 | 54 | 572 | 9.6 | 10,752 | 0 |
| *Subtotal All Buildings and Faci* | 1,595 | 24 | 117 | 1,605 | 27.0 | 26,514 | 0 |

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs (213) 244-3246, pmorais@semprautilities.com, May 2012.

Electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E, May 2012.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.

CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Buildings and Facilities** | 1,595 | 24 | 117 | 1,605 | 27.0 | 26,514 | 0 |
| **Streetlights & Traffic Signals** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *All Streetlights & Traffic Controls* | | | | | | | |
| Electricity | 309 | 7 | 19 | 312 | 5.2 | 4,758 | 0 |
| *Subtotal All Streetlights & Traff* | 309 | 7 | 19 | 312 | 5.2 | 4,758 | 0 |

Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Emissions factors for criteria air pollutions obtained from LGOP v.1.1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Streetlights & Traffic Si** | 309 | 7 | 19 | 312 | 5.2 | 4,758 | 0 |
| **Water Delivery Facilities** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *All Water Delivery Facilities* | | | | | | | |
| Electricity | 1,215 | 27 | 75 | 1,225 | 20.6 | 18,694 | 0 |
| Natural Gas | 6 | 0 | 1 | 6 | 0.1 | 108 | 1,364 |
| *Subtotal All Water Delivery Fac* | 1,221 | 27 | 75 | 1,231 | 20.7 | 18,802 | 1,364 |

Electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

This report has been generated for San Luis Obsipo APCD, CA using ICLEI's Clean Air and Climate Protection 2009 Software.

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com, May 2012.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.

CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Water Delivery Facilities** | 1,221 | 27 | 75 | 1,231 | 20.7 | 18,802 | 1,364 |

**Wastewater Facilities**

**San Luis Obsipo APCD, CA**

*All Wastewater Facilities*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Electricity | 315 | 7 | 19 | 318 | 5.3 | 4,846 | 0 |
| Natural Gas | 163 | 0 | 15 | 163 | 2.7 | 3,064 | 0 |
| *Subtotal All Wastewater Facilit* | 477 | 7 | 35 | 480 | 8.1 | 7,909 | 0 |

Electricity data provided by Jillian Rich, jillian.rich@pge.com and John Joseph, ghgdatarequests@pge.com, PG&E.

Natural gas data provided by Paulo Morais, Customer Programs Environmental Affairs, Southern California Gas Co. (213) 244-3246, pmorais@semprautilities.com, May 2012.

The "PG&E California" electricity coefficient set is based on the 2005 PG&E eCO2 emission factor of 0.489 lbs/kWh of delivered electricity as update on June 27, 2011 and provided by PG&E. PG&E's third-party-verified GHG inventory submitted to the California Climate Action Registry (CCAR)6 (2003-2008) or The Climate Registry (TCR) (2009). Criteria air pollutant emission factors for electricity were obtained from the LGOP v1.1 for California.

CEC Emission Factor for Natural Gas - RCI Average Set from Local Government Operations Protocol version 1.1 (LGOP v1.1). Fuel CO2 set provided by Southern California Gas Co for San Luis Obispo area.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Wastewater Facilities** | 477 | 7 | 35 | 480 | 8.1 | 7,909 | 0 |

**Solid Waste Facilities**

**San Luis Obsipo APCD, CA**

*3 Paso Robles Municipal Solid Waste*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Carbon Dioxide | 231 | 0 | 0 | 231 | 3.9 | 0 | 36,137 |
| *Subtotal 3 Paso Robles Munici* | 231 | 0 | 0 | 231 | 3.9 | 0 | 36,137 |

City of Paso Robles solid waste data provided by Jed Dawson, Operations Manager of PRWD, PRCD, PRR, jed@prwaste.com, (805) 237-6473.

-Landfill solid waste composition provided by the California Integrated Waste Management Board, Waste Characterization Report (2004) http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|
| **Subtotal Solid Waste Facilities** | 231 | 0 | 0 | 231 | 3.9 | 0 | 36,137 |

**Vehicle Fleet**

**San Luis Obsipo APCD, CA**

*1 Airport Operations Vehicle Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diesel | 9 | 0 | 0 | 9 | 0.1 | 120 | 0 |
| Gasoline | 149 | 14 | 27 | 154 | 2.6 | 2,194 | 0 |
| *Subtotal 1 Airport Operations V* | 158 | 14 | 28 | 163 | 2.7 | 2,313 | 0 |

1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

*1 City Hall/Library Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gasoline | 24 | 1 | 1 | 24 | 0.4 | 354 | 0 |
| *Subtotal 1 City Hall/Library Fle* | 24 | 1 | 1 | 24 | 0.4 | 354 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

*1 Community Development Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gasoline | 36 | 2 | 1 | 36 | 0.6 | 524 | 0 |
| *Subtotal 1 Community Develop* | 36 | 2 | 1 | 36 | 0.6 | 524 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|

1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

*1 Emergancy Services Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diesel | 77 | 0 | 0 | 77 | 1.3 | 1,052 | 0 |
| Gasoline | 25 | 2 | 1 | 26 | 0.4 | 369 | 0 |
| *Subtotal 1 Emergancy Service* | 102 | 2 | 2 | 103 | 1.7 | 1,421 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

*1 Parks Vehicle Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gasoline | 98 | 4 | 4 | 99 | 1.7 | 1,441 | 0 |
| *Subtotal 1 Parks Vehicle Fleet* | 98 | 4 | 4 | 99 | 1.7 | 1,441 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

*1 Police Vehicle Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diesel | 1 | 0 | 0 | 1 | 0.0 | 21 | 0 |
| Gasoline | 470 | 11 | 67 | 475 | 8.0 | 6,918 | 0 |
| *Subtotal 1 Police Vehicle Fleet* | 472 | 11 | 67 | 476 | 8.0 | 6,939 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

3. Motorcycles were included with passenger vehicles

*1 Public Works Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diesel | 11 | 0 | 0 | 11 | 0.2 | 152 | 0 |
| Gasoline | 72 | 2 | 8 | 73 | 1.2 | 1,057 | 0 |
| *Subtotal 1 Public Works Fleet* | 83 | 2 | 8 | 84 | 1.4 | 1,209 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

*1 Utilities Fleet*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diesel | 25 | 0 | 0 | 25 | 0.4 | 345 | 0 |
| Gasoline | 249 | 13 | 21 | 254 | 4.3 | 3,666 | 0 |
| *Subtotal 1 Utilities Fleet* | 274 | 13 | 22 | 279 | 4.7 | 4,011 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Vehicle fleet data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Vehicle Fleet** | 1,246 | 50 | 131 | 1,264 | 21.2 | 18,213 | 0 |

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | Equiv $CO_2$ (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|
| **Employee Commute** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *3 Employee Commute* | | | | | | | |
| Diesel | 61 | 0 | 3 | 61 | 1.0 | 840 | 0 |
| Gasoline | 273 | 24 | 43 | 281 | 4.7 | 4,018 | 0 |
| *Subtotal 3 Employee Commute* | 334 | 24 | 45 | 343 | 5.8 | 4,858 | 0 |

Source(s):
- Employee commute survey, conducted in May 2009 and adjusted for 2005 employment figuers.
-2005 and 2009 City employement figuers obtained from Susan DeCarli, Planning Manager, sdecarli@prcity.com.
- Hybrid fuel economy of a 2005 Toyota Prius, www.fueleconomy.gov.

Notes:
- 192 City employees successfully responded to the online survey or on paper, meaning that all essential entries were given. This is appoximately a 68% response rate.
-Survey responses were adjusted for the 2005 employee population, assuming constant distribution of gasoline/diesel consumption by vehicle type. The population of hybrid cars was decreased by 2/3, based on California sales records found at www.hybridcars.com.
-For more detailed information on the methodology used in this sector, please see the appendices.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Employee Commute** | 334 | 24 | 45 | 343 | 5.8 | 4,858 | 0 |
| **Transit Fleet** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *1 Transit Fleet* | | | | | | | |
| Diesel | 96 | 0 | 2 | 96 | 1.6 | 1,313 | 0 |
| *Subtotal 1 Transit Fleet* | 96 | 0 | 2 | 96 | 1.6 | 1,313 | 0 |

Source(s):
1. 2008 Vehicle fleet data in the form of monthly fuel purchase receipts and vehicle make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past vehicle make, model, and year data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Emissions coefficients for vehicle model year 2006-2009 are not available as part of the CACP2009 Software, so were entered as 2005.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Transit Fleet** | 96 | 0 | 2 | 96 | 1.6 | 1,313 | 0 |

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|
| **Other Process Fugitive** | | | | | | | |
| **San Luis Obsipo APCD, CA** | | | | | | | |
| *1 Landfill Large Equipment (Diesel)* | | | | | | | |
| Carbon Dioxide | 207 | 0 | 0 | 207 | 3.5 | | |
| Methane | 0 | 0 | 12 | 0 | 0.0 | | |
| Nitrous Oxide | 0 | 5 | 0 | 2 | 0.0 | | |
| *Subtotal 1 Landfill Large Equip* | 207 | 5 | 12 | 209 | 3.5 | | |

Source(s):
- Paso Robles Landfill fuel use data for on-site equipment provided by Jim Wyse, President of Pacific Waste Services, Inc. (jwyse4@aol.com). Equipment used on-site includes: Track Loader with 4 in 1 bucket, Garbage Compactor, Motor Scrapper, Bulldozer with ripper and 4 x 4 Backhoe/Loader 4/1 Bucket and Motor Grader.

Notes:
1. Landfill data for 2005 was available and utilized.

2. Raw data in gallons of fuel used, and converted to CO2e based on the following Emissions factors (from Table G.9 and G.12 of CARB Local Government Operations Protocol, September 2008).
- Diesel = 10.15 kg CO2, 0.26 grams N2O and 0.58 grams CH4 per gallon

3. Total of 20,400 gallons diesel = 207060 kg CO2, 5,304 grams N2O and 11,832 grams CH4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *1 Other Equipment (Diesel)* | | | | | | | |
| Carbon Dioxide | 105 | 0 | 0 | 105 | 1.8 | | |
| Methane | 0 | 0 | 6 | 0 | 0.0 | | |
| Nitrous Oxide | 0 | 3 | 0 | 1 | 0.0 | | |
| *Subtotal 1 Other Equipment (D* | 105 | 3 | 6 | 106 | 1.8 | | |

Source(s):
1. 2008 Vehicle Fleet/Equipment data in the form of monthly fuel purchase receipts and vehicle/equipment make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Raw data in gallons of fuel used, and converted to CO2e based on the following Emissions factors (from Table G.9 and G.12 of CARB Local Government Operations Protocol, September 2008).
- Diesel:10.15 kg CO2, 0.26 grams N2O and 0.58 grams CH4 per gallon

3. Vehicle fleet/equipment data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past equipment fuel use data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Total of 10,355.8 gallons diesel = 104,938.82 kg CO2, 2,692.508 grams N2O and 6,006.364 grams CH4

# Government Greenhouse Gas Emissions in 2005
# Detailed Report

| | $CO_2$ (tonnes) | $N_2O$ (kg) | $CH_4$ (kg) | Equiv $CO_2$ (tonnes) | Equiv $CO_2$ (%) | Energy (MMBtu) | Cost ($) |
|---|---|---|---|---|---|---|---|
| *1 Small/Large Equipment (Gasoline)* | | | | | | | |
| Carbon Dioxide | 75 | 0 | 0 | 75 | 1.3 | | |
| Methane | 0 | 0 | 4 | 0 | 0.0 | | |
| Nitrous Oxide | 0 | 2 | 0 | 1 | 0.0 | | |
| *Subtotal 1 Small/Large Equipm* | 75 | 2 | 4 | 76 | 1.3 | | |

Source(s):
1. 2008 Vehicle Fleet/Equipment data in the form of monthly fuel purchase receipts and vehicle/equipment make, model, and year received from Lovella Walker, Maintenance Services Administrative Assistant (805-237-3873, LWalker@prcity.com).

2. Raw data in gallons of fuel used, and converted to CO2e based on the following Emissions factors (from Table G.9 and G.12 of CARB Local Government Operations Protocol, September 2008).
- Gasoline = 8.81 kg CO2, 0.22 grams N2O and 0.50 grams CH4 per gallon

3. Vehicle fleet/equipment data manipulated by Jaime Hill (805-250-7973, JHill@PMCWorld.com).

Notes:
1. Due to a City of Paso Robles server crash, much of the past equipment fuel use data for 2005 was lost. The first full calendar year for which data was available was 2008.

2. Total of 8,552.6 gallons unleaded gasoline = 75,348.41 kg CO2, 1,881.572 grams N2O and 4,276 grams CH4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subtotal Other Process Fugitive** | 387 | 10 | 22 | 391 | 6.6 | | |
| **Total** | 5,896 | 150 | 446 | 5,952 | 100.0 | 82,368 | 37,501 |

# APPENDIX C:
# DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

# APPENDIX C: DETAILED METHODOLOGY FOR COMMUNITY-WIDE INVENTORY

## Detailed Methodology for Community-Wide Inventory

This appendix provides the detailed methodology and data sources used for calculating GHG emissions in each sector of the community-wide inventory.

### OVERVIEW OF INVENTORY CONTENTS AND APPROACH

The community inventory methodology is based on guidance from ICLEI International Local Government GHG Emissions Analysis Protocol (IEAP) (October 2009) and the Association of Environmental Professionals California Community-wide GHG Baseline Inventory Protocol (AEP Protocol) (June 2011). The community inventory identifies and quantifies emissions from the residential, commercial/industrial, transportation, off-road, and solid waste sectors. Emissions are calculated by multiplying activity data—such as kilowatt hours or gallons of gasoline consumed—by emissions factors, which provide the quantity of emissions per unit of activity. Activity data is typically available from electric and gas utilities, planning and transportation agencies and air quality regulatory agencies. Emissions factors are drawn from a variety of sources, including the California Climate Action Registry, the Local Governments Operations Protocol (LGOP) version 1.1 (May 2010), and air quality models produced by the California Air Resources Board.

In this inventory, all GHG emissions are converted into carbon dioxide equivalent units, or $CO_2e$, per guidance in the LGOP version 1.1, AEP Protocol, and IEAP. The LGOP provides standard factors to convert various greenhouse gases into carbon dioxide equivalent units; these factors are known as Global Warming Potential factors, representing the ratio of the heat-trapping ability of each greenhouse gas relative to that of carbon dioxide.

The following sections describe the specific data sources and methodology for calculating GHG emissions in each community sector.

### RESIDENTIAL AND COMMERCIAL/INDUSTRIAL SECTORS

All residential and commercial/industrial sector emissions are the result of electricity consumption and the on-site combustion of natural gas. Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal Gas Co.) provided residential electricity and natural gas consumption data. Specifically, data was provided by:

- Jillian Rich, Program Manager with PG&E Green Communities and Innovator Pilots (jillian.rich@pge.com), and John Joseph, PG&E GHG Data Requests

- Paulo Morais, Energy Programs Supervisor with Southern California Gas Company, Customer Programs (pmorias@semprautilities.com)

The raw data received from PG&E and SoCal Gas Co. is summarized in **Tables 1** and **2** below. This raw data was input into the CACP2009 software in kWh and therms. PG&E provided a 2005 carbon dioxide ($CO_2$) coefficient for electricity use and SoCal Gas Co. provided a carbon dioxide ($CO_2$) coefficient for natural gas (see ~~e~~lectricity and natural gas coefficients" section). Emissions coefficients for methane ($CH_4$) and nitrogen dioxide ($N_2O$) emissions were provided by the California LGOP version 1.1 and were converted into carbon dioxide equivalents and added to the $CO_2$ emissions to obtain carbon dioxide equivalent ($CO_2e$) emissions.

All commercial/industrial sector emissions are the result of electricity consumption and the on-site combustion of natural gas. Commercial and industrial electricity were combined into one section by PG&E due to the California 15/15 Rule. The 15/15 Rule was adopted by the California Public Utilities Commission (CPUC) in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 Rule requires that any aggregated information provided by the utilities must be made up of at least 15 customers. A single customer's load must be less than 15% of an assigned category. If the number of customers in the complied data is below 15, or if a single customer's load is more than 15% of the total data, categories must be combined before the information is released. The rule further requires that if the 15/15 Rule is triggered for a second time after the data has been screened already using the 15/15 Rule, the customer must be dropped from the information provided. As a result, PG&E aggregated commercial and industrial energy consumption into one report, whereas SoCal Gas Co. separated commercial and industrial gas usage (shown in the chart below) into two reports. It would have been misleading to present an ~~I~~ndustrial" category for only natural gas emissions; therefore, the SoCal Gas Co. emissions were aggregated with commercial as well.

## TABLE 1: RESIDENTIAL ENERGY USE

| 2005 Residential Energy Emissions | Scope | Input Data | Metric Tons $CO_2e$ per Year |
|---|---|---|---|
| PG&E Electricity | 2 | 67,747,053 kWh | 15,151 |
| SoCal Gas Co. Natural Gas | 1 | 4,706,498 Therms | 25,037 |

## TABLE 2: COMMERCIAL/INDUSTRIAL ENERGY USE

| 2005 Commercial/Industrial Energy Emissions | Scope | Input Data | Metric Tons $CO_2e$ per Year |
|---|---|---|---|
| PG&E Commercial + Industrial Electricity | 2 | 17,688,547 kWh | 19,375 |
| SoCal Gas Co. Commercial + Industrial Natural Gas | 1 | 2,585,229 Therms | 13,752 |

To make the Inventory more accurate and representative of the city's real impact on climate change, tailored coefficient sets were obtained from PG&E and the LGOP version 1.1. Sources and coefficient values are summarized in the table below.

## TABLE 3: ELECTRICITY COEFFICIENT SETS

| Coefficient Set | Unit | Value | Source |
|---|---|---|---|
| Average Grid Electricity Set | Lbs/ MWh | 489 $CO_2$<br>0.011 $N_2O$<br>0.03 $CH_4$ | Jillian Rich, Program Manager with PG&E Green Communities, and John Joseph, PG&E GHG Data Requests and LGOP version 1.1 |

## TABLE 4: NATURAL GAS COEFFICIENT SETS

| Coefficient Set | Unit | Value | Source |
|---|---|---|---|
| Fuel $CO_2$ (Natural Gas) Set | kg/MMBtu | 53.06 $CO_2$ | Coefficient set provided by LGOP version 1.1 |
| RCI Average Set – Residential | kg/MMBtu | 0.0001 $N_2O$<br>0.005 $CH_4$ | Coefficient set provided by LGOP version 1.1 |
| RCI Average Set – Commercial + Industrial | kg/MMBtu | 0.0001 $N_2O$<br>0.005 $CH_4$ | Coefficient set provided by LGOP version 1.1 |

### TRANSPORTATION SECTOR

On-road transportation emissions were derived from local jurisdiction vehicle miles traveled (VMT) data and regional vehicle and travel characteristics. The transportation analysis, conducted by Fehr & Peers, utilized the San Luis Obispo Council of Governments (SLOCOG)

Regional Travel Demand model to develop transportation-related GHG emissions data and VMT for trips that have an origin and/or destination in the city.

