Town of San Anselmo

2010 Greenhouse Gas Emissions Inventory

January 2013

Prepared by the
Marin Climate & Energy Partnership

CREDITS AND ACKNOWLEDGMENTS

TOWN OF SAN ANSELMO

Debra Stutsman, Town Manager

Phil Boyle, Senior Planner

Sean Condry, Public Works Director

David Donery, Community Services Director

Diane Henderson, Interim Building & Planning Director

Charles L. Maynard, Chief of Police

MARIN CLIMATE & ENERGY PARTNERSHIP

Christine O'Rourke, Sustainability Coordinator

MARIN ENERGY WATCH PARTNERSHIP

Dana Armanino, Sustainability Planner

PACIFIC GAS AND ELECTRIC COMPANY

John Joseph, Senior Program Manager

Armando Navarro, Community Energy Manager

Tonya Redfield, Senior Program Manager

Matthew Sturm, Senior Program Manager

ICLEI-LOCAL GOVERNMENTS FOR SUSTAINABILITY USA

Amruta Sudhalkar, Regional Associate

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Abby Young, Principal Environmental Planner

Table of Contents

EXECUTIVE SUMMARY

Climate change, caused by an increase in the concentration of atmospheric greenhouse gases, has been called one of the greatest challenges facing society today. Potential climate change impacts in Northern California include declining water supplies, spread of disease, diminished agricultural productivity, sea level rise, and increased incidence of wildfire, flooding, and landslides. In addition, the volatility of energy markets has roused concern, and is forcing communities to think differently about their resources. Here, in the State of California – with Assembly Bill 32, the Attorney General's efforts to mandate GHG reductions via CEQA, and other legislation—policies, programs and state laws designed to reduce greenhouse gases to 1990 levels by the year 2020 have been created and are being implemented.

In 2009, San Anselmo completed a Greenhouse Gas Inventory report for the baseline year of 2005. In April 2011, the San Anselmo Town Council approved a Climate Action Plan that lays out a path to achieve greenhouse gas reductions in local government operations and throughout the community. The San Anselmo Climate Action Plan is designed to meet the Town's greenhouse gas reduction target of 15% below 2005 levels by the year 2020, a target that is comparable to the state goal. This report measures the progress the Town has made on reducing greenhouse gas emissions between 2005 and 2010. In some cases, changes have been made to the baseline year calculations in order to ensure an apples-to-apples comparison of emissions from 2005 and 2010. The inventory quantifies greenhouse gas emissions from a wide variety of sources, from the energy used to power, heat and cool buildings, to the fuel used to move vehicles and power off-road equipment, to the decomposition of solid waste and treatment of wastewater. Emissions are arranged by sector to facilitate detailed analysis of emissions sources and comparison of increases and decreases between 2005 and 2010. It is important to note that the inventory provides a snapshot of two years and does not intend to imply there is necessarily a trend line between those years. Total emissions may have gone up or down during the years between 2005 and 2010.

The encouraging news is that San Anselmo reduced community greenhouse gas emissions 5.7% between 2005 and 2010, from 68,383 metric tons in 2005 to 64,453 metric tons in 2010 – a reduction of 3,930 metric tons CO_2e. Reductions occurred in all sectors. On a percentage basis, the greatest declines occurred in the waste (-34%), water (-31%) and commercial (-15%) sectors. In absolute terms, the greatest reductions were made in the commercial (1,116 metric tons CO2e), transportation (1,100 metric tons CO2e), and waste (950 metric tons CO2e) sectors.

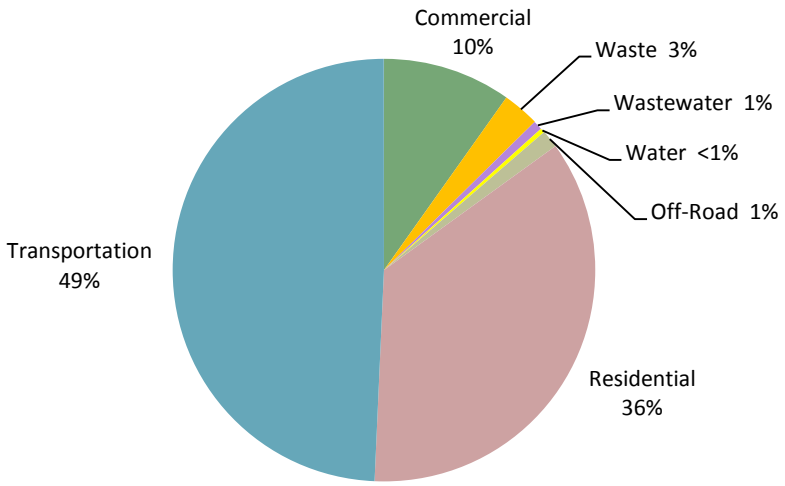
TABLE A: COMMUNITY EMISSIONS BY SECTOR, 2005 AND 2010

Sector	2005 Greenhouse Gas Emissions		2010 Greenhouse Gas Emissions		Change in Metric Tons CO_{2e}	% Change in Metric Tons
	Metric Tons CO_2e	% of Total	Metric Tons CO_2e	% of Total		
Residential	23,555	34%	23,060	36%	-485	-2.1%
Commercial	7,426	11%	6,310	10%	-1,116	-15.0%
Transportation	32,782	48%	31,682	49%	-1,100	-3.4%
Off-Road	1,015	1%	875	1%	-140	-13.8%
Water	323	<1%	222	<1%	-101	-31.3%
Wastewater	493	1%	465	1%	-28	-5.7%
Waste	2,789	4%	1,839	3%	-950	-34.1%
Total	**68,383**	**100%**	**64,453**	**100%**	**-3,930**	**-5.7%**

Reductions in electricity usage, a decline in the carbon intensity of electricity provided by PG&E, and the introduction of greener electricity provided by the Marin Energy Authority were largely responsible for the decrease in emissions in the residential and commercial sectors, while a decrease in water usage led to declines in the water and wastewater sectors. Emission reductions in the waste sector were primarily due to a 32% reduction in waste going to the landfill. In the transportation sector, improvements in fuel efficiency resulted, in part, in lower emissions from vehicles travelling on local roads. Reductions in the off-road sector were due to a 31% decrease in emissions from construction equipment. More detailed analysis of the factors related to decreases in emissions appears in the Community Inventory Detail by Sector section beginning on page 14.

As shown in Figure A, year 2010 emissions from the transportation sector are responsible for the greatest percentage of greenhouse gas emissions (49%), followed by emissions from the residential sector (36%) and the commercial sector (10%). The waste sector contributes approximately 3% of emissions, while the off-road, water, and wastewater sectors are each responsible for 1% or less of total community emissions.

FIGURE A: COMMUNITY EMISSIONS BY SECTOR, 2010



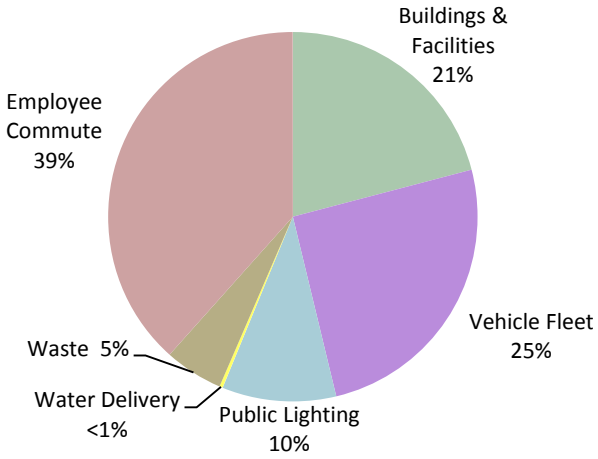
As shown in Table B, government operations emissions decreased by 59.3 metric tons CO_2e, or by 9.2%. Decreases occurred in all sectors except the employee commute sector, which increased by 16%.The largest decreases occurred in the buildings and facilities sector (47 metric tons CO_2e), the vehicle fleet sector (22 metric tons CO_2e) and the public lighting sector (-18 metric tons CO_2e).

TABLE B: GOVERNMENT OPERATIONS EMISSIONS BY SECTOR, 2005 AND 2010

Sector	2005 Greenhouse Gas Emissions		2010 Greenhouse Gas Emissions		Change in Metric Tons CO_{2e}	% Change in Metric Tons CO_2e
	Metric tons CO_2e	% of Total	Metric Tons CO_2e	% of Total		
Buildings & Facilities	169.3	26%	122.8	21%	-46.6	-27%
Vehicle Fleet	170.3	26%	148.9	25%	-21.5	-13%
Public Lighting	77.0	12%	58.7	10%	-18.4	-24%
Water Delivery	2.8	<1%	1.7	<1%	-1.1	-40%
Waste	33.5	5%	30.1	5%	-3.4	-10%
Employee Commute	193.9	30%	225.5	38%	31.7	16%
Total	**647.0**	**100%**	**587.6**	**100%**	**-59.3**	**-9.2%**

The Town reduced its use of natural gas by 27% and its use of electricity by 10%. This decline in electricity usage, coupled with an improvement in the carbon intensity of PG&E electricity and the Town's decision to switch to Marin Clean Energy electricity in 2010, was responsible for about half of the overall decline in greenhouse gas emissions from the buildings, public lighting, and water delivery sectors. The Town also reduced its waste headed to the landfill by 10%.

FIGURE B: GOVERNMENT OPERATIONS EMISSIONS BY SECTOR, 2010



These results show that San Anselmo is on its way to accomplishing its greenhouse gas reduction goals for both government operations and community emissions. San Anselmo will achieve a reduction in community emissions of 16.3% below 2005 levels by the year 2020 if community emissions continue to decrease at the current rate.

INTRODUCTION

PURPOSE OF INVENTORY

The objective of this greenhouse gas emissions inventory is to identify the sources and quantify the amounts of greenhouse gas emissions generated by the activities of the San Anselmo community and local government operations in 2010. This inventory provides a comparison to baseline 2005 emissions, and identifies the sectors where significant reductions in greenhouse gas emissions have occurred and where more work needs to be done. In some instances, baseline emissions were recalculated in order to ensure the same methodology was employed for 2005 and 2010. In addition, some new sectors were added to the inventory; this report includes emissions from water use, off-road vehicles and equipment, and wastewater treatment for the community inventory, and fugitive emissions from refrigerants in the government operations inventory.

GENERAL METHODOLOGY

A national standard called the Local Government Operations Protocol (LGO Protocol) has been developed and adopted by the California Air Resources Board (ARB) in conjunction with ICLEI, the California Climate Action Registry and The Climate Registry. This standard provides accounting principles, boundaries, quantification methods and procedures for reporting greenhouse gas emissions from local government operations. The LGO Protocol forms the basis of ICLEI's Clean Air & Climate Protection Software (CACP 2009), which allows local governments to compile data and perform the emissions calculations using standardized methods.

Local government operations emissions have been categorized according to the following sectors:

- Buildings and Other Facilities
- Public Lighting
- Water Delivery Facilities
- Vehicle Fleet
- Solid Waste
- Employee Commute

This inventory utilizes methodologies developed by the Bay Area Air Quality Management District and ICLEI for quantifying community-scale emissions. In general, the inventory follows the standards outlined in the draft International Local Government GHG Emissions Analysis Protocol and, where appropriate, the LGO Protocol, with additional guidance from the Air District with respect to quantifying emissions from the transportation, off-road, water and wastewater sectors.

