

CLIMATE ACTION PLAN

CITY OF BELVEDERE



APRIL 11, 2011

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1. INTRODUCTION

1.1 Purpose of the Climate Action Plan

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

In a community-wide survey conducted as part of the General Plan update, residents of Belvedere were asked their opinion concerning critical issues the City would be facing over the life of the General Plan (2030). Twenty-five percent of respondents placed environmental issues at the top of the list, and over 50% said it was important to encourage sustainable and green building practices and to provide programs to reduce energy consumption and conserve natural resources. This high level of community concern and awareness positions Belvedere to take effective action against climate change and provide a model for environmental stewardship.

The purpose of this Climate Action Plan is to compile existing and potential strategies (i.e., actions, projects, and programs) that the City's government operations and the community can take to address climate change. It provides a brief background on what climate change is and its potential impacts, but focuses on the efforts Belvedere 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 strategies outlined in this plan, such as increasing energy efficiency in buildings, encouraging less dependence on the automobile, and using clean, renewable energy sources, the City and the community can experience lower energy bills, improved air quality, reduced emissions, and an enhanced quality of life. The City's preparation of a 2005 Greenhouse Gas Emissions Inventory and this Climate

Action Plan is the beginning of an ongoing planning process that includes assessing, planning, mitigating and adapting to climate change.

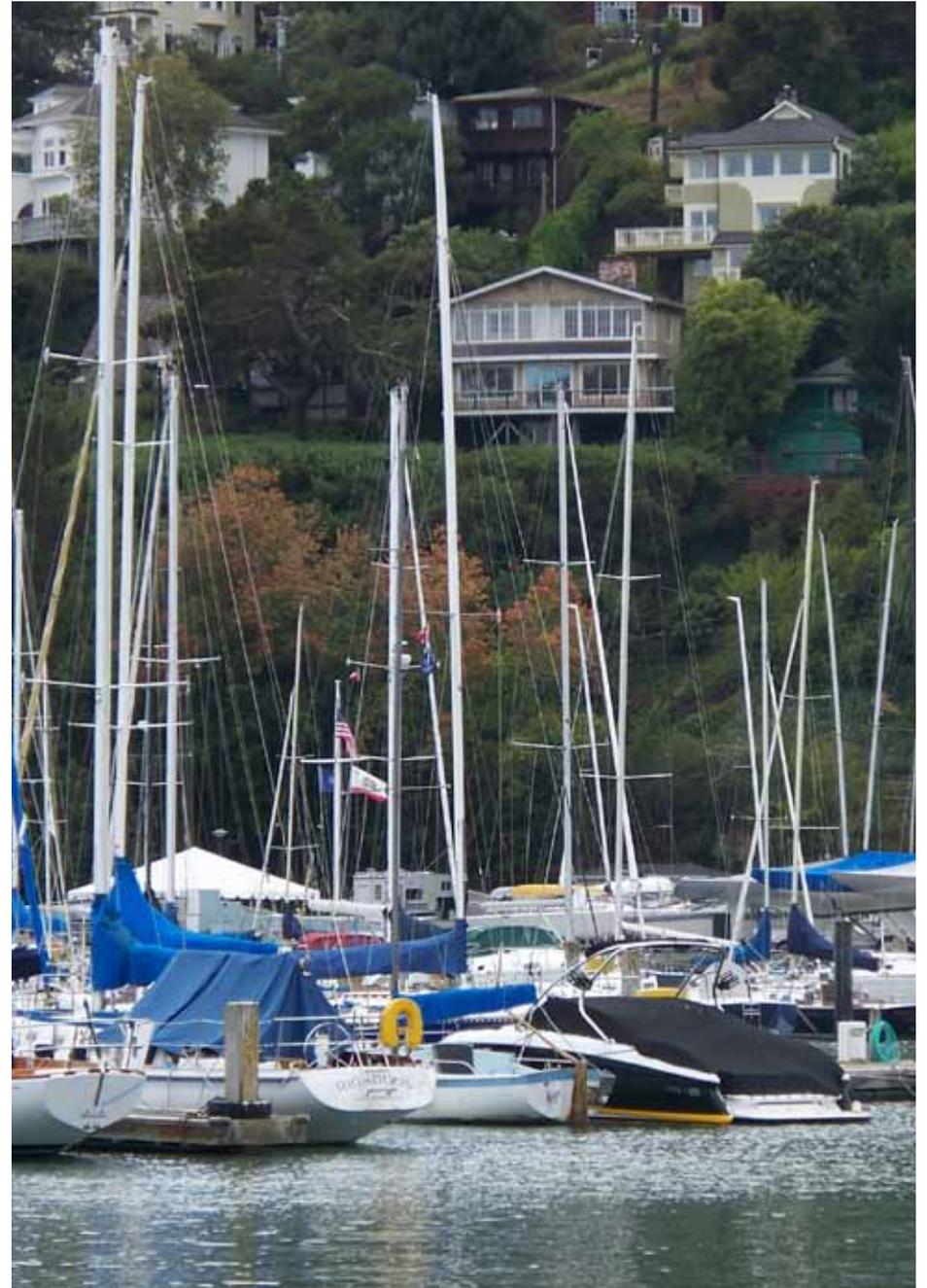
Specifically, this Plan does the following:

- Summarizes the various regulations at the federal, state, and regional levels.
- Incorporates the City of Belvedere 2005 Greenhouse Gas Emission Inventory, which identified sources of greenhouse gas emissions generated by both the community and the City's government operations.
- Estimates how these emissions may change over time and proposes action alternatives to reduce greenhouse gas emissions to 15% below 2005 levels by 2020.
- Provides energy use, transportation, land use, green purchasing, and waste and water use goals necessary to minimize Belvedere's impacts on climate change and meet the established greenhouse gas emissions reduction target.



1.2 Relationship to the General Plan

The Belvedere General Plan 2030 Sustainability Element Policy SUST-4 includes policies to create a Climate Action Plan with measurable goals, and to report progress to the public and responsible officials. The General Plan recommends updating the Climate Action Plan every five years to re-evaluate projections of climate change threats and the appropriateness of adaptation and resiliency strategies. 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. The Climate Action Plan is not included in the General Plan itself, but does integrate the strategies and actions identified in the relevant elements of the General Plan.



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. Significant evidence indicates that human activities are increasing the concentration of these gases (known as "greenhouse gas" 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. 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 GHGs, the term "carbon dioxide equivalent" or CO₂e is used. One metric ton of CO₂e may consist of any combination of GHG, and has the equivalent Global Warming Potential (GWP) as one metric ton of carbon dioxide (CO₂). According to the Environmental Protection Agency's 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, and 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 Belvedere, including changes to local and regional weather patterns, as well as changes to species migration and survival.

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 California¹:

¹ 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 3/22/10.

- Precipitation is the most important hydrologic variable and most difficult to forecast.
- Global climate warming raises the minimum elevation of snow levels, reduces spring snowmelt and increases 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 will adversely affect coastal marshes, wildlife reserves, and community development.
- Higher temperatures increase the demand for water by plants and animal life.
- 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.

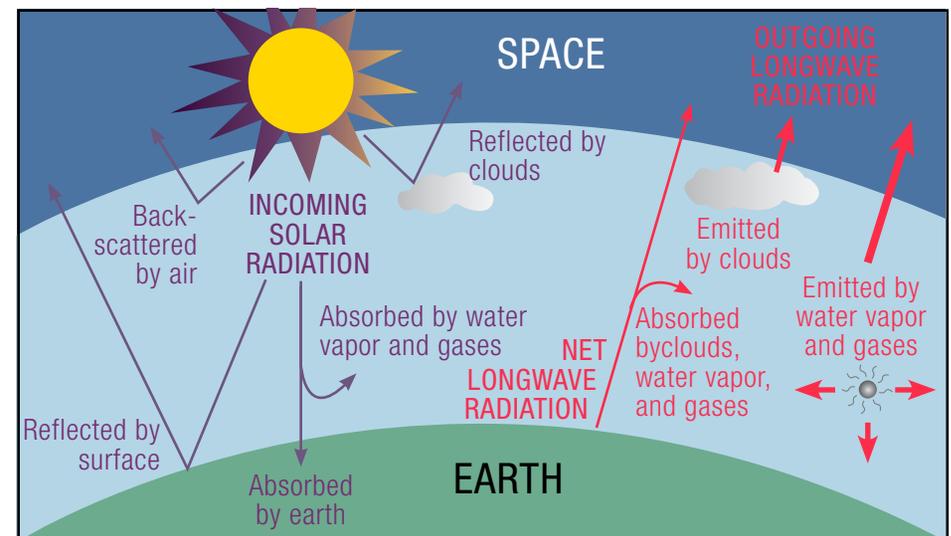


Figure 1: The Greenhouse Effect

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 2100². 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 (see Figure 2) integrate GIS data from the 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. In Belvedere, the Lagoon area is the area most at risk of inundation from a rise in sea level.

² 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 2/11/11.



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.

SOURCE:

http://www.bcdc.ca.gov/planning/climate_change/maps/16/cbay_north.pdf; Inundation data from Knowles, 2008. Aerial imagery is NAIP 2005 data. Accessed 3/30/10.

DISCLAIMER: Inundation data does not account for existing shoreline protection or wave activity. These maps are for informational purposes only.

1.4 Climate Change Mitigation Activities in Belvedere

In December 2007, the Belvedere City Council committed to participate in the Cities for Climate Protection Campaign and pledged to take a leadership role in promoting public awareness about the causes and impacts of climate change. The City also pledged to undertake the program's five milestones to reduce greenhouse gas and air pollution emissions throughout government operations and the community, specifically:

- Conduct a Greenhouse Gas Emissions Inventory and forecast to determine the source and quantity of greenhouse gas emissions in the jurisdiction. The City presented Belvedere's 2005 Greenhouse Gas Emissions Inventory in June 2010 as part of the General Plan 2030. The full report can be found on the City's website.
- Establish a Greenhouse Gas Emissions Reduction Target. In November 2010, the City Council adopted a 15% reduction target.
- Develop a Climate Action Plan with both existing and future actions which when implemented will meet the local greenhouse gas reduction target.
- Implement the Climate Action Plan. The City will be responsible for implementing the policies, goals and action alternatives identified in the Action Plan.
- Monitor and Report Progress. In order for the City to successfully achieve its emissions reduction targets, progress reports will be required to monitor how well the City and the communities are doing in reducing emissions. The Climate Action Plan will be updated and modified, as needed, based on results from the monitoring.

Belvedere is already engaged in several sustainability practices in the community, including:

- Enforcing water conservation requirements through the City's Design Review Ordinance.
- Promoting efficient transportation through the use of Belvedere's hybrid and electricity vehicles and the City's commitment to provide two electric vehicle charging stations at City Hall.
- Supporting waste reduction and recycling efforts in partnership with service providers.
- Promoting energy efficiency in City facilities.
- Adopting a green building ordinance for private development.
- Joining the Marin Energy Authority and choosing Marin Clean Energy electricity from 100% renewable energy sources for all City operations.

The City of Belvedere General Plan 2030 contains a number of policies and actions to reduce greenhouse gas emissions. These appear in the Transportation and Circulation Element and the Sustainability and Resource Conservation Element, and are incorporated into the relevant sections of this Climate Action Plan.

1.5 Regulation of Climate Change – Federal, State and Regional 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.

Absent congressional action, the U.S. Environmental Protection Agency (EPA) 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.³ 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.⁴ These rules go into effect in January 2011.

In April of 2010, the Environmental Protection Agency 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 MPG. The EPA and the Department of Transportation are currently developing first-ever regulations for medium and heavy-duty vehicles.⁵



State Climate Policy

California produces roughly 1.4% of the world’s and 6.2% of the total U.S. greenhouse gases (GHG). The State of California has taken the lead in setting specific targets for reducing greenhouse gas emissions from the burning of fossil fuels in both power plants and vehicles through the following legislation:

California Solar Initiative Program, 2006. Comprehensive \$2.8 billion program that provides incentives toward residential and commercial solar development over 11 years.

