TOWN OF FAIRFAX

Climate Action Plan

Draft
October 10, 2013

AGENDA ITEM # 4

CREDITS AND ACKNOWLEDGEMENTS

Town Council
Larry Bragman
Barbara Coler
Renee Goddard
John Reed, Mayor
David Weinsoff, Vice Mayor

Planning Commission
Morgan Hall
Shelley Hamilton, Chair
Laura Kehrlein
Brannon Ketcham
Peter Lacques
Shelby LaMotte, Vice Chair

Town Staff
Garrett Toy, Town Manager
Jim Moore, Director of Planning & Building Services
Linda Neal, Senior Planner
Mark Lockaby, Building Official
Christopher Morin, Chief of Police
Larry Kennings, Consultant

General Plan Implementation Committee
Bruce Ackerman
Diane Causey
Cassidy DeBaker
Jacob Feickert
Shelley Hamilton, Vice Chair
Ted Pugh, Chair
John Reed

Marin Climate & Energy Partnership
Christine O'Rourke, Sustainability Coordinator

Graphic Design
Elissa Park

Support for development of this Climate Action Plan was provided by a grant from the Marin Community Foundation to the Marin Climate & Energy Partnership.

TABLE OF CONTENTS

1.0 INTRODUCTION 6
1.1 Purpose of the Climate Action Plan 6
1.2 Relationship to the General Plan 7
1.3 Climate Change Background 7
1.4 Climate Change Mitigation Activities in Fairfax 11
1.5 Regulation of Climate Change – Federal, State and County Levels 12
1.6 The Unique Role of Fairfax 18
2.0 FAIRFAX'S GREENHOUSE GAS EMISSIONs 20
2.1 Fairfax's Profile 20
2.2 2005 and 2010 Greenhouse Gas Emissions Inventories 20
2.3 Forecast for 2020 Emissions 24
2.3 Greenhouse Gas Emissions Reduction Target 26
3.0 ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS 27
3.1 Summary of Greenhouse Gas Reduction Strategies 27
3.2 Natural Systems and Sequestration 28
3.3 Transportation and Land Use 30
3.4 Green Building, Energy Efficiency And Renewable Energy 33
3.5 Green Purchasing 36
3.6 Waste Reduction, Recycling and Zero Waste 37
3.7 Water and Wastewater 39
3.8 Promote Education and Citizen Involvement 42
3.9 Adaptation to the Effects of Climate Change 45
4.0 PLAN IMPLEMENTATION 46
4.1 Strategy for Implementation 46

FIGURES

Figure 1. The Greenhouse Effect 8

Figure 2. Inundation Effect of 16-Inch Sea Level Rise 10

Figure 3. Ecological Footprint Comparison 16

Figure 4. Marin County Emissions by Sector (2005) 17

Figure 5. Marin County Emissions 1990-2005 17

Figure 6. Community Emissions by Sector, 2010 23

Figure 7. Government Operations Emissions by Sector, 2010 24

Figure 8. Emissions Reduction Target 26

Figure 9. Energy Used in California Homes (2005) 40

TABLES

Table 1. Greenhouse Gases 9

Table 2. Section 3.8 Community Mitigation Measures 15

Table 3. Section 3.8 Government Operations Mitigation Measures 15

Table 4. Community Emissions Summary by Sector, 2005 and 2010 22

Table 5. Government Operations Emissions by Sector, 2005 and 2010 24

Table 6. Forecast for 2020 Emissions 25

Table 7. Mitigation Measures for Community Emissions 27

Table 8. Mitigation Measures for Government Operations Emissions 28

Table 9. Section 3.2 Community Mitigation Measures 29

Table 10. Section 3.2 Government Operations Mitigation Measures 29

Table 11. Section 3.3 Community Mitigation Measures 32

Table 12. Section 3.3 Government Operations Mitigation Measures 33

Table 13. Section 3.4 Community Mitigation Measures 35

Table 14. Section 3.4 Government Operations Mitigation Measures 35

Table 15. Section 3.5 Government Operations Mitigation Measures 37

Table 16. Section 3.6 Community Mitigation Measures 39

Table 17. Section 3.6 Government Operations Mitigation Measures 39

Table 18. Section 3.7 Community Mitigation Measure.....41

Table 19. Possible aggregate information to be displayed by the GHG-Meter 42

APPENDICES

A Data References

B Summary of Recommend Actions

ACRONYMS AND ABBREVIATIONS

Assembly Bill	AB
Association of Bay Area Governments	ABAG
Bay Conservation and Development Commission's	BCDC
Building, Energy, Retrofit & Solar Transformation	BERST
Business-As-Usual	BAU
California Air Resources Board	CARB
Carbon Action Plan	CAP
Carbon Dioxide	CO_2
Carbon Dioxide Equivalent	CO_2e
California Environmental Quality Act	CEQA
Department of Motor Vehicles	DMV
Electric Vehicles	EV
Environmental Protection Agency	EPA
Extended Producer Responsibility	EPR
Fairfax Carbon Action Committee	FCAC
General Plan	GP
General Plan Implementation Committee	GPIC
Greenhouse Gases	GHG
Global Warming Potential	GWP
Heating Ventilation and Air Conditioning	HVAC
International Council for Local Environmental Initiatives	ICLEI
Joint Powers Authority	JPA
Leadership in Energy in Environmental Design	LEED
Lighting to Energy-efficient Technologies	LED
Low Carbon Fuel Standard	LCFS
Marin County Biking Coalition	MCBC
Marin Clean Energy	MCE
Marin Climate &Energy Partnership	MCEP
Marin County Energy Watch	MCEW
Marin Municipal Water District	MMWD
Marin Sanitary Service	MSS
Metropolitan Transportation Commission	MTC
Methane	CH_4
Metropolitan Planning Organizations	MPO
Miles per gallon	MGP
Nitrous Oxide	N_2O
Property Assessed Clean Energy	PACE
Pacific Gas and Electric Company	PG&E
Plug-in Hybrid Electric Vehicle	PHEV
Renewable Portfolio Standard	RPS
Senate Bill	SB
Transit Oriented Development	TOD
Transportation Authority of Marin	TAM
United States Geological Survey	USGS
Vehicle Miles Traveled	VMT

1.0 INTRODUCTION

1.1 PURPOSE OF THE CLIMATE ACTION PLAN

The Town of Fairfax understands that climate change has the potential to significantly affect Fairfax's residents and businesses, as well as other communities around the world. The Town also recognizes that local governments play a strong role in reducing greenhouse gas emissions and mitigating the potential impacts of climate change.

The purpose of this Climate Action Plan (CAP) is to compile existing and potential strategies (i.e., actions, projects, and programs) that the Town's government operations and the community can use to address climate change. It provides a brief background on what climate change is and its potential impacts, but focuses on the efforts Fairfax can take to reduce its greenhouse gas emissions and mitigate, to the extent feasible at the local level, the potential impacts of climate change.

Through the actions outlined in this plan, such as increasing energy efficiency in buildings, encouraging less dependence on the automobile, and using clean, renewable energy sources, the Fairfax community can experience lower energy bills, improved air quality, reduced emissions, and an enhanced quality of life. The Town's preparation of 2005 and 2010 Greenhouse Gas Emissions Inventories and this Climate Action Plan are the beginning of an ongoing planning process that includes assessing, planning, mitigating and adapting to climate change.

Specifically, this plan does the following:

- Summarizes the various regulations at the federal, state, and regional levels.
- Incorporates the Town's 2005 and 2010 Greenhouse Gas Emission Inventories, which identified sources of greenhouse gas emissions generated by both the community and the Town's government operations.
- Estimates how these emissions may change over time and establishes a target to reduce greenhouse gas emissions for the Town to 20% below 2005 levels by 2020.
- Provides natural system, energy use, transportation, land use, green purchasing, waste and water use strategies necessary to minimize Fairfax's impacts on climate change and meet the established greenhouse gas emissions reduction target.
- Provides strategies by which progress toward lowering greenhouse gas emissions could enter the daily awareness of Fairfax citizens, and by which action to make that progress can be taken in a community context.

1.2 RELATIONSHIP TO THE GENERAL PLAN

The Town of Fairfax 2010 - 2030 General Plan Final Draft[1] (GP), adopted by the Town Council in April 2012, commits the Town to creating a Climate Action Plan, publishing it on the Town website, and maintaining it on an ongoing basis. The General Plan Final Draft contains polices and strategies to reduce greenhouse gas emissions. These policies and programs are referenced and integrated into this Climate Action Plan. Though both the General Plan and the Climate Action Plan are intended as long-range plans, the Climate Action Plan may be updated on a more regular basis to add and amend strategies as new information, policy guidance, and regulations regarding climate change evolve and new technologies to address it are developed.

1.3 CLIMATE CHANGE BACKGROUND

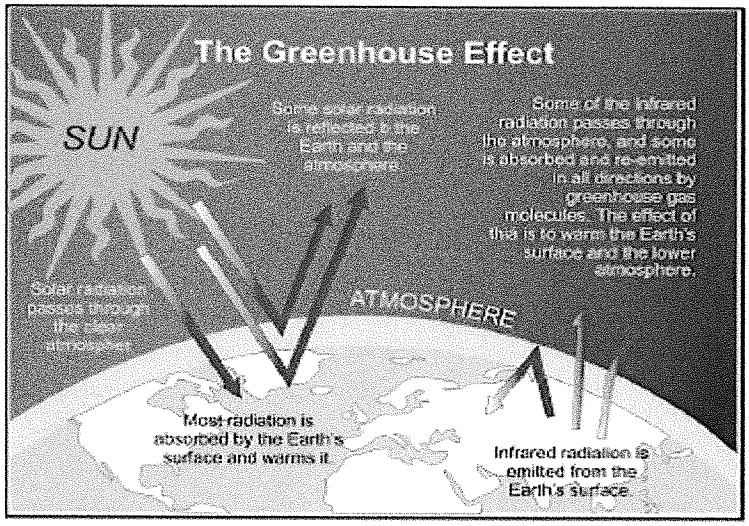
A balance of naturally occurring gases dispersed in the atmosphere determines the Earth's climate by trapping infrared radiation (heat), a phenomenon known as the greenhouse effect (Figure 1). Significant evidence suggests that human activities are increasing the concentration of these gases (known as "greenhouse gases" or GHG) in the atmosphere, causing a rise in global average surface temperature and consequent global climate change. The greenhouse gases include carbon dioxide, methane, nitrous oxide, halocarbons, ozone, and water vapor (Table 1). Each one has a different degree of impact on climate change. To facilitate comparison across different emission sources with mixed and varied compositions of several GHG, the term "carbon dioxide equivalent" or CO_2e is used. One metric ton of CO_2e may consist of any combination of GHG, and has the equivalent Global Warming Potential (GWP) as one metric ton of carbon dioxide (CO_2). According to the U.S. Environmental Protection Agency's (EPA) April 2009, "Inventory of U.S. Greenhouse Gas Emissions," the majority of GHG emissions comes from fossil fuel combustion, which in turn is used for electricity, transportation, industry, heating, etc.

Collectively, these gases intensify the natural greenhouse effect, causing global average surface temperatures to rise, which affects local and global climate patterns. These changes in climate are forecasted to manifest themselves in a number of ways that might impact Fairfax as well as other changes to local and regional weather patterns and species migration.

---

[1] Town of Fairfax 2010-2030 General Plan Final Draft, April 2012. http://www.town-of-fairfax.org/pdfs/planning_dept/general%20plan/TownofFairfax_2010-2030GeneraPlan_PDFreduced.pdf (accessed 07/01/2013)

Figure 1. The Greenhouse Effect



Source: International Council for Local Environmental Initiatives

According to a 2006 Summary Report from the California Climate Change Center, global warming could significantly impact California water and forest resources. The Center's 2006 Summary Report noted the following findings and potential risks to California:[2]

- Precipitation is the most important hydrologic variable and most difficult to forecast.
- Warming raises the elevation of snow levels with reduced spring snowmelt and more winter runoff.
- Less snowmelt runoff means lower early summer storage at major foothill reservoirs with less hydroelectric power production.
- Higher temperatures and reduced snowmelt compounds the problem of providing suitable cold-water habitat for salmon species.
- Rising sea levels would adversely affect many coastal marshes and wildlife reserves.
- Higher temperatures increase the demand for water by plants.
- Climate change in California will result in a higher frequency of large damaging fires.
- Regional climates that are hotter and drier will result in increased pest and insect epidemics within California's forests.

[2] A Summary Report from: California Climate Change Center. *Our Changing Climate: Assessing the Risks to California.* Document No. CEC-500-2006-077, July 2006. http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF (accessed 02/14/11)

Table 1. 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,wastewater and livestock	21
Nitrous Oxide	N_2O	Combustion, wastewater treatment	310
Hydroflourocarbons	Various	Leaked refrigerants, fire suppressants	12 to 11,700

Sea Level Rise

Because of scientific uncertainties, it is difficult to predict with a high degree of accuracy the sea level rise that will impact Marin County residents. The San Francisco Bay Conservation and Development Commission's (BCDC) most recent assessment assumes a 1.8° to 5.4° F (1° to 3° C) rise in global temperature over the next century and a corresponding sea level rise in San Francisco Bay of 16 inches by mid-century and 55 inches by 2100.[3] Sea level rise of this magnitude would have dramatic impacts on residences, businesses, schools, and public infrastructure located near the shoreline. Inundation maps created by BCDC (Figure 2) integrate Geographic Information System (GIS) data from the United States Geological Survey (USGS) and sea level rise projections to assess the vulnerability of Bay Area communities to different sea level rise scenarios. A 16-inch rise in sea level would result in the flooding of 180,000 acres of shoreline, which is roughly equivalent to today's 100-year floodplain. A 55-inch rise in sea level would flood over 213,000 acres of shoreline, putting billions of dollars of private and public development at risk. Changes in climate and sea level could cause an increase in storm activity, storm surges, and even greater flooding.

[3] San Francisco Bay Conservation and Development Commission Draft Staff Report, "Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline," April 7, 2009. http://www.bcdc.ca.gov/proposed_bay_plan/bp_1-08_cc_draft.pdf (accessed 03/30/10).

Figure 2. Inundation Effect of 16-Inch Sea Level Rise

The areas in blue identify the land area that is subject to inundation from a 16-inch rise in sea level[4]
Source: Inundation data from Knowles, 2008. Aerial imagery is NAIP 2005 data. (accessed 07/02/10).

[4]DISCLAIMER: Inundation data does not account for existing shoreline protection or wave activity. This map is for informational purposes only.

1.4 Climate Change Mitigation Activities in Fairfax

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

- Installed energy-efficient lighting, double-paned window and a new door in town hall.
- Installed a 25 KW solar panel system on the Pavilion roof.
- Installed electric car charging stations in the Parkade.
- Joined the Marin Energy Authority and chose Marin Clean Energy deep green 100% renewable electricity for all Town operations.
- Adopted the Town of Fairfax 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.
- Secured Safe Routes to Schools and Safe Paths to Schools grant money to construct crosswalks and safety improvements at Glen Drive/Mitchell Drive and Oak Tree Lane at Sir Francis Drake Boulevard, and a new sidewalk on Oak Manor Drive.
- Constructed bicycle and pedestrian improvements on Center Boulevard between Pastori Avenue and Pacheco Avenue, including new sidewalks, curb extensions, new and improved crosswalks and bicycle lane repaving.
- Working with funding through the Non-Motorized Transportation Pilot Program, installed new sidewalks on Pastori Avenue and Sir Francis Drake Boulevard. The improvements are intended to increase the mode share of cycling and walking for everyday transportation.
- Town sponsored electronic waste events.
- In partnership with Marin Sanitary Service, implemented curbside food waste collection for residences. The program reduces methane emissions by composting food waste instead of depositing it into the landfill. Work is being done to include businesses and restaurants in this program.
- 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 2020, and an ultimate goal of Zero Waste.
- Adopted the new CALGreen standards as part of the new California Building Code.
- 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 (CalGreen) Building Standards, improve the effectiveness of the District's water waste prevention program, and increase efficiency standards.

