



**SAN RAFAEL**

THE CITY WITH A MISSION

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# CLIMATE CHANGE ACTION PLAN

## 2030








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Final Draft



APRIL 23, 2019

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# SECTION 1: INTRODUCTION

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## What's a Climate Action Plan?

A Climate Action Plan (CAP) is a tool that any organization can use to develop the programs and actions needed to reduce greenhouse gas emissions (GHGs), which are the pollutants that cause climate change. Generally, these CAPs are focused on this *'mitigation'* aspect of climate change, but some also lay out a strategy for *'adaptation'*, or how the organization will plan to deal with the effects of climate change such as sea level rise, or increased flooding, heat waves, and wildfires. San Rafael's CAP is called the Climate Change Action Plan and mainly deals with mitigation.

## Background

San Rafael has a rich history of climate action and environmental protection. Mayor Al Boro signed on to the Mayor's Climate Protection Agreement in 2006. The first Climate Change Action Plan was adopted in 2009. San Rafael received the first state-wide [Beacon Award](#) for Sustainability by the Institute for Local Government in 2013. Several hundred citizens volunteer on behalf of the environment each year, totaling thousands of hours of volunteer work worth hundreds of thousands of dollars in in-kind contributions. San Rafael has thousands of acres of open space and parks and is a [Tree City USA](#) community. These are just a few of the actions and programs San Rafael has undertaken over the years.

In 2017 the City Council identified updating the Climate Change Action Plan as a high priority in the annual Sustainability Priorities. A 20-member Green Ribbon Working Group was identified by Councilmember Kate Colin, the City Manager's Office, and the President of Sustainable San Rafael. This Working Group included people from various neighborhoods, businesses, high schools, and organizations in order to get a diverse set of voices and perspectives. Throughout the year they participated in a series of meetings with subject matter experts to develop measures for each section of the Plan. Throughout the summer of 2018, the City solicited input from a variety of community members through meetings, pop-up events at community gathering spots, online surveys, a business mixer, and in-person surveys at organizations and activities. This has all been synthesized into the following Plan.

There is broad scientific agreement that to stave off the worst effects of climate change, communities will need to reduce their greenhouse gas emissions by 80% below 1990 levels by the year 2050. But time is of the essence. We are already seeing the effects of climate change locally and throughout the world with hotter temperatures, more severe storms, and more volatile and unpredictable weather. San Rafael has met the State GHG reduction target for 2020 and is on track to meet its more stringent local target by 2020. These emissions come from residents, businesses, and visitors, with only less than 1% coming from government operations and facilities. Recently, the State of California set interim reduction

targets of 40% below 1990 levels by 2030 to stay on track. This updated Plan, coming from broad community input, sets out a road map to do just that. We're all in this together; we can do this.



San Rafael's Beacon Award, the first-ever in the State, given by the Institute for Local Government in 2013. 2013 Councilmembers Damon Connolly & Barbara Heller, Mayor Gary Phillips, and Councilmember Andrew McCullough.

## What's Been Done So Far: San Rafael Actions

San Rafael businesses, agencies, and residents have been at the forefront of mitigation efforts such as renewable energy, low-carbon transportation, composting, and water conservation. In 2010 Marin Clean Energy was adopted by the City of San Rafael and most electricity users went immediately to purchasing 50% carbon-free electricity for their homes and businesses. San Rafael was one of the first communities to participate in curbside recycling thanks to Marin Sanitary Service's (MSS) forward-thinking owners. In 2014 MSS and Central Marin Sanitation Agency began converting food scraps into energy through their innovative Food to Energy project. By the end of the 2011-2017 drought, San Rafael water users reduced their water consumption by an average of approximately 17%. And in 2017, Marin Municipal Water District began purchasing 100% renewable Deep Green electricity from MCE Clean Energy, which reduced San Rafael resident and businesses' water-related greenhouse gas emissions dramatically.

The City of San Rafael has implemented 40 of the 48 measures in the original Climate Change Action Plan, completing the majority of those that could be completed and moving most of the rest into an ongoing implementation status. Most measures will need to be continued in order to continue to get emissions reductions! (See *Appendix C for the complete list.*)