Community emissions have been categorized according to seven primary sectors:

- Residential
- Commercial
- Transportation
- Off-Road Vehicles and Equipment
- Water
- Wastewater
- Waste

Calculating Emissions

In general, emissions can be quantified in two ways:

1. **Measurement-based methodologies** refer to the direct measurement of greenhouse gas emissions from a monitoring system. Emissions measured in this way may include those from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility. This method is the most accurate way of inventorying emissions from a given source, but is generally available for only a few sources of emissions.
2. **Calculation-based methodologies** refer to an estimate of emissions calculated based upon measurable activity data and emission factors. Table 1 provides examples of common emissions calculations. For example, in order to calculate the carbon dioxide emissions from community electricity consumption, the total amount of kilowatt hours of electricity consumed by the community over a one-year period is multiplied by an emission factor specific to that source. This results in the amount of carbon dioxide gas emitted by electricity consumption in that year. All emissions inventoried in this report are calculated in this manner.

Table 1: Factors for Calculating Emissions

Emission Source	Activity Data	Emission Factor	Emissions
Electricity Consumption	Kilowatt hours	CO_2 emitted/kWh	CO_2 emitted
Natural Gas Consumption	Therms	CO_2 emitted/therm	CO_2 emitted
Gasoline/Diesel Consumption	Gallons	$C0_2$ emitted/gallon	CO_2 emitted
Waste Generation	Tons	CH_4 emitted/ton	CH_4 emitted

This inventory calculates individual greenhouse gases – e.g., carbon dioxide, methane and nitrous oxide – and converts each gas emission to a standard metric, known as "carbon dioxide equivalents" or CO_2e, in order to allow an apple-to-apples comparison among the three emissions. Table 2 shows the greenhouse gases identified in this inventory and their global warming potential (GWP), a measure of the amount of warming each gas causes when compared to a similar amount of carbon dioxide. Methane, for example, is 21 times as potent as carbon dioxide; therefore, one metric ton of methane is equivalent to 21 metric tons of carbon dioxide. Greenhouse gas emissions are reported in this inventory as metric tons of carbon dioxide equivalents, or $MTCO_2e$.

TABLE 2: GREENHOUSE GASES

Gas	Chemical Formula	Emission Source	Global Warming Potential
Carbon Dioxide	CO_2	Combustion of natural gas, gasoline, diesel, and other fuels	1
Methane	CH_4	Combustion, anaerobic decomposition of organic waste in landfills and wastewater	21
Nitrous Oxide	N_2O	Combustion, wastewater treatment	310
Hydroflourocarbons	Various	Leaked refrigerants, fire suppressants	12 to 11,700

TYPES OF EMISSIONS

Emissions from each of the greenhouse gases can come in a number of forms:

- **Stationary or mobile combustion** resulting from the on-site combustion of fuels (natural gas, diesel, gasoline, etc.) to generate heat or electricity, or to power vehicles and equipment.
- **Purchased electricity** resulting from the generation of power from utilities outside the town limits.
- **Fugitive emissions** resulting from the unintentional release of greenhouse gases into the atmosphere, such as leaked refrigerants and methane from waste decomposition.
- **Process emissions** from physical or chemical processing of a material, such as wastewater treatment.

THE SCOPES FRAMEWORK

This inventory reports greenhouse gas emission by sector, as described earlier in this report, and by "scope" as follows:

- **Scope 1:** Direct emissions from the combustion of fuels to produce heat, steam, electricity or to power equipment; mobile combustion of fuels; process emissions from physical or chemical processing; fugitive emissions that result from production, processing, transmission, storage and use of fuels; leaked refrigerants; and other sources.
- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling. Scope 2 emissions occur as a result of activities that take place within the town limits but are generated outside of the town. For example, electricity from Pacific Gas & Electric Company is consumed within San Anselmo but the greenhouse gasses associated with this consumption are emitted outside of the town where the electricity is generated.
- **Scope 3:** All other emissions sources that hold policy relevance to the local government that can be measured and reported. Typically, these are emissions not covered in Scope 2 that occur as a result of activities within the town. Scope 3 emissions include (but are not limited to) emissions resulting from the decomposition of solid waste, the treatment and distribution of water, and the treatment of wastewater at facilities located outside of the town boundaries. Within the government operations inventory, Scope 3 emissions also include emissions resulting from employee commutes.

Organizational Boundaries

The organizational boundary for the inventory determines which aspects of operations are included in the emissions inventory and which are not. Under the LGO Protocol, two control approaches are used for reporting emissions: operational control or financial control. A local government has operational control if it has full authority to introduce and implement policies that impact the operation. A local government has financial control if the operation is fully consolidated in financial accounts. If a local government has joint control over an operation, the contractual agreement will have to be examined to see who has authority over operating policies and implementation, and thus the responsibility to report emissions under operational control.

LGO Protocol strongly encourages local governments to utilize operational control as the organizational boundary for a local government operations emission inventory. Operational control is believed to most accurately represent the emissions sources that local governments can most directly influence, and this boundary is consistent with other environmental and air quality reporting program requirements. For this reason, this inventory for local government operations emissions was conducted according to the operational control framework.

Understanding Totals

It is important to realize that the totals listed in the tables and discussed in the report are intended to represent all-inclusive, complete totals for San Anselmo's community and government operations emissions. However, these totals are only a summation of inventories emissions using available estimation methods. Each inventoried sector may have additional emissions sources associated with them that were unaccounted for, due to a lack of data or robust quantification methods. Examples of greenhouse gas emissions that are not included in the community inventory include refrigerants released into the atmosphere from the use of air conditioning in cars and buildings.

Information Items

Information items are emissions sources that are not included as Scope 1, 2, or 3 emissions in the inventory, but are reported here separately in order to provide a more complete picture of emissions from San Anselmo's government operations. Information items for this inventory include refrigerators using the refrigerant R-12 and air conditioning units using the refrigerant R-22. These refrigerants are not included in the inventory because they are ozone-depleting substances and are being phased out by 2020 under the terms of the Montreal Protocol.

Table 3: Information Items, 2010

Source	Refrigerant	Metric Tons CO_2e
Refrigerators	R-12	0.02
Air Conditioning Units	R-22	0.37
Total		0.39

Regional and Local Context

Climate Change Mitigation Activities in California

Since 2005, the State of California has responded to growing concerns over the effects of climate change by adopting a comprehensive approach to addressing emissions in the public and private sectors. This approach was officially initiated with the passage of the Global Warming Solutions Act of 2006 (AB 32), which requires the state to reduce its greenhouse gas emissions to 1990 levels by 2020. The AB 32 Scoping Plan was developed to identify

strategies for meeting the AB 32 goal, and was adopted by the California Air Resources Board (ARB) in December 2008. Among many other strategies, it encourages local governments to reduce emissions in their jurisdictions by 15 percent below current levels by 2020. In addition, it identifies the following strategies that will impact local governance:

- Develop a California cap-and-trade program
- Expand energy efficiency programs
- Establish and seek to achieve reduction targets for transportation-related GHG emissions
- Expand the use of green building practices
- Increase waste diversion, composting, and commercial recycling toward zero-waste
- Continue water efficiency programs and use cleaner energy sources to move and treat water
- Reduce methane emissions at landfills
- Preserve forests that sequester carbon dioxide

Other measures taken by the state include mandating stronger vehicle emissions standards (AB 1493, 2002), establishing a low-carbon fuel standard (EO # S-01-07, 2007), mandating a climate adaptation plan for the state (S-EO # 13-08, 2008), establishing a Green Collar Job Council, and establishing a renewable energy portfolio standard for power generation or purchase in the state. The state also has made a number of legislative and regulatory changes that have significant implications for local governments:

- SB 97 (2007) required the Office of Planning and Research to create greenhouse gas planning guidelines for the California Environmental Quality Act (CEQA). In addition, the ARB is tasked with creating energy-use and transportation thresholds in CEQA reviews, which may require local governments to account for greenhouse gas emissions when reviewing project applications.
- AB 811 (2007) authorizes all local governments in California to establish special districts that can be used to finance solar or other renewable energy improvements to homes and businesses in their jurisdiction.
- SB 375 (2008) revises the process of regional transportation planning by metropolitan planning organizations (MPOs), which are governed by elected officials from local jurisdictions. The statute calls on the ARB to establish regional transportation-related greenhouse gas targets and requires the large MPOs to develop regional "Sustainable Communities Strategies" of land use, housing and transportation policies that will move the region towards its GHG target. The statute stipulates that transportation investments must be consistent with the Sustainable Communities Strategy and provides CEQA streamlining for local development projects that are consistent with the Strategy.

The Marin Climate & Energy Partnership

Created in 2007, the mission of the Marin Climate & Energy Partnership (MCEP) is to reduce greenhouse gases emission levels to the targets of Marin County and local municipalities, consistent with the standards set by AB32. Ten Marin Cities and towns, the County of Marin, the Transportation Authority of Marin, and the Marin Municipal Water District are members. The Marin Climate and Energy Partnership provided staff support and technical expertise for the development of this inventory. Funding for this project was provided in part by the Marin County Energy Watch (MCEW), a joint project of Pacific Gas and Electric Company (PG&E) and the County of Marin.[1]

[1] MCEW is funded by California utility ratepayers under the auspices of the California Public Utilities Commission.

Climate Change Mitigation Activities in San Anselmo

The Town has taken a number of initiatives in recent years to reduce greenhouse gas emissions. These include the following early actions:

- Purchased two hybrid vehicles – a Toyota Highlander Hybrid for use by the Police Chief, and a Ford Escape Hybrid for the community services patrol.
- The Police Department has purchased two fuel-efficient patrol vehicles. The new Dodge Chargers use only four cylinders while idling, but can switch to eight cylinders in the "pursuit ready" mode. The Police Department plans to phase these fuel-efficient models into the police fleet as vehicles are replaced.
- Installed solar panels on the downtown fire station.
- Remodeled the downtown fire station with energy efficiency upgrades such as double pane windows, new insulation, etc.
- Installed energy efficient lighting in the Police Department, Council Chambers, and downtown fire station.
- Participating in Safe Routes to Schools and Safe Paths to Schools grant programs to construct sidewalks, bike paths and curb ramps near Brookside School, Wade Thomas School and St. Anselm's School to encourage walking and biking to school.
- Replaced old boiler at the Isabel Cook Community Center with three energy-efficient boilers.
- Continued implementation of the annual curb ramp replacement program to facilitate accessibility and walkability.
- Installed pedestrian improvements and overhead warning indicators at unsignalized intersections at Saunders and Madrone Avenues and Sir Francis Drake Boulevard.
- Installed bike racks, loop detectors, sharrows, and route signage and pavement stenciling to encourage bicycle use throughout town.
- Purchased numerous pieces of Energy Star-rated computer equipment to phase out older, less energy-efficient equipment.
- Adopted a Green Building Ordinance (Ord. No. 1076) in 2010 with building efficiency standards above the State green building and energy codes.
- Adopted the Town of San Anselmo Bicycle and Pedestrian Master Plan Update in 2008 which outlines future bicycle and pedestrian improvement programs and projects throughout the Town to promote increased bicycle and pedestrian travel and decrease the use of vehicles.
- Joined the Marin Energy Authority and chose Marin Clean Energy electricity with a minimum 25% (light green) renewable energy source content for all Town operations.
- Obtained a grant to replace 170 street lights with high efficiency induction or LED lighting.

Since approval of the San Anselmo Climate Action Plan in April 2011, the Town has continued to implement greenhouse gas reduction programs in San Anselmo. These include the following:

- In partnership with Marin Sanitary Service, implemented curbside food waste collection. The program reduces methane emissions by composting food waste instead of depositing it into the landfill.
- Adopted a construction and demolition (C&D) debris recycling ordinance that requires a minimum of 70% of C&D waste to be recycled rather than deposited into the landfill. The ordinance incrementally increases diversion requirements until targets meet 94% by the end of 2025.
- Adopted a Zero Waste resolution that commits the Town to reaching a 94% diversion rate by 2025, and an ultimate goal of Zero Waste.