- Purchased two hybrid and two fuel-efficient vehicles to optimize fuel utilization. The police department plans to phase more fuel-efficient models into the police fleet as existing vehicles are replaced.
- Purchased numerous pieces of Energy Star-rated computer equipment to phase out older, less energy efficient equipment.

1.5 REGULATION OF CLIMATE CHANGE – FEDERAL, STATE AND COUNTY LEVELS

Federal Climate Policy

Currently, there is no federal legislation mandating comprehensive greenhouse gas emission reporting or reduction in the United States. Efforts, however, are underway in Congress to develop and enact climate and energy legislation. The U.S. House of Representatives passed a GHG emissions cap-and-trade bill, Waxman-Markey, in June 2009.

The U.S. Senate considered, but failed to pass, various cap-and-trade bills in 2009 and 2010. Therefore, the U.S. has used its rulemaking authority under the Clean Air Act to begin to regulate greenhouse gas emissions. In 2009, the EPA made an "endangerment finding" that GHGs threaten the public health and welfare of the American people[5]. This finding provided the statutory prerequisite for EPA regulation of GHG emissions from motor vehicles and has led to a number of GHG regulations for stationary sources. In May 2010, the EPA issued a "tailoring" rule that enables the agency to control GHG emissions from the nation's largest GHG sources, including power plants, refineries, cement production facilities, industrial manufacturers and solid waste landfills, when these facilities are newly constructed or substantially modified. The EPA reports that its GHG permitting requirements will address 70% of the national GHG emissions from stationary sources[6]. These rules were scheduled to go into effect in January 2011.

In April of 2010, the EPA and Department of Transportation finalized new fuel efficiency standards for model year 2012 through 2016 cars and light trucks. These vehicles will have to meet a combined average emissions level of 250 grams of carbon dioxide per mile, or the equivalent to 35.5 miles per gallon (MPG), up from the current standard of 27.5 miles per gallon (MPG). The EPA and the Department of Transportation are currently developing first-ever regulations for medium and heavy-duty vehicles[7].

State Climate Policy

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 (CARB) in December 2008. Among many other strategies, it encourages

---

[5] Final Rule, EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under the Clean Air Act, 74 Fed. Reg. 66495, December 7, 2009. (accessed 12/09/2010).

[6] Final Rule: Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule Fact Sheet, EPA, http://www.epa.gov/NSR/documents/20100413fs.pdf. (accessed 07/01/2013).

[7] U.S. Environmental Protection Agency, http://www.epa.gov/oms/climate/regulations.htm#1-1. (accessed 12/09/2010).

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 most significant of these initiatives are AB 32 and SB 375; the first requires California to reduce its GHG to 1990 levels by 2020, and the second begins to tie GHG reductions to land use. In 2007, the CARB conducted an emissions inventory for the state to identify emissions levels in 1990 that figure 427 million

metric tons of carbon dioxide equivalent. The inventory revealed that transportation was the largest single sector (35% of the state's total 1990 emissions), followed by industrial emissions (24%), imported electricity (14%), in-state electricity generation (11%), residential use (7%), agriculture (5%), and commercial use (3%). Preliminary estimates indicate that California's 2020 emission projections could be 600 million tons of CO_2e if no actions are taken to reduce GHG. This means that California must prevent 173 million tons of CO_2e from being emitted by 2020 in order to meet the 1990 levels as required by AB 32.

CARB is responsible for monitoring and reducing GHG emissions set forth in AB 32, and is, therefore, coordinating statewide efforts. In December 2008, CARB adopted a Scoping Plan that outlines the actions required for California to reach its 2020 emission target. The actions include a broad set of clean energy, clean transportation, and efficiency standards. In 2009, CARB identified and implemented nine discrete early action measures including regulations affecting landfills, motor vehicle fuels, refrigerants in cars, tire pressure, port operations and consumer products. Additional reduction measures to meet the 2020 target will be adopted in 2011.

Key strategies identified in the CARB Climate Change Scoping Plan that are best developed and supported by local governments in achieving the climate protection and emission reduction goals include:

- Transportation and community design
- Local and regional emission targets
- Recycling and waste reduction
- Clean energy
- Green buildings
- Water

The CARB Climate Change Scoping Plan "encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels by 2020."[8] However, CARB does not yet require cities to adopt climate action plans as part of AB 32 implementation efforts.

State Actions

The following are state reduction strategies included in the AB 32 Scoping Plan and accounted for in the Town's adjustment of the business-as-usual forecast. To clarify, the State of California has approved, programmed, and/or adopted these actions. Furthermore, they are programs or projects that require no local involvement. Incorporating them into the forecast and reduction assessment provides a more accurate picture of future emissions growth and the responsibility for action.

---

[8] California Air Resources Board, "Climate Change Scoping Plan," December 2008, p. 27, http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf, (accessed0 3/31/10).

Low Carbon Fuel Standard
The State is proposing to reduce the carbon intensity of transportation fuels consumed in California. To achieve this, CARB is developing a Low Carbon Fuel Standard (LCFS), which would reduce the carbon intensity of California's transportation fuels by at least 10% by 2020 and 20% by 2035 as called for by Governor Schwarzenegger in Executive Order S-01-07. LCFS will incorporate compliance mechanisms that provide flexibility to fuel providers in how they meet the requirements to reduce greenhouse gas emissions. CARB estimates the Low Carbon Fuel Standard will reduce California's projected 2020 transportation emissions by 6.7%.

Pavley (AB 1493)
Assembly Bill 1493 (Pavley), signed into law in 2002, will require carmakers to reduce greenhouse gas emissions from new passenger cars and light trucks beginning in 2011. The California Air Resources Board adopted regulations in September 2004 that create two phases of increasingly stringent standards for car manufacturers between 2009 and 2020. The first phase, which has already been adopted, is expected to reduce California's projected 2020 transportation emissions by 7%.

Renewable Portfolio Standard (RPS)
Established in 2002 in Senate Bill 1078, the RPS program requires electricity providers to increase the portion of energy that comes from renewable sources to 20% by 2010 and to 33% by 2020. CARB estimates the RPS will reduce California's emissions from electricity use by 15.3% in 2020.

Table 2. Section 3.8 Community Mitigation Measures

Measure		GHG Emissions Reduced (metric tons)
3.8.C1	PG&E directed to achieve 33% Renewable Portfolio Standard by 2020	394
3.8.C2	AB 1493 Pavley Standards	1,421
3.8.C3	Low Carbon Fuel Standard	1,299
	TOTAL	3,114
	% Reduced from 2005 Levels	**8.5%**

Table 3. Section 3.8 Government Operations Mitigation Measures

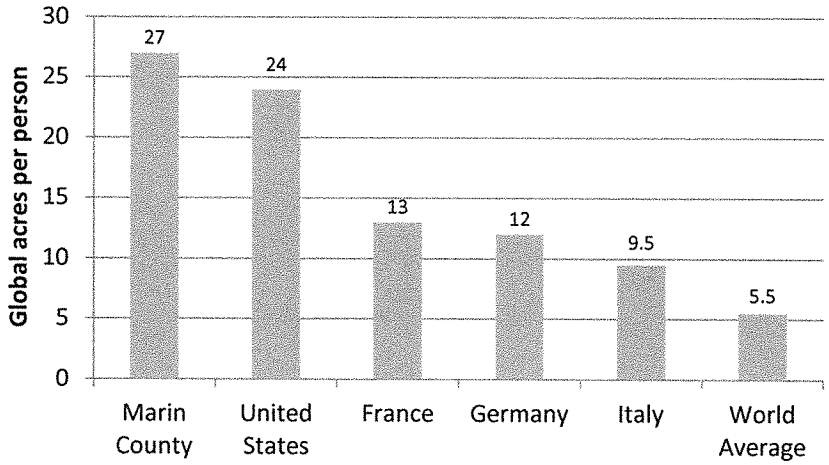
Measure		GHG Emissions Reduced (Metric Tons)
3.8.G1	AB 1493 Pavley Standards	13.9

3.8.G2	Low Carbon Fuel Standard	12.7
	TOTAL	26.5
	% Reduced from 2005 Levels	**7.9%**

Marin County Climate Policy

Underpinning sustainability and climate change efforts in Marin County is the recognition that Marin residents consume resources at a far greater rate than most industrialized nations, and that the worldwide use of resources is exceeding the earth's capacity to renew them. One way to measure the use of natural resources against the planet's actual biocapacity and ability to renew those resources is the "ecological footprint." It can be calculated for individuals, regions, countries, or the entire earth and is expressed as the number of global acres (acres with world average biological productivity) that it takes to support one person. As Figure 3 shows, the average American uses 24 global acres per capita, while the average Marin resident requires 27 global acres. Other western democracies, such as France, Germany, and Italy, have footprints of 13, 12, and 9.5 global acres per person, respectively. According to the Global Footprint network, if every person lived the lifestyle of one American, we would need five planets to sustain us.

Figure 3. Ecological Footprint Comparison



Source: *Redefining Progress*, Sustainable Sonoma County, Worldwide Fund for Nature, as quoted in the Marin Countywide Plan, adopted November 6, 2007.

In 2006, Marin County developed a strategic plan to reduce annual GHG emissions to 15% below 1990 levels by 2020. In 2007, the County re-inventoried their greenhouse gas emissions. Figures 4-7 show the distribution of County-wide GHG emissions by sector in 2005 and emission trends between 1990 and 2005. Total countywide greenhouse gas emissions increased by approximately 6% between 1990 and

2005, from 3,005,674 to 3,188,522 tons CO2e.[9] This 6% rate of increase can be used as a proxy to estimate the increase in Fairfax's emissions between 1990 and 2005, since actual data are unavailable. The results of the 2005 and 2010 GHG Inventories are included in Section 2.2 of this plan.

While the County has taken important steps to reduce greenhouse gas emissions, a large portion of Marin County is operated and governed by the 11 local jurisdictions and numerous special districts. It is therefore important that the municipalities, such as Fairfax, participate in developing local emission reduction measures and policies.

Figure 4. Marin County Emissions by Sector (2005)

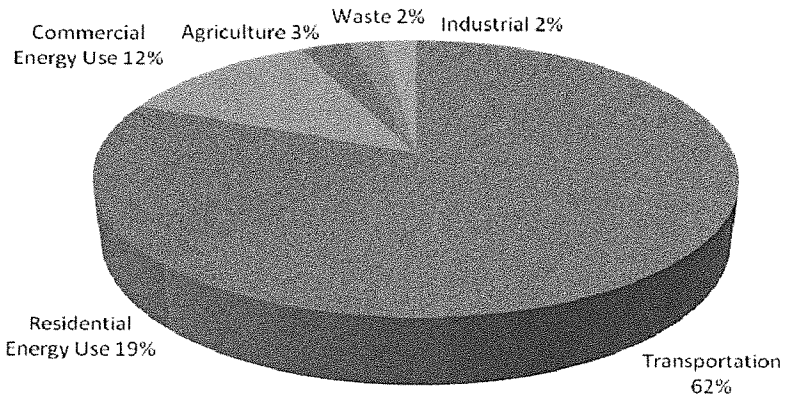
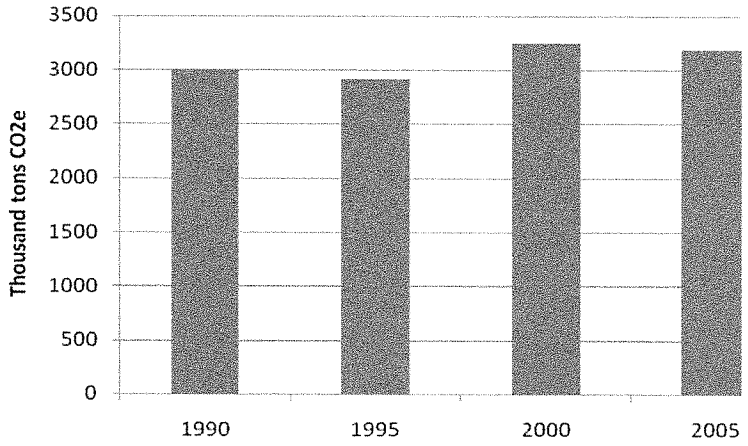


Figure 5. Marin County Emissions 1990-2005



[9] "Marin County Re-Inventory of Greenhouse Gas Emissions," Marin County Community Development Agency, September 2007.

Marin Climate and Energy Partnership – A Multi-Jurisdictional Approach

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.[10]

One of MCEP's first projects was to work with International Council for Local Environmental Initiatives (ICLEI) – Local Governments for Sustainability, a nonprofit organization, to develop GHG emissions inventories for the partner jurisdictions. With Bay Area Air Quality Management District grant funding, MCEP also worked on programs related to reducing energy use in municipal buildings, establishing a green purchasing collaborative, reducing energy use in residential and commercial buildings, reducing emissions from private and municipal vehicles, and reducing energy use and emissions from waste.

In 2009, MCEP developed a green building strategic plan and green building policies which resulted in the Marin Green Building, Energy, Retrofit & Solar Transformation (BERST) model ordinance. The Marin Community Foundation provided funding for this effort, as well as funds to develop climate action plans for six partner jurisdictions. Partner members have agreed to use their adopted climate action plans to identify mutual measures to reduce community-wide greenhouse gas emissions and develop policies and programs to support priority measures. The Town has worked closely with the MCEP to complete this climate action plan, and to implement a coordinated approach to local and regional emissions reduction targets and climate action planning goals.

1.6 THE UNIQUE ROLE OF FAIRFAX

Fairfax, while emitting a small portion of the global GHGs, is in a position to play a more significant role in addressing this problem than many communities of its size for several reasons. First, as described above, we are in a region in which we emit an outsized portion of these gases per capita. At the same time, Fairfax has been a leader in environmental consciousness in many important ways, and prides itself on having been instrumental in the creation of Marin Clean Energy, in Safe Routes to Schools, and in our preservation of a rich small-town community life. Fairfax citizens have resources, both in time and stable property values, and in volunteerism and civic engagement. Fairfax has the opportunity to leverage these strengths to become an example for the US, and for the world, of a relatively affluent US community making a real difference in our community's ecological footprint.

A few of the challenges/opportunities unique to Fairfax include the following:

- The largest sector of GHG emissions in our Town arise from transportation. We can improve these by continued focus on affordable housing (so that people who work in town can live here,

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

rather than commuting long distances). We can continue our support of live/work, so that people who live in Fairfax can avoid frequent commutes elsewhere in the Bay Area by working from our homes. Continued increase in the use of bicycling, walking and public transportation will lower our Footprint.