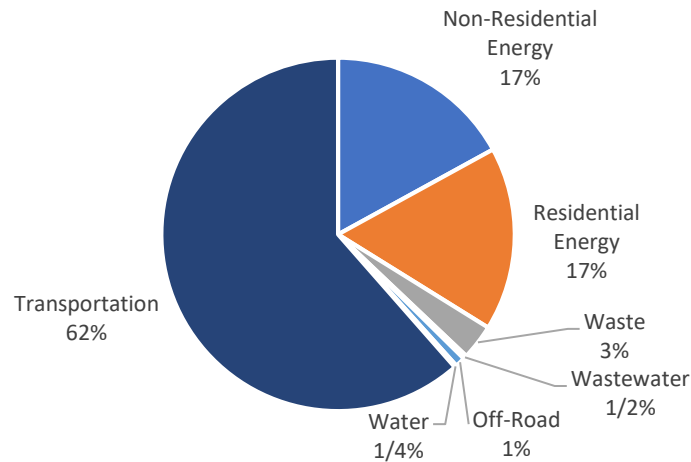


MARIN SANITARY SERVICE'S FOOD TO ENERGY PROGRAM IN CONJUNCTION WITH CENTRAL MARIN SANITATION AGENCY TURNS FOOD SCRAPS INTO ENERGY AND FUELS 100% OF CMSA'S ELECTRICITY USE.

## Where We Are At: Emissions Trend and Status

The City prepares an annual community-wide greenhouse gas inventory to track emissions in seven sectors: residential energy, commercial energy, transportation, off-road vehicles and equipment, waste, water and wastewater. As shown in Figure 1, the majority of emissions come from vehicle trips generated by San Rafael residents and businesses. Community emissions totaled 473,440 metric tons of carbon dioxide equivalents (MTCO<sub>2e</sub>) in 2005. By 2016, emissions had dropped to 389,035 MTCO<sub>2e</sub>, an 18% reduction. This is well below the State target for San Rafael, which is 15% below baseline (2005) emissions by 2020, and the trendline shows that emissions are on track to meet the City's local reduction target of 25% below 2005 levels by 2020. While emissions declined in almost all sectors, the largest reductions were due to energy conservation and efficiency, a reduction in the carbon intensity of electricity, and improvements to vehicle fuel efficiency. Emissions from City operations, which make up less than 1% of community-wide emissions, fell 16% by 2016. For more details, see the City's latest Greenhouse Gas Emissions Inventory.

FIGURE1: COMMUNITY EMISSIONS BY SECTOR, 2016

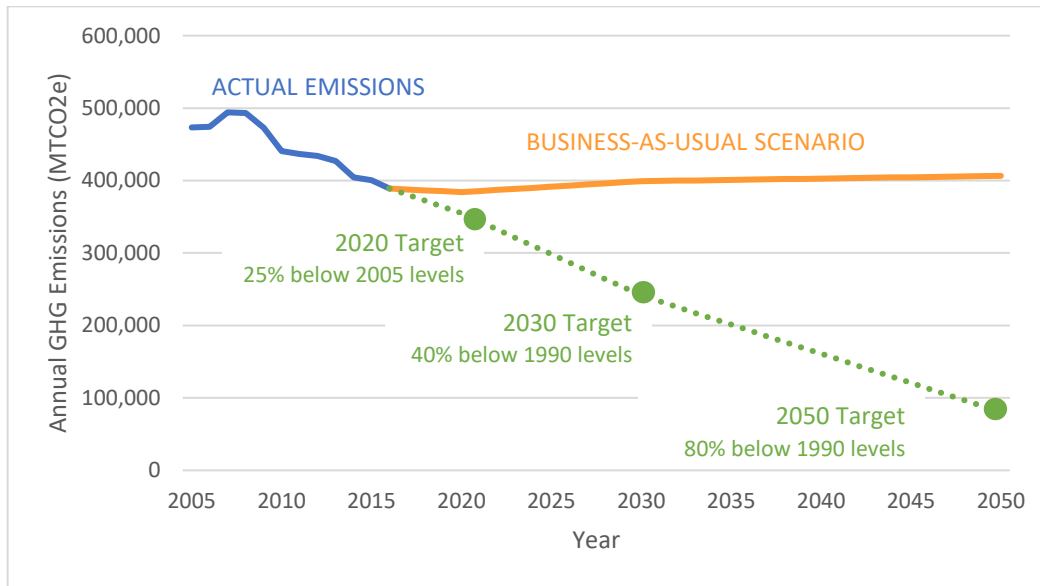


## Emissions Forecast and Reduction Targets

The Climate Change Action Plan includes a “business-as-usual” (BAU) forecast in which emissions are projected in the absence of any policies or actions that would occur beyond the base year to reduce emissions. The forecasts are derived by “growing” (increasing) 2016 emissions using forecasted changes in population, number of households, and jobs according to projections developed by the Association of Bay Area Governments. Transportation emissions are projected utilizing data provided by the Metropolitan Transportation Commission, which incorporate the vehicle miles traveled (VMT) reductions expected from the implementation of [Plan Bay Area 2020](#) and the [Regional Transportation Plan](#) adopted in 2017. Emissions are expected to rise about 2.4% by 2030 and 3.3% by 2040. Although the regional agencies have not made official projections for 2050, continuing the trendline suggests emissions would reach approximately 405,530 MTCO<sub>2</sub>e by 2050 under the BAU forecast.