3 Final Rule, EPA, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under the Clean Air Act, 74 Fed. Reg. 66495 (Dec. 7, 2009).

4 Final Rule: Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule Fact Sheet, EPA, <http://www.epa.gov/NSR/documents/20100413fs.pdf>.

5 U.S. Environmental Protection Agency, <http://www.epa.gov/oms/climate/regulations.htm#1-1>, accessed 12/9/10

Senate Bill 1078 Sher, 2002. Establishes a Renewable Portfolio Standard requiring electricity providers to increase purchases of renewable energy resources by 1% per year until they have attained a portfolio of 20% renewable resources.

Executive Order S-21-09. An executive order directing the State's Air Resources Board to adopt regulations increasing California's Renewable Portfolio Standard (RPS) to 33% by 2020. The RPS will apply to investor-owned utilities, publicly-owned utilities, direct access providers, and community choice aggregators, including Marin Energy Authority.

Assembly Bill 1493 Pavley, 2002. Requires the California Air Resources Board (CARB) to develop and adopt regulations that achieve the maximum feasible reduction of greenhouse gasses from vehicles primarily used for non-commercial transportation by January 2005. In 2009, CARB adopted final regulations that are expected to reduce GHG emissions from California passenger vehicles by about 22% in 2012 and about 30% in 2016.

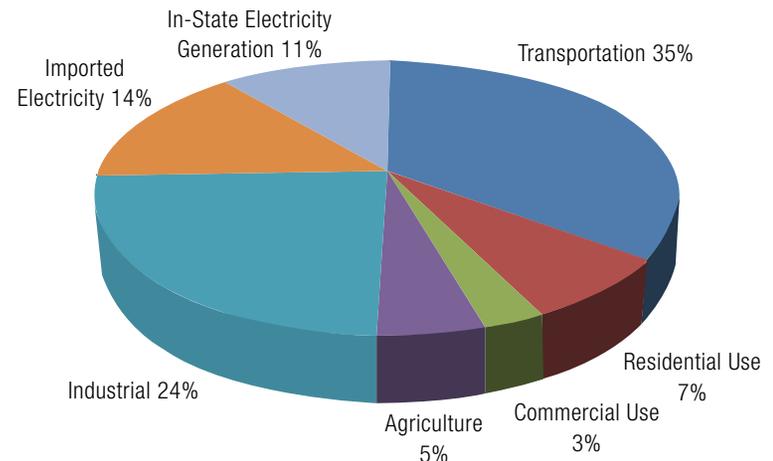
Senate Bill 1771 Sher, 2000. Requires the California Energy Commission (CEC) to prepare an inventory of the State's greenhouse gas emissions, to study data on global climate change, and to provide government agencies and businesses with information on the costs and methods for reducing greenhouse gases. Also establishes the California Climate Action Registry to serve as a certifying agency for companies and local governments to quantify and register their greenhouse gas emissions for possible future trading systems.

Assembly Bill 32 Nuñez & Pavley, 2006. Also known as The Global Warming Solutions Act of 2006, institutes a mandatory limit on greenhouse gas pollution and requires a reduction in emissions in California to 1990 levels by the year 2020. The bill also directs the California Air Resources Board (CARB) to establish a mandatory reporting system to track and monitor emission levels and requires CARB to develop various compliance options and enforcement mechanisms.

Senate Bill 375 Steinberg, 2008. Assigns a greenhouse gas reduction target for car and light truck emission for each region in the State represented by a metropolitan planning organization (MPO) that is to be addressed with a Sustainable Communities Strategy (SCS). Also touches on planning for transportation, housing and the environment and requires Alternative Planning Strategy documents where a SCS will not achieve the GHG reduction targets.

The most significant of these initiatives are AB 32 and SB 375. Assembly Bill 32 requires California to reduce its GHG to 1990 levels by 2020, and Senate Bill 375 begins to tie GHG reductions to land use. In 2007, the California Air Resources Board (CARB) conducted an emissions inventory for the state that identified emissions levels in 1990 of 427 million metric tons of carbon dioxide equivalent (CO₂e). 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%).⁶

Figure 3: California Greenhouse Gas Emissions 2007



⁶ <http://www.arb.ca.gov/newsrel/nr120607.htm>, accessed 1/1/10.

Preliminary estimates indicate that California's 2020 emission projections could be 600 million tons of CO₂e if no actions are taken to reduce GHG. This means that California must prevent 173 million tons of CO₂e from being emitted by 2020 in order to meet the 1990 levels as required by AB 32.

The California Air Resources Board (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 by early 2011.

Key strategies identified in the 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 conservation

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% from current levels by 2020.”⁷ CARB does not yet require cities to adopt climate action plans as part of AB32 implementation efforts. However, the Belvedere General Plan includes policy goals to “reduce greenhouse gas emissions from all activities within the City boundaries to support the State’s efforts and to mitigate the impact of climate change and sea level rise.” (General Plan Goal SUST-4) Environmental documents prepared for the General Plan include mitigation measures to align City GHG reductions with those of the Bay Area Clean Air Plan.

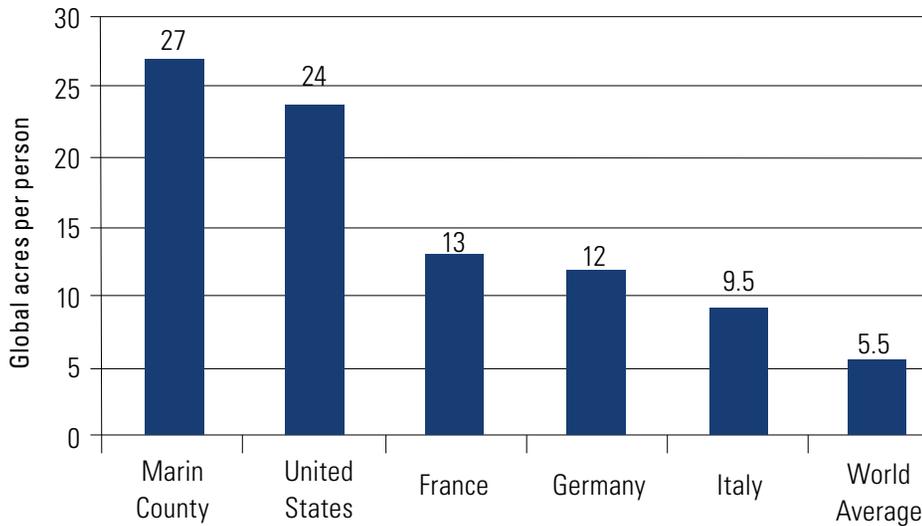
Marin County Climate Policy

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.⁸

⁷ California Air Resource Board, “Climate Change Scoping Plan,” December 2008, p. 27, http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf, accessed 3/31/10.

⁸ Global Footprint Network, http://www.footprintnetwork.org/en/index.php/GFN/page/basics_introduction/.

Figure 4: Ecological Footprint Comparison



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

Marin County was one of the first jurisdictions in the state to develop a climate action plan. In 2006, the County adopted 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 5 and 6 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 Belvedere's emissions between 1990 and 2005, since actual data is unavailable.

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

Figure 5: Marin County Emissions by Sector (2005)

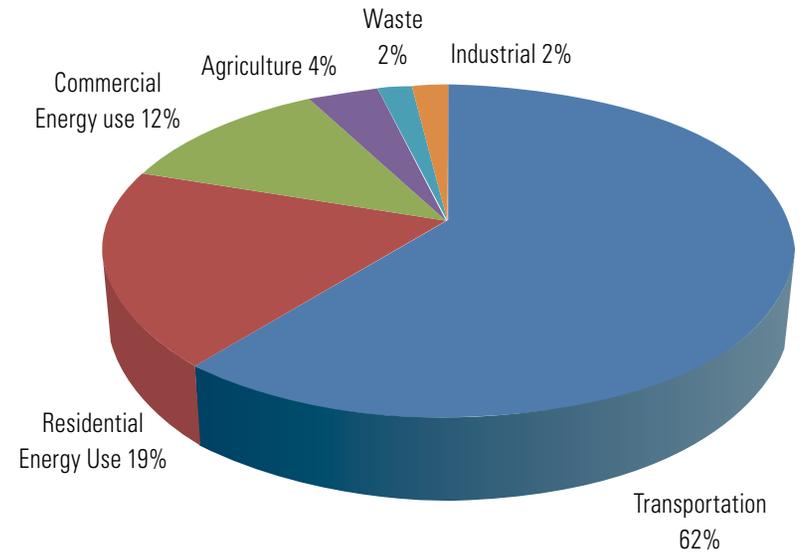
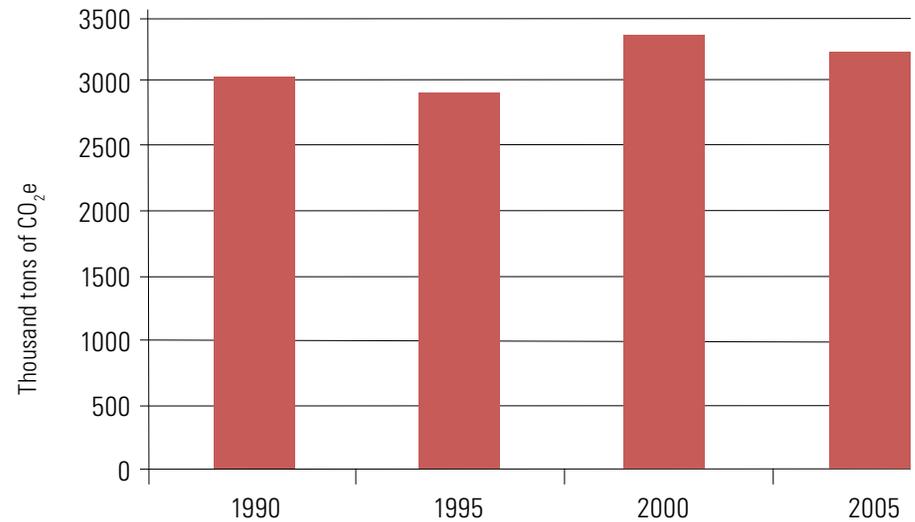