The SLOCOG Travel Demand Model was recently updated and validated to reflect 2010 conditions and to comply with the Regional Transportation Plan (RTP) guidelines on implementation of Senate Bill 375 (SB 375). The update included expanding the times of day, calibration of multiple modes, and reflecting the auto and of non-auto RTP transportation system, all beneficial when quantifying potential GHG reduction strategies. A 2005 land use scenario was developed by extrapolating 2035 and 2010. Similarly, a 2020 land use scenario was developed by interpolating between 2010 and 2035. See *Summary for the San Luis Obispo Council of Governments Model Improvement Project to Meet the Requirements of California Transportation Commission Guidelines for Regional Transportation Plans in Response to SB375* (February, 2012) for details on model calibration and validation.

Using the model, Fehr & Peers allocated vehicle trips and VMT to each of the cities in San Luis Obispo County and the unincorporated county by weighting trips based on their origin and destination. The VMT summarized for land use with each of the incorporated cities and unincorporated county includes:

a) All of the VMT associated with trips made completely internally within each jurisdiction;

b) Half of the VMT generated by jobs and residences located within each jurisdiction but that travels to/from external destinations (this is consistent with the recent SB 375 Regional Targets Advisory Committee (RTAC) decision that the two generators of an inter-jurisdictional trip should each be assigned half of the responsibility for the trip and its VMT); and

c) None of the responsibility for travel passing completely through the jurisdiction with neither an origin point, or a destination within the city (also consistent with RTAC decision).

The gateways exiting the model area were included in the VMT calculation. This means that a jurisdiction will be held responsible for some VMT occurring outside of the model borders. For example, if a household in Pismo Beach travels across the Santa Maria Bridge to Santa Barbara, or through San Luis Obispo City to reach King City.

To capture the effects of congestion, the model VMT for each time period were summarized by speed for each time period and then aggregated to daily. The VMT results are summarized in **Table 5** for the baseline year (2005) and **Table 6** for 2020.

## TABLE 5: VEHICLE MILES TRAVELED PER JURISDICTION, 2005

| Vehicle Miles Traveled per Jurisdiction, 2005 | Vehicle Miles Traveled (VMT) | |
|---|---|---|
| | Average Weekday Daily | Average Annual[1] |
| Arroyo Grande | 231,019 | 80,163,593 |
| Atascadero | 375,925 | 130,445,975 |
| Grover Beach | 116,140 | 40,300,580 |
| Morro Bay | 140,915 | 48,897,505 |
| Paso Robles | 424,515 | 147,306,705 |
| Pismo Beach | 324,400 | 112,566,800 |
| San Luis Obispo | 2,280,295 | 791,262,365 |
| Unincorporated County | 2,635,017 | 914,350,899 |
| Total | 6,528,226 | 2,265,294,422 |

1 Average Annual VMT was calculated by applying a multiplier of 347 to average weekday daily VMT to account for the total number of weekdays in one year based on the recommendation from Caltrans.

## TABLE 6: VEHICLE MILES TRAVELED PER JURISDICTION, 2020

| Vehicle Miles Traveled per Jurisdiction, 2020 | Vehicle Miles Traveled (VMT) | |
|---|---|---|
| | Average Weekday Daily | Average Annual[1] |
| Arroyo Grande | 267,068 | 92,672,596 |
| Atascadero | 501,605 | 174,056,935 |
| Grover Beach | 154,957 | 53,770,079 |
| Morro Bay | 167,302 | 58,053,794 |
| Paso Robles | 559,372 | 194,102,084 |
| Pismo Beach | 508,625 | 176,492,875 |
| San Luis Obispo | 3,298,712 | 1,144,653,064 |
| Unincorporated County | 3,378,180 | 1,172,228,460 |
| Total | 8,835,821 | 3,066,029,887 |

1 Average Annual VMT was calculated by applying a multiplier of 347 to average weekday daily VMT to account for the total number of weekdays in one year based on the recommendation from Caltrans.

The EMFAC2011 model developed by the California Air Resources Board was then used to calculate emissions from the VMT figures above. EMFAC defaults for San Luis Obispo County include regionally-specific information on the mix of vehicle classes and model years, as well as ambient conditions and travel speeds that determine fuel efficiency. Types of emissions accounted for include: running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak. The model estimates carbon dioxide, methane, and nitrous oxide emissions from these factors and inputted vehicle activity data.

### WASTE SECTOR

Emissions from the waste sector are an estimate of methane generation from the decomposition of landfilled solid waste in the base year (2005). The methane commitment method embedded in CACP is based on the EPA's WARM model for calculating life cycle emissions from waste generated within the jurisdictional boundary of the city in 2005. The analysis does not use the waste-in-place method, which calculates emissions from all waste generated in 2005 and all waste already existing in the landfill before the baseline year.

The waste sector only takes into account the waste sent to landfills from city residents, businesses, and institutions. It does not calculate emissions from the total amount of waste sent to county landfills (Paso Robles, Cold Canyon, and Chicago Grade) in 2005 since those landfills accept waste from the unincorporated county and incorporated cities.

Solid waste tonnage data per jurisdiction was provided by:

- —2005 Disposal Report" by quarter, prepared by the San Luis Obispo Integrated Waste Management Board on 3/6/06. Document provided by Peter Cron, San Luis Obispo County Integrated Waste Management Authority (pcron@iwma.com).

Since the composition of waste sent to landfill in 2005 is unknown for the city, the following statewide average waste composition study was utilized:

- CIWMB 2004 Statewide Waste Characterization Study, http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

The waste characterization study's distribution of waste by type was then converted into the five categories included in the CACP software, which resulted in the following waste characterization:

- Paper products: 21.0%
- Food waste: 14.6%
- Plant debris: 6.9%
- Wood/textiles: 21.8%
- All other waste: 35.7%

The CACP software does not have the ability to assign an individual methane recovery factor to each landfill; therefore we took a weighted average (51%) based on the portion of waste in each landfill. The methane recovery factors of the landfills are well documented by the San Luis Obispo Air Pollution Control District based on the system operations at that time. The landfills have the following methane recovery factors:

TABLE 8: COMMUNITY GENERATED WASTE, 2005

| Landfill | Methane Recovery | Total Gas Generated (mmcf/yr) | Total Gas Transferred (mmcf/yr) | Data Source | Waste Tonnage from City, 2005 (tons) |
|---|---|---|---|---|---|
| Chicago Grade | 60% | 157.47 | 94.48 | APCD 2005 Inventory | 3,514.61 |
| Cold Canyon | 60% | 700.00 | 420.00 | APCD 2005 Inventory | 17.18 |
| Paso Robles | 50% | 129.00 | 64.50 | APCD 2005 Inventory | 34,042.76 |

## OFF-ROAD VEHICLES AND EQUIPMENT SECTOR

Off-road emissions were obtained from the California Air Resources Board's OFFROAD2007 model. The model was run using default equipment population, usage, and efficiency data for San Luis Obispo County. Emissions outputs were scaled to the local jurisdiction level by indicators identified in **Table 8**. Results were converted from short tons per day to metric tons per year. Methane and nitrous oxide emissions were converted to carbon dioxide equivalent units based on the Global Warming Potential factors from LGOP version 1.1.

## TABLE 8: COUNTY-WIDE EMISSIONS INDICATORS

| Equipment Type | Allocation Indicator | Source |
|---|---|---|
| Agricultural Equipment | Acres of cropland | San Luis Obispo County, GIS shape files |
| Construction and Mining Equipment | Construction and mining jobs | U.S. Census Bureau, Center for Economic Studies, On the Map Tool |
| Industrial Equipment | Industrial jobs | U.S. Census Bureau, Center for Economic Studies, On the Map Tool |
| Lawn and Garden Equipment | Households | Economics Research Associates. (July 2006). SLOCOG Long Range Socio-Economic Projections. 2005 data |
| Light Commercial Equipment | Service and commercial jobs | U.S. Census Bureau, Center for Economic Studies, On the Map Tool |

The OFFROAD2007 software calculates emissions from other sources of off-road equipment as well, including recreational vehicles and watercrafts; however these emissions were not included because there was no feasible methodology for separating these emissions per jurisdiction within the county. Population is proven to not be an accurate indicator of consumption rates. To remain consistent with protocol and practice, emissions must be separated in a spatial manner, similar to how highway emissions are determined by road segment length within each jurisdiction. It should also be noted that many location-sources of off-road emissions, such as recreational vehicle emissions, occur in state parks or beaches outside of the jurisdiction of each city or the county.

### OTHER – AIRCRAFT

Aircraft travel was calculated in an engineering report prepared by the Air Pollution Control District in 2007. This emission category accounts for all aircraft exhaust emissions, excluding agricultural crop dusting. The operating emissions considered were those that occur in the City of Paso Robles below 3,000 feet, the average mixing depth in the U.S., which is also the assumed inversion height. Data for the report was obtained from the Paso Robles Municipal Airport (references cited in report).

The emissions calculated in the engineering report are CO, HC, VOC, NOx, SOx, PM10, and PM2.5. However, since only $CH_4$, $N_2O$, and $CO_2$ are included in the CACP calculation of carbon

dioxide equivalent ($CO_2e$), the emissions from aircraft takeoffs and landings are not shown as a source of emissions in this report.

### 2020 AND 2025 FORECAST

The GHG emissions forecast provides a ~~b~~business-as-usual estimate," or scenario, of how emissions will change in the year 2020 and 2025 if consumption trends and behavior continue as they did in 2005, absent any new federal, state, regional, or local policies or actions that would reduce emissions. The year 2020 was selected for the forecast in order to maintain consistency with AB 32 and the year 2025 was selected in order to maintain consistency with the General Plan planning horizon.

The 2020 and 2025 forecasts calculate business-as-usual growth based on population and job growth rates obtained from the San Luis Obispo Council of Governments' report, "San Luis Obispo County 2040 Population, Housing & Employment Forecast" (August 2011). Mid-range estimates of growth were used in both instances (**Figures ES-5** and **6-1**). Specifically population growth rates were applied to residential, waste, off-road, and wastewater sectors; job growth rates were applied to the commercial/industrial sector. For the transportation sector, Fehr & Peers provided VMT estimates for the year 2020 as shown in **Table 6** above, which was extrapolated for the year 2025.

It should be noted that these forecasts do not take into consideration any planned or actual efficiency or conservation measures after 2005. For example, the State Renewable Energy portfolio has advanced significantly since 2005, but the forecast calculates 2020 energy emissions by assuming constant emissions factors.

# APPENDIX D:
# DETAILED METHODOLOGY FOR CITY GOVERNMENT OPERATIONS INVENTORY

# APPENDIX D: DETAILED METHODOLOGY FOR GOVERNMENT OPERATIONS INVENTORY

## Detailed Methodology for Government Operations GHG Emissions Inventory

The municipal operations inventory follows the LGOP version 1.1, which was adopted in 2010 by CARB and serves as the national standard for quantifying and reporting GHG emissions from local government operations.

### BUILDING SECTOR

The building sector includes all emissions from natural gas and electricity consumed in City-owned and - operated buildings and facilities. Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCal Gas Co.) provided municipal electricity and natural gas consumption data respectively. Specifically, data was provided by:

- Jillian Rich, Program Manager with PG&E Green Communities and Innovator Pilots (jillian.rich@pge.com), and John Joseph, PG&E GHG Data Requests
- Paulo Morais, Energy Programs Supervisor with Southern California Gas Company, Customer Programs (pmorias@semprautilities.com)

This raw data was input into the CACP2009 software in kWh and therms. PG&E provided a 2005 carbon dioxide ($CO_2$) coefficient for electricity use and SoCal Gas Co. provided a carbon dioxide ($CO_2$) coefficient for natural gas. Emissions coefficients for methane ($CH_4$) and nitrogen dioxide ($N_2O$) emissions were provided by the California LGOP version 1.1 and were converted into carbon dioxide equivalents and added to the $CO_2$ emissions to obtain carbon dioxide equivalent ($CO_2e$) emissions (see **Appendix C**, **Tables 3** and **4**).

### VEHICLE FLEET SECTOR

The vehicle fleet sector includes gasoline and diesel vehicles from the following City departments:

- Airport Operations
- City Hall/Library
- Community Development
- Emergency Services
- Parks
- Police
- Public Works
- Utilities

# APPENDIX D: DETAILED METHODOLOGY FOR GOVERNMENT OPERATIONS INVENTORY

Gasoline and diesel consumption for calendar year 2008 was obtained from fuel usage reports generated by the Public Works Fleet Management Division. Specific sources of data within each organization are outlined in the notes of **Appendix B**. Emissions were calculated using the EMFAC software for the San Luis Obispo region, consistent with the community methodology described in **Appendix C**.

## EMPLOYEE COMMUTE SECTOR

Employees were surveyed in June 2009 through an online system run by PMC. The questions, attached as **Appendix E**, asked employees about their current commuting patterns. Of those questions, we used the following for our analysis:

- What is your approximate one-way distance to work (in miles)? Please indicate the most direct distance to work, discounting midway destinations that would be taken whether or not you drove to work each day (i.e., dropping off children at school).
- Please indicate the type of transportation you take to work each day in your average work week. Please note that there are two types of carpooling.
  - ◇ Drive alone
  - ◇ Carpool with fellow City employees
  - ◇ Carpool with drivers not employed by the City
  - ◇ Vanpool
  - ◇ Public transit
  - ◇ Motorcycle
  - ◇ Bicycle
  - ◇ Walk
  - ◇ Telecommute
  - ◇ Other
- What type of vehicle do you drive?
- What type of fuel does your vehicle use?
- If you carpool with fellow City employees, how many City employees ride with you? If you carpool with a different number each day, please indicate the average.

# APPENDIX D: DETAILED METHODOLOGY FOR GOVERNMENT OPERATIONS INVENTORY

Approximately 111 employees responded to the survey with usable information, meaning that all essential questions were answered. Answers with mileage left blank or with highly inconsistent data (example: saying they walked three days to work, biked two, and drove five) were omitted. In addition, if a respondent did not describe their "other" category of transportation, the entry was omitted.

To perform this analysis, we took the following steps:

1) Separate entries by what type of vehicle they own and operate (compact, mid-size car, full-size car, small truck, medium-small truck, large truck, motorcycle or "don't drive"). Within each new group, separate the entries by diesel, gasoline, or hybrid.

2) For each group of entries with the same vehicle type and technology, multiply the number of miles to work by 2 (to get round-trip estimate) and then by the number of drive alone days for each entry. Multiply the number of miles to work by the number of carpool days (half of the drive alone emissions). Note: If a respondent entered that they motorcycle to work, but own a car as well, the motorcycle miles were moved to the motorcycle category. Adjust for hybrids (see below).

3) Add all miles per vehicle type and technology and multiply by 52.18 workweeks per year.

4) Calculate the multiplier to adjust survey response data to the entire 2005 employee population. In 2005, there were 221 employees. This number, divided by the 111 survey entries, gives us our multiplier of 1.99.

5) Multiply the mileage per vehicle per technology type by the multiplier.

6) Divide the number of hybrid miles by 2.2 and add the difference to the passenger car category. This is to account for the large increase in hybrid sales between 2005 and 2009. Source: Hybridcars.com sales statistics.

7) Manipulate the vehicle classes to fit the CACP2009 software categories.

8) Enter final miles into the CACP2009 software per vehicle type and fuel.

## TABLE1: 2009 EMPLOYEE COMMUTE SURVEY

| Vehicle Group | 2009 Survey Results | | Adjusted for 2005 | |
|---|---|---|---|---|
| | Annual VMT | Fuel Type | | |
| Light Trucks | 54,038.65 | Gasoline | 107,536.92 | Gasoline |
| | 3,339.52 | Diesel | 6,645.64 | Diesel |
| Large Trucks | 9,924.64 | Gasoline | 19,750.03 | Gasoline |
| | 17,480.03 | Diesel | 34,785.80 | Diesel |
| Passenger Vehicle | 242,657.87 | Gasoline | 34,785.80 | Gasoline |
| Total | 306,621.16 | Gasoline | 610,176.11 | Gasoline |
| | 20,819.82 | Diesel | 41,431.44 | Diesel |

The CACP2009 software does not provide a method of calculating emissions from hybrid cars. As a result, these emissions were divided by 2.20 based on the difference between average fuel economy of a 2005 Toyota Prius and the average fuel economy included in the 2005 San Luis Obispo region EMFAC data and then entered into the CACP2009 software under passenger vehicle (Source: www.fueleconomy.gov).

### STREETLIGHT SECTOR

PG&E provided electricity usage from streetlights in kWh for 2005. The total kWh were entered into the CACP2009 software using the electricity coefficients identified in **Appendix C**.

### WATER/ SEWAGE SECTOR

This sector calculates emissions from energy consumption at City-owned and -operated water and wastewater facilities, and point-source emissions that arise due to temporary aerobic conditions or incomplete combustion of captured biogas from anaerobic digesters. PG&E and SoCal Gas Co. provided electricity and natural gas consumption data for all of the water and wastewater facilities, as well as the numerous lift stations, pumps, transfer stations and wells that are used to convey water and wastewater. Operational data provided by the Wastewater Treatment Plant Manager was utilized to determine total methane and nitrous oxide emissions using ICLEI's Wastewater Emissions Data tool. Both of these sources are outlined in **Appendix B**. These totals were entered into the CACP2009 software with the electricity and natural gas coefficients presented in **Appendix C**.

# APPENDIX D: DETAILED METHODOLOGY FOR GOVERNMENT OPERATIONS INVENTORY

## WASTE SECTOR

Paso Robles Waste Disposal reported solid waste tonnage produced by City operations. The City produced 646.9 tons of waste in 2005 that was sent to managed landfills. The waste composition was unknown for the city; therefore, the California averages provided by the 2004 California Integrated Waste Management Board Waste Characterization Report were used. A weighted average methane recovery factor of 51% was used in this analysis, as outlined in **Appendix C**.

## OTHER

The other sector includes miscellaneous equipment used by Public Works, Parks and Recreation, and the Paso Robles Municipal Landfill. Equipment included in these sectors is outlined in the detailed CACP2009 report notes in **Appendix B**. There is no automated calculation included in CACP2009 for these sources of emissions; therefore calculations were made outside of CACP2009 and entered into the ~~-o~~ther" category.

Data was given in gallons of fuel used per equipment type. Conversion factors of gallons to kg $CO_2$ and grams $N_2O$ and $CH_4$ were obtained from Table G.9 and G.12 of the LGOP.

- Small/large utility (gasoline) = 8.81 kg $CO_2$, 0.22 g $N_2O$ and 0.50 g $CH_4$ /gallon fuel;
- Other large utility (diesel) = 10.15 kg $CO_2$, 0.26 g $N_2O$ and 0.58 g $CH_4$ /gallon fuel.