- Housing stock in Fairfax tends to be older, often poorly insulated or with aging infrastructure such as heating and water heating. However, citizens are continually improving their houses for a variety of their own reasons, and if these improvements are done properly they can greatly decrease energy consumption. A combination of education, cultural shift, availability of modern technologies, availability of low-cost financing, and regulation can accelerate these improvements.
- Fairfax, being the gateway to West Marin, shares in the awareness that we need to be resilient to such events as power shortages/outages, severe weather, or disruption of transportation corridors. There is a well-recognized overlap between the actions taken to improve resiliency and those that can improve our Footprint.
- Fairfax prides itself on being active in the issues of the day nationally and globally. Were our town to make a significant, measurable improvement in our Global Footprint, this could be noticed in such venues as global climate talks. Fairfax could show the way to breaking the gridlock in such discussions, in which less-developed countries point to the affluent US as continuing to consume more than our share. As a community seeking to redefine life from one of consumption to one based more on enjoyment of the simple pleasures of community, we could show that consumption and environmental damage could be decoupled from economic well-being.
- Fairfax is presently thought of by some homeowners and those in the construction trades as being heavily regulated. Whether accurate or not, this is a public perception that limits the extent to which further regulations will be supported by the voting public, or be followed. On the other hand, the Town has numerous forward-thinking policies in place that can help homeowners and renters to live more efficiently, economically and comfortably. For example, insulation of walls is exempt by statute from being considered a "substantial remodel", thus allowing insulation to be installed quite economically; another example is exemption from permit fees for solar installation. Were the Town to strongly publicize these policies, perception might be shifted toward seeing building regulations in a more favorable light.
- Town government often appears limited in its actions by lack of funding. Yet the flow of discretionary spending by townspeople toward buying the highest quality food and supporting local suppliers is enormous. Similarly, while the Town is limited in funding to improve infrastructure directly through public works, the flow of capital toward improvement of houses is strong in the community. Every time building officials offer a constructive suggestion, or point out a regulation, that causes a construction project to upgrade the efficiency of a home, it has long-term benefits to all parties including homeowners, renters, the Town and the planet. Again, a shift in perception could maximize this synergy.
- In order to shift public perception and encourage grass-roots action toward a brighter energy and emissions future, the General Plan proposes actively and continually providing the public with a high-profile GHG-Meter of some of the important numbers contributing to GHG emission.

2.0 FAIRFAX'S GREENHOUSE GAS EMISSIONS

2.1 FAIRFAX'S PROFILE

Located in Marin County approximately thirteen miles north of the Golden Gate Bridge in beautiful Upper Ross Valley, Fairfax is a small town with a land area of 2.1 square miles. According to the U.S. Census, the population of Fairfax in 2010 was 7,441 and there were 3,585 housing units. The California Department of Finance estimates the population of Fairfax in 2005 was 7,237.[11] Fairfax 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.[12] Primarily a residential community, Fairfax has a vibrant downtown with unique shops, restaurants and well-known music venues. It is an environmentally conscious community and is considered the most progressive of Marin's 11 incorporated cities. Historic development patterns in Fairfax created a town with a distinct center, providing a good public transit hub within walking and bicycling distance of most of the town's inhabitants. Fairfax has retained a village-like quality, with distinct neighborhoods, and large areas of surrounding visible open space.

The Town has public and private schools for grades K-8, a post office, a library, police and fire stations, and a Town Hall. With abundant parks and open space, there are many recreational opportunities within town, and Fairfax is known as a mountain biking and hiking haven. The Town is home to many local artists and musicians. Although some residents work in Fairfax, a majority commute to jobs in Marin County, San Francisco and other locations.

2.2 2005 AND 2010 GREENHOUSE GAS EMISSIONS INVENTORIES

In 2009, Fairfax completed a Greenhouse Gas Inventory report for the baseline year of 2005. A 2010 GHG Inventory was also completed. In April 2012, the Fairfax Town Council adopted the 2010-2030 General Plan, which lays out a path to achieve greenhouse gas reductions in local government operations and throughout the community and directs the Town to develop a Climate Action Plan to achieve those reductions. The Town has adopted a greenhouse gas reduction target of 20% below 2005

---

[11] 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.

[12] 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 Fairfax has an average temperature of 47 degrees. For such a day we can approximate the HDD as (65 - 47) = 18.

levels by the year 2020, a target that exceeds the state goal (a goal comparable to the state goal would be 15% below 2005 levels). The 2010 GHG inventory measures the progress the Town has made on reducing greenhouse gas emissions between 2005 and 2010 and where more work needs to be done. 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 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. The inventory uses 2005 as the baseline year, as this year is increasingly becoming the standard for such inventories. Due to lack of city-specific data, the 1990 baseline year utilized by the State of California is usually too difficult for most local governments to meet and would not produce the most accurate inventory.

Calculating GHG emissions for a town must be done indirectly, because it is not possible to directly measure the town's contribution to this atmospheric component; not all emissions for which the town is responsible even occur within the town. Therefore, the methodology used in a GHG inventory is important. The 2010 GHG Inventory describes the methodology used.

The encouraging news is that Fairfax reduced community greenhouse gas emissions 4.6% between 2005 and 2010, from 36,166 metric tons in 2005 to 34,516 metric tons in 2010 – a reduction of 1,650 metric tons CO_2e. Reductions occurred in all sectors. On a percentage basis, the greatest declines occurred in the waste (-34%), water (-31%) and off-road (-15%) sectors. In absolute terms, the greatest reductions were made in the transportation (610 metric tons CO_2e), waste (559 metric tons CO_2e) and residential (198 metric tons CO_2e) sectors. For more detailed analysis of the factors related to decreases in emissions the reader is referred to the 2010 Fairfax Greenhouse Gas Emissions Inventory. Below is a summary of the Town's community and local government sectors used in this plan to categorize emission reductions and the subsequent inventory results.

Community (i.e., residential and commercial) emissions come primarily from the on-site combustion of natural gas and the off-site generation of electricity for heating, cooling, lighting, cooking, and the operation of appliances and electrical devices. Transportation emissions result from the combustion of diesel and gasoline on roadways within the Town of Fairfax. Waste emissions come from the decomposition of waste generated by residents and businesses in landfills outside the Town limits.

Community emissions have been categorized according to seven primary sectors:

- Residential
- Commercial
- Transportation

- Off-Road Vehicles and Equipment
- Water
- Wastewater
- Waste

Local government operations emissions are categorized according to six primary sectors: buildings; streetlights and park lighting; water delivery facilities such as irrigation systems; vehicle fleet, including police and public works vehicles; government-generated solid waste, including public trash cans and street sweepings; and employee commute.

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

Community Inventory Results

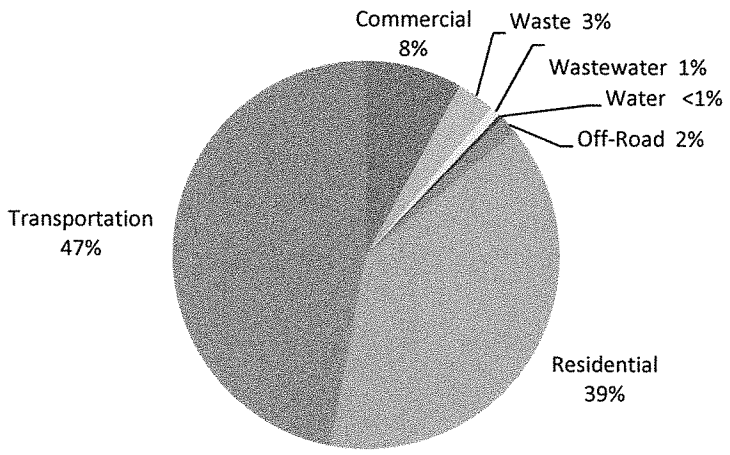
In 2005, the Fairfax community emitted approximately 36,579 metric tons of CO_2e. As shown in Table 4 and Figure 1, the transportation sector was the largest emitter of greenhouse gas emissions in both 2005 and 2010 (representing 47% of total emissions). Emissions from the residential sector produced the second highest quantity (38% in 2005 and 39% in 2010), followed by the commercial sector (8% in 2005 and 2010). Emissions were reduced in all sectors, with the greatest reductions occurring in the transportation sector (610 metric tons), waste sector (559 metric tons), and residential sector (198 metric tons).

Table 4. Community Emissions Summary by Sector, 2005 and 2010

Sector	2005 Metric Tons CO_{2e}	2010 Metric Tons CO_2e	Change Metric Tons CO_2e	% Change
Residential	13,670	13,472	-198	-1.5%
Commercial	2,888	2,770	-117	-4.1%
Transportation	16,842	16,232	-610	-3.6%
Off-Road	610	519	-91	-15.0%
Water	193	134	-59	-30.5%

Wastewater	295	280	-15	-5.0%
Waste	1,668	1,109	-559	-33.5%
Total	**36,166**	**34,516**	**-1,650**	**-4.6%**

Figure 6. Community Emissions by Sector, 2010



Local Government Operations Inventory Results

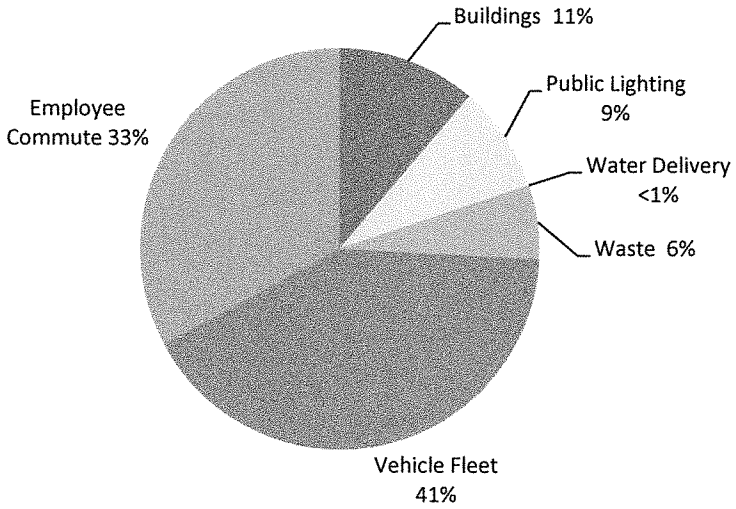
In 2005, Fairfax government operations emitted approximately 334 metric tons of CO_2e.[13]Emissions from government operations decreased in all sectors. As shown in Table 17, the greatest emissions reductions came from the public lighting sector, which experienced a reduction in emissions of 31 metric tons CO2e, or about 58%. Emissions were also reduced in the buildings and facilities sector (-28%), the vehicle fleet sector (-13%), the water delivery sector (-62%), the waste sector (-6%) and the employee commute sector (-24%). Figure 5 shows that the vehicle fleet sector was the largest emitter of greenhouse gas emissions in 2010 (41% of total emissions), followed by the employee commute sector (33%).

[13] This number includes all Scope 1 emissions from the on-site combustion of fuels in facilities and vehicles, Scope 2 emissions from the purchase of electricity, and Scope 3 emissions from waste generated by local government operations and emissions associated with employee commute patterns.

Table 5. Government Operations Emissions by Sector, 2005 and 2010

	2005	2010	Change	
Sector	**Metric Tons CO2e**	**Metric Tons CO2e**	**Metric Tons CO2e**	**% Change**
Buildings & Facilities	40.3	29.0	-11.4	-28%
Vehicle Fleet	123.2	106.6	-16.6	-13%
Public Lighting	53.6	22.3	-31.3	-58%
Water Delivery	0.09	0.03	-0.06	-62%
Waste	16.3	15.4	-0.9	-6%
Employee Commute	112.8	85.3	-27.5	-24%
Total	346.3	258.6	-87.7	-25%

Figure 7. Government Operations Emissions by Sector, 2010



2.3 FORECAST FOR 2020 EMISSIONS

To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth, and population growth from the 2005 baseline year going forward, this plan includes an

emissions forecast for the year 2020. Under a business-as-usual (BAU) scenario, Fairfax's emissions will grow by approximately 7.3% by the year 2020, from 36,579 to 39,248 metric tons CO_2e. Table 2 shows the result of the forecast by sector. A variety of different reports and projections were used to create the emissions forecast, as profiled below.

Table 6. BAU Forecast for 2020 Emissions

Sector	2005 (metric tons CO_2e)	2020 (metric tons CO_2e)	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	13,917	14,108	0.09%	1.4%
Commercial	2,879	3,037	0.36%	5.5%
Transportation	18,645	20,949	0.78%	12.4%
Waste	1,138	1,154	0.09%	1.4%
TOTAL	**36,579**	**39,248**	**0.47%**	**7.3%**

For the residential and waste sectors, population projections for Fairfax, as released by the Association of Bay Area Governments (ABAG) in 2009, were used to estimate average annual compound growth in energy demand. ABAG estimates the Fairfax population will increase from 7,300 in 2005 to 7,400 in 2015 and stabilize near that level through 2035.

Analysis contained within *California Energy Demand 2008-2018: Staff Revised Forecast*[14], a report by the California Energy Commission (CEC), shows that commercial floor space and the number of jobs have closely tracked the growth in energy use in the Commercial Sector. ABAG projects job growth will increase from 1,820 jobs in 2005 to 1,920 in 2020. Using this growth projection of 100 jobs, it was calculated that the average annual growth in energy use in the commercial sector between 2005 and 2020 would be 5.5%.

For the Transportation Sector, the Metropolitan Transportation Commission (MTC) projects that county-wide vehicle miles traveled in Marin County will increase at a rate of 0.78% a year between 2006 and 2020, or approximately 12.4% between 2005 and 2020.[15]

As no significant expansion of government services is expected over the next ten years, government operations emissions are projected to remain consistent with 2005 levels under a BAU.

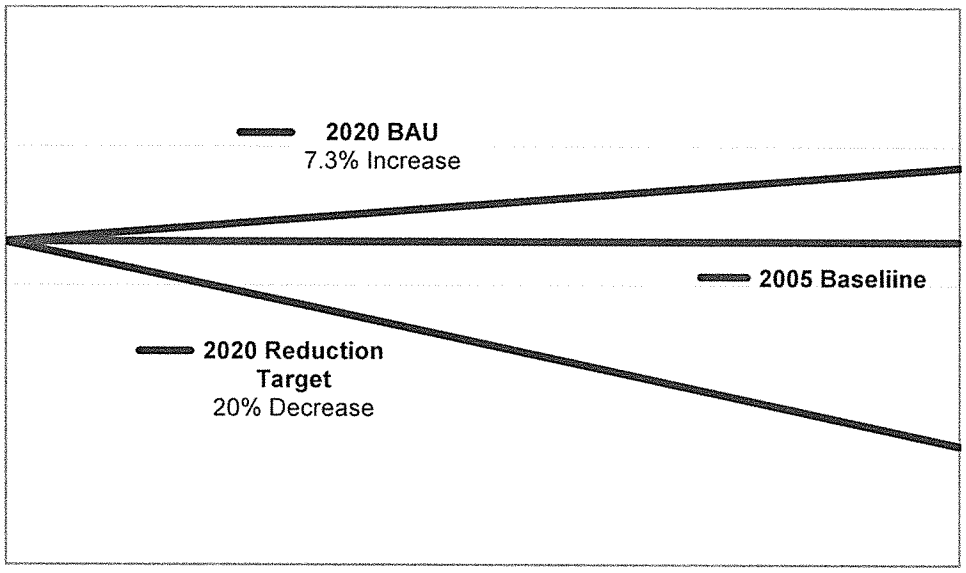
[14] http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF. (accessed 02/29/2010).