- Participated in the Energy Upgrade California program, which provides substantial rebates to homeowners to perform energy audits and "whole house" energy upgrade retrofits.
- Implemented Marin Municipal Water District's Ordinance 421 which added, amended, and repealed certain sections of MMWD's Title 13 Water Code. The revisions were necessary to further meet conservation measures within the District's service area, as well as meet 2010 California Green Building Standards, improve the effectiveness of the District's water waste prevention program, and increase efficiency standards.
- Developed a Climate Action Plan Progress Report to track the progress of the measures listed in the Climate Action Plan (CAP). The report lists the GHG reduction measures recommended in the CAP, who is responsible for implementing them, how to measure the GHG reductions, etc. This progress report is posted on the Town's website and can be easily accessed and updated.

COMMUNITY INVENTORY RESULTS

SAN ANSELMO PROFILE

Located in Marin County approximately thirteen miles north of the Golden Gate Bridge in the center of Ross Valley, San Anselmo is a small town with a land area of 2.75 square miles. According to the U.S. Census, the population of San Anselmo in 2010 was 12,336 and there were 5,538 housing units. The California Department of Finance estimates the population of San Anselmo in 2005 was 12,099.[2] San Anselmo enjoys a temperate climate, with cool, wet, and almost frostless winters and dry summers. The town is located in climate zone 2, and experienced an estimated 3,649 heating degree days and 292 cooling degree days in 2005. The year 2010 was relatively cooler, with 4,027 heating degree days and 168 cooling degree days.[3]

COMMUNITY INVENTORY SUMMARY

In 2005, the activities taking place by the San Anselmo community resulted in approximately 68,383 metric tons of CO_2e. In 2010, those activities resulted in approximately 64,453 metric tons of CO_2e, a reduction of 3,930 metric tons, or approximately 5.7%. These numbers represent a roll-up of emissions. While the roll-up is a valuable figure, the breakdown of emissions information by sectors, sources, and scope allows the comparative analysis and insight needed for effective decision-making for target setting, developing GHG reduction measures, and monitoring. The following summaries break down these totals by sector, sources, and scope.

SUMMARY BY SECTOR

As shown in Table 4 and Figure 1, the transportation sector was the largest emitter of greenhouse gas emissions in both 2005 (representing 48% of total emissions) and 2010 (49% of total emissions). Emissions from the residential sector produced the second highest quantity (34% in 2005 and 36% in 2010), followed by the commercial sector (11% in 2005 and 10% in 2010). Emissions were reduced in all sectors, with the greatest reductions occurring in

[2] California Department of Finance, "E-4 Population Estimates for Cities, Counties, and the State 2001-2010, with 2000 & 2001 Census Counts," August 2011. To make comparisons to U.S. Census data, this is the average between California Department of Finance estimates for January 1, 2005, and January 1, 2006.

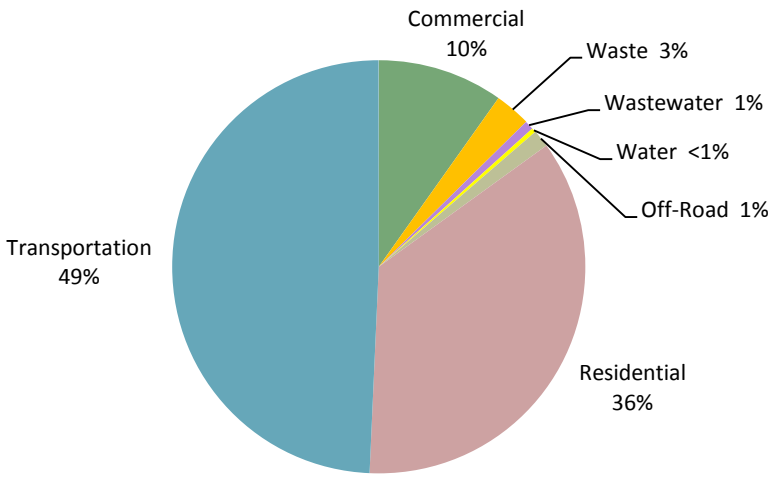
[3] Climate Zone information is supplied by the California Energy Commission, http://www.energy.ca.gov/maps/renewable/Climate_Zones_by_City.pdf, accessed 9/14/12. Heating and cooling degree days data for the North Coast Drainage Division is supplied by NOAA Satellite and Information Service, National Climatic Data Center, U.S. Department of Commerce, http://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp, accessed 9/14/12. A heating degree day (HDD) is a measurement designed to reflect demand for energy needed to heat a facility, while a cooling degree day (CDD) is used to reflect the demand on energy needed to cool a building. Degree days are calculated using daily temperature readings and a base temperature (typically 60 or 65 degrees). For example, a typical January day in San Anselmo has an average temperature of 47 degrees. For such a day we can approximate the HDD as (65 - 47) = 18.

the commercial sector (1,116 metric tons), transportation sector (1,100 metric tons), and waste sector (950 metric tons).

TABLE 4: SUMMARY BY SECTOR, 2005 AND 2010

Sector	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_2e	Change Metric Tons CO_2e	% Change
Residential	23,555	23,060	-495	-2.1%
Commercial	7,426	6,310	-1,116	-15.0%
Transportation	32,782	31,682	-1,100	-3.4%
Off-Road	1,015	875	-140	-13.8%
Water	323	222	-101	-31.3%
Wastewater	493	465	-28	-5.7%
Waste	2,789	1,839	-950	-34.1%
Total	**68,383**	**64,453**	**-3,930**	**-5.7%**

FIGURE 1: EMISSIONS BY SECTOR, 2010



SUMMARY BY SOURCE

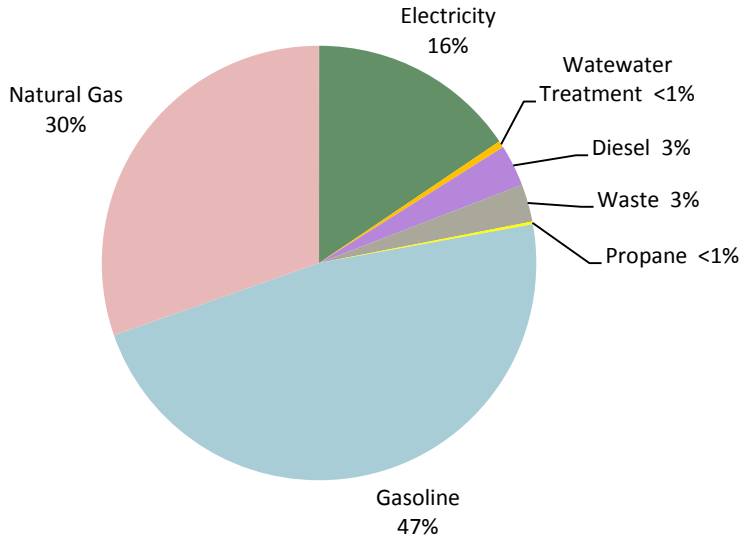
When considering how to reduce emissions, it is helpful to look not only at which sectors are generating emissions, but also at the specific raw resources and materials (gasoline, diesel, electricity, natural gas, solid waste, etc.) whose use and generation directly result in the release of greenhouse gases. Table 5 and Figure 2 provide summaries of San Anselmo's 2005 and 2010 greenhouse gas emissions by source. Between 2005 and 2010, emissions from the combustion of natural gas increased by 2.4% or 468 metric tons CO_2e. Emissions from other sources decreased in all categories except wastewater treatment which experienced a small increase of 6 metric

tons CO_2e. In 2010, the largest source of emissions was gasoline (47% of total emissions), followed by natural gas (30%) and electricity (16%).

TABLE 5: SUMMARY BY SOURCE, 2005 AND 2010

Source	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_2e	Change Metric Tons CO_2e	% Change
Gasoline	31,611	30,573	-1,038	-3.3%
Natural Gas	19,119	19,587	468	2.4%
Electricity	12,220	10,017	-2,203	-18.0%
Diesel	2,185	1,984	-201	-9.2%
Waste	2,789	1,839	-950	-34.1%
Wastewater Treatment	318	324	6	1.9%
Propane/LPG	140	130	-10	-7.1%
Total	**68,383**	**64,453**	**-3,930**	**-5.7%**

FIGURE 2: EMISSIONS BY SOURCE, 2010



SUMMARY BY SCOPE

As shown in Table 6, Scope 1 sources produced the largest amount of community greenhouse gas emissions in both 2005 and 2010, with emissions totaling 52,274 metric tons CO_2e in 2010. Scope 2 emissions comprised the second largest amount (9,654 metric tons CO_2e), and Scope 3 emissions totaled 2,526 metric tons CO_2e. The greatest reduction occurred in Scope 3 emissions (-29.9%), which includes emissions from the waste, water, and wastewater sectors. Scope 2 emissions, which represents emissions from the use of electricity generated outside the town limits, decreased by nearly 18%. Scope 1 emissions, which result primarily from the combustion of

natural gas to heat buildings and gasoline and diesel to power vehicles and off-road equipment, decreased by 1.5%.

TABLE 6: SUMMARY BY SCOPE, 2005 AND 2010

Activity	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_{2e}	% Change
Scope 1	53,056	52,274	-1.5%
Scope 2	11,722	9,654	-17.6%
Scope 3	3,605	2,526	-29.9%
Total	**68,383**	**64,453**	**-5.7%**

PER CAPITA EMISSIONS

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. That said, due to differences in emission inventory methods, it can be difficult to produce directly comparable per capita emissions numbers, and one must be cognizant that there will be some margin of error when comparing figures.

As detailed in Table 7, dividing the total community-wide GHG emissions by service population (residents and employees) yields a result of 4.0 metric tons CO_2e per capita in 2005. Per capita emissions decreased 7.0% between 2005 and 2010, falling to 3.7 metric tons per person. It is important to understand that this number is not the same as the carbon footprint of the average individual living or working in San Anselmo, which would include lifecycle emissions, emissions resulting from air travel, etc.

TABLE 7: PER CAPITA EMISSIONS, 2005 AND 2010

	2005	2010	% Change
Service Population	17,089	17,316	1.3%
Community GHG Emissions (metric tons CO_2e)	68,383	64,453	-5.7%
Per Capita GHG Emissions (metric tons CO_2e)	4.0	3.7	-7.0%

COMMUNITY INVENTORY DETAIL BY SECTOR

This section explores community activities and emissions by taking a detailed look at each primary sector. As listed above, the sectors included in the community emissions analysis are:

- Residential
- Commercial
- Transportation
- Off-Road Vehicles and Equipment
- Waste
- Water
- Wastewater

Residential Sector

Energy consumption associated with San Anselmo homes produced 23,415 metric tons of greenhouse gas emissions in 2005 and 23,060 metric tons in 2010, a decrease of 2.1%. All residential sector emissions are the result of electricity consumption and the on-site combustion of natural gas and propane. Natural gas is typically used in residences as a fuel for home heating, water heating and cooking, and electricity is generally used for lighting, heating and powering appliances. In 2005, San Anselmo's entire residential sector consumed 32,537,708 kWh of electricity and 3,035,635 therms of natural gas.

As shown in Table 8, electricity usage in San Anselmo's residential sector decreased by 1.8% between 2005 and 2010, while emissions decreased by 12.4%. This greater decline in GHG emissions occurred for two reasons. First, the carbon intensity of PG&E electricity declined 9% between 2005 and 2010. Second, some San Anselmo residents began to purchase their electricity from the Marin Energy Authority (MEA) approximately mid-way through the year, resulting in about 7% of all residential kWh purchased through MEA in 2010. The carbon intensity of MEA electricity was about 27% lower than that supplied by PG&E in 2010 due to the higher percentage of renewable and non-greenhouse gas emitting energy sources in MEA's energy mix.

The decline in PG&E's emissions from delivered electricity from 2005 to 2010 owed, in large part, to an increase in the amount of zero- and low-emitting electricity in their power portfolio and the expanded use of cleaner fossil-fueled electricity, including two new, state-of-the-art natural gas-fired plants that PG&E brought into service in 2010. More than half of PG&E's power came from a combination of non-greenhouse gas emitting and renewable sources in 2010. Several factors affect PG&E's power mix and emissions from year to year, including demand growth, the weather and the availability of hydro power.