# APPENDIX E:
# CITY EMPLOYEE COMMUTE SURVEY, 2009

## City Employee Commute Survey, 2009

1) What is your approximate one-way distance to work (in miles)? Please indicate the most direct distance to work, discounting midway destinations that would be taken whether or not you drove to work each day (i.e., dropping off children at school).

_____

2) Please indicate the type of transportation you take to work each day in your average work week. Please note that there are two types of carpooling.

| | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 |
|---|---|---|---|---|---|
| Drive alone | ☐ | ☐ | ☐ | ☐ | ☐ |
| Carpool with fellow City employees | ☐ | ☐ | ☐ | ☐ | ☐ |
| Carpool with other drivers not employed by the City | ☐ | ☐ | ☐ | ☐ | ☐ |
| Vanpool | ☐ | ☐ | ☐ | ☐ | ☐ |
| Public transit | ☐ | ☐ | ☐ | ☐ | ☐ |
| Motorcycle | ☐ | ☐ | ☐ | ☐ | ☐ |
| Bicycle | ☐ | ☐ | ☐ | ☐ | ☐ |
| Walk | ☐ | ☐ | ☐ | ☐ | ☐ |
| Telecommute | ☐ | ☐ | ☐ | ☐ | ☐ |
| Other | ☐ | ☐ | ☐ | ☐ | ☐ |

3) What type of vehicle do you drive?

- ☐ Compact/Sub-Compact car (Civic, Corolla, Focus, Neon, Cavalier, Jetta or similar)
- ☐ Mid-size car (Accord, Camry, Passat, Monte Carlo, Sable, Sebring or similar)
- ☐ Full-size car (Impala, Intrepid, Taurus, Crown Victoria, Bonneville, Town Car or similar)
- ☐ Small Truck/SUV/Pickup (RAV4, Chev S10, Pickup (4 cylinder), PT Cruiser or similar)
- ☐ Medium-Small Truck/SUV/Pickup (Minivan, Sonoma Pickup Truck or similar)
- ☐ Medium-Large Truck/SUV/Pickup (Durango, Safari Cargo Van, Ford F150 or similar)
- ☐ Large Truck/SUV/Pickup (Suburban, Expedition, Navigator, Ford E250/350/450 or similar)
- ☐ Motorcycle
- ☐ I don't drive alone or drive a carpool

4) What type of fuel does your vehicle from question 3 use?

- ☐ Gasoline
- ☐ Diesel
- ☐ Biodiesel
- ☐ Hybrid
- ☐ Electric
- ☐ I don't drive to work or drive a carpool
- ☐ Other (Specify): _____

5) If you carpool or vanpool with fellow City employees, home may City employees ride with you? If you carpool with a different number each day, please indicate the average. If ~~"n~~ot applicable," please enter ~~"~~0

Enter # of people: _____

# APPENDIX B

## TECHNICAL APPENDIX

# GHG Measure Quantification Details

Several factors including GHG reduction potential as well as economic impacts were key factors in evaluating and selecting GHG emissions reduction measures for Paso Robles' CAP. This appendix displays pages from the measure evaluation toolbox which detail the methodology, information sources, and assumptions for the GHG reduction potential and cost and savings estimates included in the CAP.

This appendix also contains details regarding the quantification of existing local measures and State reductions which were included in the adjusted forecast as described in Chapter 2 of the CAP.

## About the CAP Measure Methods and Calculations

The GHG emission reduction potential of a given measure is quantified following standardized methods for estimating emissions detailed in the California Air Pollution Control Officers Association's (CAPCOA) report Quantifying Greenhouse Gas Mitigation Measures (August 2010). The calculations utilize emissions factors and results from the Paso Robles' GHG Emissions Inventory, as well as assumptions made by the City about the degree of implementation in the year 2020.

Costs and savings directly associated with the implementation of each measure were estimated for the City, as well as for residents and businesses, where feasible. Cost estimates generally include initial capital costs (e.g., purchase and installation of technology, program development, etc.) needed to produce the emission reductions estimated by the GHG analysis in 2020, and are based on current (2013) prices. Savings include reduced costs associated with electricity, natural gas, and fuel usage, as well as the reduced need for maintenance, and are also based on current (2013) prices. Costs and savings were estimated using information specific to the region—when available—or for similar cities in the region, State of California, or United States, prioritized in that order. There are numerous factors that will affect the actual costs incurred if the measures are implemented. Because of the uncertainties and variability associated with costs and savings, they are reported as ranges in Chapters 3 and 4 of the CAP.

# City Government Energy Efficiency Retrofits and Upgrades

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Target percentage of energy savings | 50% | Percent |
| Staff time needed for this measure | 0.08 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Municipal Electricity Energy Savings (kWh)=Em x P x 0.95<br>Municipal Natural Gas Savings (therms)=NGm x P x 0.05 | | |
| | Where: | | |
| | Em= | 11,515,201 | Municipal electricity usage (GHG Emissions Inventory) |
| | NGm= | 139,240 | Municipal natural gas usage (GHG Emissions Inventory) |
| | P= | 50% | Target percentage of energy savings (applied 95% electricity, 5% natural gas) |
| Resource Savings | 5,469,720 | Municipal electricity saved (kWh/year) | |
| | 3,481 | Municipal natural gas saved (therms/year) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e)=(Se/1,000 × 0.133)+(Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation) | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 746 | MT CO2e | |
| Municipal Cost and Savings Calculations | Staff time needed to apply for funding and implement the upgrades. | | |
| | FTE = | 0.08 | Estimated staff time per year to develop new program |
| | $/FTE= | $100,000 | FTE cost |
| | Cost of staff time = | $8,000 | Dollars |
| | Total Savings = kWh reduced/year x $/kWh + therms reduced/year x $/therm | | |
| | Where: | | |
| | $/kWh = | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | $/Therm = | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| Municipal Cost and Savings | Municipal Cost = | Varies | Dollars (costs will vary based on the level of implementation and financial rebates) |
| | Municipal Savings = | $1,042,449 | Dollars |

## Notes

Actual energy and greenhouse gas emissions savings proposed upgrades. A study of building commissioning found whole-building energy savings of 15% at a cost of $0.27 per square foot (LBNL). An estimate of LEED for Existing Buildings found the program reduced energy use by 20% (SPUR).
Implementation Resources: PG&E webpage for local governments - http://www.pge.com/mybusiness/energysavingsrebates/incentivesbyindustry/government/local/

## References


1. 2005 California End Use Survey http://www.energy.ca.gov/ceus/
2. Lawrence Berkeley National Laboratory. 2004. Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States (page 1). www.ga.wa.gov/eas/bcx/Cx_Cost Effectiveness.pdf
3. SPUR - San Francisco Commercial Energy Ordinance http://www.spur.org/publications/library/report/critical_cooling/option4

# City Government Energy Efficient Public Realm Lighting

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of LED street lights installed by 2020 | 50 | Street Lights |
| Number of LED traffic signals installed by 2020 | 10 | Traffic Signals |
| Number of high efficiency airport lights installed by 2020 | 35 | Airport Lights |
| Number of other LED outdoor lights installed by 2020 | 50 | Other Outdoor Lights |
| Staff time needed for this measure | 0.02 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Total electricity saved (kWh) = (N x (Wi-We) x (h/Cf)) | | |
| | Where Street Lights: | | |
| | $N_{street}$ = | 50 | Number of street lights installed lights |
| | Wi = | 200 | Average estimated power rating in watts of high pressure sodium street light (Department of Energy [DOE] 2004. National Lighting Inventory and Energy Consumption Estimate) |
| | We = | 50 | Average power rating in watts of LED street lighting (DOE and PG&E 2008. LED Street Lighting) |
| | h = | 4,100 | Number of hours per year operating |
| | Cf = | 1,000 | Conversion factor for W to kW |
| | Where Traffic Signals: | | |
| | $N_{traffic}$ = | 10 | Number of traffic installed lights |
| | Wi = | 150 | Average estimated power rating in watts of incandescent traffic signal light. (U.S.Department of Energy, 2004 in Stockton Climate Action Plan). |
| | We = | 15 | Average power rating in watts of LED traffic signal light (CAPCOA 2010) |
| | h = | 8,760 | Number of hours per year operating (24 hours a day) |
| | Cf = | 1,000 | Conversion factor for W to kW |
| | Where Other Outdoor Lighting: | | |
| | $N_{other}$ = | 50 | Number of other outdoor installed lights |
| | Wi = | 200 | Average estimated power rating in watts of public realm lighting (Department of Energy [DOE] 2004. National Lighting Inventory and Energy Consumption Estimate) |
| | We = | 50 | Average power rating in watts of LED public realm lighting (DOE 2004) |
| | h = | 3,650 | Number of hours per year operating |
| | Cf = | 1,000 | Conversion factor for W to kW |
| | Where Airport Lighting: | | |
| | $N_{airport}$ = | 35 | Number of other outdoor installed lights |
| | Wi = | 400 | Average estimated power rating in watts of public realm lighting (City of Paso Robles 2013) |
| | We = | 100 | Average power rating in watts of LED public realm lighting (City of Paso Robles 2013) |
| | h = | 3,650 | Number of hours per year operating |
| | Cf = | 1,000 | Conversion factor for W to kW |
| Resource Savings | 30,750 | Electricity saved from LED street lights (kWh) | |
| | 11,826 | Electricity saved from LED traffic signals (kWh) | |
| | 27,375 | Electricity saved from LED "other" outdoor lighting (kWh) | |
| | 38,325 | Electricity saved from high efficiency airport lighting (kWh) | |
| | 108,276 | Total electricity saved (kWh) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e)=(Se/1,000 × 0.133) | | |
| | Where: | | |
| | 108,276 | = Se (electricity savings) | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation) | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| GHG Emission Reduction | 14 | MT CO2e/year | |
| | Total energy savings = kWh reduced/year * $/kWh | | |

| | | | |
|---|---|---|---|
| Municipal Costs and Savings Calculations | Where: | | |
| | $/kWh = | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Total annual energy cost savings= | $20,572 | Dollars per year |
| | Maintenance savings per fixture = | $17 | Annual maintenance savings/fixture (Palo Alto) |
| | Some staff time may be needed to implement the program. | | |
| | FTE = | 0.1 | Estimated staff time per year to develop new program |
| | $/FTE= | $100,000 | FTE cost |
| | Cost of staff time = | $10,000 | Dollars |
| | Total Capital Cost = [Number of units installed x cost per unit] – [Available rebates] | | |
| | Where Municipal Streetlights: | | |
| | Number of units installed = | 50 | Units |
| | Cost per unit installed = | $350 | Dollars/unit (Energy Solutions 2008; PNNL 2010) |
| | Total cost= | $17,500 | Dollars |
| | Available rebates = | $125 | Dollars/unit ($125 for 200 watt unit replaced - PG&E) |
| | Net cost = | $11,250 | Dollars (total cost - available rebates) |
| | Where Traffic Signals: | | |
| | Number of units installed = | 10 | Units |
| | Cost per unit installed = | $193 | Dollars/unit (assuming a standard three 12" (red, yellow, and green) balls per signal (Western Pacific Signal 2011; eLightBulbs 2011)) |
| | Total cost = | $1,930 | Dollars |
| | Available rebates = | $100 | Dollars ($100 for 150 watt unit replaced - PG&E) |
| | Net cost = | $930 | Dollars (total cost - available rebates) |
| | Where Other Municipal Outdoor Lighting: | | |
| | Number of units installed = | 50 | Units |
| | Cost per unit installed = | $300 | Dollars/unit (Energy Solutions 2008; PNNL 2010) |
| | Total cost = | $15,000 | Dollars |
| | Available rebates = | $100 | Dollars ($100 for 150 watt unit replaced - PG&E) |
| | Net cost = | $10,000 | Dollars (total cost - available rebates) |
| | Where Airport Lighting: | | |
| | Number of units installed = | 35 | Units |
| | Cost per unit installed = | $300 | Dollars/unit (Energy Solutions 2008; PNNL 2010) |
| | Cost installation = | $10,500 | Dollars |
| | Available rebates = | $150 | Dollars |
| | Net cost = | $5,250 | Dollars (total cost - available rebates) |
| Municipal Costs and Savings | Municipal Cost = | $37,430 | Dollars |
| | Municipal Savings = | $21,517.44 | Dollars |

## Notes

Lamp wattage varies. Stationary source outdoor lights range from 83W to 407 W (DOE, page 48). LED lamps are typically under 100 W (DOE and PG&E).

## References


1. PG&E Streetlight program - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/streetlightprogram.shtml
2. DOE National Lighting Inventory and Energy Consumption Estimate http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lmc_vol1_final.pdf
3. DOE and PG&E LED Street Lighting study - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_sf-streetlighting.pdf
4. PG&E LED Streetlight Rebates - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/incentives/index.shtml
5. Western Pacific Signal 2011; eLightBulbs 2011; Energy Solutions 2008; PNNL 2010 from Stockton Draft CAP - http://www.stocktongov.com/files/ClimateActionPlanDraftFeb2012.pdf
6. Palo Alto - Demonstration Assessment of Light-Emitting Diode (LED) Roadway Lighting on Residential and Commercial Streets - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_palo-alto.pdf

# Renewable Energy Systems on City Property

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| kW of municipal solar PV installations by 2020 | 100 | kW |
| Number of solar hot water heaters | 4 | Systems |
| Staff time needed for this measure | 0.10 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Municipal Electricity Energy Savings (kWh)=(kW × Cf) + (Msw × Ee) | | |
| | Where: | | |
| | Msi= | 100 | kW of solar installations by 2020 |
| | Msw= | 0.4 | # of solar electric water heater installations by 2020 |
| | Mswg= | 3.6 | # of solar natural gas water heater installations by 2020 |
| | Ee= | 2,945 | average expected municipal solar water heater savings in kWh per year (California Solar Initiative (CSI 2) Thermal Program Cal Solar statistics) |
| | Eg= | 139 | average expected municipal solar water heater savings in therms per year (CSI 2 - 2012 Thermal Program Cal Solar statistics) |
| | Cf= | 1,455 | conversion factor from kW to kWh per year (Solar Energy Industries Association [SEIA] Solar Radiation Conversion Map) |
| Resource Savings | 500 | Municipal natural gas saved (therms/year) | |
| | 146,629 | Municipal electricity saved (kWh/year) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation) | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reductions | 22 | MT CO2e | |
| Municipal Costs and Savings Calculations | Municipal cost savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Commercial $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/therm= | $0.81 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Staff time to obtain grant funding and implement project | | |
| | FTE = | 0.1 | Estimated staff time to develop new program |
| | $/FTE | $100,000 | Dollars per year |
| | Total Staff Cost= | $10,000 | Dollars per year |
| | Total Capital Cost = Total Cost of Solar Units (bulk purchase + installation) + Total Staff Cost - Available Rebates | | |
| | Where: | | |

| | | | |
|---|---|---|---|
| | Commercial solar installation cost = | $4.38 | Commercial Solar Installations per watt (Green Tech Media) |
| | Total solar PV installation cost = | $637,075 | Average capital cost per kW (CSI statistics) |
| | Solar water heater cost = | $4,650 | Dollars (Incremental installed cost of solar hot water heater (National Renewable Energy Lab, August 2012)) |
| | Available rebates = | $2,175 | Dollars (available Rebate for replacing natural gas heater with solar (Go Solar CA)) |
| | Cost of solar hot water heater with rebate = | $2,475 | Dollars (cost of solar hot water heater installation minus rebate) |
| | Total cost of solar water heaters = | $9,900 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $656,975 | Dollars |
| | Municipal Savings = | $27,678 | Dollars |

## Notes

Municipal installation size assumptions are the averages for PV installations in California. The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Municipal solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in California (Cal Solar).

When combining energy measures, the City should be aware of double-counting emission reductions. Some actions in this measure overlap with actions in Measures 3r and this overlay diminishes the overall effectiveness of the measure and its actions. If the City selects both measures, it should lower the commitment established in terms of units or percent reduction in order to address the issue of double-counting.

The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

## References


1. California Solar Initiative (CSI) - http://www.californiasolarstatistics.ca.gov/
2. California Solar Initiative CSI-Thermal Program - http://www.gosolarcalifornia.ca.gov/solarwater/index.php
3. CEC Planning and Permitting Resources For Renewable Energy Systems -http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/
5. http://www.greentechmedia.com/research/ussmi
6. National Renewable Energy Lab, August 2012 - http://www.nrel.gov/solar/
7. Go Solar CA - http://www.gosolarcalifornia.ca.gov/

# Transportation Demand Management (TDM) Program for City Employees

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percent City employee participation | 20% | Percent |
| Staff time needed for this measure | 0.0 | Full Time Equivalent (FTE) |

**Calculations:** MANDATORY TDM PROGRAM w/ option for vanpool/shuttle and parking "cash-out."

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduced from TDM program(C) = Vehicle Miles Travelled for City Employee Commute (A) x Percent Participation | | |
| | Vehicle Miles Travelled for City Employee Commute (A) = | 651,608 | VMT |
| | Percent City Employee Participation= | 20% | Percent |
| Resource Savings | VMT Reduced from "Base" TDM program (C) = | 130,322 | VMT |
| GHG Emission Reduction Calculations | Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 49 | MT CO2e |
| Municipal Costs and Savings Calculations | Annual staffing costs from program development and implementation. | | |
| | FTE = | 0.0 | Staff time needed for this measure |
| | $/FTE= | $100,000 | FTE cost per year |
| | Private VMT Reduced = | 130,322 | VMT |
| | Private vehicle operating cost per mile = | $0.57 | Dollars per mile |
| Municipal Costs and Savings | Municipal Cost = | $4,000 | Dollars (Assumes $0 capital cost - San Luis Obispo Rideshare works directly with employers to develop TDM programs, offering free tools and services.) |
| | Municipal Savings = | $73,632 | Dollars |

## Notes

Calculation methodology derived from RICAPS and CAPCOA measures TRT-1, TRT-2, TRT-11, and TRT-15; users should consult detailed CAPCOA guidance and example calculations when using this methodology.