[15] Transportation 2035 Plan for the San Francisco Bay Area - Travel Forecasts Data Summary, Tables F.13 and F.20.

2.3 GREENHOUSE GAS EMISSIONS REDUCTION TARGET

This Climate Action Plan supports the Town's emissions reduction target of 20% below 2005 levels by 2020, which exceeds the State's direction to local governments to reduce emissions by 15% below 2005 levels.[16] A target of 20% below 2005 emissions levels would limit community emissions to 29,263 metric tons in 2020. Figure 9 provides a comparison of the BAU forecast for 2020 to the 2005 baseline year and the 20% reduction target. Figure 9 is also a depiction of Fairfax's challenge in attempting to meet its reduction targets. Emissions will continue to increase along the BAU scenario while reduction efforts are initiated. Achieving the target is therefore more than a 20% decrease – rather, it is a 25.4% reduction from projected 2020 emissions levels for the Fairfax community.

Figure 8. Emissions Reduction Target



[16] California Air Resources Board, "Climate Change Scoping Plan," December 2008, p. 27. http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf. (accessed 03/31/10).

3.0 ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS

3.1 SUMMARY OF GREENHOUSE GAS REDUCTION STRATEGIES

The mitigation measures presented in this chapter, as summarized in the tables below, achieve greenhouse gas emissions reductions in the community of 7,111 metric tons CO_2e or approximately 19.4% below the 2005 baseline. When state reductions are added, emissions in Fairfax would be approximately 28% below 2005 levels -- enough to allow the Town to meet its reduction target of 20% below the 2005 baseline by 2020.

Within government operations, the Town could achieve reductions of 256 metric tons CO_2e, or approximately 35% below 2005 levels by implementing all of the specific, measurable actions listed in the following sections. A wide range of programs that exceed the Town's reduction goal have been included to allow for the consideration and prioritization of each program, based on its estimated cost, annual savings, and GHG reduction benefit, during the consideration of new programs, development projects, and funding opportunities. State actions would reduce emissions by another 8%, and programs to offset emissions could reduce emissions by an additional 28%.

Table 7. Mitigation Measures for Community Emissions

Section		GHG Reductions (metric tons)
3.2	Natural Systems, Sequestration and Carbon Offsets	483
3.3	Land Use and Transportation	1,426
3.4	Green Building, Energy Efficiency and Renewable Energy	4,685
3.6	Waste Reduction, Recycling and Zero Waste	455
3.7	Water and Wastewater	546
	SUBTOTAL	7,111
	% below 2005 levels	**19.4%**
3.8	State Actions	3,114
	% below 2005 levels	**8.5%**
TOTAL		10,225
Cumulative % reduction		28.0%

Table 8. Mitigation Measures for Government Operations Emissions

Section		GHG Reductions (metric tons)
3.2	Natural Systems and Sequestration (excluding Carbon Offsets)	1.9
3.3	Land Use and Transportation	26.7
3.4	Green Building, Energy Efficiency and Renewable Energy	76.5
3.5	Green Purchasing	4.0
3.6	Waste Reduction, Recycling and Zero Waste	5.0
	SUBTOTAL	116.0
	% below 2005 levels	**34.7%**
3.8	State Actions	26.5
	% below 2005 levels	**7.9%**
3.2	Carbon Offsets	93.4
	% below 2005 levels	**27.9%**
TOTAL		236
Cumulative % reduction		70.6%

3.2 NATURAL SYSTEMS AND SEQUESTRATION

The natural environment has been extensively altered by human civilization, often with little consideration for how natural systems function, depriving us of the important benefits they offer. Clearing and draining of wetlands, forestlands, grasslands and other open space for agricultural production or urban development decreases or eliminates the capacity of those natural systems to store carbon. The carbon dioxide stored in soil, trees and other vegetation is released into the atmosphere when forestland and open space is converted to other uses. Restoration of these natural areas, and establishment of new ones, has the potential to tie up or sequester greenhouse gas emissions in the form of soil and wood carbon.

This section of Fairfax's Climate Action Plan highlights carbon sequestration through the restoration and establishment of natural areas, as well as measures to offset the community's greenhouse gas emissions.

Recommended Actions

- Continue to enforce policies and programs that regulate the removal and replacement of significant trees (done by Fairfax Tree Committee). (GP CON-5.2.1)
- Support efforts to develop and implement a community-wide tree planting program for streets and parks to significantly increase the carbon storage potential of trees and other vegetation in the community (possibly connect with Tree City USA).
- To the extent possible, require new development to be planned around existing trees and require new or replacement tree planting where increased intensity of use, development or activity results in increased GHG emissions.
- Support the preservation and creation of conservation areas that provide carbon sequestration benefits, such as those with tree cover.
- Encourage the creation of community gardens, including possible use of surplus Town properties (one community garden is managed by Fairfax Volunteers, near the library).

Table 9. Section 3.2 Community Mitigation Measures

Measure		GHG Reductions (metric tons)
3.2.C1	Increase Trees and Vegetation to Achieve a Net Gain of 100 Trees	2
3.2.C2	Offset Emissions from 5% of Residential Natural Gas Use	482
	TOTAL	484
	% Reduced from 2005 Levels	**1.3%**

Table 10. Section 3.2 Government Operations Mitigation Measures

Measure		Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.2.G1	Increase Public Trees and Vegetation to Achieve a Net Gain of 50 Trees	$10,000	n/a	1.9
3.2.G2	Offset Emissions from Natural Gas Use	$194 per year	n/a	16.0
3.2.G3	Offset Emissions from Town Vehicles	$1,015 per year	n/a	77.4
	TOTAL			95.3
	% Reduced from 2005 Levels			**28.5%**

3.3 TRANSPORTATION AND LAND USE

Transportation and land use development are strongly interrelated. The more suburban the development (i.e., low density housing that causes residents to live further from urban centers), the less viable are mass transit systems and other alternative modes of transportation, such as walking or biking, and the more dependent residents become on the automobile. Studies have shown that people who live near transit drive between 10% and 30% less than suburban residents and that low-density suburban development generates twice as much GHG emissions per capita than a more dense urban development pattern. As a result, the transportation sector is one of the largest sources of GHG emissions in Marin County, and the county ranks among the highest in the U.S. in terms of per capita GHG emissions (Figure 3).

Fairfax recognizes that major changes in travel behavior will be needed to reduce GHG emissions in Fairfax. Through its General Plan, the Town has committed to promoting the development and expansion of public and alternative transportation systems to better connect jobs, housing, schools, and shopping and recreational facilities. The Town seeks to reduce dependence on single occupancy vehicles by encouraging cycling and walking and supporting public transit, and has set a goal to achieve at least 20% of trips made by walking or biking by 2020. In addition to reducing vehicle miles traveled, the Town will be able to reduce its GHG emissions from the transportation sector as Plug-in Hybrids (PHEVs), fully electric vehicles (EVs) and electric bicycles become more prevalent.

Recommended Actions

- Promote compact and efficient development, such as orienting new development and providing bike racks, covered bicycle parking, and associated safe routes. (GP C-5, C-6.1)
- Promote mixed-use development to provide housing and commercial services near the business center thereby reducing the necessity of driving. (GP C-6.1.2, CON-2.1.1.1)
- Encourage a "balanced" community, where residents do not have to travel long distances for service needs. Promote the development of workforce housing for local employees and second units for in-home providers of childcare, healthcare, and others. (GP Housing Element, CON-1.1.2.1, CON-1.1.2.2)
- Adopt planning policies and zoning designations that promote live/work situations. (GP CON-1.1.2.1)
- Locate higher density development along transit corridors. (GP C-6.1.3)
- Identify and designate Transit Oriented Development (TOD). (GP H-3.1.2.1)
- Make reductions in vehicle miles traveled (VMT) and the use of alternative transportation high-priority criteria in the evaluation of policy, program and project alternatives. As part of any traffic study, require GHG emission analysis. (GP CON-1.1.4.4)
- Improve the efficiency of traffic flow along Sir Francis Drake. (GP C-5.2.2, CON-2.1.1.4)
- Encourage bicycling and walking as a safe and efficient means to travel into and around Fairfax and the adjacent towns/cities:
    - Provide and maintain bike lanes and bike routes as identified in the Fairfax General Plan, the Bicycle and Pedestrian Master Plan, and Safe Routes to Schools. (GP C-1.3.2, C-5.6.2)
    - Improve bicycle and pedestrian safety at intersections and install bicycle loop detectors at signalized intersections to help cyclists trip the traffic signal. (GP CON-2.1.1.5)

- Install traffic calming measures to control speeding and improve pedestrian and cyclist safety. (GP C-2.3, C-2.6, TC-3.2)
- Establish a classification for second units with parking restrictions, accessible without use of an automobile. (GP LU-8.1.2.1)
- The Town shall consider bicycle and pedestrian related development a priority. (GP TC-3.2.1.1)
- Implement "Complete Streets" policies (AB1358) to ensure the needs of bicyclists, pedestrians, and the disabled are considered in the transportation element of any new capital improvement or development project. (GP TC-3.2.2.2, C-3.2.4.2)
- Install sidewalks and paths where feasible to provide a continuous pedestrian network. (GP C-5.1.3, C-5.4.2, C-5.7.1, TC-3.2.4.1, TC-3.2.15.1)
- Provide increased bicycle parking in heavily used areas, particularly downtown. (GP C-5.6.3, C-6.4.2, C-8.1.1TC-3.2.2.1, TC-3.2.4.3)
- Create a bicycle staging area including bathrooms, showers and lockers, possibly in partnership with local businesses. (GP C-5.8.1, TC-3.2.16.1, TC-3.2.16.2)
- Promote "Share the Road" strategies to improve bicycle safety and improve compliance with traffic laws. (GP C-5.1.4)
- Participate in programs that encourage bicycling and walking, such as Non-motorized Transportation Pilot Program, Safe Routes to School (AB57, but this program originated in Fairfax), and the Fairfax Bike Spine (GP C-5.2.3)
- Expand bicycle access to buses by providing bike parking at bus stops. (GP C-5.6.3)
- Work with Marin County Bicycle Coalition (MCBC) to promote safe bicycling for everyday transportation and recreation in Fairfax. (GP C-6.3.4)

- Support and promote public transit.
  - Work with neighboring jurisdictions, local and regional transit providers (i.e., Marin Transit, Golden Gate Transit), and the Transportation Authority of Marin (TAM) to increase both the frequency and types of transit services available to Fairfax residents, employees and visitors. (GP C-1.1.1, C-1.7.1, C-1.8.1, CON-2.1.1.3)
- Support and promote ridesharing and car sharing programs.
  - Encourage the creation of a system to facilitate informal carpools for Fairfax commuters. (GP C-6.3.6)
  - Educate community members about ridesharing programs, such as SchoolPool Marin and 511 Rideshare. (GP C-6.3.4)
  - Work with private or governmental groups as appropriate to develop a community car sharing program, when determined to be feasible. (GP C-6.3.6)
  - Consider participating in a Bike Sharing program as part of a larger network of bike sharing stations in Marin County.[17]
  - Educate residents and employees about the health and environmental benefits of walking, cycling, taking public transit and ridesharing, and provide information to assist in these modes of travel (e.g., information available in public places and employment centers regarding bus schedules, pedestrian pathways, bikeways and ridesharing programs). (GP C-6.3.4)
  - Support and promote locally grown products and stores, such as shopping at farmers markets and participating in "Buy Local" campaigns (i.e., Fairbuck).

---

[17] Marin County Bicycle Share Feasibility Study, Transportation Authority of Marin. http://www.marinbike.org/FINAL%20Bike%20Share%20Feasibility%20Study.pdf, accessed September 4, 2013

- Educate and encourage residents about the environmental benefits of travelling by foot and bike through events such as Bike to Work Day, International Walk and Bike to School Days, and Streets For People. (GP C-6.3.4)

- Encourage the use of fuel-efficient and low GHG-emitting vehicles and driver behaviors.
  - Encourage private development to provide parking and charging stations for hybrid, electric, and carpool vehicles. (GP C-7.1.2)
  - Adopt and implement a policy requiring limitations on idling for commercial vehicles, construction vehicles, buses and other similar vehicles beyond state law, where feasible.
  - Develop a managed parking program that "right-prices" parking spaces and reduces unnecessary driving. (GP C-6.2.1)
- Purchase or lease low or zero-emissions vehicles and the most fuel efficient models possible for the Town fleet, including police patrol cars and construction vehicles. (GP C-7.1.1)
- Provide Town employees with incentives to use alternatives to single occupant auto commuting, such as transit incentives, bicycle facilities, ridesharing services and subsidies, flexible schedules and telecommuting when practical. (GP C-6.3.5, C-6.3.9)
- Increase ownership of plug-in electric vehicles (EV) by providing EV charging station infrastructure, either meter or free to users, in the Town Center area and requiring property owners and developers to install EV charging stations in all new development and substantial improvement projects. (GP C-7.1.2, CON-1.2.2.1, CON-1.2.2.2)
- Provide the public with a GHG-Meter showing whatever among this progress is measurable in a meaningful way. This could include, if possible, counts of motor vehicles entering town through the major streets; counts of electric vehicles registered to Fairfax addresses, or counts of ride-shares arranged through exchanges. (GP CON-1.1.2, CON-1.3.1.1)
- Identify national and local programs (Bay Area Air Quality Management District' "Spare the Air" days and Ozone Strategy, Marin County's Greenhouse Gas Reduction Plan, Cities for Climate Protection Campaign, California Air Resources Board) supporting conservation, renewable resources and GHG reduction, and participate as appropriate. (GP C-6.3.7, CON-1.1.4.2, CON-1.1.4.3, CON-1.1.4.5, CON-2.3.1.1, CON-2.3.1.3)

Table 11. Section 3.3 Community Mitigation Measures

Measure		GHG Reductions (metric tons)
3.3.C1	Encourage Workforce Housing and Transit-oriented Development	11
3.3.C2	Increase Walking and Biking for Local Trips	434
3.3.C3	Increase Public Transit Use	444
3.3.C4	Increase Ridesharing	160
3.3.C5	Accelerate Adoption of Electric Vehicles	376
	TOTAL	1,426
	% Reduced from 2005 Levels	**3.9%**

Table 12. Section 3.3 Government Operations Mitigation Measures

Measure		Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.3.G1	Replace Town Vehicles with Hybrid or Electric Vehicles	As replaced	$1,323	4.5
3.3.G2	Encourage Town Employees to Commute by Alternative Means of Transportation	Variable	n/a	12.6
3.3.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	$3,825	9.6
	TOTAL			26.7
	% Reduced from 2005 Levels			**8.0%**

3.4 GREEN BUILDING, ENERGY EFFICIENCY AND RENEWABLE ENERGY

The two fundamental means for reducing emissions from electricity and natural gas use are decreasing consumption through both efficiency and behavioral change, and switching from fossil fuels to renewable sources. According to the U.S. Department of Energy, buildings account for approximately 39% of total energy use, over 12% of the total water consumption, 68% of total electricity consumption, and 38% of all carbon dioxide emissions annually in the United States.