Table 8: Residential Emissions Sources, 2005 and 2010

Source	2005 Energy Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions ($MTCO_2e$)
Electricity	32,537,708 kWh	7,279	31,952,102 kWh	6,379	-1.8%	-12.4%
Natural Gas	3,035,635 therms	16,136	3,113,726 therms	16,551	2.6%	2.6%
Propane/LPG	2,259 MMBtu	140	2,093 MMBtu	130	-7.3%	-7.3%
Total	-	23,555	-	23,060	-	-2.1%

Natural gas usage increased 2.6% between 2005 and 2010. This may be due, in part, to the fact that 2010 was a cooler year than 2005.[4] Since the natural gas emissions factor does not fluctuate, the amount of greenhouse gases emitted by the combustion of natural gas also increased 2.6%.

As shown in Table 9, San Anselmo residents generated approximately 4.4 metric tons of greenhouse gas emissions per household in 2010. This is a decrease of approximately 1.2% per household since 2005. [5]

[4] See discussion on page 11.

[5] Number of San Anselmo households is from ABAG Projections 2009 and 2010 U.S. Census SF1:H.

TABLE 9: RESIDENTIAL EMISSIONS PER HOUSEHOLD

	2005	2010
Number of Occupied Housing Units	5,290	5,243
Residential GHG Emissions (metric tons CO_2e)	23,555	23,060
Residential GHG Emissions per Household (metric tons CO_2e)	4.45	4.40

COMMERCIAL SECTOR

The commercial sector includes emissions from the operations of businesses as well as public agencies. Between 2005 and 2010, emissions from the commercial sector fell by 15%. In 2010, buildings and facilities within the commercial sector produced 6,310 metric tons of greenhouse gas emissions. All commercial sector emissions included in this inventory are the result of electricity consumption and the on-site combustion of natural gas. Natural gas is typically used in the commercial sector to heat buildings, fire boilers, and generate electricity; electricity is generally used for lighting, heating, and powering equipment and appliances.

As shown in Table 10, electricity usage decreased by 12.5% in the commercial sector between 2005 and 2010, while electricity emissions decreased even more – by 26.3% – for the emission factor reasons explained in the discussion on residential sector emissions. This decrease was offset by an increase in natural gas usage and emissions of 1.7%. The net effect was to decrease total emissions from the commercial sector by 15%.

TABLE 10: COMMERCIAL EMISSIONS, 2005 AND 2010

Source	2005 Energy Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions ($MTCO_2e$)
Electricity	17,716,566 kWh	4,443	15,499,353 kWh	3,275	-12.5%	-26.3%
Natural Gas	561,221 therms	2,983	571,020 therms	3,035	1.7%	1.7%
Total		7,426		6,310	--	-15.0%

Table 11 shows commercial emissions based on the estimated number of jobs in San Anselmo in 2005 and 2010.[6] Emissions decreased by approximately 15% per job.

TABLE 11: COMMERCIAL / INDUSTRIAL EMISSIONS PER JOB

	2005	2010
Number of Jobs	4,990	4,980
Commercial / Industrial GHG Emissions (metric tons CO_2e)	7,426	6,310
Commercial /Industrial GHG Emissions per Job (metric tons CO_2e)	1.5	1.3

[6] Number of San Anselmo jobs in 2005 and 2010 is based on ABAG Projections 2009 estimates.

Transportation Sector

Emissions in the transportation sector are calculated by estimating all vehicle miles traveled on local roads within the town limits. Air travel and vehicle miles traveled outside of Marin County are not included in the analysis. In 2005, the transportation sector generated 32,782 metric tons of CO_2e. By 2010, emissions from the transportation sector decreased approximately 3.4% to 31,682 metric tons CO_2e. As shown in Table 12, vehicle miles traveled on local roads were virtually unchanged between 2005 and 2010.

Table 12: Transportation Emissions, 2005 and 2010

Source	2005 Vehicle Miles Traveled	2005 GHG Emissions ($MTCO_2e$)	2010 Vehicle Miles Traveled	2010 GHG Emissions ($MTCO_2e$)	% Change in Vehicle Miles Traveled	% Change in GHG Emissions ($MTCO_2e$)
Local Roads	66,959,250	32,782	66,973,850	31,682	0.0%	-3.4%

Decreases in transportation sector emissions are due to changes in fuel efficiency and the carbon intensity of transportation fuels. The Pavley I vehicle standards are over the long-term increasing fuel efficiency and decreasing emissions per vehicle mile. Fuel efficiency data available for this inventory show an increase in fuel efficiency of vehicles using gasoline from an average of 18.1 miles per gallon in 2005 to an average of 18.5 miles per gallon in 2010. California's Low Carbon Fuel Standard is reducing the carbon intensity of fuel over the long term, and some decreases in carbon intensity were measured between 2005 and 2010.[7]

Off-Road Sector

Emissions in the off-road sector are from the combustion of fuels used to power vehicles and equipment in the construction and lawn and garden categories, and include everything from hedge trimmers to cranes. As shown in Table 13, off-road emissions decreased by approximately 13.8% between 2005 and 2010. This decrease was due to a reduction in gasoline and diesel use in off-road vehicles and equipment, and an improvement in the carbon-intensity of fuels. Emissions from construction equipment and off-road vehicles, in particular, decreased by about 31%, a result of the decline in construction activity since the peak of the real estate boom in 2006-2007.

Table 13: Off-Road Emissions, 2005 and 2010

Source	2005 Energy Consumption (gallons)	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption (gallons)	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions
Construction Equipment	49,740	445	34,071	307	-31.5%	-31.0%
Lawn and Garden Equipment	57,428	570	57,329	568	-0.2%	-0.4%
Total	107,168	1,015	91,400	875	-14.7%	-13.8%

[7] See the Appendix for further information.

Water Sector

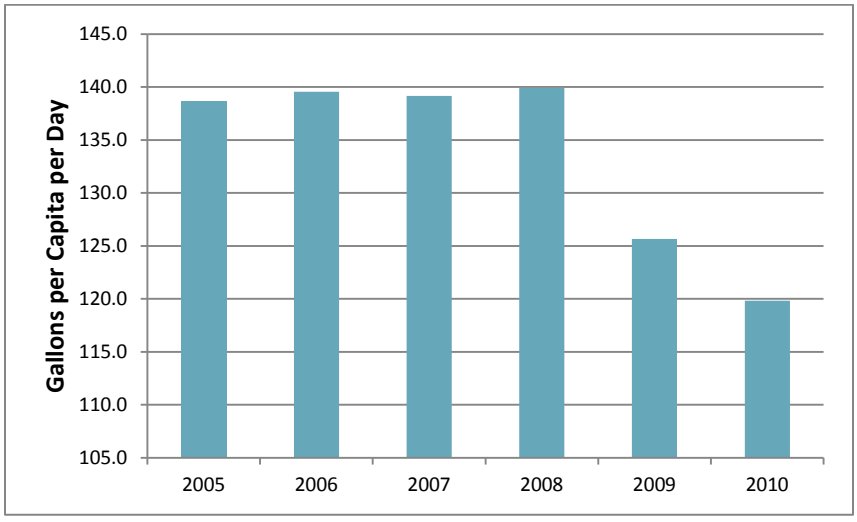
Emissions in the water sector are a result of Marin Municipal Water District's (MMWD) use of electricity to pump, treat, convey and distribute water from the water source to the water users in San Anselmo. Emissions from the water sector decreased 31.3% between 2005 and 2010 (see Table 14). This reduction is based on two factors: a decline in the amount of electricity needed to treat and distribute water, and a decline in the carbon intensity of the electricity provided by PG&E and the Marin Energy Authority (MEA). MMWD began purchasing electricity procured by the Marin Energy Authority about mid-way through 2010, and MEA electricity represented about 54% of the District's total electricity usage in that year. MEA's electricity was about 27% less carbon intensive than PG&E electricity in 2010.

Table 14: Water Emissions, 2005 and 2010

Source	2005 Energy Consumption (kWh)	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption (kWh)	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions
Water	1,442,442	323	1,280,010	222	-11.3%	-31.3%

The Water District's electricity usage decreased by almost 13% between 2005 and 2010 as a result of declining water demand. As shown in Figure 3, water use has declined from 138.7 gallons per person in 2005 to 119.8 gallons per person in 2010, a reduction of almost 14%. Water demand responds to a variety of factors, including economic conditions, precipitation patterns and weather conditions, water conservation fixture and behavioral changes, and water rate structure changes. MMWD has increased water rates significantly in recent years (9.7% in 2008, 7.3% in 2009, and 9.8% in 2010), and demand has most likely declined in response to these rate increases. The recession of December 2007 to June 2009, and the poor economic conditions that followed the official end of the recession, have also contributed to a reduction in water demand.

Figure 3: MMWD Per Capita Water Use, 2005 to 2010



Wastewater Sector

Wastewater coming from homes and businesses is rich in organic matter and has a high concentration of nitrogen and carbon, along with other organic elements. As wastewater is collected, treated and discharged by the Central Marin Sanitation Agency, chemical processes in anaerobic conditions lead to the creation and emission of two greenhouse gases: methane and nitrous oxide. Emissions are also created from use of electricity to collect and process the wastewater.

Emissions from the wastewater sector decreased by 6% between 2005 and 2010, due to a reduction in overall water usage in the community and an improvement in the carbon intensity of PG&E electricity.

Table 15: Wastewater Emissions, 2005 and 2010

Source	2005 Energy Consumption (kWh)	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption (kWh)	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions
Electricity	784,546	176	691,255	141	-11.9%	-19.9%
Treatment	-	318	-	324	-	1.9%
Total	-	493	-	465		-6.0%

Waste Sector

Emissions from the waste sector are an estimate of methane generation from the decomposition of municipal solid waste and alternative daily cover sent to the landfill in the 2005 and 2010. These emissions are calculated by estimating the emissions that will result from the decomposition of 2005 and 2010 waste over the full 100+ year cycle of its decomposition. About 75 percent[8] of landfill methane emissions are captured through landfill gas collection systems, but the remaining 25 percent escape into the atmosphere as a significant contributor to global warming.

As shown in Table 16, emissions from waste generated by the San Anselmo community in 2010 were approximately 34% lower than 2005. This was due to a reduction in landfilled waste and a change in the composition of alternative daily cover. In 2005, a greater proportion of green waste was used as alternative daily cover and then buried in the landfill, generating methane as the waste decomposed.