## References


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

2. SLO COG Rideshare - http://www.rideshare.org/employers.aspx

# Zero and Low Emission Municipal Fleet Vehicles

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of municipal vehicles replaced by 2020 | 20 | Vehicles |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Fuel savings (gallons) = V x M (1/Fi - 1/Fe) | | |
| | Where: | | |
| | Number of vehicles replaced (V) = | 20 | Vehicles |
| | Average miles driven per year (M) = | 12,500 | Miles per year |
| | Average fuel economy of replaced vehicles (Fi) = | 20 | Miles per gallon |
| | Average fuel economy of newer (more efficient) vehicles (Fe) = | 50 | Miles per gallon |
| Resource Savings | Fuel Savings = | 7,500 | Gallons of gasoline fuel |
| GHG Emission Reduction Calculations | GHG reduced (MT CO2e) = Fuel savings (gallons gasoline) x 8.81 / 1,000 | | |
| | 8.81 | = GHG emission from gasoline (kg CO2/gallon) | |
| | 1,000 | = Conversion from kg to metric tons | |
| GHG Emission Reduction | Total GHG Savings | 66 | MT CO2e |
| Municipal Costs and Savings | Energy cost per mile of regular gasoline vehicle = | $0.1468 | Dollars per mile (standard car. Ex, Toyota Corolla) ( RechargeIT) |
| | Energy cost per mile of hybrid vehicle = | $0.0690 | Dollars per mile (Electric vehicles. Ex, Toyota Prius Plug-in Hybrid, RechargeIT) |
| | Difference in energy cost per mile = | $0.0778 | Dollars per mile |
| | Estimate average miles driven per year = | 12,500 | Miles per year |
| | Difference in purchase price for hybrid above similar non-hybrid vehicle = | $4,315 | Dollars (US DOE) |
| Municipal Costs and Savings | Municipal Costs = | $86,300 | Dollars (Assumes no staff time needed above that required for purchasing regular gasoline vehicles.) |
| | Municipal Savings = | $2,918 | Dollars |

## Notes

## References


1. RechargeIT Driving Experiment: Demonstration of energy efficiency for electric vehicles. Google, org, 2007. http://www.google.org/recharge/

2. US Department of Energy (DOE)- fueleconomy.gov

# City Government Solid Waste Reduction

## Calculation Methodology and Equations

**Key Assumptions for Example Calculations:**

| | | |
|---|---|---|
| Target diversion rate by 2020 (beyond baseline) | 25% | Percent |
| Number of new recycling receptacles | 15 | Recycling Receptacles |
| Staff time needed for this measure | 0.1 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Tons Diverted = Landfilled Tonnage x Targeted Diversion Rate | | |
| | Total City Future Year (2020) Solid Waste Tonnage = | 647 | Tons |
| | Paper Products = | 21.0% | Percent |
| | Food Waste = | 14.6% | Percent |
| | Plant Debris = | 6.9% | Percent |
| | Wood/Textiles = | 21.8% | Percent |
| | All Other Waste = | 35.7% | Percent |
| | Future Year Paper Products = | 136 | Tons |
| | Future Year Food Waste = | 94 | Tons |
| | Future Year Plant Debris = | 45 | Tons |
| | Future Year Wood/Textiles = | 141 | Tons |
| | Future Year All Other Waste = | 231 | Tons |
| | Paper Products Diverted = | 34.0 | Tons |
| | Food Waste Diverted = | 23.6 | Tons |
| | Plant Debris Diverted = | 11.2 | Tons |
| | Wood/Textiles Diverted = | 35.3 | Tons |
| | All Other Waste Diverted = | 57.7 | Tons |
| Resource Savings | Future Year Total Waste Diverted = | 161.8 | Tons |
| | Total MT CO2e Diverted = (2.138)(Paper Products)(0.9072) + (1.120)(Food Waste)(0.9072) + (0.686)(Plant Debris)(0.9072) + (0.605)(Wood/Textiles)(0.9072) + (0.00)(All Other Waste)(0.9072)<br><br>1 - Emission Reduction Per Waste Category = Emissions Factor for Category x Future Year Category Tonnage Diverted x 0.9072 x (1 - Emissions captured at landfill) | | |
| | 0.9072 | = Conversion from tons to metric tons | |
| | Emission Factor - Paper Products | 2.138 | MT CO2e / MT waste |
| | Emission Factor - Food Waste | 1.210 | MT CO2e / MT waste |
| | Emissions Factor - Plant Debris | 0.686 | MT CO2e / MT waste |

| | | | |
|---|---|---|---|
| GHG Emission Reduction Calculations | Emission Factor - Wood/Textiles | 0.605 | MT CO2e / MT waste |
| | Emission Factor - All Other Waste | 0.000 | MT CO2e / MT waste |
| | Emissions from Paper Products = | 66 | Metric Tons CO2e |
| | Emissions from Food Waste = | 26 | Metric Tons CO2e |
| | Emissions from Plant Debris = | 7 | Metric Tons CO2e |
| | Emissions from Wood/Textiles = | 19 | Metric Tons CO2e |
| | Emissions from All Other Waste = | 0 | Metric Tons CO2e |
| | Emissions captured at landfill = | 60% | Percent |
| GHG Emission Reduction | Total GHG Emissions Reductions = | 47 | Metric Tons CO2e |
| Municipal Costs and Savings Calculations | Cost may include additional staff time. | | |
| | FTE = | 0.1 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Total staff time costs = | $10,000 | Dollars |
| | Capital cost to City = | $7,500 | Dollars (Assumes average cost of commercial recycling receptacle is $500.) |
| | Maintenance cost to City = | $300 | Dollars |
| Municipal Costs and Savings | Municipal Costs= | $17,800 | Dollars |
| | Municipal Savings= | $0 | Dollars |

## Notes

All cities are assumed to have a baseline year diversion rate of 50%. This diversion has already been accounted for in the baseline year landfilled solid waste tonnage.

CAGR growth rates were calculated based on population growth.

GHG Emissions Calculations assume a landfill methane recovery rate of 60%.

ICLEI's CACP software incorporates emission factors for the diversion of certain materials from the waste stream, derived from the EPA WARM model.

Assumes average cost of a commercial recycling receptacle to be $500 and ongoing additional maintenance to be $20 per receptacle.

## References


1. DRAFT City of Stockton Climate Action Plan (February 2012) - pg. C-77,C-78
2. Hayward Climate Action Plan (October, 2009) - pg. 170
3. County of San Bernardino Greenhouse Gas Emissions Reduction Plan (September 2011) - pg. 91

4. EPA's Waste Reduction Model (WARM), available at: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html
5. ICELI's Clean Air Climate Protection (CACP) Software (for members), available at: http://www.icleiusa.org/action-center/tools/cacp-software

# City Government Tree Planting Program

## Calculation Methodology and Equations

**Note: There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed.**

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Target number of trees planted on City-owned property | 500 | Trees |
| Capital cost per tree ($0 if to be paid for through grant funding) | $79 | Dollars per Tree |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction Calculations | GHG Emissions Reductions = Number of Trees Planted x Carbon Sequestration Rate | | |
| | 0.0121 | = Average carbon sequestration (MT $CO_2$/Tree) | |
| | 500 | = Number of Trees Planted | |
| GHG Emission Reduction | Annual GHG emissions reduced = | 6 | MT CO2e |
| Municipal Costs and Savings Calculations | Capital cost = (cost per tree x number of trees planted) | | |
| | Where: | | |
| | Cost per tree= | $79 | Dollars/tree (McPherson, et al) |
| | Number of trees planted= | 500 | Trees/year |
| | Capital cost to City= | $39,500 | Dollars |
| | Maintenance cost = maintenance cost per tree x number of trees planted | | |
| | Where: | | |
| | Maintenance cost= | $34 | Dollars/tree (McPherson, et al) |
| | Maintenance costs = | $17,000 | Dollars |
| | Staff time needed to develop policy/ordinance and apply for funding. | | |
| | FTE = | 0.04 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Staff time cost = | $4,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $60,500 | Dollars |
| | Municipal Savings = | $0 | Dollars |

## Notes

Carbon sequestration rate from CAPCOA Quantifying GHG Mitigation Measures Report. There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed. Account for net new trees only.

## References


1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010) - pg. 403
2. McPherson, et al as cited in Stockton Draft CAP - http://www.stocktongov.com/government/boardcom/clim.html

# Energy Efficiency Outreach and Incentive Programs

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percent of households participating by 2020 | 35% | Percent |
| Percent of businesses participating by 2020 | 35% | Percent |
| Targeted percent residential energy savings | 5% | Percent |
| Targeted percent commercial energy savings | 6% | Percent |
| Staff time needed for this measure | 0.02 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Residential Electricity Savings (kWh) = Rp × Rs x 95% x Re<br>Residential Natural Gas Savings (therms) = Rp × Rs x 5% x Rn<br>Commercial Electricity Savings (kWh) = Cp x Cs x 95%x Ce<br>Commercial Natural Gas Savings (kWh) = Cp x Cs x 5% x Cn | | |
| | Where: | | |
| | Rp= | 35% | Percent of residences participating in rebate and programs by 2020 |
| | Cp= | 35% | Percent of businesses participating in rebate and incentive programs by 2020 |
| | Rs= | 5% | Percent residential energy savings (applied 95% electricity, 5% natural gas) |
| | Cs= | 6% | Percent commercial energy savings (applied 95% electricity, 5% natural gas) |
| | Re= | 78,439,999 | 2020 residential electricity usage (kWh) |
| | Rn= | 5,355,948 | 2020 residential natural gas usage (therms) |
| | Ce= | 80,726,652 | 2020 commercial electricity use (kWh) |
| | Cn= | 2,354,906 | 2020 commercial natural gas usage (therms) |
| Resource Savings | 1,304,065 | Residential electricity saved (kWh) | |
| | 4,686 | Residential natural gas saved (therms) | |
| | 1,610,497 | Commercial electricity saved (kWh) | |
| | 2,473 | Commercial natural gas saved (therms) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | Residential or commercial electricity savings | |
| | Sg= | Residential or commercial natural gas savings | |
| | 1,000 | = Conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation) | |
| | 10 | = Conversion factor for therm to MMBtu | |
| | 0.133 | = Average projected emissions factor for electricity in 2020 in MT $CO_2$e/MWh | |
| | 53.24 | = Average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 198 | Residential Reduction (MT CO2e) | |
| | 227 | Commercial Reduction (MT CO2e) | |
| | 426 | Total Reduction (MT CO2e) in 2020 | |
| Municipal Costs and Savings Calculations | Staff time to participate in and promote existing programs. | | |
| | FTE = | 0.02 | Estimated staff time per year |
| | $/FTE= | $100,000 | FTE cost per year |
| Municipal Costs and Savings | Municipal Cost = | $1,900 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings | Total savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/therm= | $0.81 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Example:<br>Total savings = (340,750 x $0.21) + (6,500 x $1.02) = $78,187 | | |

| | | | |
|---|---|---|---|
| Calculations | Total residential savings= | $252,084 | Dollars per year |
| | Total commercial savings= | $301,555 | Dollars per year |
| | Households = | 12,864 | Total number of households projected in 2020 |
| | Households participating = | 4,502 | Households participating by 2020 |
| | Commercial units = | 2,178 | Total number of projected commercial units in 2020 |
| | Commercial units participating = | 762 | Commercial units participating by 2020 |
| Community Cost and Savings | Residential Cost = | Very Low to Low | Dollars per household (varies depending on implementation) |
| | Commercial Cost = | Very Low to Low | Dollars per business (varies depending on implementation) |
| | Residential Savings = | Very Low to Low | Dollars per household (varies depending on implementation) |
| | Commercial Savings = | Very Low to Low | Dollars per business (varies depending on implementation) |

## Notes

Assumes that of the total percent reduction in energy use, 95% applies to electricity and 5% applies to natural gas.

## References


1. Pacific Gas and Electricity Company. 2012. Energy Overview Tableau Reports.
2. Rincon Consultants. November 2012. Cities Greenhouse Gas Emissions Inventories.
3. California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast

# Energy Audit and Retrofit Program

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of households audited by 2020 | 750 | Units |
| Number of businesses audited by 2020 | 600 | Units |
| Target percentage of energy savings | 30% | Percent |
| Staff time needed for this measure | 0.05 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Residential Square Feet (Rsf) = Ru × 1,545<br>Residential Electricity Energy Savings (kWh)=E × 0.40 × Rsf × 4.1<br>Residential Natural Gas Savings (therms)=E × 0.40 × Rsf × 0.3 | | |
| | Ru= | 750 | # residential units audited by 2020 |
| | Average residential unit size= | 1,545 | Square feet/dwelling unit (California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS]) |
| | Audit to retrofit conversion rate= | 40% | Percentage of units that receive an audit that complete energy efficiency installation (EnergySavvy 1) |
| | Rsf= | 463,500 | # square feet of residential space retrofitted by 2020 |
| | E= | 30% | Target percentage of energy savings |
| | Residential electricity use intensity= | 4.1 | kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]). |
| | Residential natural gas use intensity= | 0.3 | Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]). |
| | Commercial Square Feet (Csf) = Cu × 4,500<br>Commercial Electricity Energy Savings (kWh)=E × 0.40 × Csf × 12.95<br>Commercial Natural Gas Savings (therms)=E × 0.40 × Csf × 0.3 | | |
| | Where: | | |
| | Cu= | 600 | # of commercial units or buildings audited by 2020 |
| | Average commercial unit size= | 4,500 | Average commercial unit/business size in square feet |
| | Audit to retrofit conversion rate= | 40% | Percentage of units that receive an audit that complete energy efficiency installation (Energy Savvy) |
| | Csf= | 1,080,000 | Square feet of commercial space upgraded by 2020 |
| | E= | 30% | Target percentage of energy savings |
| | Commercial electricity use intensity= | 12.95 | kWh/square foot/year (Average electric use intensity for commercial buildings in kWh/square feet/year (California Energy Commission [CEC] 2005 California End Use Survey [CEUS], page 184)). |
| | Commercial natural gas use intensity= | 0.3 | therms/square foot/year (Average natural gas usage intensity for commercial buildings in therms/square feet/year (CEC 2005 CEUS, page 184)). |
| Resource Savings | 570,105 | Residential electricity saved (kWh) | |
| | 48,667 | Residential natural gas saved (therms) | |
| | 4,197,420 | Commercial electricity saved (kWh) | |
| | 113,400 | Commercial natural gas saved (therms) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.20/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.133 | = average projected 2020 electricity emissions factor (MT CO2e/MWh) | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 335 | Residential Reduction (MT CO2e) in 2020 | |
| | 1,162 | Commercial Reduction (MT CO2e) in 2020 | |
| Municipal Cost and Savings Calculations | Staff time developing and administering program. | | |
| | FTE = | 0.05 | Staff time needed for this measure |
| | $/FTE= | $100,000 | Cost associated with staff time |
| Municipal Cost and Savings | Municipal Cost= | $5,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |

| | | | |
|---|---|---|---|
| Community Costs and Savings Calculations | Total savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/therm= | $0.81 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | $153,094 | Residential Savings ($/year) | |
| | $872,574 | Commercial Savings ($/year) | |
| | Total cost of residential retrofit = | $10,000 | Cost per home (average based on retrofits that achieve a 20-30% energy savings - EnergySavvy 2) |
| | Available residential rebates = | $3,000 | Energy Upgrade California offers rebates ranging from $2,000-$4,000 ($3,000 rebate for 30% energy savings). |
| | Total cost of commercial retrofit = | $4,545 | Cost per commercial unit ($1.01 per square foot - AECOM 2010; Gregerson 1997) |
| | Available commercial rebates = | $2,273 | PG&E offers $0.09/kWh (PG&E Customized Retrofit Incentives) and SCE offers $1.00/therm (SCE Financial Incentives for Energy Efficiency) for retrofit projects, with the total incentive capped at 50% of the measure cost |
| Community Costs and Savings | Residential Cost = | $7,000 | Dollars per household (costs will vary depending on the extent of the retrofit; costs shown here are based on a 20-30% energy savings) |
| | Commercial Cost = | $2,273 | Dollars per business (costs will vary depending on the extent of the retrofit; costs shown here are based on a 20-30% energy savings) |
| | Residential Savings = | $204 | Dollars per household |
| | Commercial Savings = | $1,454 | Dollars per business |

## Notes

This is based on average energy consumption. Programs that emphasize audits and retrofits to buildings constructed prior to Title 24 (1980), will see greater reductions.
Audit to retrofit conversion rates and energy savings vary significantly by program. In a study of 16 audit programs around the country, audit to retrofit conversion rates ranged from 30% to 50% (Energy Savvy).

When combining energy measures, the City should be aware of double-counting emission reductions. Some actions in this measure overlap with actions in Measures 3a and 3d, and this overlay diminishes the overall effectiveness of the measure and its actions. If the City selects both measures, it should lower the commitment established in terms of units or percent reduction in order to address the issue of double-counting.

## References


1. EnergySavvy 1 - Energy Audit Programs That Work http://www.energysavvy.com/blog/2010/09/14/energy-audit-programs-that-work/
2. NEEBPG - Residential Audit Programs Best Practices Report http://www.eebestpractices.com/pdf/BP_R7.PDF
3. California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS] - http://www.energy.ca.gov/appliances/rass/
4. PG&E Energy House Calls - http://www.energyhousecalls.com/?WT.mc_id=GSEHC154&WT.srch=1&gclid=CJ6xi8_jmLMCFQSqnQodsAEAiA
5. Energy Upgrade California - http://www.pge.com/myhome/saveenergymoney/energysavingprograms/euca.shtml
6. Energy Information Administration, 1995 Commercial Buildings Energy Consumption Survey - http://www.eia.gov/emeu/consumptionbriefs/cbecs/pbawebsite/retailserv/retserv_howlarge.htm
7. CONSOL. August 2008. Meeting AB 32 -- Cost-Effective Green House Gas Reductions in the Residential Sector, available at: http://www.cbia.org/go/cbia/?LinkServID=D3BFD657-F8E2-4F63-97B404B55FD856B5&showMeta=0
8. PG&E Third Party Screen and Certification of Home Improvement Contractors - http://www.egia.org/Academy/rockymountainexchange2011/docs/JaneKruse.pdf
9. PG&E Customized Retrofit Incentives - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ief/
10. SCE Financial Incentives for Energy Efficiency - http://www.socalgas.com/documents/business/EECIPFactSheet.pdf
11. U.S. Department of Energy (DOE). 2011a. Home Energy Saver. Available: <http://hes.lbl.gov/consumer>. Accessed: July 6, 2011.
12. American Council for an Energy-Efficient Economy (ACEEE), Berkeley RECO Case Study - http://aceee.org/sector/local-policy/case-studies/berkeley-california-residential-energ
13. EnergySavvy 2 - Efficiency Programs http://www.energysavvy.com/blog/2011/12/01/efficiency-program-qa-when-the-in-home-audit-is-the-retrofit/

# Income-Qualified Energy Efficient Weatherization Programs

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Residential units upgraded by 2020 | 100 | Units |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Residential Square Feet (Rsf) = Ru × 1,545<br>Residential Electricity Energy Savings (kWh)=E × Rsf × 4.1<br>Residential Natural Gas Savings (therms)=E × Rsf × 0.3 | | |
| | Ru= | 100 | Residential units upgraded by 2020 |
| | Average residential unit size= | 1,545 | Square feet/dwelling unit California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS]) |
| | Rsf= | 154,500 | Square feet of residential space upgraded by 2020 |
| | E= | 35% | Average first-year weatherization energy savings (Oak Ridge National Laboratory (ORNL) 2010 Weatherization Assistance Program Technical Memorandum: Background Data and Statistics. Page 5.) |
| | Residential electricity use intensity= | 4.1 | kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]). |
| | Residential natural gas use intensity= | 0.3 | Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]). |
| Resource Savings | 221,708 | Residential electricity saved (kWh) | |
| | 18,926 | Residential natural gas saved (therms) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e)=(Se/1,000 × 0.133)+(Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 130 | MT CO2e | |
| Municipal Costs and Savings Calculations | Staff time coordinating with CAPSLO and local utilities, and conducting outreach. | | |
| | FTE = | 0.04 | Staff time needed for this measures |
| | $/FTE= | $100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost= | $4,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Residential cost savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand |
| | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand |
| | Total Community Savings = | $59,537 | Residential Savings |
| Community Cost and Savings | Community Cost = | $0 | Dollars per household |
| | Community Savings = | $595 | Dollars per household |

## Notes

The first-year energy savings for LIHEAP households is approximately 34.5% or $437 (ORNL). The average energy savings per low-income housing unit for Weatherization Assistance is estimated by the State of California Department of Community Services and Development (CSD) to be $418 per year.