Figure 6: Marin County Emissions 1990-2005



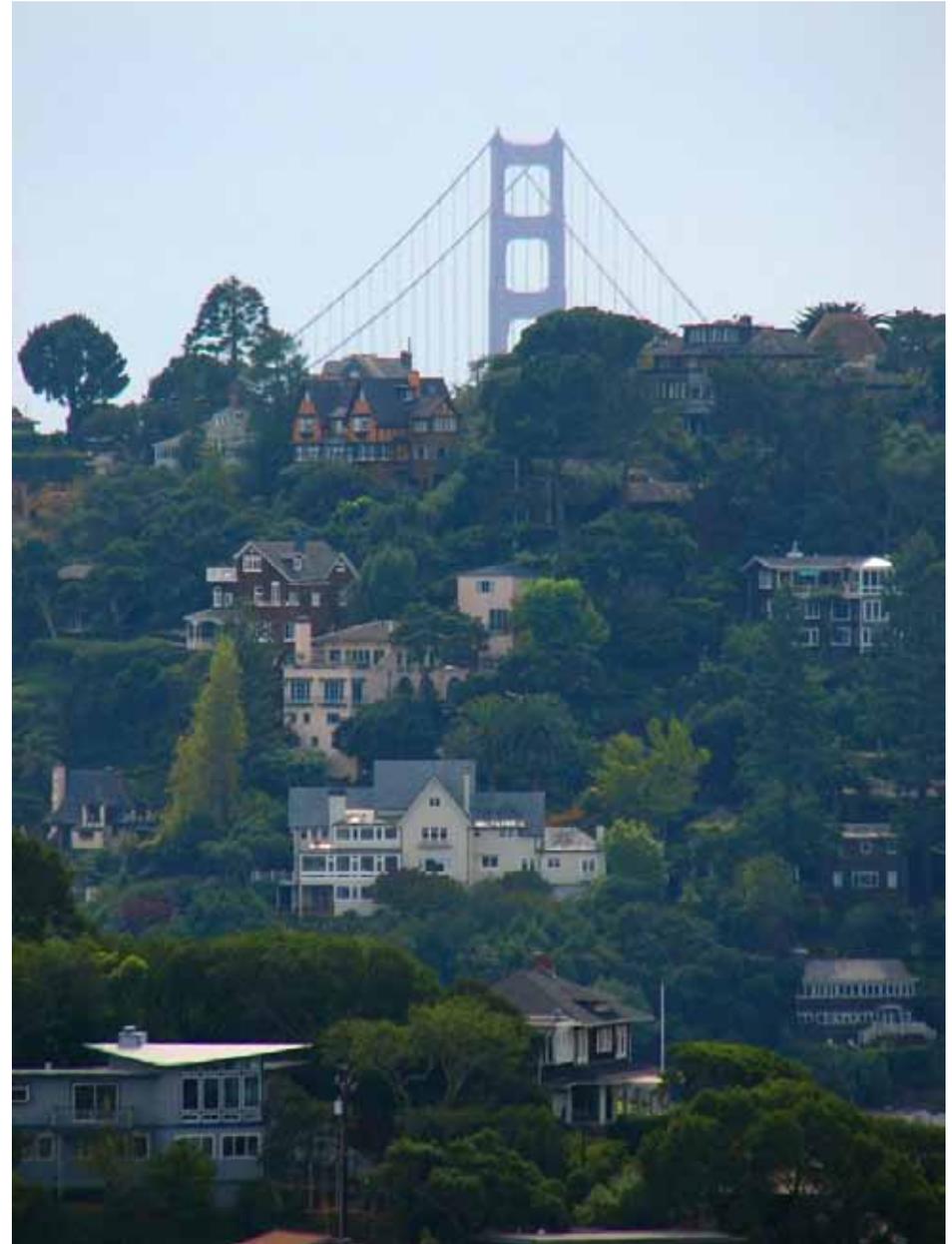
⁹ "Marin County Re-Inventoried of Greenhouse Gas Emissions," Marin County Community Development Agency, September 2007.

Coordinated Multi-Jurisdictional Approach: Marin Climate and Energy Partnership

Created in 2007, the mission of the Marin Climate & Energy Partnership (MCEP) is to reduce greenhouse gas emission levels to the targets of Marin County and local municipalities, consistent with the standards set by AB32. The MCEP Partnership includes all eleven Marin cities and towns, the Marin County Community Development Agency, the Transportation Authority of Marin, and the Marin Municipal Water District. The Marin General Services Authority is the Joint Power Authority with fiscal responsibility for the Partnership.

One of MCEP's first projects was to work with ICLEI – Local Governments for Sustainability, a nonprofit organization, to develop greenhouse gas 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 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 to develop policies and shared programs to support priority measures. The City has worked closely with the Marin Climate and Energy Partnership to complete this climate action plan, and to implement a coordinated approach to local and regional emissions reduction targets and climate action planning goals.



2. BELVEDERE'S GREENHOUSE GAS EMISSIONS

2.1 Belvedere's Profile

Located in Marin County approximately ten miles north of the Golden Gate Bridge, Belvedere is a small city with a land area of .54 square miles and an estimated current population of 2,175.¹⁰ Surrounded by water on nearly all sides, Belvedere has three distinct areas: Belvedere Island, Belvedere Lagoon, and Corinthian Island. Primarily a residential community of single-family homes, Belvedere has a small percentage of land devoted to multi-family development and commercial uses. Residents visit neighboring Tiburon to access many services, including K-8 public schools, the library, shopping, restaurants, public transit, and recreation.

Since Belvedere is located at the end of the Tiburon Peninsula, most automobile travel within the city is done by residents and by those who are providing services to them. Walking is a viable way to get around the community, as the land area is small and there are many pedestrian lanes on Belvedere Island and Corinthian island, as well as paths and sidewalks in the Lagoon area. There are no signed bike routes or stenciled bike lanes within the city, although bicycles are, by law, permitted on all roads. Public transit is very limited within Belvedere, with a single bus stop at the Beach Road and San Rafael Avenue intersection. Ferry service is located in Tiburon and is a popular way for residents to commute to San Francisco.



¹⁰ State of California, Department of Finance, E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2009 and 2010, May 2010.

2.2 2005 Greenhouse Gas Emissions Inventory

The first step toward reducing greenhouse gas emissions is to identify sources of emissions and establish baseline levels. This information can then inform the selection of a reduction target and possible reduction measures to be included in the climate action plan. In 2009, the City prepared a report that inventories greenhouse gas emissions from the Belvedere community and, as a subset of that analysis, local government operations. The report provides a detailed understanding of where the highest emissions are coming from, and, therefore, where the greatest opportunities for emissions reductions lie. The inventory also establishes a baseline emission inventory against which to measure future progress.

The inventory analyzes four primary sectors of community emissions: residential, commercial, transportation, and waste. 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 city of Belvedere. Waste emissions come from the decomposition of waste generated by residents and businesses located in landfills outside the city limits.

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

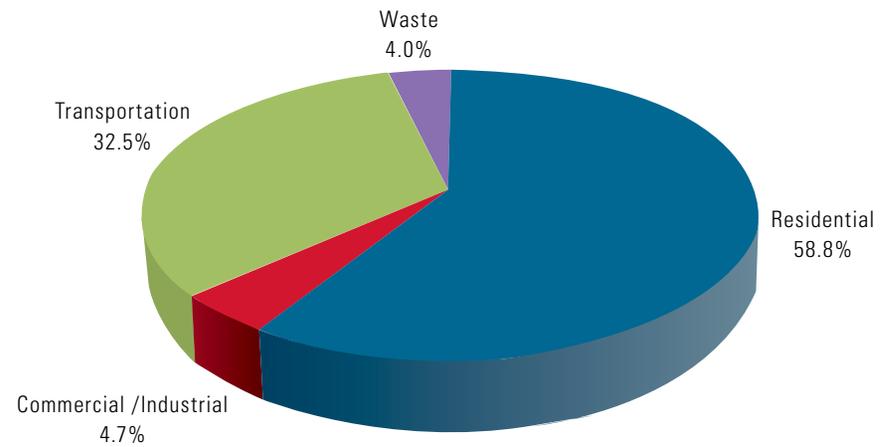
The inventory utilizes 2005 as the baseline year, as this year is increasingly becoming the standard for such inventories. Due to lack of city-specific data, the 1990 baseline year utilized by the State of California is usually too difficult for most local governments

to meet and would not produce the most accurate inventory. According to the Association of Bay Area Governments (ABAG) Projections 2009, Belvedere's population was 2,100 in 2005, and there were approximately 960 households. Included as an indicator of commercial activity, the number of jobs within Belvedere in 2005 was 1,130.

Community Inventory Results

In 2005, the Belvedere community emitted approximately 12,654 metric tons of CO₂e. As shown in Figure 7 below, electricity and natural gas use in the Residential Sector was by far the largest source of emissions, generating approximately 7,444 metric tons of CO₂e, or 58.8% of total 2005 emissions. Transportation sector emissions, totaling 4,115 metric tons CO₂e and representing 32.5% of total emissions, are the result of diesel and gasoline combustion in vehicles traveling on local roads. The Commercial/Industrial Sector, the third greatest source of 2005 emissions, generated 594 metric tons CO₂e, or 4.7% of the total. The remaining 4% (501 metric tons) are the estimated future methane emissions that will result from the decomposition of waste that was generated by the Belvedere community during 2005.

Figure 7: 2005 Community CO₂e Emissions



Government Operations Inventory Results

In 2005, Belvedere operations emitted approximately 237 metric tons of CO₂e.¹¹ As shown in Table 1, the Employee Commute sector was the largest emitter (54.9%) in 2005. Emissions from the Vehicle Fleet sector produced the second highest quantity of emissions, resulting in 22.3% of total CO₂e; and the Buildings sector produced 8.9% of total emissions. The remainder of emissions came from the Lighting sector (5.6%), the Water sector (4.5%), and the Waste sector (3.8%). Emissions from government operations produced approximately 1.9% of total community emissions.

Table 1: 2005 Government Operations Emissions by Sector

Sector	Greenhouse Gas Emissions (metric tons CO ₂ e)	Greenhouse Gas Emissions (% CO ₂ e)	Energy Equivalent (million Btu)	Cost* (\$)	% of Total Cost
Buildings	21	8.9%	338	\$11,029	28.6%
Vehicle Fleet	53	22.3%	722	\$14,588	37.8%
Lighting	13	5.6%	194	\$6,125	15.9%
Water	11	4.5%	160	\$6,806	17.7%
Waste	9	3.8%	0	n/a	0.0%
Employee Commute	130	54.9%	1,675	n/a	0.0%
TOTAL	237	100.0%	3,089	\$121,701	100.0%

* Energy cost for electricity, natural gas, gasoline and diesel in 2005.

¹¹ 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.

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 baseline year going forward, this Plan includes an emissions forecast for the year 2020. Under a business-as-usual scenario, Belvedere’s community emissions will grow by approximately 7.1% by the year 2020, from 12,654 to 13,547 metric tons CO₂e. 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.

For the residential and waste sectors, population projections for Belvedere, as released by the Association of Bay Area Governments (ABAG) in 2009, were used to estimate average annual compound growth in energy demand of 0.31%. ABAG estimates the Belvedere population was 2,100 in 2005 and will be 2,200 in 2020.

Analysis contained within *California Energy Demand 2008-2018: Staff Revised Forecast*¹², 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 1,130 jobs in 2005 to 1,140 in 2020. Using this growth projection of 10 jobs, it was calculated that the average annual growth in energy use in the commercial sector between 2005 and 2020 would be 0.9%.

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 2020.¹³

Government operations emissions are projected to remain constant, as no new facilities or expansion of existing facilities are planned.¹⁴ The number of employees and the scope of government activities are also expected to remain the same as in 2005.