Increasing the efficiency of buildings is the most cost-effective approach for reducing greenhouse gas emissions. Programs that require minimum energy efficiency upgrade for home remodeling, such as increasing insulation and sealing heating ducts, have demonstrated energy savings of up to 20%. More aggressive "whole house" retrofits can result in even greater energy savings. Many improvements are "low-hanging fruit" that can be made inexpensively and without remodeling, yet be extremely cost-efficient; these include use of efficient solid-state lighting, and use of advanced shower heads and irrigation controllers.

New construction techniques and building materials, known collectively as "green building," can significantly reduce the use of resources and energy and creation of waste in our homes and commercial buildings. Green construction methods can be integrated into buildings at any stage, from design and construction to renovation and deconstruction. The Town may also adopt energy efficiency standards for new construction and remodels that exceed existing State mandates.

A large part of the environmental footprint of building projects occurs in the disposal of waste; refer to the Waste Reduction section of this document for information on this.

It is important to note that the Town purchases Marin Clean Energy 100% renewable Deep Green electricity for all Town facilities, including streetlights, at a cost of approximately per year over the Light Green option. This action currently results in an estimated greenhouse gas reduction of 27.4 metric tons, and reduces Town emissions by % below 2005 emissions levels.[18]

Recommended Actions

- Implement the green building ordinance, requiring state-of-the-art, energy-efficient construction techniques for all new and remodel construction. Consider adopting Marin Green BERST recommendations for energy efficiency requirements, which are scaled to the project size and valuation. (GP CON-1.1.3.1, CON-2.1.3.1, CON-2.2.1.1, CON-7.1.2.2)
- Develop a town-wide green building promotional campaign. Educate Town staff and policy makers about best practices; provide checklists and specification guidelines for contractors; post green building information and resources on the Town's website. (GP CON-1.1.3.2)
- Consider incentives to development projects that exceed adopted green building standards.
- Publish information on the Town website on how to obtain an energy audit and energy reducing strategies for homeowners and businesses. (GP CON-1.1.3.2, CON-1.3.1.2)
- Continue to provide incentives to homeowners and business owners who install energy efficiency upgrades (e.g. waiving permit fees).
- Adopt an ordinance to require the Town to inform property owners of recommended energy upgrades at time of property sale or substantial remodel, such as weather stripping doors and windows and stopping air leaks (FCAC).
- Support efforts of PG&E and the MEA to maximize residential and business subscription rates for energy efficiency programs and to promote conservation and renewable energy use. (GP CON_1.1.4.1)
- Support efforts of MCE to increase the renewable content of the electricity provided to Fairfax residents and businesses. (GP CON-1.1.4.1)
- If available, participate in a countywide or regional Property Assessed Clean Energy program to assist homeowners in funding installation of energy efficiency upgrades and renewable energy systems.
- Adopt policies and incentives to encourage residents and businesses to install solar and renewable energy systems, including solar panels to generate electricity and solar water heating systems, and to construct solar ready buildings.
- Complete energy efficiency upgrades to Town facilities as recommended by the Marin Energy Management Team. (GP CON-1.2.1.1, CON-1.2.1.2, CON-6.1.2.3)
- Continue to replace street lights and parking lot lights with energy-efficient technologies, such as LED lighting.
- Encourage local businesses to use LED lighting in their retail outlets, and offer ways for those businesses to show customers that these lights are in use, e.g. a window decal.
- Design new and remodeled public facilities to meet Leadership in Energy and Environmental Design (LEED) Silver requirements, or its equivalent, and, at a minimum, to not require any additional energy use over existing facilities. (GP-CON-1.2.1.2)

---

[18] This number exceeds the emissions reported for Action Alternative 3.3.G5 in Table 10 because the table calculations assume all actions, including streetlight retrofits and building energy efficiency upgrades, are implemented.

- Continue to maintain the solar electric generation atop the Pavilion, and consider other venues. (GP CON-1.2.1.1)
- Continue to purchase Marin Clean Energy Deep Green 100% renewable electricity for all Town operations.
- Promote the adaptive reuse of historic buildings in the downtown which would allow for the preservation of buildings and structures important to the character, setting, and feeling of Fairfax. (CON-8.2.1.3)
- Provide the public with a GHG-Meter showing whatever among this progress is measurable in a meaningful way. This could include the per-home or per-capita electricity consumption in Fairfax; the per-home or per-capita natural gas consumption; and the per-home or per-capita water consumption. (GP CON-1.3.1.1)

Table 13. Section 3.4 Community Mitigation Measures

Measure		GHG Reductions (metric tons)
3.4.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	557
3.4.C2	Improve Energy Efficiency in 20% Existing Commercial Buildings	115
3.4.C3	Reduce Energy Use in New Residential Buildings	58
3.4.C4	Reduce Energy Use in New Commercial Buildings	21
3.4.C5	Install Solar Energy Systems in 20% of Existing Residential Buildings	729
3.4.C6	Install Solar Energy Systems in 15% of Existing Commercial Buildings	192
3.4.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	413
3.4.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	2,601
	TOTAL	4,685
	% Reduced from 2005 Levels	**12.8%**

Table 14. Section 3.4 Government Operations Mitigation Measures

	Measure	Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.4.G1	Install Energy Efficiency Upgrades in Town Buildings	$37,534	$17,320	28.8
3.4.G2	Install Solar Energy System at Pavilion	Completed	$7,388	9.7

3.4.G3	Upgrade Street Lighting to Energy-efficient Technologies (LED)	$301,679	$13,767	25.2
3.4.G4	Upgrade Traffic Signals to Energy-efficient Technologies (LED)	$4,620	$106	0.2
3.4.G5	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities	$566 per year	n/a	12.6
	TOTAL			76.5
	% Reduced from 2005 Levels			**34.7%**

3.5 GREEN PURCHASING

By adopting environmentally preferable purchasing standards and policies, Fairfax can measurably reduce its GHG emissions, while benefiting from reduced toxic exposures, pollution prevention, and, in many instances, reduced operating costs. Often, purchases that are environmentally preferable are also fiscally preferable. These include energy star certified appliances, high-efficiency lighting and heating ventilation and air conditioning (HVAC) units, duplexing printers, and more.

Many durable manufactured goods – from computers to motor vehicles — embody much of the energy used (and carbon emitted) over their life span in their initial production. Optimizing purchasing schedules according to ongoing needs assessment, rather than a fixed replacement schedule, can lower the environmental burden and cost.

Recommended Actions

- Prioritize purchases of products and services with superior environmental performance and purchase Energy Star-rated office equipment and appliances.
- Implement operational policies to reduce energy use and conserve resources, such as setting the printer's default option to duplex printing. Shut off computer monitors and imaging equipment at night.
- Engage Town staff in support and implementation of green purchasing goals and processes, such as by providing an easy reference binder for finding "green" products and distributors.
- Continue to purchase office paper with high recycled content. (GP CON-7.2.1.2)
- Work with Town businesses to provide plans and programs for non-toxic solutions for cleaning products, solvents, insecticides, herbicides. (GP CON-4.2.3.1, CON-4.2.3.2, CON-4.2.3.4)

Table 15. Section 3.5 Government Operations Mitigation Measures

	Measure	Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.5.G1	Upgrade to Energy Star-Rated Office Equipment	At time of replacement	$1,235	1.6
3.5.G2	Purchase 30% Recycled Paper	$2,410/year	n/a	2.4
	TOTAL			4.0
	% Reduced from 2005 Levels			**1.2%**

3.6 Waste Reduction, Recycling and Zero Waste

The reduction of waste, as well as the reuse and recycling of products, is key to reducing impacts on the environment. It is necessary to rethink what has traditionally been regarded as garbage and treat all materials as valued resources instead of items to discard. This requires shifting consumption patterns, more carefully managing purchases, and maximizing the reuse of materials at the end of their useful life.

The Town of Fairfax is a member of the Marin Hazardous and Solid Waste Joint Powers Authority (JPA), which works with private waste haulers and facility operators to implement recycling programs and achieve state-mandated targets for waste diversion rates. Marin County has a high rate of diversion, with a current rate of about 72% (this includes the green waste).

In 2009, the JPA completed a zero-waste feasibility study that concluded that between 75% and 80% of the material that goes to the landfill can be diverted. Currently the JPA is targeting the diversion of food waste and demolished building materials to increase the county's diversion rate. The JPA has embraced an aggressive goal for achieving zero waste based upon realizing 80% diversion of waste from disposal by 2012 and achieving zero waste by 2025. Fairfax passed a resolution in 2007 setting a goal of zero waste by 2020. Plastic bags have been banned from Fairfax stores and restaurants since May 2009, after a referendum was passed by 79 percent of voters.

The JPA supports the collection and processing of green waste and food waste to create electricity from methane gas. The waste is processed in anaerobic digesters for soil amendments and the production of biogas. Biogas is the gas produced by anaerobic digestion of organic matter and consists of 60-80% methane (natural gas), 30-40% carbon dioxide, and other trace gases such as hydrogen sulfide, ammonia and hydrogen. The predominance of methane means it can be used as a fuel source.

The JPA proposes that the member agencies endorse an Extended Producer Responsibility resolution and sign the California Product Stewardship Council pledge to shift California's product waste management system from one focused on government funded and ratepayer financed waste diversion to one that relies on extended producer responsibility (EPR) in order to reduce public costs and drive improvements in product design that promote environmental sustainability.

One successful example of targeting the increased diversion of construction debris is the "roofs to Roads" program begun in 2011. Under this program, roofing shingles are trucked to a plant in Alameda where they are turned into a renewable asphalt base or hot mix additive for paving. Locally, Fairfax Hardware hosts the Away Station, which allows reusable building materials to be donated and then purchased by others.

In late 2011, AB341 was signed into state law. This bill builds on the success of California's landmark 1989 recycling legislation (AB 939), which required each city and county to cut their garbage in half by the year 2000, by now directing CalRecycle to increase statewide diversion to 75% by 2020. More specifically, AB341 seeks to expand recycling to every multi-family dwelling and business. At present, businesses and multifamily dwellings recycle at far lower rates than the rest of the state.

Recommended Actions

- Enact ordinances that reduce the amount of waste created by residences and businesses. (GP CON-7.1.1.1, CON-7.1.1.3, CON-7.1.1.4, CON-7.1.2.1.
- Endorse an Extended Producer Responsibility resolution as proposed by the JPA.
- Provide education about reducing waste and available recycling services. (GP CON-7.1.2.3, CON-7.2.1.1)
- Adopt and implement an ordinance to increase construction and demolition waste diversion for construction, demolition and renovation projects, as proposed in the JPA's model ordinance. (GP CON-7.1.2.2)
- Adopt and implement a multi-family dwelling and business recycling ordinance. (GP CON-7.1.2.1)
- Review and revise the Town's franchise agreement with its waste hauler to ensure waste reduction and diversion rates are maximized. (cf. GP CON-7.1.2.5)
- Promote commercial and residential composting.
    - Partner with Sustainable Fairfax, Master Gardeners and others to provide education and resources to residents on backyard and curbside composting.
    - Continue to work with Marin Sanitary Service (MSS) to promote commercial and residential food waste collection in Fairfax and to create centrally located facilities to compost all green and food waste and process it into biogas.
    - Inform residents about the free community compost pile (soil created from green waste in Zamora) located next to Contratti Field, provided by MSS per the Fairfax contract.
    - Explore creating "community compost centers" in town ROW, easements, near trails, within neighborhoods. (GP CON-7.1.1.3)
    - Continue to implement the Source Reduction and Recycling Element of the California Integrated Waste Management Act. (GP CON-7.1.2.4)
- Provide the public with a GHG-Meter showing whatever among this progress is measurable in a meaningful way. In terms of waste reduction, available metrics could include the tons of waste hauled out of Fairfax from curbside pickup; the tons of waste hauled away in dumpsters; and the portion of waste separated for recycling (distinguishing green waste from other recyclables). (GP CON-1.3.1.1)
- Promote "Take Back Day", at which MSS as per agreement with the Town collects e-waste, provides paper shredding, and collects prescription drugs. (GP CON-7.1.1.4)

- Continue to make available and educate the public about hazardous waste collection. (GP CON-7.1.1.4)
- Work with Sustainable Fairfax to provide waste sorting/diversion stations at local events such as Streets For People, Fairfax Town Picnic and others.
- Team with Sustainable Fairfax to educate business in the use of effective recycling systems.
- Expand and, importantly, maintain the receptacles for sorting recyclables in public buildings and sidewalks. (GP CON-7.1.1.3)

Table 16. Section 3.6 Community Mitigation Measures

Measure		GHG Reductions (metric tons)
3.6.C1	Divert All Food Waste from Landfill	222
3.6.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	233
	TOTAL	455
	% Reduced from 2005 Levels	**1.2%**

Table 17. Section 3.6 Government Operations Mitigation Measures

Measure		Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.6.G1	Reduce Solid Waste Disposal to Landfill by 25%	n/a	n/a	5.0
	% Reduced from 2005 Levels			**1.5%**

3.7 WATER AND WASTEWATER

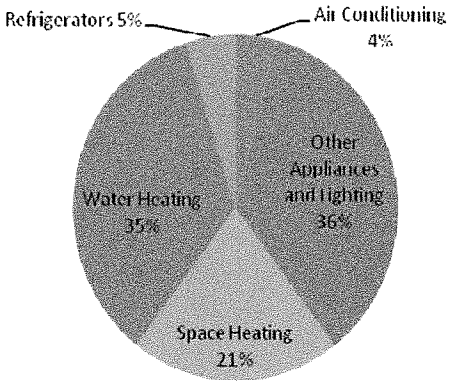
Water demand in California is increasing because of population expansion. In addition, demand for water for irrigation rises with warmer temperatures. The actual impacts of the climate-induced change in water quality, quantity and demand will depend on the changes in water policy and operations, and on the water use patterns of all communities.

The Marin Municipal Water District (MMWD) supplies clean drinking water to a 147 square-mile area of south and central Marin. MMWD's water comes from three main sources: local reservoirs, the Russian River in Sonoma County and recycled water.

Fairfax falls within MMWD's jurisdiction and all properties in Fairfax are subject to the agency's water conservation regulations. The water conservation requirements, particularly irrigation efficiency, are fairly complex, and the Town relies on MMWD to provide technical review and oversight on water conservation and direction in regard to drought-tolerant landscaping. In December 2010, MMWD updated their regulations to comply with CALGreen, the State's new Green Building code. The new CALGreen code requires every new building to reduce indoor and outdoor water use by 20%. MMWD has also adopted water-efficient landscaping requirements that apply to all newly constructed and rehabilitated developer-installed residential landscapes of 1,000 square feet or greater, as well as homeowner residential projects of 2,500 square feet or greater.

In 2007, MMWD adopted a Water Conservation Plan intended to reduce water usage by approximately 9% by 2020. At the end of fiscal year 2009-2010, water usage had fallen 8.7% below 2005 levels. Additional water conservation measures could further reduce greenhouse gas emissions in Fairfax. The most effective way to reduce emissions from water use is by reducing hot water use, as an estimated 35% of energy used in homes is for water heating.