When combining energy measures, the City should be aware of double-counting emission reductions. Some actions in this measure overlap with actions in Measures 3a and 3d, and this overlay diminishes the overall effectiveness of the measure and its actions. If the City selects both measures, it should lower the commitment established in terms of units or percent reduction in order to address the issue of double-counting.

PG&E and SoCalGas contract with CAPSLO to provide weatherization services to the region as part of the statewide Energy Savings Assistance Program (ESAP). http://www.cpuc.ca.gov/PUC/energy/Low+Income/liee.htm
For low-income households: no-cost weatherization under Energy Savings Assistance Program. For middle-income households: free weatherization under PG&E's Middle Income Direct Install program.

## References


1. CSD - Helps Low-Income Families Manage and Reduce Energy Costs http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20%282008%29.pdf
2. California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey [RASS] - http://www.energy.ca.gov/appliances/rass/
3. ORNL 2010 Weatherization Assistance Program Technical Memorandum: Background Data and Statistics (page 5) - http://weatherization.ornl.gov/pdfs/ORNL_TM-2010-66.pdf
4. California Energy Commission (CEC) 2005 California End Use Survey - http://www.energy.ca.gov/2006publications/CEC-400-2006-005/CEC-400-2006-005.PDF
5. California Flex Your Power - http://www.fypower.org/feature/lowincome/
6. PG&E Direct Install -http://www.staplesenergy.com/residential-case-studies/pge-middle-income-direct-install-program

# Incentives for Exceeding Title 24 Building Energy Efficiency Standards

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| New residential units exceeding State standards | 50 | Units |
| New non-residential buildings exceeding State standards | 75 | Units |
| Target percentage of energy savings above State standards | 20% | Percent |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Residential Square Feet (Rsf) = Ru × 1,545<br>Residential Electricity Energy Savings (kWh) = E × Eec × Rsf × (1 - CSP) × 4.1<br>Residential Natural Gas Savings (therms) = E × Egc × Rsf × (1 - CSP) × 0.3 | | |
| | Ru= | 50 | # of new residential units exceeding State standards by 2020 |
| | Average residential unit size= | 1,545 | Square feet/dwelling unit (California Energy Commission [CEC] 2010 Residential Appliance Saturation Survey (RASS)) |
| | Rsf= | 77,250 | # square feet of residential space that exceed State standards by 2020 |
| | E= | 20% | Target percentage of energy savings above State standards |
| | Eec= | 32.8% | Percent of single family electricity use covered by Title 24 (Statewide Energy Efficiency Collaborative [SEEC] 2011 Greenhouse Gas Forecasting Assistant, page 7) |
| | Egc= | 85.7% | Percent of single family natural gas use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 7) |
| | CSP= | 25% | Percent single family residential energy savings above current State standards (CEC 2013 Building Efficiency Standards, slide 11) |
| | Residential electricity use intensity= | 4.1 | kWh/square foot/year (Average electric use intensity for residential buildings in kWh/square foot/year [RASS]). |
| | Residential natural gas use intensity= | 0.3 | Therms/square foot/year (Average natural gas usage intensity for residential buildings in therms/square foot/year [RASS]). |
| | Commercial Electricity Energy Savings (kWh)= E × Egc × (1 - CSP) × 12.95 × Csf<br>Commercial Natural Gas Savings (therms)=E × Egc × (1 - CSP) × 0.3 × Csf | | |
| | Where: | | |
| | Cu= | 75 | # of commercial units or buildings audited by 2020 |
| | Average commercial unit size= | 4,500 | Average square feet for all commercial buildings (Energy Information Administration) |
| | Csf= | 337,500 | # of new square feet of commercial space that exceeds State standards by 2020 |
| | E= | 20% | Target percentage of energy savings above State standards |
| | Eec= | 64% | Percent of commercial electricity use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 9) |
| | Egc= | 70% | Percent of commercial natural gas use covered by Title 24 (SEEC 2011 Greenhouse Gas Forecasting Assistant, page 9) |
| | CSP= | 30% | Percent non-residential energy savings above current State standards (CEC 2013 Building Efficiency Standards, slide 17) |
| | Commercial electricity use intensity= | 12.955 | kWh/square foot/year (Average electric use intensity for commercial buildings in kWh/square feet/year (California Energy Commission [CEC] 2005 California End Use Survey [CEUS])) |

| | | | |
|---|---|---|---|
| | Commercial natural gas use intensity= | 0.35 | therms/square foot/year (Average natural gas usage intensity for commercial buildings in therms/square feet/year (CEC 2005 CEUS)) |
| Resource Savings | 15,583 | Residential electricity saved (kWh) | |
| | 3,476 | Residential natural gas saved (therms) | |
| | 391,759 | Commercial electricity saved (kWh) | |
| | 11,576 | Commercial natural gas saved (therms) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas equation) | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.13 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 21 | Residential Reduction (MT CO2e/year) | |
| | 114 | Commercial Reduction (MT CO2e/year) | |
| Municipal Costs and Savings Calculations | Staff time developing new materials, identifying and adopting incentives. | | |
| | FTE = | 0.04 | Estimated staff time per year to develop new program |
| | $/FTE= | $100,000 | FTE cost |
| Municipal Costs and Savings | Municipal Cost= | $4,000 | Dollars per year |
| | Municipal Savings = | $0 | Dollars per year |
| Community Costs and Savings Calculations | Total savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/therm= | $0.81 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Total residential savings = | $6,158 | Residential Savings ($/year) |
| | Total commercial savings = | $82,244 | Commercial Savings ($/year) |
| | Average residential Cost = | $0.91 | Residential average cost to implement (sqft) - Projected PG&E Zone 5 Costs (US Department of Energy) |
| | Average commercial Cost = | $1.25 | Commercial average cost to implement (sq ft) - Projected PG&E Zone 5 Costs (CA Department of Energy) |
| Community Costs and Savings | Residential Cost = | $1,406 | Dollars per household |
| | Commercial Cost = | $5,625 | Dollars per business |
| | Residential Savings = | $123 | Dollars per household |
| | Commercial Savings = | $1,097 | Dollars per business |

## Notes

Title 24 covers only 64% of commercial electricity use and 70% of natural gas use (SEEC, page 7). 2013 Title 24 updates are expected to reduce non-residential energy use by 30% (CEC).
Title 24 covers only 32.8% of single family residential electricity use and 85.7% of natural gas use (SEEC, page 7). 2013 Title 24 updates are expected to reduce single family residential energy use by 25% and multifamily residential by 14% (CEC).

## References


1. 2005 California End Use Survey http://www.energy.ca.gov/ceus/
2. CEC 2013 Building Efficiency Standards, slide 17 - http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-05-31_2013_standards_adoption_hearing_presentation.pdf
3. SEEC 2011 Greenhouse Gas Forecasting Assistant, page 7 - http://californiaseec.org/documents/forecasting-tools/seec-forecast-assistant-documentation
4. http://www.energy.ca.gov/title24/2008standards/ordinances/san_luis_obispo/CZ5_Cost-Effectiveness_Report-Final.pdf

# Energy Efficient Public Realm Lighting Requirements

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of Private LED street lights installed by 2020 | 100 | Street Lights |
| Number of other Private LED outdoor lights installed by 2020 | 400 | Other Outdoor Lights |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Total electricity saved (kWh) = (N x (Wi-We) x (h/Cf) | | |
| | Where Street Lights: | | |
| | $N_{street}$ = | 100 | Number of street lights installed lights |
| | Wi = | 200 | Average estimated power rating in watts of high pressure sodium street light (Department of Energy [DOE] 2004. U.S. Lighting Market Characterization) |
| | We = | 50 | Average power rating in watts of LED street lighting (DOE and PG&E 2008. LED Street Lighting) |
| | h = | 4,100 | Number of hours per year operating |
| | Cf = | 1,000 | Conversion factor for W to kW |
| | Where Traffic Signals: | | |
| | $N_{traffic}$ = | 0 | Number of traffic installed lights |
| | Wi = | 150 | Average estimated power rating in watts of incandescent |
| | We = | 15 | Average power rating in watts of LED traffic signal light |
| | h = | 8,760 | Number of hours per year operating (24 hours a day) |
| | Cf = | 1,000 | Conversion factor for W to kW |
| | Where Other Outdoor Public Realm Lighting: | | |
| | $N_{other}$ = | 400 | Number of other outdoor installed lights |
| | Wi = | 150 | Average estimated power rating in watts of public realm lighting (DOE 2004) |
| | We = | 17 | Average power rating in watts of LED public realm lighting (DOE 2004) |
| | h = | 3,650 | Number of hours per year operating |
| | Cf = | 1,000 | Conversion factor for W to kW |
| Resource Savings | 61,500 | Electricity saved from LED street lights (kWh) | |
| | 0 | Electricity saved from LED traffic signals (kWh) | |
| | 194,180 | Electricity saved from LED "other" public realm lighting (kWh) | |
| | 255,680 | Total electricity saved (kWh) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e)=(Se/1,000 × 0.133) | | |
| | Where: | | |
| | 255,680 | = Se (electricity savings) | |
| | 1,000 | = conversion factor for kWh to MWh | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| GHG Emission Reduction | 34 | MT CO2e/year | |
| Municipal Costs and Savings Calculations | Staff time needed to develop and adopt ordinance. Would be incorporated into permitting process. | | |
| | FTE = | 0.04 | Estimated staff time to develop requirements |
| | $/FTE= | $100,000 | Dollars |
| | Maintenance savings per fixture = | $17 | Annual maintenance savings/fixture (City of Palo Alto) |
| | Maintenance savings = | $1,700 | Dollars (for streetlights and traffic signals) |
| Municipal Costs and Savings | Municipal Cost= | $4,000 | Dollars |
| | Municipal Savings = | $1,700 | Dollars |
| | Total Savings = kWh reduced/year x $/kWh | | |
| | Where: | | |
| | $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Total capital savings = | $48,579 | Dollars |
| | Maintenance savings per fixture = | $17 | Annual maintenance savings/fixture (City of Palo Alto) |

| | | | |
|---|---|---|---|
| Community Cost and Savings Calculations | Total maintenance savings = | $6,800 | Dollars (other public realm lighting) |
| | Total Capital Cost = [Number of units installed x cost per unit] – [Available rebates] | | |
| | Where Streetlights: | | |
| | Number of units installed = | 100 | Units |
| | Cost per unit installed = | $350 | Dollars/unit (Energy Solutions 2008; PNNL 2010) |
| | Total cost= | $35,000 | Dollars |
| | Available rebates = | $125 | Dollars/unit ($125 for 200 watt unit replaced - PG&E) |
| | Net cost = | $22,500 | Dollars (total cost - available rebates) |
| | Where Other Outdoor Lighting (in Public Realm): | | |
| | Number of units installed = | 400 | Units |
| | Cost per unit installed = | $300 | Dollars/unit (Energy Solutions 2008; PNNL 2010) |
| | Cost installation = | $120,000 | Dollars |
| | Available rebates = | $100 | Dollars ($100 for 150 watt unit replaced - PG&E) |
| | Net cost = | $80,000 | Dollars (total cost - available rebates) |
| Community Cost and Savings | Community Cost = | $205 | Dollars per light |
| | Community Savings = | $114 | Dollars per light |

## Notes

## References


1. PG&E Streetlight program - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/streetlightprogram.shtml
2. PG&E LED Street Light Turnkey Replacement Service - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/ledturnkey/
3. DOE U.S. Lighting Market Characterization Study. National Lighting Inventory and Energy Consumption Estimate - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lmc_vol1_final.pdf
4. DOE and PG&E LED Street Lighting study - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_sf-streetlighting.pdf
5. IES Model Lighting Ordinance - http://www.ies.org/PDF/MLO/MLO_FINAL_June2011.pdf

6. PG&E LED Streetlight Rebates - http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ref/lighting/lightemittingdiodes/incentives/index.shtml
7. Western Pacific Signal 2011; eLightBulbs 2011; Energy Solutions 2008; PNNL 2010 from Stockton Draft CAP - http://www.stocktongov.com/files/ClimateActionPlanDraftFeb2012.pdf
8. Palo Alto - Demonstration Assessment of Light-Emitting Diode (LED) Roadway Lighting on Residential and Commercial Streets - http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_palo-alto.pdf

# Small Solar Photovoltaic (PV) Incentive Program

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of commercial solar PV installations (between 2013-2020) | 180 | Systems |
| Number of residential solar PV installations (between 2013-2020) | 350 | Systems |
| Number of residential solar water heaters installed by 2020* | 167 | Systems |
| Staff time needed for this measure | 0.08 | Full Time Equivalent (FTE) |

*Approximately 0.013 installations per household as a result of the Solar Water Heating program established under Assembly Bill 1470, the Solar Thermal Heating Act of 2007.

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Commercial Electricity Energy Savings (kWh)= Csi × Acsi × 1,900<br>Residential Electricity Energy Savings (kWh)= (Rsi × Arsi × 1,900) + (Rsw × Ee)<br>Residential Natural Gas Energy Savings (therms) = Rswg × Eg | | |
| | Where: | | |
| | Csi = | 180 | # of commercial solar installations by 2020 |
| | Rsi = | 350 | # of residential solar installations by 2020 |
| | Rsw = | 17 | # of residential solar electric water heater installations by 2020 (assumes 10% electric) |
| | Rswg = | 150 | # of residential solar natural gas water heater installations by 2020 (assumes 90% natural gas) |
| | Acsi = | 46.9 | average commercial solar installation size in kW (Cal Solar Initiative [CSI 1]) |
| | Arsi = | 5.4 | average residential solar installation size in kW (CSI 1) |
| | Ee = | 2,945 | average expected residential solar water heater savings in kWh per year (California Solar Initiative (CSI 2) Thermal Program Cal Solar statistics) |
| | Eg = | 139 | average expected residential solar water heater savings in therms per year (CSI 2 - 2012 Thermal Program Cal Solar statistics) |
| | Conversion factor = | 1,900 | conversion factor from kW to kWh per year (Solar Energy Industries Association [SEIA] Solar Radiation Conversion Map) |
| Resource Savings | 3,666,782 | Residential electricity saved (kWh) | |
| | 20,892 | Residential natural gas saved (therms) | |
| | 16,039,800 | Commercial electricity saved (kWh) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.133 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reduction | 2,732 | MT CO2e | |
| Municipal Costs and Savings Calculations | Staff time developing new materials and performing marketing and outreach activities. | | |
| | FTE = | 0.08 | Estimated staff time per year to develop new program |
| | $/FTE | $100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost = | $8,000 | Dollars per year |
| | Municipal Savings = | $0 | Dollars per year |
| | Commercial cost savings = [Electricity Savings x $/kWh]<br>Residential cost savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Commercial $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |

| | | | |
|---|---|---|---|
| Community Costs and Savings Calculations | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Total residential savings = | $715,909 | Dollars |
| | Total commercial savings = | $2,983,403 | Dollars |
| | Commercial solar installed cost = | $4.38 | Commercial Solar Installations per watt (Green Tech Media) |
| | Residential solar installed cost = | $5.46 | Residential Solar Installations per watt (Green Tech Media) |
| | Total cost of installed commercial solar = | $36,975,960 | Dollars |
| | Total cost of installed residential solar = | $10,395,840 | Dollars |
| | Residential solar water heater cost = | $4,650 | Dollars (Incremental installed cost of solar hot water heater (National Renewable Energy Lab, August 2012)) |
| | Available rebates = | $2,175 | Dollars (available Rebate for replacing natural gas heater with solar (Go Solar CA)) |
| | Cost of solar hot water heater with rebate = | $2,475 | Dollars (cost of solar hot water heater installation minus rebate) |
| | Total cost of solar water heaters = | $413,325 | Dollars |
| Community Cost and Savings | Residential Cost = | $20,907 | Dollars per household |
| | Commercial Cost = | $205,422 | Dollars per business |
| | Residential Savings = | $1,385 | Dollars per household |
| | Commercial Savings = | $16,574 | Dollars per business |

## Notes

Commercial and residential installation size assumptions are the averages for San Luis Obispo County PV installations for completed and PBI projects (Cal Solar). The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in San Luis Obispo County (CSI 2).

The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

Installed cost of conventional natural gas system is $1,350 and installed cost of residential solar water heaters: $6,000 (National Renewable Energy Lab).

Between 2006 and 2012, 1,410 kW of residential solar PVs were installed in Paso Robles (266 units at 5.3 kW each) and 4,339 kW of commercial solar PVs were installed. This excludes income-qualified solar PV installations.