Table 2: Forecast for 2020 Emissions

Sector	2005 (metric tons CO ₂ e)	2020 (metric tons CO ₂ e)	Annual Growth Rate	Percent Change from 2005 to 2020
Residential	7,444	7,799	0.31%	4.8%
Commercial	594	599	0.06%	0.9%
Transportation	4,115	4,623	0.78%	12.4%
Waste	501	525	0.31%	4.8%
TOTAL	12,654	13,547	0.46%	7.1%

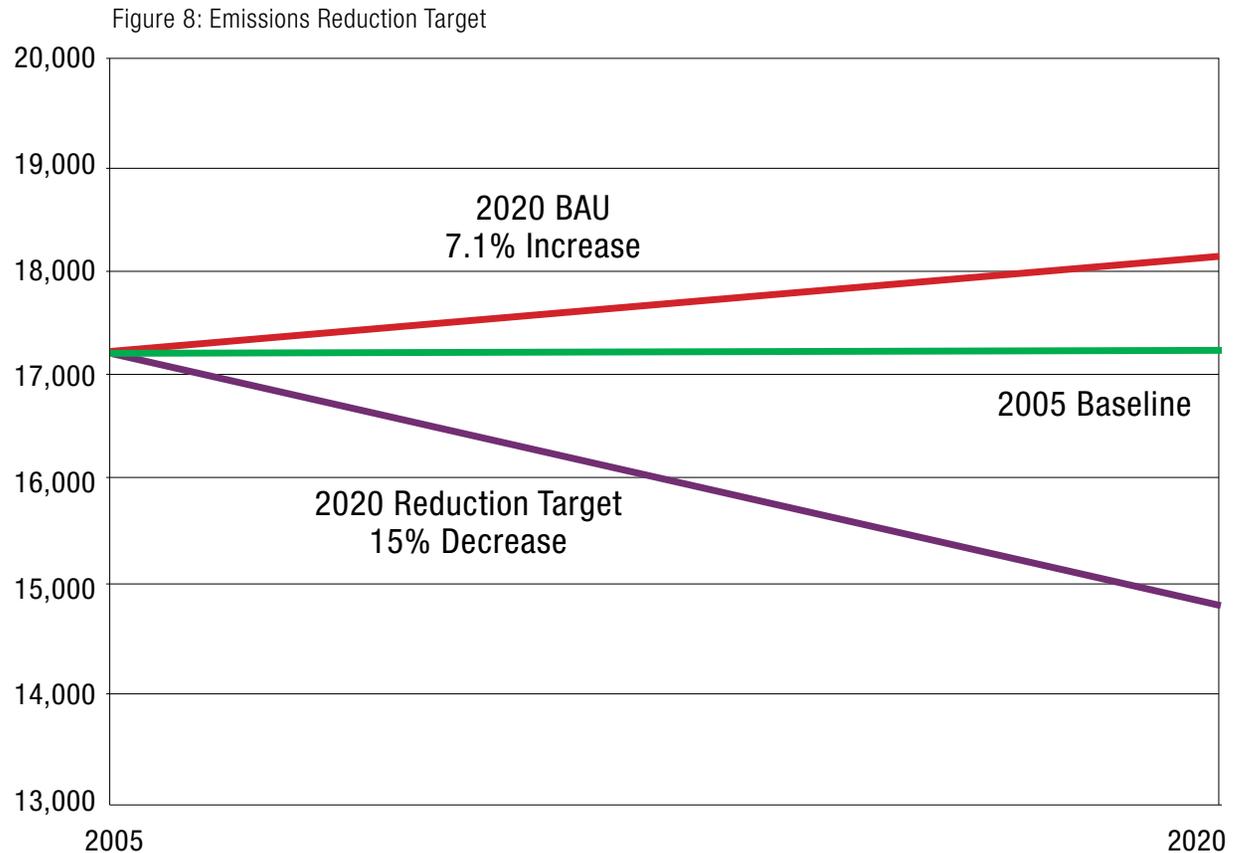
¹² <http://www.energy.ca.gov/2007publications/CEC-200-2007-015/CEC-200-2007-015-SF2.PDF>

¹³ Transportation 2035 Plan for the San Francisco Bay Area - Travel Forecasts Data Summary

¹⁴ On July 1, 2005, the City transferred PG&E accounts for sewer pumping facilities to Sanitary District #5. The energy use for these accounts (34,136 kWh of electricity and 240 therms of natural gas in 2005) have been deducted from baseline emissions used for this Climate Action Plan, resulting in a decrease of 9.3 metric tons CO₂e from 2005 levels and a revised 2005 baseline of 227 metric tons CO₂e.

2.4 Greenhouse Gas Emissions Reduction Target

On November 8, 2010, the Belvedere City Council adopted a goal of reducing greenhouse gas emissions by 15% below 2005 levels by 2020. This would require a reduction from 2005 levels of 12,654 metric tons CO₂e to 10,756 metric tons. Figure 8 provides a comparison of the business-as-usual forecast for 2020 to the 2005 baseline year and the 15% reduction target. Figure 8 is also a depiction of Belvedere's challenge in attempting to meet its reduction targets. Emissions will continue to increase along the business-as-usual (BAU) scenario while reduction efforts are initiated. Achieving the target is therefore more than a 15% decrease – rather, it is a 20.6% reduction from projected 2020 emissions levels of 13,547 metric tons CO₂e.¹⁵ These adopted goals are consistent with the State's direction to local governments in the AB 32 Scoping Plan.¹⁶



¹⁵ 13,547 metric tons CO₂e (projected 2020 level) less 20.6% equals 10,756 metric tons CO₂e (targeted level).

3. ACTIONS TO REDUCE GREENHOUSE GAS EMISSIONS

3.1 Summary of Greenhouse Gas Reduction Strategies

The emissions reduction strategies presented in this chapter, and as summarized in Tables 3 and 4, achieve community greenhouse gas emissions reductions of 2,854 metric tons of CO₂e or approximately 22.6% below the 2005 baseline. When state reductions are added, community emissions in Belvedere would be 28.8% below 2005 levels -- enough to allow the City to surpass a reduction target of 15% below the 2005 baseline by 2020. The most significant source of greenhouse gas reductions is found in actions related to Marin Clean Energy, which are estimated to reduce emissions by 1,461 metric tons, or about 12%. This potential, however, is primarily dependent upon the Marin Energy Authority meeting its planned objective of delivering over 90% renewable energy for all customers by 2020. Table 3 provides a summary of goals and corresponding GHG reductions for community emissions.

Within government operations, the City could achieve reductions of 57.4 metric tons of CO₂e, or 25.3% below 2005 levels by implementing all of the specific, measurable actions listed in the following sections. A wide range of programs that exceed the City's reduction goal have been included to allow for the consideration

Table 3: Summary of Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)	% Below 2005 Levels
Sec. 3.2	Land Use and Transportation		
3.2.C1	Encourage Transit-oriented Development and Workforce Housing	8	0.1%
3.2.C2	Increase Walking and Biking for Local Trips	131	1.0%
3.2.C3	Increase Public Transit Use	66	0.5%
3.2.C4	Increase Ridesharing	35	0.3%
3.2.C5	Accelerate Adoption of Electric Vehicles	83	0.7%
Sec. 3.3	Green Building, Energy Efficiency and Renewable Energy		
3.3.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	298	2.4%
3.3.C2	Improve Energy Efficiency in 10% of Existing Commercial Buildings	24	0.2%
3.3.C3	Reduce Energy Use in New Residential Buildings	71	0.6%
3.3.C4	Reduce Energy Use in New Commercial Buildings	1	--
3.3.C5	Install Renewable Energy Systems in 15% of Existing Residential Buildings	284	2.2%
3.3.C6	Install Renewable Energy Systems in 10% of Existing Commercial Buildings	25	0.2%
3.3.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	200	1.6%
3.3.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	1,261	10.0%
Sec. 3.5	Waste Reduction, Recycling and Zero Waste		
3.5.C1	Divert All Food Waste from Landfill	97	0.8%
3.5.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	107	0.8%
Sec. 3.6	Water and Wastewater		
3.6.C1	Reduce Hot Water Use in Community by 15%	162	1.3%
SUBTOTAL		2,854	22.6%
Sec. 3.8	State Actions	790	6.2%
TOTAL		3,644	28.8%

and prioritization of each program, based on its estimated cost, annual savings, and GHG reduction benefits. State actions would reduce emissions by another 10.3%. It is important to note that the City's purchase of Marin Clean Energy Deep Green electricity for all City facilities results in an estimated emissions reduction of 8% for government operations. Table 4 provides a summary of goals and corresponding GHG reductions for government operations emissions.

Table 4: Summary of Reduction Strategies for Government Operations Emissions

Goal		Cost to Implement	Annual savings	GHG Reductions (Metric Tons)	% Below 2005 Levels
Section 3.2	Land Use and Transportation				
3.2.G1	Replace City Vehicles with Electric Vehicles	As replaced	n/a	2.2	1.0%
3.2.G2	City Employees Commute by Alternative Means of Transportation	Variable	n/a	13.0	5.7%
3.2.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	\$4,800	12.1	5.3%
Section 3.3	Green Building, Energy Efficiency and Renewable Energy				
3.3.G1	Install Energy Efficiency Upgrades in City Buildings	\$3,700	\$1,200	1.8	0.8%
3.3.G2	Install Renewable Energy System for Corp Yard (PV)	\$15,700	\$800	0.8	0.4%
3.3.G3	Upgrade Street Lighting to Energy-efficient Technologies (LED)	\$81,400	\$3,800	6.7	3.0%
3.3.G4*	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities	\$810/year	\$0	18.2	8.0%
Section 3.4	Green Purchasing				
3.4.G1	Upgrade to Energy Star-Rated Office Equipment	At time of replacement	\$165	0.2	0.1%
3.4.G2*	Purchase 30% Recycled Paper	\$170/year	n/a	0.2	0.1%
Section 3.5	Waste Reduction, Recycling and Zero Waste				
3.5.G1	Reduce Solid Waste Disposal to Landfill by 25%	n/a	n/a	2.3	1.0%
SUBTOTAL				57.4	25.3%
Section 3.8	State Actions			23.3	10.3%
TOTAL				80.7	35.5%

*Already Implemented

3.2 Land Use and Transportation

Transportation and land use development are strongly interrelated. The more suburban the development (i.e., low density housing which 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 percent less 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. Though Marin County is known for its environmental consciousness, it is also known for its low-density developments, larger homes, multi-vehicle households, and consumerism. It also ranks among the highest in the U.S. in terms of per capita GHG emissions. Although many of the measures listed below are difficult to quantify, implementing them can significantly reduce the community's emission totals.

Belvedere's General Plan 2030 recognizes that greenhouse gas emissions from vehicles play a significant role in climate change. Transportation sector emissions can be reduced by making it easier for residents to use alternative modes of transportation, including bicycling, walking, and riding the ferry or other public transportation. A guiding principle of the Belvedere General Plan is to promote alternatives to the automobile by providing safe streets, trails, sidewalks and bike paths.

Table 5: Section 3.2 Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)
3.2.C1	Encourage Transit-oriented Development and Workforce Housing	8
3.2.C2	Increase Walking and Biking for Local Trips	131
3.2.C3	Increase Public Transit Use	66
3.2.C4	Increase Ridesharing	35
3.2.C5	Accelerate Adoption of Electric Vehicles	83
	TOTAL	324
	% Reduced from 2005 Levels	2.6%

Table 6: Section 3.2 Reduction Strategies for Government Operations Emissions

Goal		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.2.G1	Replace City Vehicles with Electric Vehicles	As replaced	n/a	2.2
3.2.G2	City Employees Commute by Alternative Means of Transportation	Variable	n/a	13.0
3.2.G3	Replace Police Patrol Cars with More Fuel-Efficient Vehicles	As replaced	\$4,800	12.1
	TOTAL			27.3
	% Reduced from 2005 Levels			12.0%

Goal 3.2.C1: Encourage Transit-oriented Development and Workforce Housing

Policy

Support the integration of local and regional land use and transportation plans.
(General Plan Policy SUST-7.2)

Action Alternatives

- A. Coordinate with the Metropolitan Transportation Commission to develop a Sustainable Communities Strategy that integrates regional land use and transportation planning in a manner consistent with Belvedere's general plan.
- B. Promote compact and efficient development, such as orienting new development to capitalize on access to public transportation, and local services and shopping.
- C. Encourage a "balanced" community, where residents do not have to travel long distances for service needs.
- D. Promote the development of workforce housing for local employees and second units for in-home providers of childcare, healthcare and building and grounds maintenance.