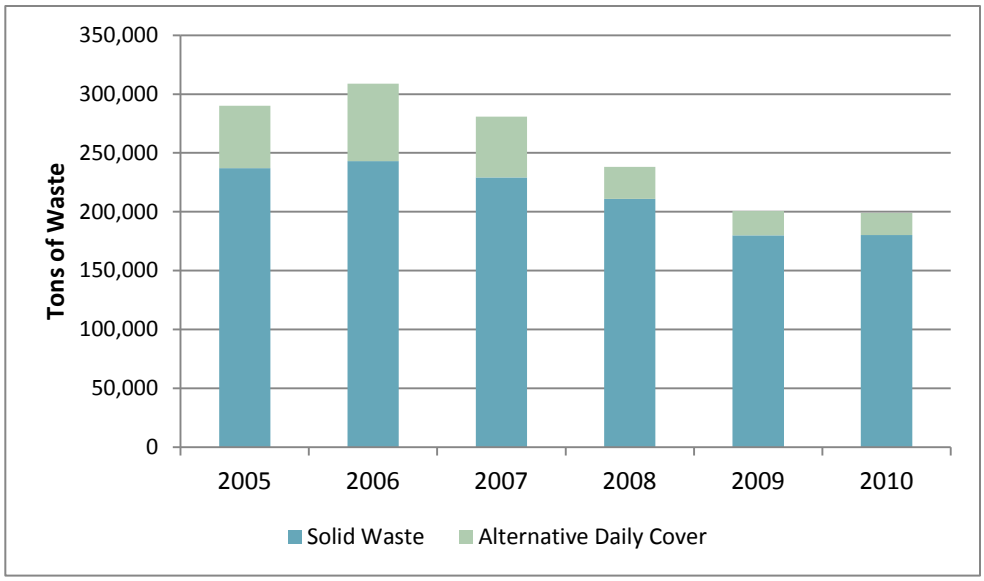
Table 16: Waste Emissions, 2005 and 2010

Source	2005 Quantity (tons)	2005 GHG Emissions ($MTCO_2e$)	2010 Quantity (tons)	2010 GHG Emissions ($MTCO_2e$)	% Change in Waste Generation	% Change in GHG Emissions
Solid Waste	11,624	2,351	8,805	1,781	-24.3%	-24.3%
Alternative Daily Cover	2,589	439	926	58	-64.2%	-86.8%
Total	14,213	2,789	9,731	1,839	-31.5%	-34.1%

[8] U.S. Environmental Protection Agency, "Compilation of Air Pollutant Emissions Factors," AP-42, Fifth Edition, January 1995.

Figure 4 shows the trend in county-wide waste generation between 2005 and 2010. Waste disposal decreased approximately 31% over that time period. County-wide waste disposal hit a high of nearly 309,000 tons in 2006, steadily declined over the next three years, and leveled off at just over 199,000 tons in 2010.

FIGURE 4: COUNTYWIDE WASTE GENERATION, 2005 TO 2010



GOVERNMENT OPERATIONS INVENTORY

GOVERNMENT PROFILE

The Town of San Anselmo is a general law city and operates under the council-city manager form of government. The local government operates administrative, planning, building and public works departments, as well as a police department, library and community center. In 2010, there were 53 total employees. General Fund expenditures and transfers to other funds were $13,299,049 in fiscal year 2009-2010 and $12,426,460 in fiscal year 2010-2011.

GOVERNMENT OPERATIONS INVENTORY SUMMARY

In 2005, San Anselmo's government operations produced approximately 647 metric tons of CO_2e. In 2010, those activities resulted in approximately 588 metric tons of CO_2e, a decrease of 59 metric tons, or 9.2%. These numbers include all Scope 1 emissions from the on-site combustion of fuels and fugitive emissions from leaked refrigerants in facilities and vehicles, Scope 2 emissions from the purchase of electricity generated outside San Anselmo's borders, and Scope 3 emissions from waste generated by local government operations and employee commutes. The following summaries break down these totals by sector, sources and scope.

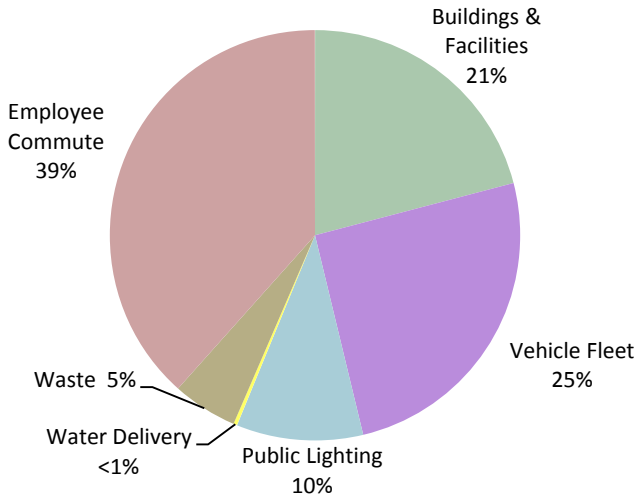
SUMMARY BY SECTOR

Emissions from government operations decreased in all sectors except the employee commute sector, which experienced an increase of 16%. As shown in Table 17, the greatest emissions reductions came from the buildings and facilities sector, which experienced a reduction in emissions of 46.6 metric tons CO2e, or about 27%. Emissions were also reduced in the vehicle fleet sector (-13%), the public lighting sector (-24%), the water delivery sector (-40%) and the waste sector (-10%). Figure 5 shows that the employee commute sector was the largest emitter of greenhouse gas emissions in 2010 (39% of total emissions), followed by the vehicle fleet sector (25%).

TABLE 17: SUMMARY BY SECTOR, 2005 AND 2010

Sector	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_2e	Change Metric Tons CO_2e	% Change
Buildings & Facilities	169.3	122.8	-46.6	-27%
Vehicle Fleet	170.4	148.9	-21.5	-13%
Public Lighting	77.0	58.7	-18.4	-24%
Water Delivery	2.8	1.7	-1.1	-40%
Waste	33.5	30.1	-3.4	-10%
Employee Commute	193.9	225.5	31.7	16%
Total	**647.0**	**587.6**	**-59.3**	**-9.2%**

FIGURE 5: EMISSIONS BY SECTOR, 2010



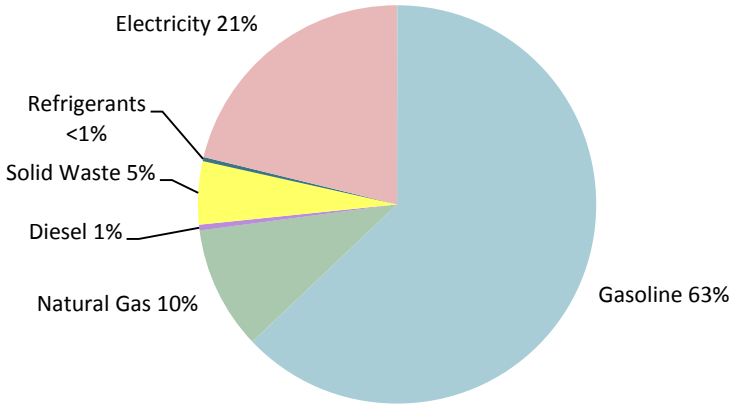
SUMMARY BY SOURCE

Table 18 shows a summary of the Town's greenhouse gas emissions by source. On a percentage basis, emissions from diesel increased the most (93%), while emissions from natural gas decreased the most (-27%). In absolute terms, the greatest increase in emissions came from gasoline sources and the greatest decrease from electricity sources. As shown in Figure 6, gasoline was the largest source of greenhouse gas emissions (63% of total emissions) in 2010, followed by electricity (21%). Emissions from refrigerants were not calculated in the 2005 inventory, so the same amount of 2010 greenhouse gas emissions from refrigerants is assumed for 2005.

TABLE 18: SUMMARY BY SOURCE, 2005 AND 2010

Source	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_2e	Change Metric Tons CO_2e	% Change
Electricity	168.4	124.4	-44.0	-26%
Natural Gas	80.8	58.7	-22.1	-27%
Gasoline	360.9	369.7	8.8	2%
Diesel	1.4	2.7	1.3	93%
Solid Waste	33.5	30.1	-3.4	-10%
Refrigerants	1.9	1.9	0.0	0%
Total	**647.0**	**587.6**	**-59.3**	**-9.2%**

FIGURE 6: EMISSIONS BY SOURCE, 2010



SUMMARY BY SCOPE

As shown in Table 19, Scope 1 sources represented the largest share of emissions in 2005 and Scope 3 sources took over the lead in 2010. Scope 1 emissions, which result primarily from the combustion of gasoline and diesel in the Town's vehicle fleet and the combustion of natural gas in the Town's buildings, decreased 17%. Scope 2 emissions, which represents emissions from electricity produced outside San Anselmo's borders, decreased 26%. Scope 3 emissions, comprising emissions from employee commutes and the decomposition of solid waste in landfills, increased 12%.

TABLE 19: SUMMARY BY SCOPE, 2005 AND 2010

Activity	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_{2e}	% Change
Scope 1	251.2	207.6	-17%
Scope 2	168.4	124.4	-26%
Scope 3	227.4	255.6	12%
Total	**647.0**	**587.6**	**-9.2%**

GOVERNMENT OPERATIONS INVENTORY DETAIL BY SECTOR

This section explores government operations and emissions by taking a detailed look at each primary sector. As listed above, the sectors included in the government operations emissions analysis are:

- Buildings and Other Facilities
- Public Lighting
- Water Delivery
- Vehicle Fleet
- Waste
- Employee Commute

Buildings and Other Facilities

Facilities operations contribute to greenhouse gas emissions in two major ways. First, facilities consume electricity and fuels such as natural gas. This consumption is associated with the majority of greenhouse gas emissions from buildings and facilities. In addition, air conditioning and refrigeration equipment in buildings can emit hydrofluorocarbons (HFCs) when these systems leak refrigerants. Refrigerants are very potent greenhouse gases, and have a Global Warming Potential (GWP) of up to many thousand times that of CO_2. For example, HFC-134a, a very common refrigerant, has a GWP of 1,300, or 1,300 times that of CO_2. Therefore, even small amounts of leaked refrigerants can have a significant effect on greenhouse gas emissions.

In 2010, San Anselmo operated four major facilities – the Town Hall, the library, the public works corporation yard, and the Isabel Cook Community Center. Data relating to electricity and natural gas consumption for buildings and facilities was obtained from PG&E. Data for refrigerants and fuel used for backup generators was obtained from San Anselmo staff.

As shown in Table 20, emissions from the buildings sector decreased by 27% between 2005 and 2010. This decline was due to reductions in both electricity and natural gas consumption and emissions. Electricity consumption decreased by 13% and emissions decreased further – by 28% – primarily because the carbon intensity of PG&E electricity was lower in 2010. In addition, the Town purchased approximately 36% of its electricity for buildings from MEA in 2010; as noted earlier, the carbon intensity of MEA electricity was about 27% lower than that supplied by PG&E in 2010, due to the higher percentage of renewable and non-greenhouse gas emitting energy sources in MEA's energy mix.

Natural gas consumption and emissions decreased by 27%. Fugitive emissions from refrigerants used in air conditioners and refrigerators barely registered because most of the older equipment in San Anselmo uses refrigerants that are being phased out and are not reported in the Local Government Operating Protocol. These emissions are reported separately and were discussed on page 8.

Table 20: Buildings and Other Facilities Emissions, 2005 and 2010

Source	2005 Energy Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Energy Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Energy Consumption	% Change in GHG Emissions ($MTCO_2e$)
Electricity	395,601 kWh	88.5	345,815 kWh	64.1	-13%	-28%
Natural Gas	15,194 therms	80.8	11,042 therms	58.7	-27%	-27%
Fuel	5 gallons	0.04	n/a	n/a	n/a	n/a
Refrigerants	--	0.01	--	0.01	n/a	0%
Total	--	169.3	--	122.8	--	-27%

Table 21 shows electricity and natural gas usage by facility. Natural gas usage declined by 48% in Town Hall, while electricity usage remained relatively stable. Electricity usage went down by 24% at the library, while natural gas usage went up by 30%. Electricity use increased by 59% and natural gas use increased by 15% at the corporation yard. Electricity and natural gas usage declined by about 39% at the Isabel Cook Community Center.