## References


1. Cal Solar - http://www.californiasolarstatistics.ca.gov/
2. California Solar Initiative CSI-Thermal Program - http://www.gosolarcalifornia.ca.gov/solarwater/index.php
3. CEC Planning and Permitting Resources For Renewable Energy Systems - http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/
5. http://www.nrel.gov/docs/fy11osti/48986.pdf
6. http://www.greentechmedia.com/research/ussmi
7. National Renewable Energy Lab, August 2012 - http://www.nrel.gov/solar/
8. Go Solar CA - http://www.gosolarcalifornia.ca.gov/

# Income-Qualified Solar PV Program

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Number of low-income residential solar PV installations by 2020 | 120 | Systems |
| Number of low-income residential solar water heaters installed by 2020 | 25 | Systems |
| Staff time needed for this measure | 0.02 | Full Time Equivalent |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Residential Electricity Energy Savings (kWh)= (Rsi × Arsi × 1,900) + (Rsw × Ee)<br>Residential Natural Gas Energy Savings (therms) = Rswg × Eg | | |
| | Rsi= | 120 | # of low-income residential solar PV installations |
| | Rsw= | 2.5 | # of low-income residential solar electric water heater installations by 2020 (assumes 10% electric) |
| | Rswg= | 22.5 | # of residential solar natural gas water heater installations by 2020 (assumes 90% natural gas) |
| | Arsi= | 5.4 | average residential solar installation size in kW (Cal Solar Initiative [CSI 1]) |
| | Ee= | 2,945 | average expected residential solar water heater savings in kWh per year (California Solar Initiative (CSI 2) Thermal Program Cal Solar statistics) |
| | Eg= | 139 | average expected residential solar water heater savings in therms per year (CSI 2 - 2012 Thermal Program Cal Solar statistics) |
| | Conversion factor= | 1,900 | conversion factor from kW to kWh per year (Solar Energy Industries Association [SEIA] Solar Radiation Conversion Map) |
| Resource Savings | 1,247,683 | Residential electricity saved (kWh) | |
| | 3,128 | Residential natural gas saved (therms) | |
| GHG Emission Reduction Calculations | GHG Savings (MT CO2e) = (Se/1,000 × 0.133) + (Sg/10 × 53.2/1,000) | | |
| | Where: | | |
| | Se= | electricity savings | |
| | Sg= | natural gas savings | |
| | 1,000 | = conversion factor for kWh to MWh (electricity equation) or from kg to metric tons (natural gas | |
| | 10 | = conversion factor for therm to MMBtu | |
| | 0.13 | = average projected emissions factor for electricity in 2020 in MT CO2e/MWh | |
| | 53.24 | = average emissions factor for natural gas (kg CO2e/MMBtu) | |
| GHG Emission Reductions | 183 | MT CO2e | |
| Municipal Costs and Savings Calculations | Staff time for collaboration and outreach. | | |
| | FTE = | 0.02 | Estimated staff time per year to develop new program |
| | $/FTE= | $100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost= | $2,000 | Dollars per year |
| | Municipal Savings = | $0 | Dollars per year |
| Community Costs and Savings Calculations | Residential savings = [Electricity Savings x $/kWh] + [Natural Gas Savings x $/therms] | | |
| | Where: | | |
| | Residential $/kWh= | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Residential $/therm= | $0.92 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Total residential savings = | $239,937 | Dollars |
| Community Costs and Savings | Community Cost = | $0 | Dollars per household (Assumes to be paid for through programs.) |
| | Community Savings = | $1,655 | Dollars per household |

## Notes

Residential installation size assumptions are the averages for San Luis Obispo County PV installations for completed projects (Cal Solar 1). The installation size uses the CSI rating, which accounts for a design factor, and is a more accurate reflection of energy generated by the installation. Solar water heater savings is an average of the expected savings for all the projects that have applied for the CSI-Thermal rebate in San Luis Obispo County (Cal Solar 2).

The model assumes that solar water heaters are installed in combination with both electric and natural gas water heaters. The model assumes that 90% of the systems installed offset natural gas water heaters; 10% offset electric water heaters.

## References


1. California Solar Initiative (CSI) - http://www.californiasolarstatistics.ca.gov/
2. California Solar Initiative CSI-Thermal Program - http://www.gosolarcalifornia.ca.gov/solarwater/index.php
3. CEC Planning and Permitting Resources For Renewable Energy Systems - http://www.energy.ca.gov/localgovernment/planning_resources/
4. SEIA Solar Radiation Conversion Map - http://www.getsolar.com/blog/what-can-one-kilowatt-of-solar-do-for-you/13483/

# Bicycle Network

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Miles of new bike lane by 2020 | 20 | Miles |
| Staff time needed for this measure | 0.03 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduction = (A*B)+(A*D) | | |
| | City Area = | 19.9 | Square Miles |
| | Forecast VMT (2020) = | 194,102,084 | VMT in 2020 |
| | Decrease in VMT (B) = | 1.0% | Estimated VMT reduction factor for incorporating bike lanes into street design (CAPCOA) (Assumes 1% decrease in VMT per mile of new bike lane per square mile area. Maximum reduction capped at 1% to avoid double counting from alternative travel related VMT reductions.) |
| | VMT reduction for installing bicycle racks (D)= | 0.06% | Percent - (CAPCOA, SDT-6) |
| Resource Savings | Total VMT Reduction = | 2,062,335 | VMT per year |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 771 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time required for developing policies and acquiring grant funding for bicycle infrastructure. There would be minimal additional costs associated with staff time needed for plan checks; however, this cost will be absorbed through development/permitting fees. | | |
| | FTE = | 0.03 | Estimated staff time per year to develop new program |
| | $/FTE= | 100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost = | $3,000 | Dollars (Assumes that grant funding would be used to implement bicycle infrastructure. Minimal costs would occur as a result of incorporating multi-modal improvements into pavement resurfacing, restriping, and signalization operations (less than $5,000).) |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Community VMT Reduced= | 2,062,335 | Dollars per year |
| | Community operating cost per mile = | $0.57 | Dollars |
| | Average round trip length = | 17.82 | Miles (Fehr & Peers) |
| | Round trips switching from driving to biking = | 115,731 | Round trips |
| | Cost per mile of new bicycle lane = | $40,000 | Dollars per mile (Assumes $40,000 per mile average. Actual cost would depend on the type of bicycle lane being installed - see notes below) |
| | Total cost of new bicycle lanes = | $800,000 | Dollars |
| | Cost of bicycle parking = | $0 | Dollar (Bicycle parking standards for non-residential development went into effect January 1, 2001 as part of California Green Building Standards Code, and are therefore now a cost associated with doing business-as-usual) |
| Community Costs and Savings | Community Cost = | $0 | Dollars per person (Assumes cost of bike lanes would be incurred by the City through grant funding and private developers.) |
| | Community Savings = | $10 | Dollars per trip (Savings varies depending on how many bicycle trips are made by a single person.) |

## Notes

Calculation methodology derived from CAPCOA measures SDT-5 and SDT-6

The following is provided for informational purposes:
Cost of infrastructure development is highly variable. Cost estimates for bicycle infrastructure: Class I Bike Path - approximately $1,000,000 per mile; Class II Bike Lanes - $10,000 - $1,000,000 per mile (depending on level of roadway improvement required); Class III Bike Routes - $2,000 - $60,000 per mile (depending on the level of treatment; route signage only would be lower end, signage and shoulder striping, pavement markings, signal actuation would be higher end). The cost per mile of sidewalk is approximately $250,000.

## References and Links


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
2. Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions (2009). http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf
3. Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p.13) http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf
4. US Department of Transportation, http://www.nhtsa.gov/people/injury/pedbimot/bike/Safe-Routes-2002/safe.html#8
5. SLO COG RTP - http://www.slocog.org/cm/Programs_and_Projects/2010_Regional_Transportation_Plan.html

# Pedestrian Network

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Miles of sidewalk added by 2020 | 20 | Miles |
| Staff time needed for this measure | 0.03 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduction = Forecast VMT x A x B | | |
| | Forecast VMT (2020) = | 194,102,084 | VMT |
| | Percent VMT reduction from pedestrian network improvements (A) = | 0.5% | Percent reduction in VMT (CAPCOA SDT-1) |
| | Traffic Calming Selected? | Yes | Traffic Calming Selected (Yes or No from cell G17) |
| | Percent VMT reduction from traffic calming improvements (B) = | 0.25% | Percent reduction in VMT (CAPCOA SDT-2) |
| Resource Savings | Total VMT Reduction = | 1,455,766 | VMT per year |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 544 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time required for review and approval of projects and acquiring grant funding for pedestrian infrastructure. | | |
| | FTE = | 0.0 | Estimated staff time per year to develop new program |
| | $/FTE= | 100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost = | $3,000 | Dollars (Assumes that grant funding would be used to implement pedestrian infrastructure. Minimal costs would occur as a result of incorporating multi-modal improvements into pavement resurfacing, restriping, and signalization operations (less than $5,000).) |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Community VMT Reduced= | 1,455,766 | Dollars per year |
| | Community operating cost per mile = | $0.57 | Dollars |
| | Cost per mile of new sidewalk = | $250,000 | Dollars per mile |
| | Total cost of new bicycle lanes = | $5,000,000 | Dollars |
| Community Costs and Savings | Community Cost = | $0 | Dollars per person (Assumes cost would be incurred by the City through grant funding and the private developer.) |
| | Community Savings = | Varies | Dollars per person (Varies based on number of trips made by foot and distance travelled. Savings of $0.555 per mile.) |

## Notes

The City's General Plan Circulation Element requires sidewalks or paths to be constructed on all public streets. LED lighted crosswalks are encouraged, particularly on routes to schools and/or public destinations where enhanced visibility is needed.

POLICY CE-1A calls for the City to to address the mobility needs of all users of the streets, roads and highways including bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, users of public transportation, and seniors by: establishing safe pedestrian and bicycle paths, for children and their parents to schools and other major destinations such as downtown, retail and job centers; maintaining mobility for all modes; and requiring new development to mitigate its impact on the transportation network.

## References


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
2. Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions (2009). http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices_Complete_102209.pdf
3. Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p.13) http://www.airquality.org/ceqa/GuidanceLUEmissionReductions.pdf

# Expand Transit Network

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percent Increase in Transit Service | 30% | Percent |
| Staff time needed for this measure | 0.001 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | % VMT Reduction = Coverage * Elasticity * Mode* Adjustment (CAPCOA, Strategy TST-3, Page 277) | | |
| | Forecast VMT (2020) = | 194,102,084 | VMT in 2020 |
| | Coverage = | 30% | Percent increase in transit service |
| | Elasticity = | 1.01 | Elasticity of transit ridership with respect to service coverage (CAPCOA, Strategy TST-3, Page 277) |
| | Mode = | 1.5% | Existing transit mode share, countywide (CAPCOA, Strategy TST-3, Page 277) |
| | Adjustment = | 0.67 | Adjustments from transit ridership increase to VMT (CAPCOA, Strategy TST-3, Page 277) |
| | % VMT Reduction = | 0.3% | Percent |
| Resource Savings | Total VMT Reduction due to transit network expansion= | 591,070 | VMT |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 221 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time required for coordinating with RTA/transit agencies. | | |
| | FTE = | 0.00 | Estimated staff time per year to develop new program |
| | $/FTE = | 100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost = | $100 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Private costs and savings of increasing transit service, scaled to City population. | | |
| | Private VMT reduced = | 591,070 | VMT |
| | Private vehicle operating cost = | $0.57 | Dollars per mile |
| | Private savings from avoided driving = | $333,955 | Dollars |
| | Cost of transit fare = | $2 | Dollars/day (may vary depening on pass) (SLO RTA) |
| | City forecast (2020) population = | 32,137 | People |
| | Number of people switching to from driving to transit = | 98 | People |
| | Private cost from transit fares = | $196 | Dollars |
| Community Costs and Savings | Community Cost = | $2 | Dollars |
| | Community Savings = | $3,413 | Dollars |

## Notes

Calculation methodology derived from CAPCOA measure TST-3.

## References


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
2. Transit Cooperative Research Program. TCRP Report 95 Traveler Response to System Changes – Chapter 10: Bus Routing and Coverage. 2004. (p. 10-8 to 10-10)
3. US Census Journey to Work
4. SLO RTA - http://www.slorta.org/fares/rta

# Increase Transit Service Frequency/Speed

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percentage reduction in headways (increase in frequency) | 10% | Percent |
| Bus rapid transit selected? (1 for yes, 0 for no) | 1 | Yes or No |
| Staff time needed for this measure | 0.001 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | % VMT Reduction = (Headway * B * C * Mode * E) + (% Reduction from BRT) (CAPCOA, TST-4 and TST-1) | | |
| | Forecast VMT (2020) = | 194,102,084 | VMT |
| | Headway = | 10% | Percent reduction in headways |
| | B = | 0.38 | Elasticity of transit ridership with respect to increased frequency of service (CAPCOA, TST-4, Page 283) |
| | C = | 85% | Adjustment for level of implementation (CAPCOA, TST-4, page 281) |
| | Mode = | 1.5% | Existing transit mode share, countywide (CAPCOA, TST-4, Page 281) |
| | E = | 0.67 | Ratio of decreased VMT to increased transit ridership (CAPCOA, TST-4, Page 281) |
| | % VMT Reduction from Headway= | 0.3% | Percent VMT Reduction |
| | % VMT Reduction from Bus Rapid Transit = | 0.2% | Percent VMT Reduciton if selected |
| | Total % VMT Reduction | 0.5% | Percent VMT Reduction |
| Resource Savings | Total VMT Reduction due to transit network expansion= | 970,510 | Annual Reduced VMT due to transit frequency improvement |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 363 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time required for coordinating with RTA/transit agencies. | | |
| | FTE = | 0.00 | Estimated staff time per year to develop new program |
| | $/FTE= | 100,000 | Dollars per year |
| Municipal Costs and Savings | Municipal Cost = | $100 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Private VMT reduced = | 970,510 | VMT |
| | Vehicle operating cost per mile = | $0.57 | Dollars per mile |
| | Private savings from avoided driving = | $548,338 | Dollars |
| | Cost of transit fare = | $2 | Dollars/day (may vary deepening on pass) (SLO RTA) |
| | City forecast (2020) population = | 32,137 | People |
| | Number of people switching to from driving to transit = | 96 | People |
| | Private cost from transit fares = | $193 | Dollars |
| Community Costs and Savings | Community Cost = | $2 | Dollars |
| | Community Savings = | $5,688 | Dollars |

## Notes

Calculation methodology derived from CAPCOA measure TST-1 and TST-3.

## References


1. Transit Cooperative Research Program. TCRP Report 95 Traveler Response to System Changes – Chapter 9: Transit Scheduling and Frequency (p. 9-14)

2. SLO RTA - http://www.slorta.org/fares/rta

# Transportation Demand Management (TDM) Incentives

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Targeted percent of employees eligible to participate* | 75% | Percent |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduction = Forecast Employee Commute VMT x (A x B) (CAPCOA TRT-1) | | |
| | Where: | | |
| | Forecast Annual VMT (2020) = | 194,102,084 | VMT in 2020 |
| | Forecast Annual Employee Commute VMT (2020)= | 54,348,584 | Employee commute VMT in 2020 (Fehr & Peers) |
| | Percent Reduction in Commute VMT (A) = | 5.4% | Percent (CAPCOA, page 220) |
| | Percent of Employees Eligible to Participate (B) = | 75% | Percent of employees eligible to participate in TDM programs |
| Resource Savings | VMT Reduction = | 2,201,118 | VMT in 2020 |
| GHG Emission Reduction Calculations | GHG Reduction = VMT Reduction x Cef | | |
| | Where: | | |
| | Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 823 | MT CO2e |
| Municipal Costs and Savings Calculations | Annual staffing costs associated with coordination and marketing. | | |
| | FTE = | 0.04 | Estimated cost of staff time |
| | $/FTE = | $100,000 | Total annual cost per FTE |
| Municipal Costs and Savings | Municipal Cost = | $4,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Cost and Savings Calculations | Private VMT Reduced = | 2,201,118 | VMT |
| | Private vehicle operating cost per mile = | $0.57 | Dollars per mile |
| | Total community savings = | $1,243,631 | Dollars |
| | Total employees = | 13,000 | Employees (projected in 2020) |
| | Employees participating in TDM = | 9,750 | Employees |
| Community Costs and Savings | Community Cost= | $0 | Dollars per employee |
| | Community Savings= | $128 | Dollars per employee |

## Notes

Calculation methodology derived from CAPCOA measures TRT-7, page 240.

## References


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

2. Fehr & Peers calculation of countywide VMT associated with employee commute from the San Luis Obispo Council of Governments Regional Traffic Model 2.0, November 2012.

# Parking Supply Management

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Implementation Year | 2015 | Year |
| Net reduction in parking spaces | 800 | Parking Spaces |
| New parking spaces by 2020 forecast under existing regulations | 4,000 | Parking Spaces |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduction = VMT Growth x (((N - O)/O) x 0.5) | | |
| | Baseline VMT (2005) = | 147,306,705 | Annual Vehicle Miles Traveled (VMT) |
| | Forecast VMT (2020) = | 194,102,084 | Annual VMT |
| | VMT Growth = | 15,598,460 | VMT generated by forecast development between implementation year and 2020 |
| | N = | 3,200 | Parking spaces forecast under proposed regulations. (Placeholder value assumes 1,000,000 square feet of new development and 3.5 spaces per 1,000 square feet) |
| | O= | 4,000 | Parking forecast under existing regulations. (Placeholder value assumes 1,000,000 square feet of forecast development and 4 spaces per 1,000 square feet) |
| | P = | 0.5 | Estimated ratio of reduction in parking supply to reduction in vehicle trips (CAPCOA PDT-1) |
| | Percent change = | -20% | Percent change in new parking supply |
| Resource Savings | Annual VMT Reduction = | 1,712,711 | Annual reduction in VMT (CAPCOA PDT-1) |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: | | |
| | 2020 Composite Emissions Factor Cef= | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emission Reduction | Total GHG Savings = | 641 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time to develop policy and establish in-lieu fees. | | |
| | FTE = | 0.04 | Estimated staff time per year |
| | $/FTE= | $100,000 | FTE cost per year |
| Municipal Costs and Savings | Municipal Cost = | $4,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Private costs and savings of increasing transit service, scaled to City population. Change in private costs = (A*B)+((D*E)/G) | | |
| | Private VMT Reduced (A) = | 1,712,711 | VMT |
| | Private vehicle operating cost per mile (B) = | $0.57 | Dollars per mile |
| | Private Savings from avoided driving (C) = | $967,682 | Dollars |
| | Reduction in required parking spaces (D) = | 800 | Reduction in required parking spaces |
| | Surface parking construction costs (Excludes cost of land) = | $10,000 | Dollars per space (U.S. parking structure construction costs are reported to average about $15,000 per space in 2008. Adjusted to reflect cost of ground floor spaces.) (Victoria Transport Policy Institute) |
| | Total cost savings from reduced parking construction (F) = | $8,000,000 | Dollars (This is a savings for the project applicant/developer, not the general public.) |
| Community Costs and Savings | Community Cost = | $0 | Dollars per parking space reduced |
| | Community Savings = | $1,210 | Dollars per parking space reduced (Excludes savings to private developers.) |

## Notes

Calculation methodology derived from CAPCOA measure PDT-1.