Figure 9. Energy Used in California Homes (2005)



Source: U.S. Energy Information Administration, 2005 Residential Energy Consumption Survey

Recommended Actions

- Establish a town goal of 20 percent reduction in use of potable water by 2015. (GP CON-4.1.1.1)
- Assess, maintain and repair existing plumbing fixtures, pipes, and irrigation systems in all Town buildings and facilities to minimize water use, including landscaping, public rest rooms and parks, and other recreational facilities. As feasible, upgrade and retrofit agency plumbing and irrigation systems with state-of-the-art water conserving technology.
- Promote education on plant species native to northern California and Marin County, and encourage homeowners to use drought-tolerant plants and install rain gardens (Master Gardeners and MMWD).
- Publicize water heater and other household appliances upgrade incentives. (GP CON-4.1.1.2)
- Conduct water audits on remodels and new business and homes.
- Adopt a retrofit program to encourage or require installation of water conservation measures in existing businesses and homes, such as Property Assessed Clean Energy (PACE) program.
- Provide education about water conservation and available outreach programs and incentives (work with Sustainable Fairfax).
- Allow for the use of grey water for irrigation and other suitable uses to decrease the amount of potable water need by the community. (GP CON-4.1.1.4, CON-4.1.1.5)
- Provide the public with a GHG-Meter showing water usage per-capita or per-household in Fairfax. (GP CON-1.3.1.1)

Table 18. Section 3.7 Community Mitigation Measure

Measure		GHG Reductions (metric tons)
3.7.C1	Reduce Hot Water Use in Community by 15%	546
	% Reduced from 2005 Levels	**1.5%**

3.8 PROMOTE EDUCATION AND CITIZEN INVOLVEMENT

Given the strong currents of citizen involvement and volunteerism in Fairfax, as well as the fact that the majority of GHG emissions are related to use of energy and resources by citizens and households, the General Plan, in Objective CON-1.3, points toward education as a primary means to achieve meaningful emissions reductions. The first of the Programs within this section of the Plan is an ambitious one, the creation and ongoing maintenance of a public "GHG-Meter" showing frequently-updated indicators of the Town's overall GHG emissions. Additionally, the Town will actively collaborate with and support other local organizations, such as Resilient Neighborhoods and Sustainable Fairfax, whose missions include reduction of GHG emissions.

The Greenhouse Gas Emissions Meter (GHG Meter)

The purpose of the GHG-Meter would be to raise awareness of multiple activities by which GHG emissions are being produced, with a focus on those that individuals and households can incrementally improve. If successful, the GHG-Meter could promote ongoing discussion and meaningful action to reduce emissions. Other educational programs outlined in the General Plan seek to guide citizens toward specific resources and actions by which they might directly reduce their GHG emissions.

While ambitious, if the GHG-Meter were successful it might serve as a model and inspiration for other communities within Marin to do something similar, possibly leading to a friendly competition and sharing of techniques among towns.

The "GHG-Meter" is taken to refer collectively to what might be several locations/presentations of regularly updated information. For example, there could be a permanent sign erected in one or more locations in town, such as in Peri Park, showing graphs or other presentations and updated monthly. There could also be a web page (on the Town's web site and/or other locations on the web) that showed the same information with greater detail, with links to other educational materials. Access to the information via mobile devices, and a presence within the social media sphere could foster the goal of making GHG emissions the subject of widespread awareness based upon factual, locally-based information.

Table 19. Possible aggregate information to be displayed by the GHG-Meter

Data	Where Obtained	Frequency Updated
Electrical usage	PG&E and/or MCE	Monthly
Natural gas usage	PG&E	Monthly
Water usage	MMWD	Bi-Monthly
Percentage of electrical from renewable sources	PG&E and/or MCE	Monthly
Solar generation installed in Fairfax	PG&E and/or MCE	Annually?

Electric vehicles registered in Fairfax	DMV	Annually?
Waste hauled to landfill	MSS	Bi-Monthly?
Waste hauled for recycling	MSS	Bi-Monthly?
Proxy for Vehicle Miles Travelled	Traffic counters located on key roads into the town	Bi-Monthly?

Arranging for the above information to be obtained on a regular basis is a daunting task, which the General Plan assigns to FCAC and Planning and Building Services. In order to attempt this, FCAC will seek partners, possibly including MCEP, MCE, Sustainable Fairfax, the Marin Community Foundation, CPUC, and others, as well as the organizations from which the data itself must be regularly obtained.

Presentation of these data, as is often the case with information about energy use, must be accessible to citizens despite the considerable level of detail required to accurately describe it. It will be important to collaborate with web designers, graphics designers, and others to effectively communicate with the public. The smoothing of raw data and adjustment by season and according to other factors are considerations that will require expertise beyond that likely available within the town, so this also suggests that collaborations be pursued.

Collaboration with Resilient Neighborhoods

This intriguing local organization[19] organizes small groups of households (about ten typically), called EcoTeams, and facilitates these teams following a process to reduce their carbon footprint. From their website:

> You and your EcoTeam meet 5 times, you calculate your carbon footprints, then choose from a menu of actions that reduce household CO2 emissions by at least 5,000 pounds per household. You'll learn about rebates available now for energy efficient home improvements. Even if you've already "done a lot," you'll discover many new earth-friendly strategies. Once complete, data from teams will be provided to local governments to show that residents are doing their part to help with climate change.

Resilient Neighborhoods has expressed interest in collaborating with the Town to create more EcoTeams in Fairfax. The community-based orientation of this approach resonates well with the GHG Meter and other recommended actions in this plan.

[19] http://resilientneighborhoods.org/

Partnership with Other Local Organizations

Sustainable Fairfax, the other "Sustainables" throughout Marin, and the Zero Waste Committee can contribute greatly to the Town's community and government efforts to reduce greenhouse emissions and to facilitate innovate and action oriented programs some of which are currently ongoing.

Marin County Energy Watch – long-term program funded by PG&E-collected public goods money. Give money to MCEP for community outreach. MCEP working on a "report card" on their web site, to compare annual GHG progress among cities. Using 15% below 2005 as a proxy for 1990, since 1990 data is not complete.

Energy Upgrade California, PG&E contributed to this program by providing energy usage information that can be filtered by neighborhoods, size of houses, age of houses, etc.

3.9 ADAPTATION TO THE EFFECTS OF CLIMATE CHANGE

As the climate changes, so must Fairfax. To effectively address the challenges that a changing climate will bring, the Town must not only reduce its greenhouse gas emissions, but be prepared to respond to the expected impacts of climate change. Many of the mitigation measures incorporated in this CAP will help the community prepare for the effects of climate change. Reducing water use will ease competition for limited water supplies expected from higher temperatures and reduced snowmelt, while reducing electricity use will help ease demand for diminishing hydroelectric power. Other expected effects from climate change – such as a higher frequency of large damaging fires and pest and insect epidemics – must be anticipated through adequate public safety, emergency, and public health responses.

Recommended Actions

- Incorporate the likelihood of climate change impacts into Town emergency planning and training. (GP S-4, esp. S-4.5)
- Partner with neighboring municipalities and regional agencies to develop and implement regional adaptation programs. (GP S-4.1.1.6, S-4.1.1.10, S-4.1.1.11, S-4.1.1.12, S-4.3.2.1 and others)
- Encourage Federal, State and local agencies to be pro-active and supportive of efforts to combat the expected rise in sea levels.
- Coordinate internally and with water districts, wildlife agencies, flood control and fire districts, Marin County, and other relevant organizations. Address human health and the health and adaptability of natural systems, including the following:
    - Water resources including expanded rainwater harvesting, water storage and conservation techniques, water reuse, and water use and/or irrigation efficiency. (GP CON-4.1.1)
    - Biological resources including land acquisition, creation of marshlands/wetlands as a buffer against sea level rise and flooding, and protection of existing natural barriers. (GP CON-4.2.2)
    - Cultural resources including documenting and monitoring the condition of archaeological and historical sites as they are stressed and/or impacted by climate change (i.e., in flood plains). (GP CON-8.2, though not specific regarding flooding or climate change mitigation)
    - Public health including heat-related health plans, vector control, safe water, and improved sanitation.
    - Environmental hazards including storm surge barriers and fire protection. (GP S-2 and S-3)

4.0 PLAN IMPLEMENTATION

Fairfax recognizes that responding to and preparing for climate change is a critical step toward a sustainable future. The Town's early actions to reduce its contribution to climate change reflect the Town's history and commitment to decrease the impacts of day-to-day activities on the natural environment while enhancing its vibrant quality of life. Mitigating climate change will require everyone – residents, businesses, government agencies and nonprofit organizations – to work together to implement this plan.

This plan provides a strategy to achieve emission reductions that will achieve the Town's target of 20% below 2005 emissions by the year 2020. A wide range of programs that exceed the Town's reduction goal have been included to allow for the evaluation and prioritization of potential programs and capital improvement projects as new program and funding opportunities arise. Successful implementation of the plan will require staff and the Town Council to identify and commit resources to climate change mitigation activities, and to monitor and report on progress towards meeting emissions reduction goals.

4.1 STRATEGY FOR IMPLEMENTATION

- The General Plan calls in program CON-1.1.1.1 for formation of a Fairfax Climate Action Committee (FCAC). The FCAC is listed in the General Plan as being responsible for certain programs. Therefore the FCAC needs to become a functional committee, with members prepared to focus specifically on the implementation of the CAP. Some programs within the CAP will be the primary responsibility of FCAC, whereas for others (e.g. promotion of bicycling), FCAC will only monitor their progress and attempt to translate that progress into GHG-reduction terms.

- GPIC will monitor and report on the FCAC's progress, as it does with other Town committees responsible for portions of the General Plan implementation.

- The Town will continue to update the baseline Greenhouse Gas Emissions Inventory every five years.

- FCAC will review and update the Climate Action Plan to reflect the results of GHG inventories, to comply with state regulations and to incorporate other new information.

- Continue and expand public and private partnerships that support implementation of the CAP, including membership in the MCEP. Partnerships with MCEP, MCE, CPUC, PG&E, MMWD, Marin Sanitary and others will be essential for obtaining the data needed for implementation of the GHG-Meter.

- Identify funding sources for recommended actions, and pursue local, regional, state and federal grants as appropriate.

APPENDIX A

Data References

All 2005 greenhouse gas emissions data for community and government operations are from the Town of Fairfax 2005 Greenhouse Gas Emissions Inventory, with emission factors as follows:

Emission Source	GHG	Emission Factor	Emission Factor Source
PG&E Electricity	CO_2	0.489155 lbs/kWh	The certified CO2 emission factor for delivered electricity is publicly available at http://www.climateregistry.org/CarrotDocs/19/2005/2005_PUP_Report_V2_Rev1_PGE_rev2_Dec_1.xls
	CO_2e	0.492859 lbs/kWh	PG&E
Default Direct Access Electricity	CO_2	343.3 short tons/GWh	ICLEI/Tellus Institute (2005 Region 13 - Western Systems Coordinating Council/CNV Average Grid Electricity Coefficients)
	CH_4	0.035 short tons/GWh	
	N_2O	0.027 short tons/GWh	
Natural Gas	CO_2	53.05 kg/MMBtu	PG&E/CCAR. Emission factors are derived from: California Energy Commission, Inventory of California Greenhouse Gas Emissions and Sinks: 1990-1999 (November 2002); and Energy Information Administration, Emissions of Greenhouse Gases in the United States 2000 (2001), Table B1, page 140.
	CH_4	0.0059 kg/MMBtu	CCAR. Emission factors are derived from: U.S. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2000" (2002), Table C-2, page C-2. EPA obtained original emission factors from the Intergovernmental Panel on Climate Change, Revised IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual (1996), Tables 1-15 through 1-19, pages 1.53-1.57.
	N_2O	0.001 kg/MMbtu	

Avoided emissions are calculated using 2005 emission factors for comparative purposes.

Population and household estimates and projections are from the Association of Bay Area Governments, "Projections and Priorities 2009: Building Momentum," August 2009.

3.2 Natural Systems, Sequestration and Carbon Offsets

Measure 3.2.C1: Increase Trees and Vegetation for a Net Gain of 50 Trees

Number of trees	50
Average sequestration per tree	83.52 pounds
Total CO2 sequestered	1.9 metric tons

Data Source Notes and Assumptions: Average is based on tree species and diameters as listed on the County of Marin's "Trees Native to Marin County." Ordinance #3342, Attachment 1, . Sequestration data from National Tree Benefit Calculator, www.treebenefits.com.

Measure 3.2.C2: Offset Emissions for Natural Gas Use

Projected residential natural gas usage, year 2020	1,825,539 therms
5% natural gas usage reduced through offsets	91,277 therms
GHG emissions offset	482 metric tons

Data Source Notes and Assumptions: Assumes participation in PG&E's ClimateSmart program at 2009 costs of $0.06528 per therm. PG&E's ClimateSmart program allows customers to balance out the greenhouse gas emissions associated with their own natural gas and electricity use. Under the program, customers who participate are charged an extra $0.06528 per therm of natural gas, which is the volumetric rate set by the California Public Utilities Commission to make the GHG emissions associated with their home or business energy use "carbon neutral." The revenues from the program are used solely to invest in new GHG emission reduction projects in California, including forestry, dairy, and landfill methane capture that reduce or absorb GHGs such as carbon dioxide and methane. All of the GHG emission reduction projects are selected through a competitive solicitation with clear and stringent criteria and are independently verified under the rigorous protocols developed by the Climate Action Reserve (CAR), the successor organization to the California Climate Action Registry, to ensure the projects meet the commitment to make participating customers carbon neutral.

Measure 3.2.G1: Increase Trees and Vegetation for a Net Gain of 100 Trees

Number of trees	50
Average sequestration per tree	83.52 pounds
Total CO2 sequestered	1.9 metric tons

Data Source Notes and Assumptions: Average is based on tree species and diameters as listed on the County of Marin's "Trees Native to Marin County." Ordinance #3342, Attachment 1, . Sequestration data from National Tree Benefit Calculator, www.treebenefits.com.

Measure 3.2.G2: Offset Emissions from Residential Natural Gas Use

Projected natural gas usage, year 2020	4,215 therms
Natural gas usage reduced through other measures	1,240 therms

Remaining natural gas usage to be offset	2,975 therms
Annual cost to offset natural gas	$194
GHG emissions to be offset	16 metric tons

Data Source Notes and Assumptions: Assumes participation in PG&E's ClimateSmart program at 2009 costs of $0.06528 per therm. PG&E's ClimateSmart program allows customers to balance out the greenhouse gas emissions associated with their own natural gas and electricity use. Under the program, customers who participate are charged an extra $0.06528 per therm of natural gas, which is the volumetric rate set by the California Public Utilities Commission to make the GHG emissions associated with their home or business energy use "carbon neutral." The revenues from the program are used solely to invest in new GHG emission reduction projects in California, including forestry, dairy, and landfill methane capture that reduce or absorb GHGs such as carbon dioxide and methane. All of the GHG emission reduction projects are selected through a competitive solicitation with clear and stringent criteria and are independently verified under the rigorous protocols developed by the Climate Action Reserve (CAR), the successor organization to the California Climate Action Registry, to ensure the projects meet the commitment to make participating customers carbon neutral.

Measure 3.2.G3: Offset Emissions from Town Vehicles

Projected Town vehicle emissions in 2020	92 metric tons
Emissions offset through other measures	14 metric tons
Remaining GHG emissions to offset	77 metric tons
Annual cost to offset vehicle emissions	$1,015

Data Source Notes and Assumptions: Assumes participation in TerraPass program at 2010 cost of $5.95 per 1,000 lbs. TerraPass is a private company that sells carbon offsets to balance vehicle emissions. TerraPass funds three different types of carbon reduction projects: clean energy produced by wind power; landfill gas capture, and methane reduction projects at farms. TerraPass offsets are verified annually against broadly accepted standards by independent third party verifiers. Their primary standards are the latest version of the Voluntary Carbon Standard (issued in 2008) and the Climate Action Reserve.