TABLE 21: ENERGY USAGE AT SAN ANSELMO BUILDINGS AND FACILITIES

Building/ Facility	Energy Source	2005 Energy Consumption	2010 Energy Consumption	% Change in Energy Consumption
Town Hall	Electricity	208,960 kWh	216,160 kWh	3%
	Natural Gas	3,116 therms	1,630 therms	-48%
Library	Electricity	34,120 kWh	26,000 kWh	-24%
	Natural Gas	693 therms	904 therms	30%
Corporation Yard	Electricity	6,880 kWh	10,960 kWh	59%
	Natural Gas	376 therms	434 therms	15%
Isabel Cook Community Center	Electricity	113,640 kWh	68,040 kWh	-40%
	Natural Gas	10,696 therms	6,553 therms	-39%
Minor Facilities	Electricity	32,001 kWh	24,655 kWh	-23%
	Natural Gas	313 therms	1,521 therms	386%

PUBLIC LIGHTING

San Anselmo operates 654 street and outdoor lights, as well as traffic and pedestrian signals. Emissions associated with the operation of this public lighting are from electricity consumption. While electricity usage for streetlights was relatively flat, electricity use in traffic signals decreased by 42% as shown in Table 22. The Town purchased approximately 41% of electricity for public lighting from the Marin Energy Authority in 2010. Overall, electricity consumption in the public lighting sector decreased by 6% between 2005 and 2010, resulting in a 24% emissions reduction.

TABLE 22: PUBLIC LIGHTING EMISSIONS, 2005 AND 2010

Source	2005 Electricity Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Electricity Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Electricity Consumption	% Change in GHG Emissions ($MTCO_2e$)
Streetlights	287,348 kWh	64.3	290,948 kWh	52.6	1%	-18%
Traffic Signals	56,870 kWh	12.7	32,777 kWh	6.1	-42%	-52%
Outdoor Lighting	180 kWh	0.04	180 kWh	0.03	0%	-19%
Total	344,398 kWh	77.0	323,905 kWh	58.7	-6%	-24%

WATER DELIVERY

This sector includes any facilities used for the management and distribution of water. Typical systems included in this sector are potable water delivery pumps, sprinkler and irrigation controls, and stormwater management. Electricity usage in the water sector is responsible for a small amount of government operations. Nonetheless, electricity consumption decreased significantly between 2005 and 2010 by 26%, which resulted in a 40% decrease in emissions as shown in Table 23.

TABLE 23: WATER DELIVERY EMISSIONS, 2005 AND 2010

Source	2005 Electricity Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Electricity Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Electricity Consumption	% Change in GHG Emissions ($MTCO_2e$)
Water Delivery	12,728 kWh	2.8	9,388 kWh	1.7	-26%	-40%

VEHICLE FLEET

The vehicles and mobile equipment used for San Anselmo's daily operations include police cars and motorcycles, and public works trucks and equipment. These vehicles and equipment burn gasoline and diesel, which result in greenhouse gas emissions. In addition, vehicles with air conditioning use refrigerants that leak from the vehicles. In 2010, San Anselmo operated a fleet of 31 vehicles.

Table 24 shows that total fuel consumption decreased by 12% between 2005 and 2010, which resulted in a 13% emissions decrease. The police department decreased its gasoline use by 4%, while the public works department decreased its use of diesel and gasoline by 33%.

TABLE 24: VEHICLE FLEET EMISSIONS, 2005 AND 2010

Source	2005 Fuel Consumption	2005 GHG Emissions ($MTCO_2e$)	2010 Fuel Consumption	2010 GHG Emissions ($MTCO_2e$)	% Change in Fuel Consumption	% Change in GHG Emissions ($MTCO_2e$)
Police	13,674 gallons	122.7	13,152 gallons	115.8	-4%	-6%
Public Works	5,080 gallons	45.7	3,399 gallons	31.1	-33%	-32%
Refrigerants, all departments	--	1.9	--	1.9	--	0.0%
Total	18,754 gallons	170.4	16,551 gallons	148.9	-12%	-13%

WASTE

Waste generated by government buildings and operations include organic material such as paper, food scraps, plant debris, textiles, and construction waste. This organic material generates methane as it decays in the anaerobic environment of a landfill. An estimated 75 percent of this methane is routinely captured via landfill gas collection systems; however, a portion escapes into the atmosphere, contributing to the greenhouse effect. Emissions from waste are an estimate of methane generation that will result from the decomposition of all organic waste sent to the landfill in the inventoried year, even though those emissions will occur over the 100+ year timeframe that the waste will decompose.

As shown in Table 25, waste generated by governmental operations and deposited into the landfill decreased by 10% between 2005 and 2010, resulting in an emissions decrease by the same percentage.

TABLE 25: WASTE EMISSIONS, 2005 AND 2010

Source	2005 Landfilled Waste (tons)	2005 GHG Emissions ($MTCO_2e$)	2010 Landfilled Waste (tons)	2010 GHG Emissions ($MTCO_2e$)	% Change in Landfilled Waste	% Change in GHG Emissions ($MTCO_2e$)
Town Hall	5.4	1.1	4.8	1.0	-11%	-11%
Fire Station	2.1	0.4	2.1	0.4	0%	0%
Corp Yard	94.7	19.2	88.1	17.8	-7%	-7%
City Cans	37.4	7.6	31.5	6.4	-16%	-16%
Community Center	5.4	1.1	4.8	1.0	-11%	-11%
Robson House	7.8	1.6	6.6	1.3	-15%	-15%
Creek Park	13.0	2.6	10.9	2.2	-16%	-16%
Total	165.8	33.5	148.8	30.1	-10%	-10%

EMPLOYEE COMMUTE

Emissions in the employee commute sector are due to the combustion of fuels used by Town employees commuting to and from work in San Anselmo. Table 26 shows that vehicle miles traveled increased by 18% between 2005 and 2010, which resulted in a 16% increase in emissions. Table 27 shows that the amount of greenhouse gas emissions generated by commuting increased by 21% per employee. However, it is difficult to draw definitive conclusions from the data, as emissions are determined from employee commute surveys, and changes from year to year may be within the survey's margin of error.

TABLE 26: EMPLOYEE COMMUTE EMISSIONS, 2005 AND 2010

Source	2005 Vehicle Miles Traveled	2005 GHG Emissions ($MTCO_2e$)	2010 Vehicle Miles Traveled	2010 GHG Emissions ($MTCO_2e$)	% Change in Vehicle Miles Traveled	% Change in GHG Emissions
Employee Commute	406,359 miles	193.9	478,176 miles	225.5	18%	16%

TABLE 27: COMMUTE EMISSIONS PER EMPLOYEE, 2005 AND 2010

	2005	2010	% Change
Employees	55	53	-4%
Commute GHG Emissions (metric tons CO_2e)	193.9	225.9	16%
Per Employee GHG Emissions (metric tons CO_2e)	3.5	4.3	21%

CONCLUSION

San Anselmo has achieved some early success in reducing greenhouse gas emissions between 2005 and 2010. Community emissions decreased by 5.7% over these five years, putting the town on track to reduce emissions by approximately 16.3% below the 2005 baseline year if the community continues to reduce emissions at the current rate. Emissions decreased in all sectors.

Some of the largest decreases occurred in the commercial and transportation sectors. Further reductions in transportation emissions can be expected as state mandates to increase vehicle fuel efficiency and reduce the carbon intensity of transportation fuels take hold. Locally, the Town can continue to implement programs and provide infrastructure to increase travel by bicycle, foot, and alternative means of transportation. Electric vehicles also offer much promise to reduce emissions significantly in the community, especially since the electricity provided by local utilities is significantly lower in carbon intensity than most other electricity producers in the rest of the country.

Emissions reductions in the residential sector, while small on a percentage basis, had a significant effect on the bottom line. San Anselmo will most likely experience additional reductions from electricity emissions as PG&E and the Marin Energy Authority add more renewable sources to their energy portfolios. Since the Marin Energy Authority began supplying electricity to some of its customers midway through 2010, emissions reductions attributed to the switch to MEA's greener electricity were not fully realized in that year. Therefore, San Anselmo can expect to see additional reductions in electricity emissions in subsequent years. An increase in the number of customers who sign up for 100% renewable electricity from MEA could further reduce San Anselmo's community emissions.

Despite the potential for greener electricity, residents and businesses need to do their part to reduce energy demand in homes and commercial buildings. Natural gas consumption increased in 2010, and emissions rose lockstep with consumption. In order to reduce emissions from natural gas consumption, consumers can reduce demand by better insulating and sealing buildings, turning down the thermostat, and installing solar-powered water heaters and more energy-efficient furnaces.

The waste sector also experienced significant decreases in emissions. Programs to divert food waste from the landfill, recycle more construction and demolition debris, and achieve zero waste goals in Marin County will continue to reduce waste sector emissions.

Within government operations, emissions decreased by 9.2%. Reductions occurred in the buildings, vehicle fleet, public lighting, water delivery, and waste sectors. The Town's continued use of Marin Clean Energy electricity for all facilities should have a significant, positive effect on emissions. The Town could reduce future emissions by switching to MEA deep green electricity for all facilities, completing energy efficient upgrades to its buildings and equipment (including HVAC upgrades), installing solar energy systems at the Town Hall, the corporation yard and

the Isabel Cook Community Center, upgrading streetlights to more energy-efficient technologies, purchasing more fuel-efficient vehicles, and completing other actions identified in the San Anselmo Climate Action Plan. Staff should always be aware of the impact their decisions have on the environment.

San Anselmo has made a good start. If the community's emissions are to continue to decline, then residents, businesses, and other organizations must modify their energy consumption and travel patterns and support more clean energy from utility providers. San Anselmo can serve as a model to others in curbing greenhouse gas emissions affecting the entire world by getting its own house in order.

APPENDIX A: COMMUNITY INVENTORY

RESIDENTIAL AND COMMERCIAL SECTOR NOTES

2005 DATA SUMMARY

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Residential	2	Electricity	32,537,708	kWh	7,219.44	0.16	0.44	7,279.07
	1	Natural Gas	3,035,635	therms	16,094.94	0.03	1.52	16,136.22
	1	Propane/LPG	2,259	MMBtu	138.84	0.00	0.02	140.13
		TOTAL			23,453.22	0.20	1.99	23,555.42
Commercial	2	Electricity	15,414,187	kWh	3,420.09	0.08	0.21	3,448.33
	1	Natural Gas	561,221	therms	2,975.59	0.01	0.28	2,983.23
	2	Direct Access Electricity	2,302,379	kWh	990.33	0.01	0.03	994.55
		TOTAL			7,386.01	0.09	0.52	7,426.11

2010 DATA SUMMARY

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Residential	2	PG&E Electricity	29,566,339	kWh	5,967.92	0.13	0.39	6,017.67
	1	Natural Gas	3,113,726	therms	16,508.98	0.03	1.56	16,551.32
	2	MEA Electricity	2,341,301	kWh	343.94	0.01	0.03	347.88
	2	Direct Access Electricity	44,462	kWh	13.28	0.00	0.00	13.33
	1	Propane/LPG	2,093	MMBtu	128.64	0.00	0.02	129.83
		TOTAL			22,962.76	0.18	2.00	23,060.03
Commercial	2	PG&E Electricity	13,584,187	kWh	2,741.95	0.06	0.18	2,764.80
	1	Natural Gas	571,020	therms	3,027.55	0.01	0.29	3,035.31
	2	MEA Electricity	424,787	kWh	62.40	0.00	0.01	63.12
	2	Direct Access Electricity	1,490,379	kWh	445.28	0.00	0.02	446.99
		TOTAL			6,277.18	0.07	0.49	6,310.22

2005 Emission Factors

Emission Source	GHG	Emission Factor	Emission Factor Source
PG&E Electricity	CO_2	0.48916 lbs/kwh	Local Government Operations Protocol, Version 1.1, May 2010, Table G.6, Utility Specific Verified Electricity CO2 Emission Factors
	CH_4	0.000030 lbs/kWh	Local Government Operations Protocol, Version 1.1, May 2010, G.7 California Grid Average Electricity Emission Factors
	N_20	0.000011 lbs/kWh	
Default Direct Access Electricity	CO_2	0.94828 lbs/kWh	Local Government Operations Protocol, Version 1.1, May 2010, G.7 California Grid Average Electricity Emission Factors
	CH_4	0.000030 lbs/kWh	
	N_20	0.000011 lbs/kWh	
Natural Gas	CO_2	53.02 kg/MMBtu	Local Government Operations Protocol, Version 1.1, May 2010, Table G.1 U.S. Default Factors for Calculating Carbon Dioxide Emission from Fossil Fuel Combustion
	CH_4	0.005 kg/MMBtu	Local Government Operations Protocol, Version 1.1, May 2010, Table G.3 Default Methane and Nitrous Oxide Emission Factors by Fuel type and Sector
	N_20	0.0001 kg/MMbtu	