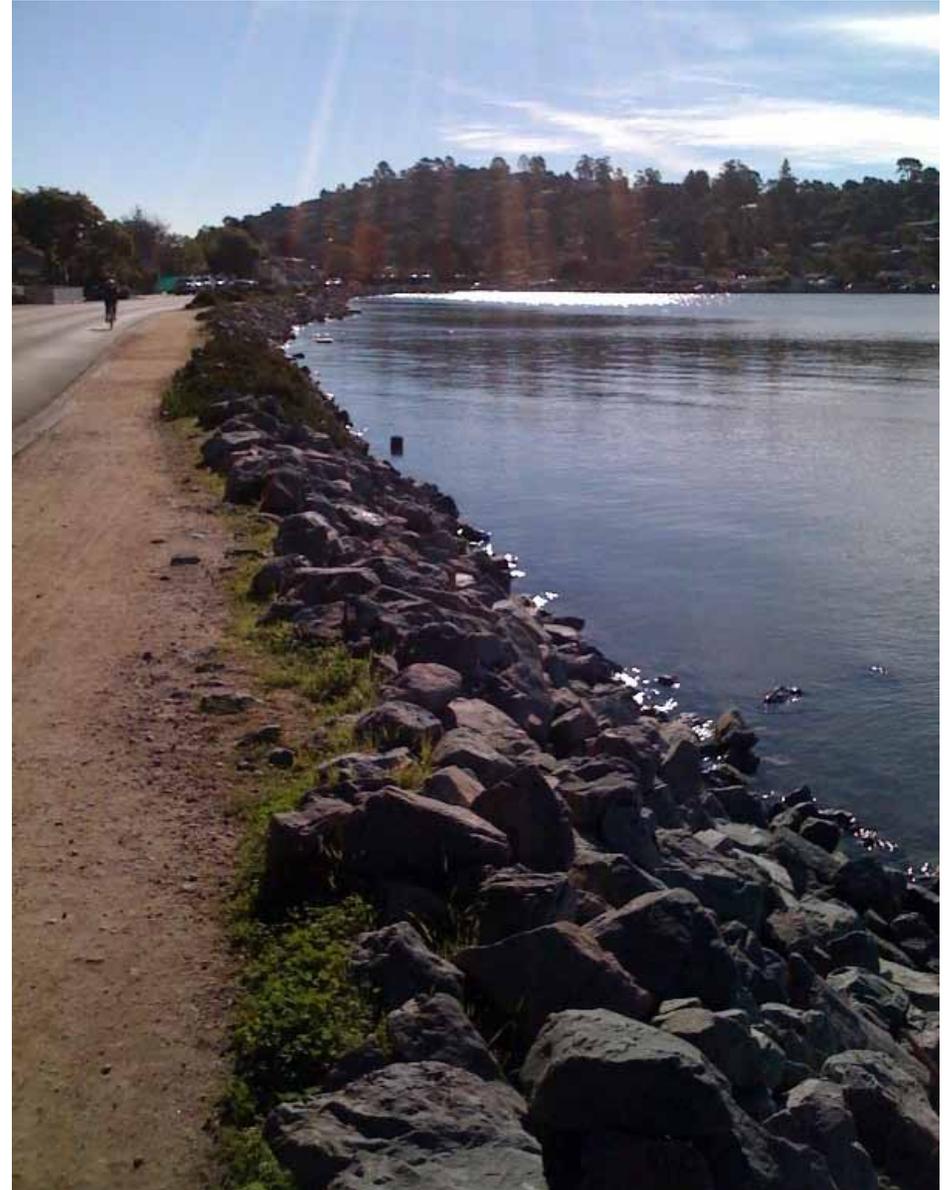
Goal 3.2.C2: Increase Walking and Biking for Local Trips

Policies

Reduce vehicle miles traveled by 15%. (General Plan Policy SUST-7.1)

Improve access to bicycle and pedestrian networks. (General Plan Policy SUST-8.2)

Support and facilitate the use of bicycles for non-recreational uses (i.e., commuting).
(General Plan Policy SUST-9.2)



Action Alternatives

- A. 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.
- B. Improve existing bike and pedestrian pathways and add new paths where feasible. (General Plan Action 7.1.2)
- C. Improve bicycle and pedestrian safety at intersections and install bicycle loop detectors at signalized intersections to help cyclists trip the traffic signal.
- D. Install traffic calming measures to control speeding and improve pedestrian and cyclist safety.
- E. Implement “Complete Streets” policies to ensure the needs of bicyclists, pedestrians and the disabled are considered in the transportation element of any new capital improvement or development project.
- F. Provide bicycle racks and lockers at public destinations and establish bicycle parking requirements for non-residential and multi-family developments.
- G. Create bicycle lanes and walking paths where feasible that are directed at destination points. (General Plan Action 8.2.1)
- H. Encourage pedestrian activity and reduction in auto use by further improving the public steps and lanes for safe pedestrian use. Protect and, when possible, expand the locations of lanes. (General Plan Action 8.2.2)
- I. Educate residents and employees about the health and environmental benefits of walking, cycling, taking public transit, and ride sharing, 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).
- J. Provide bicycle parking at large City-sponsored events and encourage hosts of large events to do the same.
- K. Encourage employers to provide bicycle parking and shower and changing facilities for employees in their development plans and as a component in all commute and traffic demand management programs.
- L. Promote “Share the Road” strategies to improve bicycle safety and improve compliance with traffic laws.
- M. Participate in programs that encourage bicycling and walking, such as Safe Routes to School programs. Provide adequate, convenient and secure bike parking at public and private facilities and destinations when appropriate. (General Plan Action 9.2.1)
- N. Develop materials on bicycle safety to teach drivers and riders the laws, riding protocols, routes, safety tips and emergency maneuvers. (General Plan Action 9.2.2)
- O. Augment existing bike facilities to accommodate more users and be effective for different types of trips. (General Plan Action 9.2.3)
- P. Incorporate bicycle-friendly intersections into any new street design, Include safe and convenient bicycle and pedestrian access in all transportation improvement projects, and ensure that road improvements should not be required if they impact the safety and convenience of walking or biking. (General Plan Action 9.2.4)

Goal 3.2.C3: Increase Public Transit Use

Policies

- Minimize single-occupant vehicles and reduce congestion. (General Plan Policy SUST-7.4)
- Improve access to and frequency of public transportation that serves Belvedere residents and businesses. (General Plan Policy SUST-8.1)

Action Alternatives

- A. Investigate working with Tiburon and/or Mill Valley to implement a shuttle service with bike rack from 101 to be shared by the residents, commuters, visitors, and employees of these communities. (General Plan Action 7.4.1)
- B. Work with the Town of Tiburon and the Reed Union School District to develop feasible measures to reduce vehicle congestion near schools during the morning drop off and afternoon pick up in order to improve air quality and safety. (General Plan Action 7.4.3)
- C. Work with the Town of Tiburon and Caltrans to improve the signal timing at the Tiburon Boulevard/Trestle Glen intersection to reduce congestion in order to improve air quality and safety. (General Plan Action 7.4.4)
- D. Give funding preference to investment in public transit over investment in infrastructure for private automobile traffic. (General Plan Action 8.1.1)
- E. Work with neighboring cities and transit providers to increase both the frequency and types of transit services available to Belvedere residents and visitors. (General Plan Action 8.1.2)
- F. Reduce minimum parking requirement for new buildings that are close to public transportation. (General Plan Action 8.1.3)
- G. Educate residents and employees about the environmental benefits of taking public transit, and provide information (e.g., information available in public places and employment centers regarding bus and ferry schedules).

Goal 3.2.C4: Increase Ridesharing

Policy

- Minimize single-occupant vehicles and reduce congestion. (General Plan Policy SUST-7.4)

Action Alternatives

- A. Encourage the creation of a system to facilitate informal carpools for Belvedere commuters. (General Plan Action 7.4.2)
- B. Work with the Town of Tiburon and the Reed Union School District to develop feasible measures to reduce vehicle congestion near schools during the morning drop off and afternoon pick up in order to improve air quality and safety. (General Plan Action 7.4.3)
- C. Require carpooling and shuttles for employees of larger construction projects. (General Plan Action 7.4.5)
- D. Educate residents and employees about the environmental benefits of ride sharing and provide information on ridesharing programs.
- E. Promote ridesharing programs, such as SchoolPool Marin and 511 Rideshare.
- F. Work with the County to develop a community car-sharing program, when determined to be feasible.

Goal 3.2.C5: Accelerate Adoption of Electric Vehicles

Policy

Encourage use of electric vehicles. (General Plan Policy SUST-9.1)

Action Alternatives

- A. Increase use of alternative fuels and transportation technologies. (General Plan Action 7.1.1)
- B. Encourage new commercial construction to include vehicle access to properly wired outdoor receptacles to accommodate zero-emission vehicles (ZEVs) and/or plug in electric hybrids. (General Plan Action 9.1.1)
- C. Increase ownership of plug-in electric vehicles (EV) by providing EV charging station infrastructure, where appropriate, and encouraging property owners and developers to install EV charging stations in commercial and residential projects.
- D. Encourage the use of fuel-efficient and low GHG-emitting vehicles and driver behaviors.
- E. Encourage private development to provide prioritized parking for hybrid, electric, and carpool vehicles.

Goal 3.2.G1: Replace City Vehicles with Electric Vehicles

Action Alternatives

- A. Replace one City vehicle with an electric vehicle.
- B. Purchase or lease low or zero-emissions vehicles and the most fuel efficient models possible for the City fleet, including construction vehicles.

Goal 3.2.G2: City Employees Commute by Alternative Means of Transportation

Action Alternatives

- A. Support employee commute alternative programs to reduce solo driving and vehicle miles travelled. (General Plan Action 7.1.3)
- B. Provide City 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.

Goal 3.2.G3: Replace Police Patrol Cars with More Fuel-Efficient Vehicles

Action Alternative

- A. If available, replace all police patrol cars with fuel-efficient models that will improve fuel efficiency by 40%.

3.3 Green Building, Energy Efficiency And Renewable Energy

The two fundamental means for reducing emissions from electricity and natural gas use are decreasing consumption through efficiency 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 which require minimum energy efficiency upgrade for home remodeling, such as increasing insulation and sealing heating ducts, have demonstrated energy savings of up to 20%.

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.

Table 7: Section 3.3 Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)
3.3.C1	Improve Energy Efficiency in 20% of Existing Residential Buildings	298
3.3.C2	Improve Energy Efficiency in 20% of Existing Commercial Buildings	24
3.3.C3	Reduce Energy Use in New Residential Buildings	71
3.3.C4	Reduce Energy Use in New Commercial Buildings	1
3.3.C5	Install Renewable Energy Systems in 15% of Existing Residential Buildings	284
3.3.C6	Install Renewable Energy Systems in 10% of Existing Commercial Buildings	25
3.3.C7	10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity	200
3.3.C8	70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity	1,261
	TOTAL	2,163
	% Reduced from 2005 Levels	17.1%

Table 8: Section 3.3 Reduction Strategies for Government Operations Emissions

Goal		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.3.G1	Install Energy Efficiency Upgrades in City Buildings	\$3,700	\$1,200	1.8
3.3.G2	Install Solar Photovoltaic (PV) System for Corp Yard	\$15,700	\$800	0.8
3.3.G3	Upgrade Street Lighting to Energy-efficient Technologies (LED)	\$81,400	\$3,800	6.7
3.3.G4	Purchase Marin Clean Energy Deep Green Electricity for Government Facilities ¹⁷	\$810/year	\$0	18.2
	TOTAL			27.5
	% Reduced from 2005 Levels			12.1%

¹⁷ Already implemented.

Goal 3.3.C1: Improve Energy Efficiency in 20% of Existing Residential Buildings
Goal 3.3.C2: Improve Energy Efficiency in 20% of Existing Commercial Buildings

Policies

Encourage energy efficient retrofit of existing homes. (General Plan Policy SUST-1.1)

Limit the hours of operation of outdoor lighting. (General Plan Policy SUST-2.2)

Action Alternatives

- A. Conduct water and energy audits on remodels and new houses. Energy audits required for all new or remodeled construction would both save money for property owners and improve the City's ability to reduce its carbon footprint. (General Plan Action 1.1.1)
- B. Encourage development of county-wide or regional-wide PACE financing under AB811 for solar systems and energy efficient furnaces and hot water heaters, and explore local, state and national incentives for installation of solar and renewable energy systems. Solar installations are an ideal way to make existing homes much more energy efficient and provide long term sustainability. (General Plan Action 1.1.2)
- C. Adopt an ordinance that will require the City to inform property owners of needed energy upgrades at time of property sale, such as weather-stripping doors and windows and stopping air leaks. (General Plan Action 1.1.3)
- D. Educate potential consumers of solar power systems, solar and tankless hot water heaters, and energy-efficient heating ventilation and air conditioning of existing incentives. (General Plan Action 1.1.4)
- E. Support efforts of PG&E and the Marin Energy Authority to maximize residential and business subscription rates for energy efficiency programs and to promote conservation and renewable energy use.