## References


1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

2. Nelson\Nygaard (2005). Crediting Low-Traffic Developments (p. 16): http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf

3. SF Bay Area Metropolitan Transportation Commission Parking Code Guidance - http://www.mtc.ca.gov/planning/smart_growth/parking/6-12/Parking_Code_Guidance_June_2012.pdf

4. Victoria Transport Policy Institute - www.vtpi.org/tca/tca0504.pdf

# Electric Vehicle Network and Alternative Fueling Stations

## Calculation Methodology and Equations

**Key Assumptions for Calculations**

| | | |
|---|---|---|
| Percent Adoption of Electric Vehicles Based on Implementation of Comprehensive EV Network | 5% | Percent |
| Staff time needed for this measure | 0.04 | Full Time Equivalent |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction Calculations | GHG reduction = (City Forecast VMT x B) x D | | |
| | City Forecast VMT (2020) = | 194,102,084 | VMT |
| | Estimated percent of drivers switching to EV's by 2020 (B) = | 5% | Percent |
| | VMT driven by those shifting to EV's (C) = | 10,481,513 | VMT |
| | Default composite emissions factor = | 0.00037 | MT CO2e per VMT |
| | Emissions factor for plug-in hybrid vehicle = | 0.000045 | MT CO2e per VMT (Ex. Toyota Prius Plug-in Hybrid, http://www.google.org/recharge/experiment/CO2.html) |
| | Emissions-per mile difference between average car and EV (D) = | 0.00033 | MT CO2e per VMT |
| GHG Emission Reduction | Total GHG Savings = | 3,448 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed for EV Readiness streamlining and coordination with APCD and Central Coast Clean Cities Coalition. (A specific program of investments has not yet been identified by APCD and the Central Coast Clean Cities Coalition. It is expected that localities would seek outside funds to support investments in EV charging stations and alternative fuel stations.) | | |
| | FTE = | 0.0 | Estimated staff time to develop new program |
| | $/FTE = | $100,000 | Total annual cost per FTE |
| Municipal Costs and Savings | Municipal Cost = | $4,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Cost of EV charging station = | $8,000 | Dollars (Average total cost for commercial charging station including hardware and installation for AC Level 2, 7.5 kW, 240V Charger) (Ready Set Charge California) |
| Community Costs and Savings | Community Cost = | $0 | Dollars per charging station (Assumes cost of EV charging stations would be incurred by private developer. Developer costs may be covered by applicable grants.) |
| | Community Savings = | $0 | Dollars per charging station |

## Notes

## References


1. Argonne National Laboratory. 2009. Multi-Path Transportation Futures Study: Vehicle Characterization and Scenario Analyses. ANL/ESD/09-5. Table 3-11a, p. 53.).

2. "Electric Vehicle Infrastructure, A Guide for Local Governments in Washington State: Model Ordinance, Model Development Regulations, and Guidance Related to Electric Vehicle Infrastructure and Batteries per RCW 47.80.090 and 43.31.970." http://www.psrc.org/assets/4325/EVI_full_report.pdf

3. RechargeIT Driving Experiment: Demonstration of energy efficiency for electric vehicles. Google, org, 2007. http://www.google.org/recharge/

4. Ready, Set, Charge California - A Guide to EV Ready Communities - http://www.rmi.org/Content/Files/Readysetcharge.pdf

# Infill Development

## Calculation Methodology and Equations

**Note: Calculated by Fehr & Peers using the Regional Travel Model**

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percentage of new residential units located within 0.25 miles of transit by 2020 | 50% | Percent |
| Percentage of new jobs located within 0.25 miles of transit by 2020 | 50% | Percent |
| Percentage increase from base density for new development | 67% | Percent |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | VMT Reduction = new residences x persons per household x per capita VMT reduction | | |
| | 2020 VMT | 194,102,084 | VMT |
| | % Reduction in VMT | 6% | Percent |
| Resource Savings | Annual VMT Reduction = | 11,646,125 | Vehicle miles traveled |
| GHG Emission Reduction Calculations | GHG Savings = VMT Reduction × Cef | | |
| | Where: Cef = | 0.000374 | Composite emission factor; MT CO2 per VMT (EMFAC 2011) |
| GHG Emissions Reduction | Total GHG Savings = | 4,356 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to identify incentives and update codes and regulations. | | |
| | FTE = | 0.0 | Estimated staff time to develop new program |
| | $/FTE = | $100,000 | Total annual cost per FTE |
| Municipal Costs and Savings | Municipal Cost = | $4,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Private developers will gain from a wider choice of potential development opportunities, costs of which would vary based on the incentives provided. | | |
| | Private VMT reduced = | 11,646,125 | VMT |
| | Private vehicle operating cost per mile = | $0.57 | Private vehicle operating cost per mile |
| | Private savings from avoided driving = | $6,580,061 | Private savings from avoided driving. |
| Community Costs and Savings | Community Cost = | Varies | Dollars per unit |
| | Community Savings = | $13,160,121 | Dollars per unit |

## Notes

CAPCOA measures LUT- (see link below); users should consult detailed CAPCOA guidance and example calculations when using this methodology.

## References


1. CAPCOA, Quantifying Greenhouse Gas Mitigation Measures (2010): http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

2. Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p.12). Journal of the American Planning Association: http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf

3. Boarnet, Marlon and Handy, Susan. 2010. "Draft Policy Brief on the Impacts of Residential Density Based on a Review of Empirical Literature."

4. Criteron Planner/Engineers and Fehr & Peers Associates (2001). Index 4D Method. A Quick-Response Method of Estimating Travel Impacts from Land-Use Changes. Technical Memorandum prepared for US EPA, October 2001.

5. TCRP Report 95, Transit Oriented Development Traveler Response to Transportation System Changes, Transit Oriented Development. (p 17-35) http://www.fta.dot.gov/documents/Transit_Oriented_Development_-_Traveler_Response_to_Transportation_System_Changes_TCRP_Report_95.pdf

6. ICLEI CAPPA version 1.5 - Transit Oriented Development tab

# Off-Road Equipment Upgrades, Retrofits, and Replacements

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Is this measure selected in conjunction with Measure 5a - Construction Equipment Efficiency? | No | Yes or No |
| Percentage of off-road equipment replaced with electric equipment | 15% | Percent |
| Percentage of off-road equipment replaced with alternative fuels | 15% | Percent |
| Staff time needed for this measure | 0.05 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction Calculations | GHG Emissions Reduced = Reduction from Replacement with Electric Equipment + Reduction from Alternative Fuels<br>1 - GHG Reduced from Replacement with Electric Equipment = Forecast Off-Road Emissions x Percent Equipment Replaced x (Percent Diesel Equipment x Diesel Reduction) x (Percent Gasoline Equipment x Gasoline Reduction)<br>2 - GHG Emissions Reduced from Alternative Fuels = Forecast Off-Road Emissions x Percent Equipment Replaced x (Percent Diesel Equipment X Diesel Reduction) x (Percent Gasoline Equipment x Gasoline Reduction) | | |
| | Total Forecast (2020) Off-Road GHG Emissions = | 14,291 | MT CO2e |
| | Forecast (2020) Off-Road GHG Emissions from Construction Equipment = | 10,077 | MT CO2e |
| | Percentage GHG Emissions from Diesel Equipment = | 90% | Percent |
| | Percentage GHG Emissions from Gasoline Equipment = | 8% | Percent |
| | Percentage GHG Emissions from Compressed Natural Gas = | 2% | Percent |
| | GHG Reduction from Replacing Diesel Equipment with Electric Equipment = | 72.9% | Percent (CAPCOA C-2, page 421) |
| | GHG Reduction from Replacing Gasoline Equipment with Electric Equipment = | 72.4% | Percent (CAPCOA C-2, page 421) |
| | GHG Reduction from Purchase of Electric Equipment = | 1,531 | MT CO2e |
| | Emission Reduction Due to Fuel Switch from Diesel to Compressed Natural Gas = | 18% | Percent (CAPCOA C-1, page 415) |
| | Emission Reduction Due to Fuel Switch from Gasoline to Compressed Natural Gas = | 20% | Percent (CAPCOA C-1, page 415) |
| | GHG Reduction from Use of Alternative Fuels = | 381 | MT CO2e |
| GHG Emission Reduction | Total GHG Reduction = | 1,912 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to conduct outreach and promotional activities. | | |
| | FTE = | 0.1 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| Municipal Costs and Savings | Municipal Cost = | $5,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings | Community Cost = | $0 | Dollars (Assumes equipment replacement and upgrades would be funded through the Carl Moyer program.) |
| | Community Savings = | Varies | Dollars (Varies based on vehicle/equipment replacement type.) |

## Notes

Off-Road GHG Emissions were calculated from County-wide data from OFF-ROAD 2007.
Emissions reduction percentages from switching from diesel to compressed natural gas and from gasoline to compressed natural gas were calculated using the averages for all construction equipment type and horsepower categories for 2020 Tables in CAPCOA, C-1.

## References

1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010): C-1, C-2, C-3
2. California Air Resources Board (ARB). Off-road Emissions Inventory. OFFROAD2007

# Exceed SB X7-7 Water Conservation Target

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Percent water savings | 10% | Percent |
| Staff time needed for this measure | 0.08 | Full Time Employee (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Total Water Savings (gallons) = (Projected Water Consumption x Percentage Residential) x Savings<br>Total Electricity Savings (kWh) = Gallons saved x 0.0013 kWh/gallon | | |
| | Where: | | |
| | Projected water consumption (2020 w/ SBx7-7) = | 2,263,890,965 | Gallons |
| | Savings = | 10% | Expected water use savings target per capita (recommend 10%) |
| | 0.0013 | = kWh saved per gallon of water reduced (California Energy Commission, December 2006) | |
| Resource Savings | Total Water Savings = | 226,389,097 | gallons/year |
| | Total Electricity Savings = | 305,399 | kWh/year |
| GHG Emission Reduction Calculations | Total Emissions Savings (MT) from Electricity Reductions = Electricity Savings (kWh)/1000 x 0.13 | | |
| | Where: | | |
| | 0.133 | = Projected PG&E emissions factor in metric Ton per MWh (LGOP) | |
| | 1,000 | = Conversion factor from kWh to MWh (electricity equation) | |
| GHG Emission Reduction | Total GHG Emissions Savings = | 41 | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to write, implement, and enforce water policy. No capital costs expected. | | |
| | FTE = | 0.1 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| Municipal Costs and Savings | Municipal Cost = | $8,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Residential cost savings = [Electricity Savings x $/kWh] | | |
| | $/kwh = | $0.19 | California Energy Commission, California Energy Demand 2010-2020, Adopted Forecast |
| | Aggregated community savings= | $58,026 | Dollars |
| Community Cost and Savings | Community Cost = | Varies | Dollars (Costs will vary based on implementation programs and mechanisms.) |
| | Community Savings = | Varies | Dollars (Per unit savings varies since the number of participating households and businesses is currently unknown.) |

## Notes

Senate Bill X7-7* (Water Conservation Act of 2009) was enacted in November 2009, requiring all water suppliers to increase water use efficiency. The legislation sets an overall goal of reducing per capita urban water use by 20% by December 31, 2020.

2020 energy rates are calculated based on information provided in the CEC's Report, California Energy Demand 2010-2020, Adopted Forecast. See Table 7, and also Form 2.3-California Energy Demand 2009 Natural Gas Rates, and Form 2.3: Electricity Prices (2007 cents/kwh) - PG&E.

## References


1. California Energy Commission (CEC) Refining Estimates of Water-Related Energy Use in California (December 2006)
2. Paso Robles 2010 Urban Water Management Plan. June 2011. http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Paso%20Robles,%20City%20of/2010%20UWMP%20ADOPTED%20FINAL%20June%2020
3. California Energy Commission (CEC) California Energy Demand 2010-2020, Adopted Forecast.
4. ICLEI Local Government Operations Protocol Version 1.1 (May 2010)
5. California Department of Water Resources - http://www.water.ca.gov/wateruseefficiency/sb7/

# Solid Waste Diversion Rate

## Calculation Methodology and Equations

**Key Assumptions for Example Calculations:**

| | | |
|---|---|---|
| Target additional diversion rate (2020)* | 25% | Percent |
| Estimated staff time needed for this measure | 0.04 | Full Time Employee (FTE) |

*AB 341 establishes a statewide goal of 75% (25% beyond what is currently mandated)

**Calculations:**

| | | | |
|---|---|---|---|
| Resource Savings Calculations | Tons Diverted = Future Year Landfilled Tonnage x Future Year Diversion Rate<br>1 - Future Year Landfilled Tonnage = (1 + CAGR)^15 x Baseline Year Landfilled Solid Waste | | |
| | Baseline Year (2005) Landfilled Solid Waste (Community-Wide) = | 37,575 | Tons |
| | Baseline Year (2005) GHG Emissions from Landfilled Solid Waste = | 13,433 | MT CO2e |
| | Projected (2020) GHG Emissions from Landfilled Solid Waste = | 14,745 | MT CO2e |
| | Compound Annual Growth Rate (CAGR) = | 1.02% | Percent |
| | Total City Future Year (2020) Solid Waste Tonnage = | 41,244 | Tons |
| | Paper Products = | 21.0% | Percent |
| | Food Waste = | 14.6% | Percent |
| | Plant Debris = | 6.9% | Percent |
| | Wood/Textiles = | 21.8% | Percent |
| | All Other Waste = | 35.7% | Percent |
| | Future Year Paper Products = | 8,661 | Tons |
| | Future Year Food Waste = | 6,022 | Tons |
| | Future Year Plant Debris = | 2,846 | Tons |
| | Future Year Wood/Textiles = | 8,991 | Tons |
| | Future Year All Other Waste = | 14,724 | Tons |
| | Paper Products Diverted = | 2,165 | Tons |
| | Food Waste Diverted = | 1,505 | Tons |
| | Plant Debris Diverted = | 711 | Tons |
| | Wood/Textiles Diverted = | 2,248 | Tons |
| | All Other Waste Diverted = | 3,681 | Tons |
| Resource Savings | Future Year Total Waste Diverted = | 10,311 | Tons |
| GHG Emission Reduction Calculations | Total MT CO2e Diverted = (2.138)(Paper Products)(0.9072) + (1.120)(Food Waste)(0.9072) + (0.686)(Plant Debris)(0.9072) + (0.605)(Wood/Textiles)(0.9072) + (0.00)(All Other Waste)(0.9072)<br><br>1 - Emission Reduction Per Waste Category = Emissions Factor for Category x Future Year Category Tonnage Diverted x 0.9072 x (1 - Emissions captured at landfill) | | |
| | 0.9072 | = Conversion from short tons to metric tons | |
| | Emission Factor - Paper Products = | 2.138 | MT CO2e / MT waste |
| | Emission Factor - Food Waste = | 1.210 | MT CO2e / MT waste |
| | Emissions Factor - Plant Debris = | 0.686 | MT CO2e / MT waste |
| | Emission Factor - Wood/Textiles = | 0.605 | MT CO2e / MT waste |
| | Emission Factor - All Other Waste = | 0.000 | MT CO2e / MT waste |
| | Emissions from Paper Products = | 4,200 | MT CO2e |
| | Emissions from Food Waste = | 1,653 | MT CO2e |
| | Emissions from Plant Debris = | 443 | MT CO2e |
| | Emissions from Wood/Textiles = | 1,234 | MT CO2e |
| | Emissions from All Other Waste = | 0 | MT CO2e |
| | Emissions captured at landfill = | 60% | Percent |
| GHG Emission Reduction | Total GHG Emissions Reductions = | 3,012 | MT CO2e |
| Municipal Costs and Savings Calculations | Cost may include additional staff time. | | |
| | FTE = | 0.0 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| Municipal Costs and Savings | Municipal Costs= | $4,000 | Dollars |
| | Municipal Savings= | $0 | Dollars |
| Community Costs and Savings | Community Costs = | $0 | Dollars |
| | Community Savings = | $0 | Dollars |

## Notes

All cities are assumed to have a baseline year diversion rate of 50%. This diversion has already been accounted for in the baseline year landfilled solid waste tonnage.

CAGR growth rates were calculated based on population growth.

ICLEI's CACP software incorporates emission factors for the diversion of certain materials from the waste stream, derived from the EPA WARM model.

GHG Emissions Calculations assume a landfill methane recovery rate of 60%.

## References


1. DRAFT City of Stockton Climate Action Plan (February 2012) - pg. C-77,C-78

2. Hayward Climate Action Plan (October, 2009) - pg. 170

3. County of San Bernardino Greenhouse Gas Emissions Reduction Plan (September 2011) - pg. 91

4. EPA's Waste Reduction Model (WARM), available at: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

5. ICELI's Clean Air Climate Protection (CACP) Software (for members), available at: http://www.icleiusa.org/action-center/tools/cacp-software

# Tree Planting Program

## Calculation Methodology and Equations

**Note: There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed.**

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Target number of trees planted (net new trees) | 1,500 | Trees |
| City subsidy of tree cost and planting | 10% | Percent Subsidized by City |
| Cost per tree | $79 | Dollars per Tree |
| Staff time needed for this measure | 0.04 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction Calculations | GHG Emissions Reduction=Number of Trees Planted x Carbon Sequestration Rate | | |
| | 0.0121 | = Average carbon sequestration rate (MT $CO_2$/Tree) | |
| | 1,500 | = Number of Trees Planted | |
| GHG Emission Reduction | Total GHG Emissions Reduced = | 18 | MT CO2e |
| Municipal Costs and Savings Calculations | Cost per tree = | $79 | Dollars/tree (McPherson, et al) |
| | City subsidy of tree cost and planting = | 10% | Percent subsidized |
| | City cost per tree = | $8 | Dollars per tree |
| | Total capital cost= | $11,850 | Dollars |
| | FTE = | 0.04 | Estimated staff time to develop program |
| | $/FTE | $100,000 | FTE cost per year |
| | Cost of staff time = | $4,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $15,850 | Dollars |
| | Municipal Savings = | $0 | Dollars |
| Community Costs and Savings Calculations | Capital cost = (cost per tree x number of trees planted x percentage of city subsidy) | | |
| | Where: | | |
| | Community cost per tree = | $71 | Dollars/tree |
| | Number of trees planted = | 1,500 | Trees |
| | Total tree capital cost (for community)= | $106,650 | Dollars |
| | Maintenance cost = maintenance cost per tree x number of trees planted. (Assumes community covers all maintenance costs.) | | |
| | Maintenance cost= | $34 | Dollars/tree (McPherson, et al) |
| | Total maintenance cost (for community) = | $51,000 | Dollars |
| Community Costs and Savings | Community Cost = | $105 | Dollars per tree |
| | Community Savings = | $0 | Dollars per tree |

## Notes

Carbon sequestration rate from CAPCOA Quantifying GHG Mitigation Measures Report p. 403. There is no reduction in GHG emissions associated with preservation of existing trees or mitigation of trees removed. Account for net new trees only.