2010 Emission Factors

Emission Source	GHG	Emission Factor	Emission Factor Source
PG&E Electricity	CO_2	0.445 lbs/kwh	PG&E, http://www.pgecurrents.com/2012/03/26/pge-reports-lowest-greenhouse-gas-emissions/
	CH_4	0.000029 lbs/kWh	Local Government Operations Protocol, Version 1.1, May 2010, G.7 California Grid Average Electricity Emission Factors (2007 factors used)
	N_20	0.000010 lbs/kWh	
Default Direct Access Electricity	CO_2	0.65868 lbs/kWh	eGrid2012 Version 1.0 Year 2009Summary Tables http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf
	CH_4	0.00002894 lbs/kWh	
	N_20	0.00000617 lbs/kWh	
Marin Energy Authority	CO_2	0.323859 lbs/kwh	Marin Energy Authority, Light Green and Deep Green combined. Emission factor is not certified.
	CH_4	0.000029 lbs/kWh	Local Government Operations Protocol, Version 1.1, May 2010, G.7 California Grid Average Electricity Emission Factors (2007 factors used)
	N_20	0.000010 lbs/kWh	
Natural Gas	CO_2	53.02 kg/MMBtu	Local Government Operations Protocol, Version 1.1, May 2010, Table G.1 U.S. Default Factors for Calculating Carbon Dioxide Emission from Fossil Fuel Combustion
	CH_4	0.005 kg/MMBtu	Local Government Operations Protocol, Version 1.1, May 2010, Table G.3 Default Methane and Nitrous Oxide Emission Factors by Fuel type and Sector
	N_20	0.0001 kg/MMbtu	

Data Sources

PG&E Electricity and Natural Gas Data: John Joseph, JGJ3@pge.com, Mathew Sturm, MwSs@pge.com.
Direct Access Electricity: California Energy Commission (CEC): Steven Mac, Smac@energy.state.ca.us
Marin Energy Authority: Justin Kudo, jkudo@marinenergy.com.

Propane/LPG use estimated from number of households using propane/LPG as a home heating source from the 2010 American Community Survey 5 Year Estimate (Table B25040) and average site consumption of propane/LPG from the U.S. Energy Information Administration, Average Consumption by Fuels Used, 2005, Table US9 and Household Site Fuel Consumption in the West Region, Totals and Averages, 2009 (Table CE2.5). Wood use was excluded because average site consumption data was not reported by the U.S. Energy Information Administration for 2009 and no comparison could be made between the two years.

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net.
Estimates of electricity purchased through Direct Access (DA) contracts are derived from county level DA consumption figures, provided by the California Energy Commission.

2005 emissions were recalculated using updated activity data from the 2005 Greenhouse Gas Emissions Inventory and 2005 emission factors from the LGO Protocol. Activity data for residential natural gas consumption was revised according to updated data provided by PG&E. Activity data for direct access electricity was revised due to a change in the methodology to allocate direct access among jurisdictions.

Transportation Sector Notes

2005 Data Summary

Sector	Scope	Subsector	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Transportation	1	Local Roads	66,959,250	VMT	31,257.99	4.63	4.25	32,781.51
	1	State Highways	0	VMT	0.00	0.00	0.00	0.00
		TOTAL	66,959,250	VMT	31,257.99	4.63	4.25	32,781.51

2005 Emission Factors: Provided by the BAAQMD, using EMFAC 2007

County	CO_2 Rates (grams/mile)		CH_4 Rates (grams/mile)		N_2O Rates (grams/mile)		VMT Mix		CO_2 Rates- (grams/gallon)		Fuel Usage		Fuel Efficiency (miles/gallon)	
	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel
Marin County	476	1,426	0.065	0.030	0.070	0.050	95.5%	4.5%	8,628	9,957	89.2%	10.8%	18.1	7.0
BAAQMD Average	463	1,389	0.063	0.030	0.070	0.050	94.9%	5.1%	8,607	10,091	87.8%	12.2%	18.6	7.3

2010 Data Summary:

Sector	Scope	Subsector	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Transportation	1	Local Roads	66,973,850	VMT	30,183.30	4.63	2.97	31,682.03
	1	State Highways	0	VMT	0.00	0.00	0.00	0.00
		TOTAL	66,973,850	VMT	30,183.30	4.63	2.97	31,682.03

2010 Emission Factors: Provided by the BAAQMD, using EMFAC 2007

County	CO_2 Rates (grams/mile)		CH_4 Rates (grams/mile)		N_2O Rates (grams/mile)		VMT Mix		CO_2 Rates- (grams/gallon)		Fuel Usage		Fuel Efficiency (miles/gallon)	
	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel
Marin County	471	1,500	0.045	0.030	0.070	0.050	95.9%	4.1%	8,732	9,673	89.0%	11.0%	18.5	6.4
BAAQMD Average	461	1,469	0.042	0.027	0.070	0.050	95.3%	4.7%	8,695	10,086	88.1%	11.9%	18.9	6.9

Data Sources

Local Roads Vehicle Miles Traveled (VMT) Data: 2005 Public Roads Data, Highway Performance Monitoring System (HPMS) division of the California Department of Transportation (Caltrans), http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2005PRD.pdf; 2010 Public Roads Data, HPMS division of Caltrans, http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2010PRD.pdf.

EMFAC Data: Amir Fanai, Principal Air Quality Engineer, Bay Area Air Quality Management District, AFanai@baaqmd.gov.

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net.
Local Road and State Highway VMT data provided by MTC is in Daily VMT (DVMT); Annual VMT = DVMT x 365.
Fleet mix data (on-road fleet breakdown by vehicle type, fuel efficiency, and fuel type) was used to extrapolate VMT into actual gallons of gasoline and diesel consumed on Marin roads and state highways.

2005 data was recalculated using emission factors and fuel usage estimates provided by the Bay Area Air Quality Management District.

Off-Road Vehicles and Equipment Sector Notes

2005 Summary

Sector	Scope	Subsector	Quantity	Units	Fuel	Greenhouse Gas Emissions (metric tons)			
						CO_2	N_2O	CH_4	CO_2e
Off-Road	1	Construction and Mining Equipment	5,614	gallons	diesel	57.32	0.00	0.00	57.32
	1		44,126	gallons	gasoline	387.43	0.00	0.00	387.43
	1	Lawn and Garden Equipment	45,891	gallons	diesel	468.55	0.00	0.00	468.55
	1		11,537	gallons	gasoline	101.29	0.00	0.00	101.29
		TOTAL	107,168	gallons		1,014.59	0.00	0.00	1,014.59

2010 Data Summary

Sector	Scope	Subsector	Quantity	Units	Fuel	Greenhouse Gas Emissions (metric tons)			
						CO_2	N_2O	CH_4	CO_2e
Off-Road	1	Construction and Mining Equipment	5,585	gallons	diesel	57.02	0.00	0.00	57.02
	1		28,486	gallons	gasoline	250.11	0.00	0.00	250.11
	1	Lawn and Garden Equipment	45,375	gallons	diesel	463.28	0.00	0.00	463.28
	1		11,954	gallons	gasoline	104.96	0.00	0.00	104.96
		TOTAL	91,400	gallons		875.36	0.00	0.00	875.36

Fuel usage data provided by Steve Zelinka, Manager, Emission Inventory Development Section, California Air Resources Board, szelinka@arb.ca.gov. Fuel usage was provided at the county level and allocated to individual cities according to population. Emission factors for gasoline and diesel consumption from the 2010 Local Government Operations Protocol, Table G.11.

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net.

Water Sector Notes

2005 Data Summary

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Water	3	PG&E Electricity	1,442,442	kWh	320.05	0.01	0.02	322.69
		TOTAL	1,442,442	kWh	320.05	0.01	0.02	322.69

2010 Data Summary

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Water	3	PG&E Electricity	584,017	kWh	117.88	0.00	0.01	118.87
	3	MEA Electricity	695,993	kWh	102.24	0.00	0.01	103.41
		TOTAL	1,280,010	kWh	220.12	0.01	0.02	222.28

Data Sources

Marin Municipal Water District (MMWD) electricity usage provided by Jon LaHaye, MMWD Principal Engineer, jlahaye@marinwater.org and Jamie Tuckey, Marin Energy Authority Communications Director, jtuckey@marinenergyauthority.org. Electricity usage was provided for the service area population and allocated to individual cities on a per capita basis.

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net.

Wastewater Sector Notes

2005 Data Summary

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Wastewater	3	PG&E Electricity	784,546	kWh	174.07	0.00	0.01	175.51
	3	Treatment	12,099	people	0.00	0.98	0.66	317.96
		TOTAL			174.07	0.98	0.67	493.47

2010 Data Summary

Sector	Scope	Fuel	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Wastewater	3	PG&E Electricity	691,255	kWh	139.53	0.00	0.01	140.69
	3	Treatment	12,336	people	0.00	1.00	0.68	324.18
		TOTAL			139.53	1.00	0.69	464.87

Data Sources

Electricity usage estimates: "Refining Estimates of Water-Related Energy Use in California," California Energy Commissions, December 2006.

Wastewater production estimates: Nancy Gibbs, Marin Municipal Water District Business Systems Analyst, ngibbs@marinwater.org and Dan Carney, Marin Municipal Water District Water Conservation Manager, dcarney@marinwater.org.
Wastewater treatment data provided by Robert Cole, Environmental Services Manager, Central Marin Sanitation Agency, rcole@cmsa.us, 415-459-1455 ext 142.
2005 population estimate from CA Dept. of Finance E-4 Population Estimates for Cities, Counties and State 2001-2010 with 2000 and 2010 Census Counts. 2005 population estimate is mid-point between 1/1/2005 and 1/1/2006 estimates. 2010 population from 2010 U.S. Census.

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net
Electricity usage calculated according to BAAQMD recommended methodology. 67% of per capita water use assumed to be indoor water use and processed as wastewater. Electricity used to treat wastewater based on northern California averages.
Treatment process emissions calculated according to ICLEI methodology for process N2O emissions from a centralized wastewater treatment plant and stationary CH4 emissions from an anaerobic digester.

Waste Sector Notes

2005 Data Summary

Sector	Scope	Subsector	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Waste	3	Landfilled Municipal Solid Waste	11,624	tons	0.00	0.00	111.94	2,350.77
	3	Alternative Daily Cover	2,589	tons	0.00	0.00	20.88	438.53
		TOTAL	14,213	tons	0.00	0.00	132.82	2,789.30

2010 Data Summary

Sector	Scope	Subsector	Quantity	Units	Greenhouse Gas Emissions (metric tons)			
					CO_2	N_2O	CH_4	CO_2e
Waste	3	Landfilled Municipal Solid Waste	8,805	tons	0.00	0.00	84.79	1,780.67
	3	Alternative Daily Cover	926	tons	0.00	0.00	2.76	58.02
		TOTAL	9,731	tons	0.00	0.00	87.56	1,838.69

Emission Factors

Waste Type	Methane Emissions (metric tons / short ton of waste)	Emission Factor Source
Paper Products	1.940	US EPA
Food Waste	1.098	US EPA
Plant Debris	0.622	US EPA
Wood / Textiles	0.549	US EPA
All Other Waste	0.000	US EPA

Data Sources

Municipal solid waste and ADC tonnage data: CalRecycle Disposal Reporting System http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx and Alex Soulard, Waste Management Specialist, ASoulard@marincounty.org, County of Marin Public Works Department - Waste Management.
Landfilled waste characterization: Final Draft Zero Waste Feasibility Study, Marin County Hazardous and Solid Waste Management JPA, R3 Consulting Group, December 2009, http://www.marinrecycles.org/Docs/Final_Draft_Zero_Waste_Feasibility_Study_121609.pdf.
ADC waste characterization: CalRecycle, "Alternative Daily cover (ADC) by Jurisdiction of Origin and Material Type," http://www.calrecycle.ca.gov/LGCentral/Reports/Viewer.aspx?P=ReportName%3dEdrsJurisAndMaterials%26CountyID%3d21%26ReportYear%3d2005 and http://www.calrecycle.ca.gov/LGCentral/Reports/Viewer.aspx?P=ReportName%3dEdrsJurisAndMaterials%26CountyID%3d21%26ReportYear%3d2010.