Goal 3.3.C3: Improve Energy Efficiency in New Residential Buildings
Goal 3.3.C4: Improve Energy Efficiency in New Commercial Buildings

Policies

Strengthen local building codes for new construction and renovation to require a higher level of energy efficiency. Require all new government buildings and all major renovations and additions to meet identified green building standards, and prioritize new public and private development that includes design and construction methods that minimize energy use and impacts on the environment. (General Plan Policy SUST-1.2)

Require the use of technology such as cool roofs, cool pavements, and strategically placed shade trees. (General Plan Policy SUST-2.5)

Encourage cool roofs, green roofs, and use of cool paving for pathways, parking and other roadway surfaces. (General Plan Policy SUST-2.6)

Action Alternatives

- A. Require water and energy use audits as part of remodels, additions, and major re-landscaping projects. (General Plan Action 1.2.1)
- B. Adopt a Green Building Ordinance (General Plan Action 1.2.2)
- C. Provide permitting-related and other incentives for energy efficient building projects. (General Plan Action 1.2.3)
- D. Encourage or require the highest level water saving devices to be installed for remodels and new homes. (General Plan Action 1.2.4)
- E. Adopt local amendments to the 2010 California Green Building Standards Code (CALGreen) to extend green building requirements to remodels and additions. Adopt amendments that require new residential buildings to perform 15% better than Title 24 energy budget requirements, and new commercial buildings to perform 10% better than Title 24 energy budget requirements.
- F. Develop a city-wide green building promotional campaign. Educate City staff and policy makers about best practices; provide checklists and specification guidelines for contractors; post green building information on the City's website.

Goal 3.3.C5: Install Renewable Energy Systems in 15% of Existing Residential Buildings

Goal 3.3.C6: Install Renewable Energy Systems in 10% of Existing Residential Buildings

Policies

Provide information on available funding alternatives for renewable energy projects, rates of return and other information to support community members interested in pursuing renewable energy projects. (General Plan Policy SUST-3.2)

Increase installation of solar facilities for power needs and provision of clean energy. (General Plan Policy SUST-3.3)

Pursue partnerships with other governmental entities and private companies and utilities to establish incentive programs for renewable energy. (General Plan Policy SUST-3.4)

Action Alternatives

- A. Educate potential consumers of solar power systems, solar and tankless hot water heaters, and energy-efficient heating ventilation and air conditioning of existing incentives. (General Plan Action 1.1.4)
- B. Encourage new residential construction to have roofs that are strong enough for a solar installation (“solar ready roof”). (General Plan Action 1.2.5)
- C. 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.
- D. If available, participate in a countywide or regional property assessment district financing program to assist homeowners in funding installation of energy efficiency upgrades and renewable energy systems.

Goal 3.3.C7: 10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity

Goal 3.3.C8: 70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity

Policy

Support efforts of the Marin Energy Authority to increase the proportion of renewable power offered to residents and businesses. (General Plan Policy SUST-3.1)

Goal 3.3. G1: Install Energy Efficiency Upgrades in City Buildings

Action Alternative

- A. Install energy-efficient lighting in City Hall, the Community Center and the Corp Yard as recommended by the Marin Energy Management Team.

Goal 3.3.G2: Install Solar Photovoltaic (PV) System for Corp Yard

Policies

Explore the feasibility of installing solar panels at City facilities. (General Plan Policy SUST-2.3)

Explore the feasibility of using the energy generated by a future solar panel installation at the City’s Corporation Yard to charge the City’s electric vehicles and to provide power for the emergency communications equipment that is stored there. (General Plan Policy SUST-2.4)

Action Alternative

- A. Install 2.2 KW solar photovoltaic system at City Corp yard.

Goal 3.3.G3: Upgrade Street Lighting to Energy-efficient Technologies (LED)

Policy

Consider new lighting technologies for street lights. Investigate the potential to convert existing high pressure sodium street lights to Light Emitting Diode lights to save energy and money. (General Plan Policy SUST-2.1)

Action Alternative

- A. Monitor pilot programs in other municipalities that are installing LED lights in streetlights. If successful, create a City policy to install new street lights using only the most energy efficient LED lights. Over time, replace existing street lights with LED technology. (General Plan Action 2.1.1)

Goal 3.3.G4: Purchase Marin Clean Energy Deep Green Electricity for Government Facilities

Action Alternative

- A. Continue to purchase 100% renewable, Deep Green electricity from the Marin Energy Authority for all of the City's operations.



3.4 Green Purchasing

By adopting environmentally preferable purchasing standards and policies, Belvedere 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 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.

Table 9: Section 3.4 Reduction Strategies for Government Operations Emissions

Goal	Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)	
3.4.G1	Upgrade to Energy Star-Rated Office Equipment	At time of replacement	\$165	0.2
3.4.G2	Purchase 30% Recycled Paper ¹⁸	\$170/year	n/a	0.2
TOTAL				0.4
% Reduced from 2005 Levels				0.2%



¹⁸ Already implemented.

Goal 3.4.G1 Upgrade to Energy Star-Rate Office Equipment

Action Alternatives

- A. Prioritize purchases of products and services with superior environmental performance and purchase Energy Star-rated office equipment and appliances.
- B. Implement operational policies to reduce energy use and conserve resources, such as setting the printer's default option to duplex printing and shutting off computers and imaging equipment at night.
- C. Purchase products only when needed and not solely on a replacement schedule.
- D. Create an interdepartmental Green Team to review and implement a Green Purchasing Policy & Implementation Plan. Engage City staff in support and implementation of green purchasing goals and processes.
- E. Provide each City department with an easy reference binder for finding "green" products and distributors.

Goal 3.4.G2 Purchase 30 Recycled Paper

Action Alternative

- A. Continue to purchase office paper with 30% recycled content.

3.5 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 City of Belvedere 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%.

In 2009, the JPA completed a zero waste feasibility study which concluded that that between 75 and 80 percent 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.

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 to 80 percent methane (natural gas), 30 to 40 percent 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 (EPR) 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 in order to reduce public costs and drive improvements in product design that promote environmental sustainability.

Table 10: Section 3.5 Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)
3.5.C1	Divert All Food Waste from Landfill	97
3.5.C2	Reduce All Other Solid Waste Disposal to Landfills by 25%	107
	TOTAL	204
	% Reduced from 2005 Levels	1.6%

Table 11: Section 3.5 Reduction Strategies for Government Operations Emissions

Goal		Cost to Implement	Annual Savings	GHG Reductions (Metric Tons)
3.5.G1	Reduce City's Solid Waste Disposal to Landfill by 25%	n/a	n/a	2.3
	% Reduced from 2005 Levels			1.0%

Goal 3.5.C1: Divert All Food Waste from Landfill

Policy

Work with the City's solid waste provider to expand recycling services offered to the community. (General Plan Policy SUST-5.2)

Action Alternatives

- A. Consider a composting program alongside the recycling program. (General Plan Action 5.2.1)
- B. Promote commercial and residential composting.
 - a. Partner with Master Gardeners and others to provide education and resources to residents on backyard and curbside composting.
 - b. Work with Mill Valley Refuse Service and Redwood Landfill Recycling Center to promote commercial and residential food waste collection in Belvedere.

Goal 3.5.C2: Reduce All Other Solid Waste Disposal to Landfills by 25%

Policies

Work with the City's solid waste provider to expand recycling services offered to the community. (General Plan Policy SUST-5.2)

Develop Construction and Demolition Recycling Ordinance specific to Belvedere's conditions that will require the salvage, reuse, and recycling of construction debris at all construction sites. (General Plan Policy SUST-5.1)

Action Alternatives

- A. Provide education and publicity about reducing waste and available recycling services. (General Plan Action 5.2.2)
- B. Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers located in public areas. (General Plan Action 5.2.3)
- C. Adopt a policy to achieve zero waste going to landfills.
- D. Endorse an Extended Producer Responsibility resolution as proposed by the JPA.
- E. Adopt and enforce a multi-family dwelling and business recycling ordinance.
- F. Review and revise the City's franchise agreement with its waste hauler to ensure waste reduction and diversion rates are maximized.

Goal 3.5.G1: Reduce All City's Solid Waste Disposal to Landfills by 25%

Action Alternative

- A. Strengthen recycling programs, purchasing policies, and employee education at City facilities.

3.6 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.

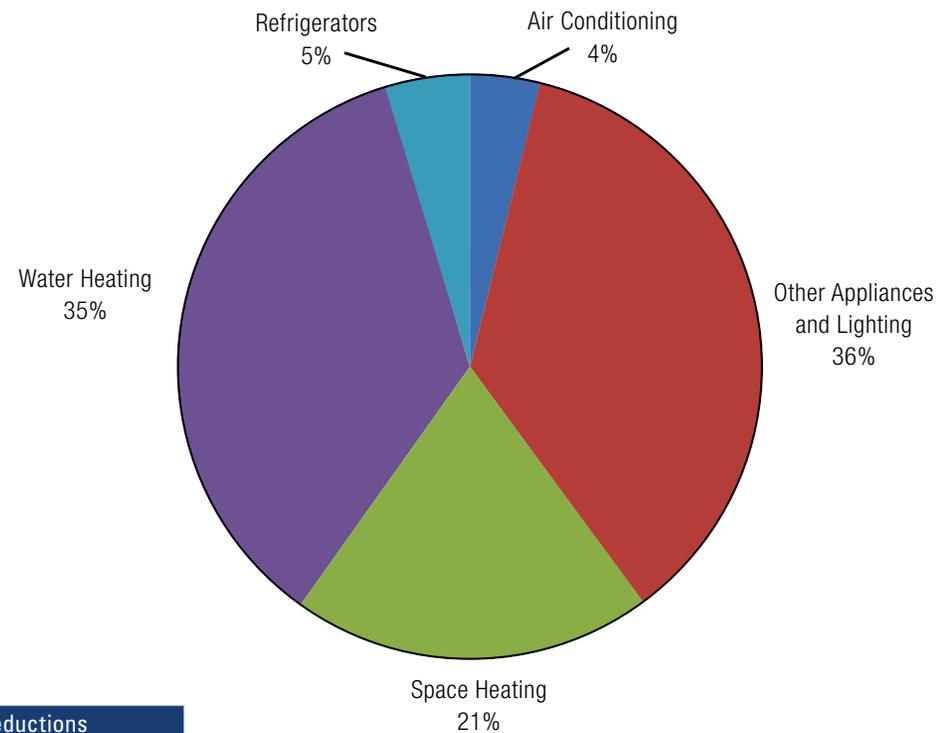
Belvedere falls within MMWD’s jurisdiction and all properties in Belvedere are subject to the agency’s water conservation regulations. The water conservation requirements, particularly irrigation efficiency, are fairly complex, and the City relies on MMWD to provide technical review and oversight on 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.