## References


1. California Air Pollution Control Officers Association (CAPCOA) Quantifying Greenhouse Gas Mitigation Measures (August 2010) - pg. 403

2. McPherson, et al as cited in Stockton Draft CAP - http://www.stocktongov.com/government/boardcom/clim.html

# Climate Change Vulnerability

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Staff time needed for this measure | 0.02 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction | Annual GHG emissions reduced = | N/A | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to to participate in meetings and planning activities and incorporate new adaptation measures into City documents as appropriate. | | |
| | FTE = | 0.02 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Staff time cost = | $2,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $2,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |

## Notes

## References

# Public Health and Emergency Preparedness

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Staff time needed for this measure | 0.08 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction | Annual GHG emissions reduced = | N/A | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to time to coordinate with other agencies and community-based organizations. Additional staff time needed for community education and outreach related to this measure. | | |
| | FTE = | 0.08 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Staff time cost = | $8,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $8,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |

## Notes

## References

# Water Management

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Staff time needed for this measure | 0.02 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction | Annual GHG emissions reduced = | N/A | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to time to collaborate with other jurisdictions. Costs of seeking grant funding is business-as-usual. | | |
| | FTE = | 0.02 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Staff time cost = | $2,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $2,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |

## Notes

## References

# Infrastructure

## Calculation Methodology and Equations

**Key Assumptions for Calculations:**

| | | |
|---|---|---|
| Staff time needed for this measure | 0.08 | Full Time Equivalent (FTE) |

**Calculations:**

| | | | |
|---|---|---|---|
| GHG Emission Reduction | Annual GHG emissions reduced = | N/A | MT CO2e |
| Municipal Costs and Savings Calculations | Staff time needed to time to complete a climate assessment and incorporate climate change consideration in infrastructure planningl. | | |
| | FTE = | 0.08 | Estimated staff time per year |
| | $/FTE = | $100,000 | FTE cost per year |
| | Staff time cost = | $8,000 | Dollars |
| Municipal Costs and Savings | Municipal Cost = | $8,000 | Dollars |
| | Municipal Savings = | $0 | Dollars |

## Notes

## References

## Existing Local Measures – Quantification Details

| Emissions Category | Measure Title | Detailed Description | Actual Measure or Commitment | Annual Emissions Reduction in 2020 (MT $CO_2e$) | Measure Source | GHG Calculation Source | Incremental Reduction (%) - Including Range | Activity Data | Units | Assumptions | Data Sources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Energy (Community) | Solar Energy Installations (Commercial) | Since 2005, 3,719 kW of solar photovoltaic and hot water systems have been installed on commercial properties in Paso Robles. Many of these installations utilized rebates offered through the California Solar Initiative (CSI), a solar rebate program for California consumers that are customers of the investor-owned utilities, such as PG&E. The CSI program is a key component of the Go Solar California campaign for California. The City also participates in the CaliforniaFIRST AB 811 Solar and Energy Efficiency Financing Program (commercial and multi-family residential financing only). | 3,719 kW of solar installed | -960 | California Solar Initiative | CAPCOA AE-2 | 0%-100% | 7,066,100 | kWh | Use 1,900 to convert CEC rating to kWh | Solar Capacity from CA Solar (CEC PTC Rating); Conversion factor from US DOE |
| Energy (Community) | Solar Energy Installations (Residential) | Since 2005, 1,082 kW of solar photovoltaic and hot water systems have been installed on residential properties in Paso Robles. Many of these installations utilized rebates offered through the California Solar Initiative (CSI), a solar rebate program for California consumers that are customers of the investor-owned utilities, such as PG&E. The CSI program is a key component of the Go Solar California campaign for California. The City also participates in the CaliforniaFIRST AB 811 Solar and Energy Efficiency Financing Program (commercial and multi-family residential financing only). The City also collaborates with GRID Alternatives on outreach and eligibility to promote the Single-family Affordable Solar Homes (SASH) Program. | 1,050 kW of solar installed on residential; 32 kW from SASH program = 1,082 kW total | -279 | California Solar Initiative | CAPCOA AE-2 | 0%-100% | 2,055,800 | kWh | Use 1,900 to convert CEC rating to kWh | Solar Capacity from CA Solar (CEC PTC Rating); Conversion factor from US DOE |

| Emissions Category | Measure Title | Detailed Description | Actual Measure or Commitment | Annual Emissions Reduction in 2020 (MT $CO_2e$) | Measure Source | GHG Calculation Source | Incremental Reduction (%) - Including Range | Activity Data | Units | Assumptions | Data Sources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Energy (Community) | Solar Energy Installations (Municipal) | Since 2005, 1 kW of solar installations | 1 kW of solar installed | -0.3 | California Solar Initiative | CAPCOA AE-2 | 0%-100% | 2,242 | kWh | Use 1,900 to convert CEC rating to kWh | Solar Capacity from CA Solar (CEC PTC Rating); Conversion factor from US DOE |
| Energy (Municipal) | Energy Efficient Street Lights | This project involved removing existing 150 watt Metal Halide lamps and ballasts from approximately 313 decorative light fixtures and replacing them with 50 watt electrodes Metal Halide lamps, associated generators and internal reflector kits (induction retrofit kit). The City also has a lights-out-at-night policy. | 173,246 kWh savings | -24 | PG&E Project Application | CAPCOA LE-1 | 16%-40% | 173,246 | kWh | | |
| Energy (Municipal) | Energy Efficient Traffic Signal Lights | The City has 24 signalized intersections. Of those 24, 22 started out as incandescent lights and were converted to LED. | 88 LED lights (4 signals per intersection) | -14 | CIP | CAPCOA LE-3 | 0%-90% | 104,069 | kWh | Assumes Watt rating of bulbs fell from 150 to 15. Assumes 4 signals per intersection. Assumes traffic signals operate 8,760 hrs/yr. | U.S. Department of Energy U.S. Lighting Market Characterization. |
| Transportation and Land Use | Increase Density and Diversity of Land Use | Specific Plan provides a road map for growth and change for the plan area for at least the next 25 years. The 25-year build-out projection includes the addition of up to: 1,649 residential units (unit counts over 989 would require a General Plan amendment), 228,000 square feet of retail space, 223,000 square feet of office space, 275,000 square feet of industrial space, and 20 acres of usable open space. | Specific Plan provides a road map for growth, projecting up to 1,649 new residential units and more than 725,000 square feet of non-residential area. | Not quantified - included in regional travel demand forecast model | Specific Plan | CAPCOA LUT-1 | A 1% increase in density results in a -0.7 reduction in VMT | 28,400 | VMT | | The SLOCOG 2010 travel demand model used to estimate 2005 baseline and 2020 vehicle miles traveled (VMT) uses a 2010 base year and its VMT are calculated and calibrated to 2009-2011 traffic counts. As such, results for transit and transportation demand management are inherent to the 2008 results. In addition, year 2020 VMT estimates included SLOCOG travel demand forecast model “4-Ds” adjustments for the built environment (land use Density, Design, Diversity, and access to Destinations). Thus, applying additional reductions off-model would |

| Emissions Category | Measure Title | Detailed Description | Actual Measure or Commitment | Annual Emissions Reduction in 2020 (MT $CO_2e$) | Measure Source | GHG Calculation Source | Incremental Reduction (%) - Including Range | Activity Data | Units | Assumptions | Data Sources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | double count reductions. |
| Transportation and Land Use | Bicycle Network Improvements | Constructed 4-miles of bike lanes since 2006: Class 2 - 2 miles new "red" pained bike lanes / major road repair traffic calming and class 1 - 2 miles new multipurpose trail. | 4 miles new bike lanes | Not quantified - included in regional travel demand forecast model | Bike Master Plan, completed before 2011 | CAPCOA SDT-5 | 1% increase in share of workers commuting by bike for each additional mile of bike lane per square mile | 67,940 | VMT | Already captured in the VMT forecast. | The SLOCOG regional travel demand model used to estimate 2005 baseline and 2020 vehicle miles traveled (VMT) uses a 2010 base year and its VMT are calculated and calibrated to 2009-2011 traffic counts. As such, results from this action are inherent to the model results. |
| Transportation and Land Use | South River Road Bike path | The City has State Transit Enhancement Act (TEA) funding to install a bike path from Navajo to the 13th Street Bridge. The project is being designed by Rick Engineering. The project has completed its environmental phase and is now in final design. It will be advertised for bids in early 2012. | 1.3 miles | -16 | CIP | CAPCOA SDT-5 | 1% increase in share of workers commuting by bike for each additional mile of bike lane per square mile | 44,161 | VMT | Assumes 1% bike share mode. Average reduction in trip length is 20 miles (round trip). Average working days per year is 260. | CAPCOA SDT-5 |
| Transportation (Municipal) | Utilize Electric or Hybrid Vehicles | Purchased two hybrid SUVs in 2009. | 10,721 miles, 320.20 gallons used in 2011 | -2 | Fuel records from the City | CAPCOA VT-3 | 0.4%-20.3% | 10,721 miles; 320.20 gallons used | N/A | Assumes replaced vehicles 21 MPG; light truck MY 1984-1993 | Local Government Operations Protocol 1.1 |

| Emissions Category | Measure Title | Detailed Description | Actual Measure or Commitment | Annual Emissions Reduction in 2020 (MT $CO_2e$) | Measure Source | GHG Calculation Source | Incremental Reduction (%) - Including Range | Activity Data | Units | Assumptions | Data Sources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Waste (Community) | Green Waste Diversion | The City collects greenwaste | Unknown commitment | Not quantified | | CAPCOA SW-1 | BMP | | | | |
| Waste (Community) | Construction and Demolition Debris Diversion | As of 2010, the California Green Building Standards Code (CalGreen) requires that 50% of non-hazardous construction and demolition debris be recycled or reused. | 50% diversion of construction and demolition debris | -908 | California Green Building Standards Code | CAPCOA p. 43; SW-2 | Varies | | | According to the California 2008 Statewide Waste Characterization Study, construction and demolition debris makes up 29% of the waste stream and 40% of that is non-hazardous and recyclable. | California 2008 Statewide Waste Characterization Study |
| Water | Water Conservation Programs to Meet SB X7-7 Target | Implementation of programs identified in the City's 2010 Urban Water Master Plan to reduce per capita water consumption by 20% consistent with SBx7-7. | 563,040,240 gallons water savings | -97 | 2010 Urban Water Management Plan | CAPCOA WSW-2 | Varies | 563,040,240 | Gallons | Assumes 1,300 kWh/million gallons electricity required to supply, treat, and distribute water. Assumes 0.133 MT CO2e/ MWh electricity. | Urban Water Management Plan (June, 2011), CAPCOA WSW-2 (pg. 337), California Energy Commission Refining Estimates of Water-Related Energy Use in California (December 2006) |

## State Measures - Quantification Details

| Measure Title | 2020 Reduction (MT $CO_2e$) | Assumptions |
|---|---|---|
| **Clean Car Standards, AB 1493 (Pavley I)** | 12,339 | CARB anticipates that the Pavley I standard will reduce GHG emissions from new California passenger vehicles by about 22 percent in 2012 and about 30 percent in 2016. Reductions in GHG emissions from the Pavley I standard were calculated using CARB's EMFAC2011 model for San Luis Obispo County. To account for this standard, EMFAC2011 integrates the reductions into the mobile source emissions portion of its model (CARB, 2013). |
| **Low Carbon Fuel Standard** | On-Road: 8,057<br><br>Off-Road: 1,588 | The Low Carbon Fuel Standard (LCFS) requires a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. Reductions in GHG emissions from LCFS were calculated using CARB's EMFAC2011 model for San Luis Obispo County. To account for this standard, EMFAC2011 integrates the reductions into the mobile source emissions portion of its model (CARB, 2013). |
| **Title 24** | 822 | The California Energy Commission (CEC) estimates that the 2008 standards reduce consumption by 10 percent for residential buildings and 5 percent for commercial buildings, relative to the previous standards. For projects implemented after January 1, 2014, the CEC estimates that the 2013 Title 24 energy efficiency standards will reduce consumption by 25 percent for residential buildings and 30 percent for commercial buildings, relative to the 2008 standards. These percentage savings relate to heating, cooling, lighting, and water heating only and do not include other appliances, outdoor lighting that is not attached to buildings, plug loads, or other energy uses. Therefore, these percentage savings were applied to the percentage of energy use covered by Title 24. The calculations and 2020 GHG emissions forecast assume that all growth in the residential and commercial/industrial sectors is from new construction (CEC, 2008; Statewide Energy Efficiency Collaborative, 2011). |
| **Renewable Portfolio Standard** | 14,367 | PG&E must have a renewable portfolio of 33% by 2020. In order to calculate future emissions that take into account the Renewable Portfolio Standard, PG&E's 2020 emissions factor was applied (PG&E, 2011). |

# APPENDIX C

## CAP CONSISTENCY WORKSHEET

# CAP Consistency Worksheet

The City of Paso Robles CAP was developed to comprehensively analyze and mitigate the significant effects of GHG emissions consistent with CEQA Guidelines Section 15183.5(b) and to support the State's efforts to reduce GHG emissions under Executive Order S-3-05 and AB 32 (see CAP Chapter 1, Sections 1.1 and 1.4). Pursuant to CEQA Guidelines Sections 15064(h)(3) and 15130(d), if a project is consistent and complies with the requirements of an adopted plan, such as a CAP, that includes the attributes specified in CEQA Guidelines Section 15183.5(h), the lead agency may determine that the project's GHG impacts are less than significant with no further analysis required. This appendix sets forth a CAP consistency worksheet that an applicant may use to demonstrate project compliance with the CAP. This checklist should be filled out for each new project, subject to discretionary review of the City of Paso Robles.

To determine project consistency and compliance with the CAP, the applicant should complete Sections A and B below, providing project-level details in the space provided. Generally, only projects that are consistent with the General Plan land use designations, and SLOCOG population and employment projections, upon which the GHG emissions modeling and CAP is based, can apply for a determination of consistency with the CAP. In addition, all mandatory actions identified in Section B must be incorporated as binding and enforceable components of the project for it to be found consistent with the CAP. If an action is not applicable to the proposed project, please identify and explain.

At this time, the voluntary actions are not required for project consistency with the CAP; however, if a project does include voluntary actions identified in Section B, project-level details should be described to help the City track implementation of voluntary CAP actions that would contribute to Paso Robles's achievement of its GHG emissions reduction target.

If the project cannot meet one or more of the mandatory actions, substitutions (preferably starting with the voluntary actions) may be allowed if the applicant can demonstrate how substituted actions would achieve equivalent reductions to the City's satisfaction. The applicant would also be required to demonstrate that the project would not substantially interfere with implementation of the mandatory CAP actions.

If it is determined that a proposed project is not consistent with the CAP, further analysis would be required and the applicant would be required to demonstrate that the proposed project's GHG emissions fall below the APCD's adopted GHG significance thresholds (see CAP Chapter 1, Section 1.8.3, and **Table 1-2**). The project would also be required to demonstrate that it would not substantially interfere with implementation of the CAP.

## A. PROJECT INFORMATION

| | |
|---|---|
| **Date:** | |
| **Project Name:** | |
| **Project Address:** | |
| **Project Type:** | |
| **Project Size:** | |
| **Land Use Designation(s):** | |
| **Zoning Designation(s):** | |
| **Project Service Population (Residents + Employees):** | |
| **Brief Project Description:** | |
| **Compliance Checklist Prepared By:** | |

## B. CAP COMPLIANCE WORKSHEET

| Measure | Project Actions | Mandatory or Voluntary | Project Compliance (Yes/No/NA) | Details of Compliance* |
|---|---|---|---|---|
| **Energy** | | | | |
| **Measure E-4:** Incentives for Exceeding Title 24 Energy Efficiency Building Standards | Does the project exceed 2013 Title 24 Building Energy Efficiency Standards? | Voluntary | | |
| **Measure E-5:** Energy Efficient Public Realm Lighting Requirements | Does the project utilize high efficiency lights in parking lots, streets, and other public areas? | Mandatory | | |
| **Measure E-6:** Small-Scale On-Site Solar PV Incentive Program | Does the project include installation of small-scale on-site solar PV systems and/or solar hot water heaters? If so, what type and how much renewable energy would be generated? | Voluntary | | |
| **Measure E-7:** Income-Qualified Solar PV Program | Does the project include installation of small-scale on-site solar PV systems and/or solar hot water heaters on income-qualified housing units? If so, what type and how much renewable energy would be generated? | Voluntary | | |
| **Transportation and Land Use** | | | | |
| **Measure TL-1:** Bicycle Network | For subdivisions and large developments, does the project incorporate bicycle lanes, routes, and/or shared-use paths into street systems to provide a continuous network of routes, facilitated with | Mandatory | | |

| Measure | Project Actions | Mandatory or Voluntary | Project Compliance (Yes/No/NA) | Details of Compliance* |
|---|---|---|---|---|
| | markings, signage, and bicycle parking? | | | |
| | For non-residential development, does the project comply with mandatory California Green Building Standards Code bicycle parking standards? | Mandatory | | |
| | Does the project incorporate bicycle facilities and/or amenities beyond those required? | Voluntary | | |
| **Measure TL-2:** Pedestrian Network | Does the project provide a pedestrian access network that internally links all uses and connects all existing or planned external streets and pedestrian facilities contiguous with the project site? | Mandatory | | |
| | Does project minimize barriers to pedestrian access and interconnectivity? | Mandatory | | |
| | Does the project implement traffic calming improvements as appropriate (e.g., marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, median islands, mini-circles, tight corner radii, etc.)? | Mandatory | | |
| | Does the project incorporate pedestrian facilities and/or amenities beyond those required? | Voluntary | | |

| Measure | Project Actions | Mandatory or Voluntary | Project Compliance (Yes/No/NA) | Details of Compliance* |
|---|---|---|---|---|
| **Measure TL-3:** Expand Transit Network | Does the project provide safe and convenient access to public transit within and/or contiguous to the project area? | Mandatory | | |
| **Measure TL-6:** Parking Supply Management | Does the project include a reduced number of parking spaces or utilize shared parking? | Voluntary | | |
| **Measure TL-7:** Electric Vehicle Network and Alternative Fueling Stations | Does the project include the installation of electric or other alternative fueling stations? | Voluntary | | |
| **Measure TL-8:** Infill Development | Is the project consistent with the City's land use and zoning code? | Mandatory | | |
| | Does the project include any "smart growth" techniques, such as mixed-use, higher density, and/or infill development near existing or planned transit routes, in existing community centers/downtowns, and/or in other designated areas? | Voluntary | | |
| **Off-Road** | | | | |
| **Measure O-1:** Equipment Upgrades, Retrofits, and Replacements | If the project involves construction or demolition, does equipment utilize low- or zero-emissions vehicles or equipment? | Voluntary | | |
| **Water** | | | | |
| **Measure W-1:** Exceed SB X7-7 (Water Conservation Act of 2009), Water Conservation Target | Does the project meet CALGreen Tier 1 or Tier 2 standards for water efficiency and conservation? | Mandatory | | |
| | Does the project incorporate grey | Voluntary | | |

| Measure | Project Actions | Mandatory or Voluntary | Project Compliance (Yes/No/NA) | Details of Compliance* |
|---|---|---|---|---|
| | water or recycled water infrastructure? | | | |
| **Solid Waste** | | | | |
| **Measure S-1:** Solid Waste Diversion Rate | If the project involves construction or demolition, will the contractor divert 65 percent of non-hazardous construction or demolition debris? | Mandatory | | |
| | Does the project provide receptacles for the collection of organic waste? | Voluntary | | |
| | Does the project include composting facilities? | Voluntary | | |
| **Tree Planting** | | | | |
| **Measure T-1:** Tree Planting Program | Does the project include the planting of native and drought-tolerant trees beyond those required as mitigation for tree removal? If so, how many? | Mandatory | | |

*Please attach additional pages as needed to complete the description and provide project details.