Landfilled Waste Characterization, 2005 and 2010

Waste Type	% of Total
Paper Products	23.50
Food Waste	22.85
Plant Debris	7.98
Wood / Textiles	9.57
All Other Waste	36.12

Alternative Daily Cover Waste Characterization, 2005

Waste Type	% of Total
Paper Products	0.00
Food Waste	11.63
Plant Debris	88.37
Wood / Textiles	0.00
All Other Waste	0.00

Alternative Daily Cover Waste Characterization, 2010

Waste Type	% of Total
Paper Products	0.00
Food Waste	16.65
Plant Debris	10.90
Wood / Textiles	0.00
All Other Waste	72.46

Additional Notes

Data analyzed by Christine O'Rourke, Marin Climate and Energy Partnership Sustainability Coordinator, christine.o@comcast.net.
The methane emission factors used in ICLEI's CACP Software were derived from the EPA WARM model. For quantification of emissions, only methane generation (or gross emissions) is taken into account. These emissions are estimated to take place over an extensive (up to 100 year) cycle, as anaerobically degradable organic carbon decomposes in a landfill. More information on the WARM Model is available at: http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html.

2005 solid waste tonnage and emissions were recalculated using municipal solid waste and ADC tonnage data (including sludge ADC) provided by County of Marin Public Works Department Waste Management Division, updated waste characterization from the Final Draft Zero Waste Feasibility Study, Marin County Hazardous and Solid Waste Management JPA, R3 Consulting Group, December 2009, and updated ADC waste characterization from CalRecycle 2005 report , "Alternative Daily Cover (ADC) by Jurisdiction of Origin and Material Type" for Marin County.

APPENDIX B: GOVERNMENT OPERATIONS INVENTORY

BUILDINGS AND OTHER FACILITIES SECTOR NOTES

LGO PROTOCOL – EMISSIONS BY SCOPE AND EMISSION TYPE, 2005

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 1	Stationary Combustion	15,194 therms	80.56	0.00	0.01	0.00	80.77
	Stationary Combustion	5 gallons	0.04	0.00	0.00	0.00	0.04
	Fugitive Emissions	--	0.00	0.00	0.00	0.00	0.01
	TOTAL		80.60	0.00	0.01	0.00	80.81
Scope 2	Purchased Electricity PG&E	395,601 kWh	87.78	0.00	0.01	0.00	88.50
	TOTAL	395,601 kWh	87.78	0.00	0.01	0.00	88.50

LGO PROTOCOL – EMISSIONS BY SCOPE AND EMISSION TYPE, 2010

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 1	Stationary Combustion	11,042 therms	58.54	0.00	0.00	0.00	58.69
	Fugitive Emissions	--	0.00	0.00	0.00	0.00	0.01
	TOTAL		58.58	0.00	0.00	0.00	58.70
Scope 2	Purchased Electricity PG&E	230,813 kWh	44.21	0.00	0.00	0.00	44.58
	Purchased Electricity MEA	115,002 kWh	19.27	0.00	0.00	0.00	19.48
	TOTAL	345,815 kWh	63.48	0.00	0.00	0.00	64.06

2005 emissions were recalculated using activity data from the 2005 Greenhouse Gas Emissions Inventory and 2005 emission factors from the LGO Protocol. Since refrigerants were not inventoried in 2005, refrigerant data from 2010 was used as a proxy.

2010 energy usage was provided by Pacific Gas & Electric Company (PG&E) based on energy usage of PG&E service accounts. MEA electricity usage data provided by Jamie Tuckey, Marin Energy Authority Communications Director, jtuckey@marinenergyauthority.org. Energy usage data included electricity in units of kilowatt hours (kWh) and natural gas in thermal units (therms). Backup generators for buildings and facilities were recorded by amount of fuel consumed and fuel type. LGO Protocol recommended methods were followed in collection and analysis of this activity data. See Appendix A for emission factors.

Refrigerant type and capacity for air conditioning units and refrigerators was provided by San Anselmo staff. LGO Protocol alternate methods were followed in collection and analysis of refrigerant activity data.

Public Lighting Sector Notes

LGO Protocol – Emissions by Scope and Emission Type, 2005

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 2	Purchased Electricity PG&E	344,398 kWh	76.41	0.00	0.00	0.00	77.05
	TOTAL	344,398 kWh	76.41	0.00	0.00	0.00	77.05

LGO Protocol – Emissions by Scope and Emission Type, 2010

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 2	Purchased Electricity PG&E	191,913 kWh	38.74	0.00	0.00	0.00	39.06
	Purchased Electricity MEA	131,992 kWh	19.39	0.00	0.00	0.00	19.61
	TOTAL	323,905 kWh	58.13	0.00	0.00	0.00	58.67

2005 emissions were recalculated using activity data from the San Anselmo 2005 Greenhouse Gas Emissions Inventory and 2005 emission factors from the LGO Protocol.

2010 energy usage was provided by Pacific Gas & Electric Company (PG&E) based on energy usage of PG&E service accounts. MEA electricity usage data provided by Jamie Tuckey, Marin Energy Authority Communications Director, jtuckey@marinenergyauthority.org. Energy usage data included electricity in units of kilowatt hours (kWh). LGO Protocol recommended methods were followed in collection and analysis of this activity data. See Appendix A for emission factors.

Water Delivery Sector Notes

LGO Protocol – Emissions by Scope and Emission Type, 2005

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 2	Purchased Electricity PG&E	12,728 kWh	2.82	0.00	0.00	0.00	2.85
	TOTAL	12,728 kWh	2.82	0.00	0.00	0.00	2.85

LGO Protocol – Emissions by Scope and Emission Type, 2010

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 2	Purchased Electricity PG&E	5,526 kWh	1.12	0.00	0.00	0.00	1.12
	Purchased Electricity MEA	3,862 kWh	0.57	0.00	0.00	0.00	0.57
	TOTAL	9,388 kWh	1.68	0.00	0.00	0.00	1.70

2005 emissions were recalculated using activity data from the San Anselmo 2005 Greenhouse Gas Emissions Inventory and 2005 emission factors from the LGO Protocol.

2010 energy usage was provided by Pacific Gas & Electric Company (PG&E) based on energy usage of PG&E service accounts. MEA electricity usage data provided by Jamie Tuckey, Marin Energy Authority Communications Director, jtuckey@marinenergyauthority.org. Energy usage data included electricity in units of kilowatt hours (kWh). LGO Protocol recommended methods were followed in collection and analysis of this activity data. See Appendix A for emission factors.

Vehicle Fleet Sector Notes

LGO Protocol – Emissions by Scope and Emission Type, 2005

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 1	Mobile Combustion	18,754 gallons	164.85	0.01	0.01	0.00	168.41
	Fugitive Emissions	--	0.00	0.00	0.00	0.00	1.94
	TOTAL		164.85	0.01	0.01	0.00	170.35

LGO Protocol – Emissions by Scope and Emission Type, 2010

Scope	Emission Type	Energy Consumption	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 1	Mobile Combustion	16,551 gallons	145.70	0.00	0.01	0.00	146.91
	Fugitive Emissions	--	0.00	0.00	0.00	0.00	1.94
	TOTAL		145.70	0.00	0.01	0.00	148.86

2005 activity and emissions data obtained from the San Anselmo 2005 Greenhouse Gas Emissions Inventory. Emissions from police department vehicles were recalculated using fuel cost data in order to ensure a comparable methodology was used for 2005 and 2010.

Vehicle fleet data was provided by San Anselmo staff. LGO Protocol methods were followed in collection and analysis of vehicle fuel consumption and vehicle miles traveled (VMT). Gasoline usage for police department vehicles was estimated from fuel cost data. VMT for police department vehicles was annualized from partial VMT data for each vehicle. Emissions were calculated using default emission factors from the LGOP.

Refrigerant capacities for vehicles were estimated using sources provided by ICLEI. LGO Protocol alternate methods were followed in collection and analysis of refrigerant activity data. As refrigerant emissions were not included in the 2005 Greenhouse Gas Inventory, 2010 data was used as a proxy for 2005 fugitive emissions.

Waste Sector Notes

LGO Protocol – Emissions by Scope and Emission Type, 2005

Scope	Emission Type	Weight	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 3	Landfilled Waste	165.8 tons	0.00	0.00	1.60	0.00	33.53
	TOTAL	tons	0.00	0.00	1.60	0.00	33.53

LGO Protocol – Emissions by Scope and Emission Type, 2010

Scope	Emission Type	Weight	Greenhouse Gas Emissions (metric tons)				
			CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 3	Landfilled Waste	148.8 tons	0.00	0.00	1.43	0.00	30.10
	TOTAL	148.8 tons	0.00	0.00	1.43	0.00	30.10

2005 solid waste emissions were recalculated using activity data from the San Anselmo 2005 Greenhouse Gas Inventory and updated waste characterization from the Final Draft Zero Waste Feasibility Study, Marin County Hazardous and Solid Waste Management JPA, R3 Consulting Group, December 2009, http://www.marinrecycles.org/Docs/Final_Draft_Zero_Waste_Feasibility_Study_121609.pdf

2010 solid waste collection data for quantity of containers, container size, pick-ups per week was provided by Neil Roscoe at Marin Sanitary District. Containers were assumed to be 100% filled at 75 lbs. cubic yard. Landfilled waste characterization: Final Draft Zero Waste Feasibility Study, Marin County Hazardous and Solid Waste Management JPA, R3 Consulting Group, December 2009, http://www.marinrecycles.org/Docs/Final_Draft_Zero_Waste_Feasibility_Study_121609.pdf.
See Appendix A for emission factors.

Employee Commute Sector Notes

LGO Protocol – Emissions by Scope and Emission Type, 2005

Scope	Emission Type	Number Employees	Vehicle Miles Traveled	Greenhouse Gas Emissions (metric tons)				
				CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 3	Mobile Combustion	55	406,359	191.72	0.01	0.01	0.00	193.87
	TOTAL		406,359	191.72	0.01	0.01	0.00	193.87

LGO Protocol – Emissions by Scope and Emission Type, 2010

Scope	Emission Type	Number Employees	Vehicle Miles Traveled	Greenhouse Gas Emissions (metric tons)				
				CO_2	N_2O	CH_4	HFCs	CO_2e
Scope 3	Mobile Combustion	53	478,176	222.94	0.01	0.01	0.00	225.54
	TOTAL		478,176	222.94	0.01	0.01	0.00	225.54

2005 emissions were recalculated using activity data from the San Anselmo 2005 Greenhouse Gas Emissions Inventory and emission factors from the LGO Protocol.

For the 2010 inventory, the Town distributed commute surveys to its employees regarding travel mode, vehicle type and model year, fuel type, time of travel to work, and miles traveled to work. Information provided by respondents was used to determine fuel efficiency at www.fueleconomy.gov and estimate gallons of fuel consumed. Weekly data were converted into annual VMT data assuming 10 vacation days, 10 sick days and 10 holidays for full-time employees. Twenty-two employees responded to the survey, a response rate of 41.5% of the 53 San Anselmo employees. Estimates for total employee commutes were extrapolated from this data.