Table 12: Section 3.6 Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)
3.6.C1	Reduce Hot Water Use in the Community by 15%	162
	% Reduced from 2005 Levels	1.3%

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 Belvedere. 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)



Goal 3.6.C1 Reduce Hot Water Use in Community by 15%

Policies

Develop community wide water use reduction benchmarks in conjunction with MMWD, and a mechanism to inform the community of on-going progress. (General Plan Policy SUST-6.1)

Develop water conservation measures for municipal operations and throughout the community. (General Plan Policy SUST-6.2)

Provide education about water conservation and available programs and incentives. (General Plan policy 6.1.1)

Work cooperatively with MMWD to devise a comprehensive water conservation strategy and participate in area-wide water conservation outreach programs. (General Plan Policy 6.2.1)

Action Alternatives

- A. Require water and energy use audits as part of remodels, additions, and major re-landscaping projects. (General Plan Action 1.2.1)
- B. Encourage or require the highest level water saving devices to be installed for remodels and new homes. (General Plan Action 1.2.4)
- C. Educate potential consumers of solar and tankless hot water heaters. Provide permitting-related and other incentives for water heater upgrades.
- D. Assess, maintain and repair existing plumbing fixtures, pipes, and irrigation systems in all City 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.
- E. Plant materials native to northern California and Marin County, and encourage the use of drought-tolerant plant material.
- F. Minimize turf areas and avoid narrow turf areas, such as in parking strips. Encourage homeowners to avoid turf and replace existing turf areas.

3.7 Adaptation

As the climate changes, so must Belvedere. To effectively address the challenges that a changing climate will bring, the City must not only reduce its greenhouse gas emissions, but be prepared to respond to the expected impacts of climate change. Many of the reduction strategies incorporated in this Climate Action Plan 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 flooding, shoreline erosion, higher frequency of large damaging fires and pest and insect epidemics – must be anticipated through adequate public safety, emergency, and public health responses.

Coastal communities like Belvedere will be especially challenged by rising sea levels. Existing development in inundation areas will need to be adequately protected from flooding and erosion due to climate change. The most practical approach for minimizing the effects from the adverse effect of sea level rise and storm activities is to carefully consider new development within areas vulnerable to inundation and erosion.

Policy

Prepare for the impacts of climate change through the adoption of resiliency and adaptation strategies. (General Plan Policy SUST-4.2)

Action Alternatives

- A. Update the Climate Action Plan at least every five years to re-evaluate projections for climate change threats and the appropriateness of adaptation and resiliency strategies. (General Plan Policy 4.2.1)
- B. Incorporate the likelihood of climate change impacts into City emergency planning and training. (General Plan Policy 4.2.2)
- C. Partner with neighboring municipalities and regional agencies to develop and implement regional adaptation programs. (General Plan Policy 4.2.3)
- D. Partner with neighboring municipalities and regional agencies to prepare for and mitigate coastal inundation and cliffside erosion as a result of sea level rise. (General Plan Policy 4.2.4)
- E. Coordinate development of private erosion and flood control measures with neighboring properties to avoid unintended off-site impacts. (General Plan Policy 4.2.5)
- F. Encourage Federal, State and local agencies to be pro-active and supportive of efforts to combat the expected rise in sea levels. (General Plan Policy 4.2.6)
- G. 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:
 - a. Water resources including expanded rainwater harvesting, water storage and conservation techniques, water reuse, and water use and/or irrigation efficiency.
 - b. Biological resources including land acquisition, creation of marshlands/wetlands as a buffer against sea level rise and flooding, and protection of existing natural barriers.
 - c. Public health including heat related health plans, vector control, safe water, and improved sanitation.
 - d. Environmental hazards including seawalls, storm surge barriers, and fire protection.

3.8 State Actions

The following are state reduction strategies included in the AB 32 Scoping Plan and accounted for in the City’s summary of greenhouse gas reduction strategies. 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.

Low Carbon Fuel Standard (LCFS)

The State is proposing to reduce the carbon intensity of transportation fuels consumed in California. To reduce the carbon intensity of transportation fuels, 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%.

Table 13: Section 3.8 Reduction Strategies for Community Emissions

Goal		GHG Reductions (Metric Tons)
3.8.C1	PG&E Achieves 33% Renewable Portfolio Standard by 2020	191
3.8.C2	AB 1493 Pavley Standards	313
3.8.C3	Low Carbon Fuel Standard	286
	TOTAL	790
	% Reduced from 2005 Levels	6.2%

Table 14: Section 3.8 Reduction Strategies for Government Operations Emissions

Goal		GHG Reductions (Metric Tons)
3.8.G1	AB 1493 Pavley Standards	12.2
3.8.G2	Low Carbon Fuel Standard	11.1
	TOTAL	23.3
	% Reduced from 2005 Levels	10.3%

Assembly Bill 1493 (Pavley)

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.



4. PLAN IMPLEMENTATION

Belvedere recognizes that responding to and preparing for climate change is a critical step toward a sustainable future. The City's early actions to reduce its contribution to climate change reflect the City'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 City's target of 15% below 2005 emissions by the year 2020. A wide range of programs that exceeds the City's reduction goal has 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 City Council to identify and commit resources to climate change mitigation activities, and to monitor and report on progress towards meeting emissions reduction goals.

Policy

Nurture a public dialogue on local sustainability efforts and policies and plan to reduce greenhouse gas emissions from four main areas: vehicular traffic, water usage, energy consumption, and construction activities. Develop measurable steps, track the efforts, and establish a means for assessing their effectiveness. (General Plan Policy SUST-4.1)

Action Alternatives

- A. Develop well-researched protocols and systems for measuring and monitoring general sustainability efforts so that progress can be recorded and celebrated, and to create a base of support for progress and improvements. (General Plan Policy 4.1.1)

- B. Develop interesting, engaging materials to inform and educate an already highly educated public on the community-wide efforts to place sustainability at the forefront of community planning and preparation. (General Plan Policy 4.1.2)
- C. Create a Climate Action Plan Implementation Program with measurable goals, including mechanisms to ensure regular review of progress toward the emission reduction targets established by the Climate Action Plan, report progress to the public and responsible officials, and revise the Plan as appropriate, using principles of adaptive management. Allocate funding to implement the Plan and fund staff to oversee implementation of the plan. (General Plan Policy 4.1.3)
- D. Update greenhouse gas inventories at least every five years to incorporate improved methods, better data, and more accurate tools and methods, and to assess progress in meeting reduction goals. (General Plan Policy 4.1.4)
- E. Continue and expand public and private partnerships that support implementation of the Climate Action Plan, including membership in the Marin Climate and Energy Partnership.
- F. Identify funding sources for recommended actions, and pursue local, regional, state and federal grants as appropriate.

APPENDIX

Data Sources, Assumptions and Calculations

All 2005 greenhouse gas emissions data for community and government operations is from the City of Belvedere 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 CO ₂ 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 ₂ e	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 ₂ O	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 ₂ O	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 Land Use and Transportation

Community Goal 3.2.C1: Encourage Transit-oriented Development and Workforce Housing

Number of new housing units projected, year 2005-2020	20
Number of new TOD and workforce housing units projected, year 2005-2020	10
Vehicle miles traveled (VMT) on local roads, projected year 2020	8,530,244 VMT
Number of households, projected year 2020	980
Local VMT per household, projected year 2020	8,704 VMT
20% reduction in local VMT	17,409 VMT
Estimated reduction in GHG emissions	8 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 projected new second units and transit-oriented housing units provided by City of Belvedere Planning Department. Local Roads Vehicle Miles Traveled (VMT) 2005 Data: Harold Brazil, Air Quality Associate, Metropolitan Transportation Commission (MTC), as reported in the City of Belvedere 2005 Greenhouse Gas Inventory. Projected local 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 City of Belvedere 2005 Greenhouse Gas Inventory as follows:

Area	CO ₂ Rates (grams/mile)		CH ₄ Rates (grams/mile)		N ₂ O 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

Community Goal 3.2.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 Belvedere, year 2005	513,555 miles
Increase average daily walking and biking miles traveled to 1.0 mile by year 2020	269,005 miles
Estimated reduction in GHG emissions	131 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 Nonmotorized Transportation Pilot Program SAFETEA-LU Section 1807," November 2007. According to this survey data, 11.8% of trips in 2007 were made by walking and 1.8% by bicycle, for a total mode share of 13.6%.

Community Goal 3.2.C3: Increase Public Transit Use

Projected vehicle miles traveled in Belvedere, year 2020	8,530,244 miles
Public transit trips as a percentage of all Marin trips, year 2007	3.2%
Increase transit trips to 4.8% of all trips by year 2020	136,484 miles
Estimated reduction in GHG emissions	66 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.

Community Goal 3.2.C4: Increase Ridesharing

Projected vehicle miles traveled in Belvedere, year 2020	8,530,244 miles
Ridesharing as a percentage of vehicle miles traveled by Marin residents, year 2007	1.7%
Increase ridesharing trips to 2.6% of all trips by year 2020	72,507 miles
Estimated reduction in GHG emissions	35 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.

Community Goal 3.2.C5: Accelerate Adoption of Electric Vehicles

Projected transportation GHG emissions, year 2020	4,624 metric tons
2% of emissions displaced by electric vehicles	92
Electric vehicle VMT, year 2020	170,605 VMT
Electric vehicle electricity use	42,651 kWh
Electric vehicle emissions from electricity use	9.5 metric tons
Estimated reduction in GHG emissions	83 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 Goal counts transportation emissions reductions Belvedere 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, <http://www.fullermoney.com/content/2009-11-03/ElectricCarsPluggedIn2.pdf>. This report projects U.S. market sales shares in 2020 of 12% for hybrid electric vehicles, 7% for plug-in hybrid electric vehicles, and 4% for electric vehicles.

Government Operations Goal 3.2.G1: Replace City Vehicles with Electric Vehicles

Vehicle	VMT	KWh	GHG Emissions (metric tons)	GHG Emissions from Electricity Use (metric tons)	Estimated Reduction in GHG Emissions (metric tons)
1996 Pontiac	5,432	1,358	2.47	0.30	2.2

Data Source Notes and Assumptions: VMT data from City of Belvedere 2005 Greenhouse Gas Emissions Inventory background data reports. Assumes electric vehicle energy efficiency of 4 miles per kWh.

Government Operations Goal 3.2.G2: City Employees Commute by Alternative Means of Transportation

Employee commute GHG emissions, year 2005	129.8 metric tons
10% reduction in GHG emissions	13.0 metric tons

Government Operations Goal 3.2.G3: Replace Police Patrol Cars with More Fuel-Efficient Vehicles

Patrol car VMT, year 2005	30,974 VMT
Patrol car fuel, year 2005	3,441 gallons
Patrol car GHG emissions, year 2005	30.59 metric tons
Projected fuel reduction, year 2020	1,376 gallons
Projected fuel savings, year 2020	\$4,817
Projected GHG emissions reduction, year 2020	12.1 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%. Police patrol cars were assumed to have fuel economy of 9 mpg in the Belvedere 2005 Greenhouse Gas Emissions Inventory. The Carbon Motors vehicle will have a combined city/highway fuel economy of 28-30 mpg. The analysis assumes average fuel efficiency for Belvedere patrol cars will be 22.5 mpg. Projected fuel savings assumes an average fuel cost of \$3.50 per gallon.

3.3 Green Building, Energy Efficiency and Renewable Energy

Community Goal 3.3.C1: Improve Energy Efficiency in 20% of Existing Residential Buildings

Number of occupied households in year 2005	960
Electricity use in residential sector in year 2005	9,526,452 kWh
GHG emissions from residential sector in year 2005	7,444 metric tons
Expected energy efficiency achieved	20%
Potential energy efficiency upgrade penetration	20%
Number of housing units improved	192
Estimated reduction in electricity use	381,058 kWh
Estimated GHG reduction in electricity use	89 metric tons
Total estimated GHG reduction	298 metric tons

Community Goal 3.3.C2: Improve Energy Efficiency in 20% of Existing Commercial Buildings

GHG emissions from commercial sector in year 2005	594 metric tons
Electricity use in commercial sector in year 2005	1,185,843 kWh
Expected energy efficiency achieved	20%
Potential EE upgrade penetration	20%
Estimated reduction in electricity use	47,434 kWh
Estimated GHG reduction in electricity use	12 metric tons
Total estimated GHG reduction	24 metric tons

Community Goal 3.3.C3: Reduce Energy Use in New Residential Buildings

Projected increase in GHG emissions in residential sector, years 2005 – 2020	354 metric tons
Projected increase in electricity use in residential sector 2005-2020	453,641 kWh
15% reduction in electricity use due to CA 2008 Building Efficiency Standards, years 2010-2020	45,364 kWh
Additional 15% reduction from Marin Green BERST Standards, years 2010-2020	45,364 kWh
Estimated reduction in electricity use	90,728 kWh
15% reduction in energy use due to CA 2008 Building Efficiency Standards, years 2010-2020	35 metric tons
Additional 15% reduction from Marin Green BERST Standards, years 2010-2020	35 metric tons
Estimated GHG reduction	71 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. The 2020 California Green Building Standards, which took effect on January 1, 2011, do not require any additional energy efficiency over the 2008 Building Efficiency Energy Standards.