3.3 Land Use and Transportation

Measure 3.3.C1: Encourage Workforce Housing and Transit-oriented Development

Number of new housing units projected, 2005-2020	30
Number of new TOD housing units projected, 2005-2020	20
Vehicle miles traveled (VMT) on local roads, projected 2020	38,652,670 VMT
Number of households, projected 2020	3,340
Local annual VMT per household, projected 2020	11,573
10% reduction in local VMT for transit-oriented units	23,145 VMT
Estimated reduction in GHG emissions	11 metric tons

Data Source Notes and Assumptions: Household projections from the Association of Bay Area Governments, "Projections and Priorities 2009: Building Momentum," August 2009. Number of new transit-oriented housing units provided by Town of Fairfax Planning Department. Local roads Vehicle Miles Traveled (VMT) 2005 Data: Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC), as reported in the Town of Fairfax 2005 Greenhouse Gas Inventory. Projected VMT based on Travel Forecasts Data Summary: Transportation 2035 Plan for the San Francisco Bay, Metropolitan Transportation Commission, December 2008. Transportation greenhouse gas emissions are based on emission factors as reported in the Town of Fairfax 2005 Greenhouse Gas Inventory as follows:

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

Area	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	0.03	0.07	0.05	95.50%	4.50%	8,628	9,957	89.20%	10.80%	18.1	7
BAAQMD Average	463	1,389	0.063	0.03	0.07	0.05	94.90%	5.10%	8,607	10,091	87.80%	12.20%	18.6	7.3

Measure 3.3.C2: Increase Walking and Biking for Local Trips

Average daily walking and bicycling for utilitarian purposes per adult in Marin	0.67 miles
Estimated annual walking and biking miles traveled in Fairfax 2005	1,785,215 miles

Increase walking and biking miles traveled by 50% by 2020	892,608 miles
Estimated reduction in GHG emissions	434 metric tons

Data Source Notes and Assumptions: Average daily walking and bicycling data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Non-motorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007. According to this survey data, 11.8% of utilitarian trips in 2007 were made by walking and 1.8% by bicycle, for a total mode share of 13.6%. Estimated annual walking and biking miles in Fairfax assumes same mileage for children, which were not surveyed due to privacy concerns.

Measure 3.3.C3: Increase Public Transit Use

Average daily transit miles per adult in Marin	1.37 miles
Estimated transit miles traveled in Fairfax 2005	3,650,365 miles
Increase transit miles traveled by 25% by 2020	912,591 miles
Estimated reduction in GHG emissions	444 metric tons

Data Source Notes and Assumptions: Average daily transit data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Non-motorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007. According to this survey data, 3.2% of trips in 2007 were made using public transit. Estimated transit miles traveled in Fairfax assumes same mileage for children, which were not surveyed due to privacy concerns.

Measure 3.3.C4: Increase Ridesharing

Projected local vehicle miles traveled in Fairfax, 2020	38,652,670 miles
Ridesharing as a percentage of vehicle miles traveled, 2007	1.7%
Increase ridesharing miles traveled by 50% by 2020	328,548 miles
Estimated reduction in GHG emissions	160 metric tons

Data Source Notes and Assumptions: Rideshare data: Federal Highway Administration, "Interim Report to the U.S. Congress on the Non-motorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007.

Measure 3.3.C5: Accelerate Adoption of Electric Vehicles

Projected transportation GHG emissions from local road VMT, 2020	20,949 metric tons
2% of emissions displaced by electric vehicles	419 metric tons

Electric vehicle VMT, 2020	773,053 VMT
Electric vehicle electricity use	193,263 kWh
Electric vehicle emissions from electricity use	43 metric tons
Estimated reduction in GHG emissions	376 metric tons

Data Source Notes and Assumptions: Assumes electric vehicle energy efficiency of 4 miles per kWh, a generally accepted estimate. The 2011 Nissan Leaf, for example, is advertised to have a range of up to 100 miles on full battery charge of 24 kWh, which equates to approximately 4 miles per kWh. This measure counts transportation emissions reductions Fairfax could achieve by increasing the percentage of EVs in the community fleet 2% over State projections. For a discussion of the electric vehicle market and forecasts, see "Plugged in 2," Deutsche Bank, November 3, 2009, . This report projects U.S. market shares in 2020 of 12% for hybrid electric vehicles, 7% for plug-in hybrid electric vehicles, and 4% for electric vehicles.

Measure 3.3.G1: Replace Town Vehicles with Electric Vehicles

Vehicle	Annual VMT	GHG Emissions	Replacement	New GHG Emissions	kWh Use for EV	Fuel Cost Savings	GHG Reduction
2000 Chevrolet Blazer	5,068	4.29	Electric Vehicle	0.28	1,267	$1,051	4.01
2001 Chevrolet Impala	1,793	0.60	Electric Vehicle	0.10	448	$272	0.50
TOTAL	6,861	4.89		0.38	1,715	$1,323	4.51

Data Source Notes and Assumptions: VMT data extrapolated from Town of Fairfax 2005 Greenhouse Gas Emissions Inventory background data reports. Assumes electric vehicle energy efficiency of 4 miles per kWh. Fuel cost savings assume an average price per gallon for gasoline of $3.50 and a per kWh cost of $0.1708.

Measure 3.3.G2: Town Employees Commute by Alternative Means of Transportation

Employee commute GHG, year 2005	126 metric tons
10% reduction	12.6 metric tons

Measure 3.3.G3: Replace Police Patrol Cars with More Fuel-Efficient Vehicles

Patrol car VMT, year 2005	64,807 miles
Patrol car fuel, year 2005	3,643 gallons
Patrol car GHG emissions, year 2005	32.5 metric tons
Projected fuel reduction, year 2020	1,093 gallons
Projected fuel savings, year 2020	$3,825
Projected GHG emissions reduction, 2020	9.6 metric tons

Data Source Notes and Assumptions: Assumes fuel-efficient patrol cars will be available, such as vehicles currently in development by Carbon Motors. As advertised, these have an ultra low-sulfur, "clean" diesel engine and fuel system that will improve fuel efficiency by up to 40%. The Carbon Motors vehicle will have a combined city/highway fuel economy of 28-30 mpg. This estimate assumes a 30% improvement over 2005 patrol fleet fuel economy. Projected fuel savings assumes an average fuel cost of $3.50 per gallon.

3.4 Green Building, Energy Efficiency and Renewable Energy

Measure 3.4.C1: Improve Energy Efficiency in 20% of Existing Residential Buildings

Number of occupied households in 2005	3,310
Electricity use in residential sector in 2005	18,314,689 kWh
Natural gas use in residential sector in 2005 (therms)	1,800,870
GHG emissions from residential sector in 2005	13,917 metric tons
Expected energy efficiency achieved	20%
Potential energy efficiency upgrade penetration	20%
Number of housing units improved	662
Estimated reduction in electricity use	732,588 kWh
Estimated GHG reduction in electricity use	171 metric tons
Total estimated GHG reduction	557 metric tons

Measure 3.4.C2: Improve Energy Efficiency in 20% Existing Commercial Buildings

GHG emissions from commercial sector in 2005	2,879 metric tons

Electricity use in commercial sector in 2005	6,119,792 kWh
Expected energy efficiency achieved	20%
Potential energy efficiency upgrade penetration	20%
Estimated reduction in electricity use	244,792 kWh
Estimated GHG reduction in electricity use	60 metric tons
Total estimated GHG reduction	115 metric tons

Measure 3.4.C3: Reduce Energy Use in New Residential Construction

Projected number of new homes and substantial remodels, 2005-2020	80
Average residential electricity use per household, 2005	5,533 kWh
Average natural gas use per household	544.1 therms
Reduction in electricity use due to CA 2008 Building Efficiency Standards 2010-2020	44,265 kWh
Reduction in natural gas use due to CA 2008 Building Efficiency Standards 2010-2020	4,353 therms
Reduction in electricity use from Marin Green BERST Standards 2010- 2020	8,853 kWh
Reduction in natural gas use from Marin Green BERST Standards 2010- 2020	4,353 therms
Estimated total reduction in electricity use	53,118 kWh
Estimated GHG reduction	58 metric tons

Data Source Notes and Assumptions: According to the CEC, the 2008 Building Efficiency Standards, which took effect on January 1, 2010, require, on average, a 15% increase in energy efficiency savings compared with the 2005 Building Efficiency Standards: California Energy Commission, 2009 Integrated Energy Policy Report, Final Commission Report, December 2009, CEC -100-2009-003-CMF, p.5.

Marin Green BERST recommends an additional reduction from existing Title 24 Part 6 energy budget requirements for new single family and two-family residential construction as follows: 500-3,999 sq. ft., 15%; 4,000 – 5,499 sq. ft., 20%; 5,500 – 6,999 sq. ft., 30%; over 7,000 sq. ft., net zero energy. The Marin Green BERST recommendation for new multi-family buildings is 15% below Title 24 energy budget requirements. This analysis assumes an average 15% across all residential building types. Every 1% increase over Title 24 requirements is assumed to result in a 0.2% decrease in electricity use and a 1% decrease in natural gas use.

Measure 3.4.C4: Reduce Energy Use in New Commercial Construction

Projected increase in GHG emissions in commercial sector 2005-2020	158
Projected increase in electricity use in commercial sector 2005-2020	336,252 kWh
Projected increase in natural gas use in commercial sector 2005-2020	14,111 therms
Reduction in electricity use due to CA 2008 Building Efficiency Standards 2010-2020	33,625 kWh
Reduction in natural gas use due to CA 2008 Building Efficiency Standards 2010-2020	1,411 therms
Reduction in electricity use from Marin Green BERST Standards 2010- 2020	4,483 kWh
Reduction in natural gas use from Marin Green BERST Standards 2010- 2020	941 therms
Estimated total reduction in electricity use	38,109 kWh
Estimated GHG reduction	21 metric tons

Data Source Notes and Assumptions: According to the CEC, the 2008 Building Efficiency Standards, which took effect on January 1, 2010, require, on average, a 15 percent increase in energy efficiency savings compared with the 2005 Building Efficiency Standards: California Energy Commission, 2009 Integrated Energy Policy Report, Final Commission Report, December 2009, CEC -100-2009-003-CMF, p.5.

Marin Green BERST recommends an additional 15% reduction from existing Title 24 Part 6 energy budget requirements for new commercial construction over 5,000 sq. ft. This analysis assumes an average 10% reduction across all commercial building sizes. Every 1% increase over Title 24 requirements is assumed to result in a 0.2% decrease in electricity use and a 1% decrease in natural gas use.

Measure 3.4.C5: Install Solar Energy Systems in 20% of Existing Residential Buildings

Annual electricity use in residential sector in 2005	18,314,689 kWh
GHG emissions from residential electricity use in 2005	4,286 metric tons
Number of households in 2005	3,310
Average annual residential energy use	5,533 kWh
% potential solar energy of total electricity use	85%
Potential solar system penetration	20%
Potential number of homes	662
Estimated electricity saved	3,113,497 kWh
Estimated GHG reduction	729 metric tons

Data Source Notes and Assumptions: Number of Fairfax households in 2005 is based on estimates provided by the Association of Bay Area Governments (ABAG) *Projections 2009.* As of 2/23/11, Fairfax had approximately 73 small (under 10Kw), installed solar energy systems with a total capacity of 256 kW or approximately 3.5 kW per system, the majority of which are residential systems (Marin Energy Management Team and California Solar Initiative data). This number represents approximately 2.2% of the existing 3,300 housing units in Fairfax. Solar installation in Fairfax has occurred at a greater rate than California (0.4%) and Marin County (1.1%).

Measure 3.4.C6: Install Solar Energy Systems in 15% of Existing Commercial Buildings

Annual electricity use in commercial sector in 2005	6,119,792 kWh
GHG emissions from commercial electricity use in 2005	1,506 metric tons
% potential solar energy of total electricity use	85%
Potential solar system penetration	15%
Estimated electricity saved	780,274 kWh
Estimated GHG reduction	192 metric tons

Data Source Notes and Assumptions: As of 2/23/11, Fairfax had 6 installed commercial solar energy systems with a total capacity of 109 kW (Marin Energy Management Team and California Solar Initiative data).

Measure 3.4.C7: 10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity

Projected electricity use in 2020	25,021,620 kWh
Less direct access electricity	884,245 kWh
Electricity use reduced by other measures	5,865,672 kWh
Electricity use added back for electric vehicles	193,263 kWh
Remaining electricity use	18,464,967 kWh
Projected Deep Green Electricity Use in 2020	10%
Projected Deep Green kWh in 2020	1,846,497 kWh
GHG emissions reductions	413 metric tons

Data Source Notes and Assumptions: Assumes 10% of PG&E ratepayers will purchase deep green, 100% renewable energy in 2020. As of December 2010, Marin Energy Authority had enrolled approximately 4% of its Phase I customer prospects throughout Marin in the deep green option.

Measure 3.4.C8: 70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity

Projected electricity use in 2020	25,021,620 kWh
Less direct access electricity	884,245 kWh
Electricity use reduced by other measures	5,865,672 kWh
Electricity use added back for electric vehicles	193,263 kWh
Remaining electricity use	18,464,967 kWh
Projected Light Green Electricity Use in 2020	70%
Projected Light Green kWh in 2020	12,925,477 kWh
GHG emissions reduction	2,601 metric tons

Data Source Notes and Assumptions: Assumes 70% of PG&E ratepayers will purchase light green energy in 2020, and light green will be 90% greenhouse gas-free by 2020, as per Marin Energy Authority's projections. As of December 2010, Marin Energy Authority had enrolled approximately 76% of its Phase I customer prospects throughout Marin in the light green option.

Measure 3.4.G1: Install Energy Efficiency Upgrades in Town Buildings

Energy-Efficiency Project	Reduction in Annual Electricity Use (kWh)	Reduction in Annual Natural Gas Use (therms)	Estimated Project Cost	Annual Energy Cost Savings	Reduction in GHG emissions (metric tons)
Lighting Retrofit	98,459	0	Completed	$15,458	22.01
Occupancy Sensors	801	0	$645	$126	0.18
Heater	0	310	$20,000	$371	1.65
Cool roof	0	253	$10,139	$304	1.34
Heat Pump- Corp Yard	294	0	$750	$46	0.07
Radiant Heaters	0	677	$6,000	$1,015	3.59
TOTAL	99,554	1,240	$37,534	$17,320	28.84

Data Source Notes and Assumptions: Proposed energy-efficiency projects, estimated project, and estimated energy savings based on Energy Management Study for the Town of Fairfax prepared by the Marin Energy Management Team on June 8, 2006.

Measure 3.4.G2: Install Solar Energy System at Pavilion

Facility	System Size KW AC	Annual kWh Produced	Project Cost	Annual Cost Savings	Reduction in GHG Emissions (metric tons)
Pavilion	25	43,250	completed	$7,388	9.67

Data Source Notes and Assumptions: PV system data as reported in an SPG Solar press release, " Town of Fairfax Leads the Way to Solar," August 20, 2009. Annual electricity cost savings are based on an average of summer and winter rates of .17082 per kWh from PG&E's A-1 Electric Rate Schedule, effective January 1, 2011.

Measure 3.4.G5: Upgrade Street Lighting to Energy-Efficient Technologies: LED Retrofit

Lamp Type	Quantity	Annual Energy Use (kWh)	Annual Cost	GHG Emissions (metric tons)	Potential Replacement Lamp*	Annual Energy Use (kWh)	Annual Cost	GHG Emissions (metric tons)	Replacement Cost	Reduction in Annual Energy Use (kWh)	Reduction in Annual Operating Cost	GHG Emissions Reduction (metric tons)
HPS 70w, 120v	475	165,300	$20,087	36.95	LED 42w	82,650	$10,043	18.48	$263,625	82,650	$10,043	18.48
HPS 70w, 120v	62	21,576	$2,622	4.82	Induc 40w	10,416	$1,266	2.33	EECBG Grant	11,160	$1,356	2.49
HPS 70w, 240v	31	12,648	$1,537	2.83	LED 42w	5,394	$655	1.21	$17,205	7,254	$882	1.62
HPS 100w, 120v	14	6,888	$837	1.54	LED 60w	3,293	$400	0.74	$8,904	3,595	$437	0.80
HPS 150w, 120v	2	1,440	$175	0.32	LED 99w	799	$97	0.18	$1,532	641	$78	0.14
HPS 150w, 120v	2	1,440	$175	0.32	Induc 85w	720	$19	0.16	EECBG Grant	720	$156	0.16
HPS 200w, 120v	11	10,560	$1,283	2.36	LED 117w	5,293	$643	1.18	$8,811	5,267	$640	1.18
HPS 200w, 240v	2	2,400	$292	0.54	LED 117w	962	$117	0.22	$1,602	1,438	$175	0.32
TOTAL	599	222,252	$27,008	49.69		109,528	$13,241	24.49	$301,679	112,724	$13,767	25.20

Data Source Notes and Assumptions: Potential replacement lamps and estimated installation costs provided by Republic ITS for illustrative purposes only; actual replacement lamps will require further analysis. Fairfax was awarded an Energy Efficiency and Conservation Block Grant in 2010 from the California Energy Commission to replace 64 existing HPS fixtures with induction lamps. Replacement costs assume that all fixtures are 120 volts and all fixtures are cobra heads, since material pricing and wattages vary based on the style of fixture. Operating costs derived from PG&E's LS-2 Electric Schedule for customer-owned street and highway lighting, effective of March 1, 2011.

Measure 3.4.G6: Upgrade Traffic Signals to Energy-Efficient Technologies: LED Retrofit

Signal Type	Quantity	Existing Lamp (watts)	Annual Energy Use (kWh)	Annual Energy Cost	GHG Emissions (metric tons)	Proposed Replacement LED Lamp (watts)	Annual Energy Use (kWh)	Annual Energy Cost	GHG Emissions (metric tons)	Installation Cost	Reduction in Annual Energy Use (kWh)	Annual Energy Cost Savings	Reduction in GHG Emissions (metric tons)
12" Yellow Balls	19	135	468	$64	0.10	12	42	$6	0.01	$1,425	427	$58	0.10
12" Yellow Arrows	9	135	222	$30	0.05	9	15	$2	0.00	$675	207	$28	0.05
16" Pedestrian Signals	14	69	176	$24	0.04	11	28	$4	0.01	$2,520	148	$20	0.03
TOTAL			866	$118	0.19		84	$11	0.02	$4,620	782	$106	0.17

Data Source Notes and Assumptions: Existing and proposed lamp types and estimated installation costs provided by Republic ITS in a traffic signal audit completed in April 2009. Annual energy costs based upon PG&E's TC-1 Schedule for traffic control service, effective March 1, 2011.

Measure 3.4.G7: Purchase Marin Clean Energy Deep Green Electricity for Government Facilities

Projected electricity use in 2020	318,399 kWh
Electricity use reduced by other measures	263,542 kWh
Electricity use added back for electric vehicles	1,715 kWh
Deep Green electricity purchase	56,572 kWh
Annual Deep Green electricity cost	$566
GHG emissions reduction	12.6 metric tons

Data Source Notes and Assumptions: Assumes 2010 deep green electricity cost of $0.01 per kWh.

3.5 Green Purchasing

Measure 3.5.G1: Upgrade to Energy Star-Rated Office Equipment

Equipment	Quantity	Annual Energy Savings (kWh)	Annual Energy Cost Savings	Reduction in GHG Emissions (metric tons)
Monitors	28	2,408	$411	0.54
Computer CPU	22	4,114	$703	0.92
Imaging Equipment	4	710	$121	0.16
TOTAL	70	7,232	$1,235	1.62

Data Source Notes and Assumptions: Estimated energy savings based upon energy savings calculators developed by the U.S. Environmental Protection Agency and U.S. Department of Energy and available at . For estimating purposes, monitors were assumed to not have sleep settings activated and to be turned off at night. Computer CPUs were assumed to not be turned off at night. Annual electricity cost savings are based on an average of summer and winter rates of .17082 per kWh from PG&E's A-1 Electric Rate Schedule, effective January 1, 2011.

Measure 3.5.G2: Switch to 30% Recycled Paper

Paper purchased per year	2,410 reams
Paper weight	12,050 pounds
Paper cost @ $36 per case	$8,676

30% recycled paper cost @ $43 per case	$11,086
Additional cost	$2,410
GHG emissions reduction	5,187 pounds
GHG emissions reduction	2.4 metric tons

Data Source Notes and Assumptions: GHG emissions reduction estimates were made using the Environmental Defense Fund Paper Calculator.

3.6 Waste Reduction, Recycling and Zero Waste

Measure 3.6.C1: Divert All Food Waste from Landfill

Projected waste in 2020	6,522 tons
Projected food waste in 2020	808 tons
GHG emissions reduced	222 metric tons

Data Source Notes and Assumptions:
Estimated food waste based on the CIWMB 2004 Statewide Waste Characterization Study. This state average waste characterization accounts for residential, commercial and self-haul waste. http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097 HYPERLINK "http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097%20" HYPERLINK "http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097%20" HYPERLINK "http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097%20"

CACP	CIWMB	% of Total	Methane Emissions (metric tons / short ton of waste)
Paper Products	All paper types	21	1.940
Food Waste	Food	14.6	1.098
Plant Debris	Leaves and Grass, Prunings and Trimmings, Branches and Stumps, Agricultural Crop Residues, and Manures	6.9	0.622
Wood/Textiles	Textiles, Remainder/Composite Organics, Lumber, and Bulky Items	19.8	0.549

All Other Waste	The other category includes all inorganic material types reported: Glass, Metal, Electronics, Plastics, Non-organic C&D, and Special/Hazardous Waste.	37.7	0.000

The 75% methane recovery factor is derived from the Local Government Operations Protocol, Chapter 9.
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 Fairfax 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

Measure 3.6.C2: Reduce All Other Solid Waste Disposal to Landfills by 25%

Projected waste in 2020	6,522 tons
Food waste diverted	808 tons
Remaining landfilled waste in 2020	5,714 tons
GHG emissions from remaining waste	932 metric tons
25% reduction in remaining waste	233 metric tons

Measure 3.6.G1: Reduce Solid Waste Disposal to Landfill by 25%

Projected waste in 2020	80.6 tons
GHG emissions from waste in 2020	20.0 metric tons
25% reduction in GHG emissions	5.0 metric tons

Data Source Notes and Assumptions: Waste Characterization based on California Integrated Waste Management Board (CIWMB), derived specifically for the "Public Administration" sector, using the Business Waste Characterization portion of the CIWMB 1999 Statewide Waste Characterization Study: http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp

CACP	CIWMB	Percent of Total

Paper Products	All paper types	39.4
Food Waste	Food	9.8
Plant Debris	Leaves and Grass, Prunings and Trimmings, Branches and Stumps, Remainder/Composite Organic	17
Wood/Textiles	Textiles (Under "Other Organic"), Lumber (Under "Construction and Demolition"), Remainder/Composite Construction and Demolition	6.7
All Other Waste	The other category includes all inorganic material types reported: Glass, Metal, Electronics, Plastics, Non-organic C&D, and Special/Hazardous Waste.	27.1

3.7 Water and Wastewater

Measure 3.7.C1: Reduce Water Use in Community by 15%

Per capita water use per day, FY 05/06	139 gallons
Water use in 2005	370,365,500 gallons
Projected water use in 2020	375,439,000 gallons
Indoor, hot water use	75,463,239 gallons
15% reduction in hot water use	11,319,486 gallons
Reduction in natural gas use	64,340 therms
Reduction in electricity use	903,295 kWh
Estimated reduction in GHG emissions	546 metric tons

Data Source Notes and Assumptions: Per capita water use in Marin Municipal Water District FY 2005/2006 was 139 gallons per day, MMWD Report on Water Production and Related Statistics, June 30, 2008, p.12. Indoor water use assumed to be 67% of total water use (Dan Carney, MMWD) and hot water use 30% of indoor water use (EBMUD Indoor Water Conservation Study (p. 31), 2003; see

http://www.ebmud.com/about_ebmud/publications/technical_reports/residential_indoor_wc_study.pdf). Analysis assumes 0.0098 therms to heat one gallon of water, 0.19 kWh to heat one gallon of water, and 58% of hot water heaters use natural gas (ICLEI CAPPA Beta).

3.8 State Actions

Measure 3.8.C1: PG&E Achieves 33% Renewable Portfolio Standard by 2020

Projected community electricity use in 2020	25,021,620 kWh
Less direct access electricity	884,245 kWh
Electricity use reduced from other measures	20,637,645 kWh
Electricity use added back for electric vehicles	193,263 kWh
Remaining electricity usage	3,692,993 kWh
GHG emissions with 2005 PG&E emission factor	826 metric tons
GHG emissions with projected 2020 PG&E emissions factor	432 metric tons
Estimated reduction in GHG emissions	394 metric tons

Data Source Notes and Assumptions: Projected 2020 PG&E CO2e emission factor of 0.25763 is based on PG&E's 2005 electric power mix as follows: 12% from renewable sources; 20% from large hydro; 24% from nuclear; 42% from natural gas; 1% from coal; and 1% from other GHG-emitting sources. Analysis assumes additional 21% renewable energy will displace GHG-emitting sources in the electric power mix. Many variables will affect the actual 2020 emission factor, including the availability of large hydro and nuclear electricity sources, and the GHG reduction potential calculated here assumes conditions will be similar to 2005.

Measure 3.8.C2: AB 1493 Pavley Standards

2020 CA transportation emissions	225.4 MMTCO2e
Expected reduction in emissions under phase one	16.4 MMTCO2e
% reduction	7.28%
Community transportation emissions, projected 2020	20,949 metric tons
GHG emissions reduced by other measures	1,426 metric tons
Remaining GHG emissions	19,524 metric tons
Estimated reduction in GHG emissions	1,421 metric tons

Data Source Notes and Assumptions: California Air Resources Board, "Climate Change Scoping Plan: A Framework for Change," December 2008, p. 13. California Air Resources Board, "Comparison of Greenhouse Gas Reductions for the United States and Canada under U.S. CAFE standards and California Air Resources Board Greenhouse Gas Regulations," Feb. 25, 2008, p. 13, .

Measure 3.8.C3: Low Carbon Fuel Standard

2020 CA transportation emissions	225.4 MMTCO2e
Expected reduction in emissions	15 MMTCO2e
% reduction	6.65%
Community transportation GHG emissions, projected 2020	20,949 metric tons
GHG emissions reduced by other measures	1,426 metric tons
Remaining GHG emissions	19,524 metric tons
Estimated GHG emissions reduction	1,299 metric tons

Data Source Notes and Assumptions: California Air Resources Board, "Climate Change Scoping Plan: A Framework for Change," December 2008, pp. 13 and 17.

Measure 3.8.G2: AB 1493 Pavley Standards

California transportation emissions, year 2020	225.4 MMTCO2e
Expected reduction in emissions under phase one	16.4 MMTCO2e
% reduction	7.28%
Local government transportation emissions, year 2020	217.1 metric tons
GHG emissions reduced by other measures	26.7 metric tons
Remaining GHG emissions	190.4 metric tons
Estimated reduction in GHG emissions	13.9 metric tons

Measure 3.8.G3: Low Carbon Fuel Standard

California transportation emissions, year 2020	225.4 MMTCO2e

Expected reduction in emissions	15 MMTCO2e
% reduction	6.65%
Local government transportation emissions, year 2020	217.1 metric tons
GHG emissions reduced by other measures	26.7 metric tons
Remaining GHG emissions	190.4 metric tons
Estimated reduction in GHG emissions	12.7 metric tons

APPENDIX B

Summary of Recommended Actions

Recommended Community Actions

Measure		GHG Reductions (metric tons)
3.2.C1	Increase Trees and Vegetations for a Net Gain of 100 Trees	2
3.2.C2	Offset Emissions from Residential Natural Gas Use	482
3.3.C1	Encourage Transit-oriented Development and Workforce Housing	11
3.3.C2	Increase Walking and Biking for Local Trips	434
3.3.C3	Increase Public Transit Use	444
3.3.C4	Increase Ridesharing	160
3.3.C5	Accelerate Adoption of Electric Vehicles	376
3.4.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	557
3.4.C2	Improve Energy Efficiency in 20% of Existing Commercial Buildings	115
3.4.C3	Reduce Energy Use in New Residential Buildings	58
3.4.C4	Reduce Energy Use in New Commercial Buildings	21
3.4.C5	Install Solar Energy Systems in 20% of Existing Residential Buildings	729
3.4.C6	Install Solar Energy Systems in 15% of Existing Commercial Buildings	192
3.4.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	413
3.4.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	2,601
3.6.C1	Divert All Food Waste from Landfill	222
3.6.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	233

3.7.C1	Reduce Water Use in Community by 15%	546

Recommended Government Operations Actions

Measure		Cost to Implement	Annual savings	GHG Reductions (metric tons)
3.2.G1	Increase Public Trees and Vegetation for a Net Gain of 100 Trees	$10,000	n/a	1.9
3.2.G2	Offset Emissions from Natural Gas Use	$194 per year	n/a	16.0
3.2.G3	Offset Emissions from Town Vehicles	$1,015 per year	n/a	77.4
3.3.G1	Replace Town Vehicles with Electric Vehicles	As replaced	$3,445	4.5
3.3.G2	Encourage Town Employees to Commute by Alternative Means of Transportation	Variable	n/a	12.6
3.3.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	$3,825	9.6
3.4.G1	Install Energy Efficiency Upgrades in Town Buildings	$37,534	$17,320	28.8
3.4.G2	Install Solar Energy System at Pavilion	Completed	$7,388	9.7
3.4.G3	Upgrade Street Lighting to Energy-efficient Technologies (LED)	$301,679	$13,767	25.2
3.4.G4	Upgrade Traffic Signals to Energy-efficient Technologies (LED)	$4,620	$106	0.2
3.4.G5	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities	$566 per year	n/a	12.6
3.5.G1	Upgrade to Energy Star-Rated Office Equipment	As replaced	$1,235	1.6
3.5.G2	Purchase 30% Recycled Paper	$2,410	n/a	2.4
3.6.G1	Reduce Solid Waste Disposal to Landfill by 25%	n/a	n/a	5.0