Marin Green BERST recommends an additional reduction from existing Title 24 Part 6 energy budget requirements for new single 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.

Community Goal 3.3.C4: Reduce Energy Use in New Commercial Buildings by an Additional 10%

Projected increase in GHG emissions in commercial sector, years 2005-2020	5 metric tons
Projected increase in electricity use in commercial sector, years 2005-2020	10,494 kWh
15% reduction in electricity use due to CA 2008 Building Efficiency Standards, year 2010-2020	1,049 kWh
Additional 10% reduction from Marin Green BERST Standards, years 2010-2020	700 kWh
Estimated reduction in electricity use	1,749 kWh
15% reduction in energy use due to CA 2008 Building Efficiency Standards, years 2010-2020	0.5 metric tons
Additional 10% reduction from Marin Green BERST Standards, years 2010-2020	0.4 metric tons
Estimated GHG reduction (metric tons)	0.9 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. The 2020 California Green Building Standards, which took effect on January 1, 2011, do not require any additional energy efficiency over the 2008 Building Efficiency Energy Standards.

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.

Community Goal 3.3.C5: Install Renewable Energy Systems in 15% of Existing Residential Buildings

Annual electricity use in residential sector in year 2005	9,526,452 kWh
GHG emissions from residential electricity use in year 2005	2,229 metric tons
Number of households in year 2005	960
Average annual residential energy use	9,923 kWh
% potential solar energy of total electricity use	85%
Potential solar system penetration	15%
Potential number of homes	144
Estimated electricity saved	1,214,623 kWh
Estimated GHG reduction	284 metric tons

Data Source Notes and Assumptions: Number of Belvedere households in 2005 is based on estimates provided by the Association of Bay Area Governments (ABAG) Projections 2009. As of 5/15/10, Belvedere has 52 installed residential systems and a total capacity of 208 kW or approximately 4 kW per system (Marin Energy Management Team and California Solar Initiative data).

Community Goal 3.3.C6: Install Renewable Energy Systems in 10% of Existing Commercial Buildings

Annual electricity use in commercial sector in year 2005	1,185,843 kWh
GHG emissions from commercial electricity use in year 2005	292 metric tons
% potential solar energy of total electricity use	85%
Potential solar system penetration	10%
Estimated electricity saved	100,797 kWh
Estimated GHG reduction	25 metric tons

Community Goal 3.3.C7: 10% of Ratepayers Purchase Marin Clean Energy Deep Green Electricity

Projected electricity use in year 2020	11,176,430 kWh
Less direct access electricity	162,418 kWh
Electricity use reduced by other measures	2,104,935 kWh
Electricity use added back for electric vehicles	42,651 kWh
Remaining electricity use	8,951,728 kWh
Projected Deep Green electricity use	895,173 kWh
GHG emissions reductions	200 metric tons

Data Source Notes and Assumptions: Assumes 10% of all 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.

Community Goal 3.3.C8: 70% of Ratepayers Purchase Marin Clean Energy Light Green Electricity

Projected electricity use in year 2020	11,176,430 kWh
Less direct access electricity	162,418 kWh
Electricity use reduced by other measures	2,104,935 kWh
Electricity use added back for electric vehicles	42,651 kWh
Remaining electricity use	8,951,728 kWh
Projected Light Green electricity use	6,266,209 kWh
GHG emissions reduction	1,261 metric tons

Data Source Notes and Assumptions: Assumes 70% of all ratepayers will purchase light green energy in 2020, and light green will be 90% renewable by 2020. As of December 2010, Marin Energy Authority had enrolled approximately 76% of its Phase I customer prospects throughout Marin in the light green option.

Government Operations Goal 3.3.G1: Install Energy Efficiency Upgrades in City 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)
Install energy-efficient lighting in City Hall, Community Center and Corp Yard	7,845	--	\$3,702	\$1,232	1.75

Data Source Notes and Assumptions: Proposed energy-efficiency projects, estimated project costs (net of rebates), and annual energy savings based on Energy Management Studies prepared by the Marin Energy Management Team on October 27, 2010.

Government Operations Goal 3.3.G2: Install Solar Photovoltaic (PV) System for Corp Yard

Facility	System Size (sq. ft.)	System Size KW AC	Annual kWh Produced	Project Cost	Annual Cost Savings	Reduction in GHG Emissions (metric tons)
Corp Yard	295	2.2	3,749	\$15,728	\$814	0.84

Data Source Notes and Assumptions: Proposed PV system and project cost is based on an analysis completed by the Marin Energy Management Team, October 27, 2010.

Government Operations Goal 3.3.G3: 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	138	48,024	\$5,995	10.74	LED 42w	24,012	\$2,997	5.37	\$69,690	24,012	\$2,997	5.37
HPS 100w 120v	9	4,428	\$553	0.99	LED 60w	2,117	\$265	0.47	\$5,049	2,311	\$288	0.52
Incandescent 189w	10	7,800	\$974	1.74	LED 99w	3,996	\$499	0.89	\$6,660	3,804	\$475	0.85
TOTAL	157	60,252	\$7,522	13.47		30,125	\$3,761	6.73	\$81,399	30,127	\$3,761	6.74

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. Annual energy costs based upon PG&E's LS-2 Electric Schedule for customer-owned street and highway lighting, as per Marin Energy Management Team report of October 27, 2010.

Goal 3.3.G4: Purchase Marin Clean Energy Deep Green Electricity for Government Facilities

Projected electricity use in 2020 (kWh)	122,523
Electricity use reduced by other measures (kWh)	42,681
Electricity use added back for electric vehicles (kWh)	1,358
Deep Green electricity purchase (kWh)	81,200
Annual Deep Green electricity cost	\$812
GHG emissions reduction (metric tons)	18.15

3.4 Green Purchasing

Government Operations Goal 3.5.G1: Upgrade to Energy Star-Rated Office Equipment

Equipment	Quantity	Estimated Energy Saving Per Unit (kWh)	Annual Energy Savings (kWh)	Annual Energy Cost Savings	Reduction in GHG Emissions (metric tons)
Monitor	5	42	210	\$36	0.05
Computer CPU	5	138	690	\$118	0.15
Imaging Equipment	5	12	60	\$10	0.01
TOTAL			960	\$165	0.21

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 www.energystar.gov. For estimating purposes, computers were assumed to have sleep settings activated. Based on industry studies, computers and monitors were assumed to be shut off at night 36% of the time. Annual electricity cost savings are based on an average of summer and winter rates of .17115 per kWh from PG&E's A-1 Electric Rate Schedule, effective June 1, 2010.

Government Operations Goal 3.4.G2: Switch to 30% Recycled Paper

Paper purchased per year	240 reams
Paper weight	1,200 pounds
Paper cost @ \$36 per case	\$864
30% recycled paper cost @ \$43 per case	\$1,032
Additional cost	\$168
GHG emissions reduction	443 pounds
GHG emissions reduction	0.20 metric tons

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

3.5 Waste Reduction, Recycling and Zero Waste

Community Goal 3.5.C1: Divert All Food Waste from Landfill

Projected waste in year 2020	2,429 tons
Food waste in year 2020; 14.6% of total	355 tons
GHG emissions reduced	97 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>

Government Operations Goal 3.4.G2: Switch to 30% Recycled Paper

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 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

Community Goal 3.5.C2: Reduce All Other Solid Waste Disposal to Landfills by 25%

Projected waste in year 2020	2,994 tons
Food waste diverted	355 tons
Remaining landfilled waste in year 2020	2,639 tons
GHG emissions from remaining waste	427 metric tons
25% reduction in remaining waste	107 metric tons

Government Operations Goal 3.5.G1: Reduce Solid Waste Disposal to Landfill by 25%

Projected waste in year 2020	35.6 tons
GHG emissions from waste in year 2020	9.0 metric tons
25% reduction in GHG emissions	2.3 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

3.6 Water and Wastewater

Community Goal 3.6.C1: Reduce Water Use in Community by 15%

Per capita water use per day, FY 05/06	139 gallons
Water use in year 2005	106,543,500 gallons
Projected water use in year 2020	111,617,000 gallons
Indoor, hot water use	22,435,017 gallons
15% reduction in hot water use	3,365,253 gallons
Reduction in natural gas use	19,128 therms
Reduction in electricity use	268,547 kWh
Estimated reduction in GHG emissions	162 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 CAPP Beta).

3.7 State Actions

Community Goal 3.7.C1: PG&E Achieves 33% Renewable Portfolio Standard by 2020

Projected community electricity use in year 2020	11,176,430 kWh
Less direct access electricity	162,418 kWh
Electricity use reduced from other measures	2,104,935 kWh
Electricity use added back for electric vehicles (kWh)	42,651 kWh
Remaining electricity usage (kWh)	8,951,728 kWh
20% of accounts projected for PG&E in year 2020	1,790,346 kWh
GHG emissions with year 2005 PG&E emission factor	400 metric tons
GHG emissions with projected year 2020 PG&E emissions factor	209 metric tons
Estimated reduction in GHG emissions	191 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.

Community Goal 3.7.C2: AB 1493 Pavley Standards

Projected year 2020 California transportation emissions	225.4 MMTCO2e
Expected reduction in emissions under phase one	16.4 MMTCO2e
Percent(%) reduction	7.28%
Community transportation emissions, projected year 2020	4,624 metric tons
GHG emissions reduced by other measures	324 metric tons
Remaining GHG emissions	4,299 metric tons
Estimated reduction in GHG emissions	313 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, <http://www.energy.ca.gov/2008publications/ARB-1000-2008-012/ARB-1000-2008-012.PDF>.

Community Goal 3.7.C3: Low Carbon Fuel Standard

Projected year 2020 California transportation emissions	225.4 MMTCO2e
Expected reduction in emissions	15 MMTCO2e
Percent (%) reduction	6.65%
Community transportation GHG emissions, projected year 2020	4,624 metric tons
GHG emissions reduced by other measures	324 metric tons
Remaining GHG emissions	4,299 metric tons
Estimated GHG emissions reduction	286 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.

Government Operations Goal 3.7.G1: AB 1493 Pavley Standards

Projected year 2020 California transportation emissions	225.4 MMTCO2e
Expected reduction in emissions under phase one	16.4 MMTCO2e
Percent (%) reduction	7.28%
Projected year 2020 government transportation emissions	182.5 metric tons
GHG emissions reduced by other measures	15.1 metric tons
Remaining GHG emissions	167.3 metric tons
Estimated reduction in GHG emissions	12.2 metric tons

Government Operations Goal 3.7.G2: Low Carbon Fuel Standard

Projected year 2020 California transportation emissions	225.4 MMTCO2e
Expected reduction in emissions	15 MMTCO2e
Percent (%) reduction	6.65%
Projected year 2020 government transportation emissions	182.5 metric tons
GHG emissions reduced by other measures	15.1 metric tons
Remaining GHG emissions	167.3 metric tons
Estimated reduction in GHG emissions	11.1 metric tons