The Climate Change Action Plan establishes targets similar to the State’s goals to reduce emissions to 40% below 1990 levels by 2030 and 80% below 1990 levels by 2050. In San Rafael, that means emissions would need to drop to 241,455 MTCO<sub>2</sub>e by 2030 and 80,485 MTCO<sub>2</sub>e by 2050. The Plan lays out measures that will exceed the 2030 target and put the City on a trajectory to meet the 2050 goal. The community emissions trend, forecast and targets are shown in Figure 2 below.

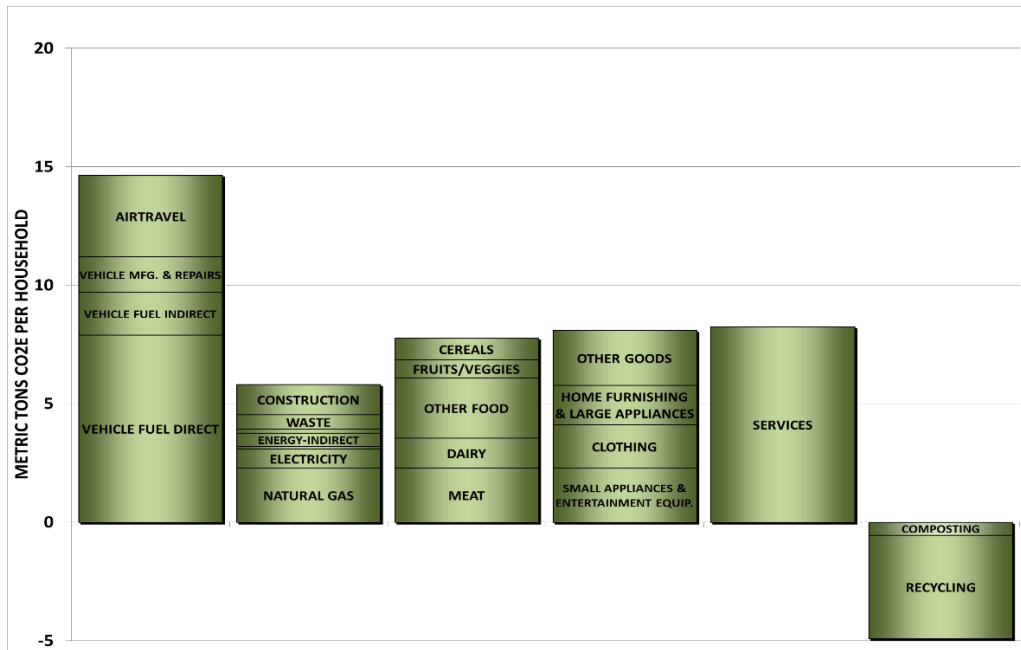
FIGURE 2: EMISSIONS TREND, FORECAST AND TARGETS



## Our Carbon Footprint

The Bay Area Air Quality Management District (BAAQMD) and U.C. Berkeley developed a [Consumption-Based Inventory](#) to better understand how our purchasing habits contribute to global climate change. A consumption-based inventory includes emission sources that don't get counted in the typical "in-boundary" GHG inventory, as well as other items that are difficult to quantify like airplane travel and upstream emissions from the production, transport and distribution of food and household goods. Figure 3 shows the results of the consumption-based inventory for San Rafael households. According to this inventory, the average San Rafael household generates 44 MTCO<sub>2</sub>e per year. As a comparison, the City's community-wide emissions of 389,035 MTCO<sub>2</sub>e works out to about 17 MTCO<sub>2</sub>e per household. In essence, our consumption drives climate change more than anything and although San Rafael is meeting its state targets for strict "in-boundary" emissions reductions, we as a community have a long way to go. For more information on this and to see carbon footprints by census tract, visit the [SF Bay Area Carbon Footprint Map](#). To learn how to measure and reduce your household carbon footprint, check out our local [Resilient Neighborhoods](#) program.

**FIGURE 3: AVERAGE SAN RAFAEL HOUSEHOLD CARBON FOOTPRINT**



This graph shows the relative impact of all the sources of emissions that make up a household carbon footprint. *Source: CoolClimate Network*

## State Pillars & DRAWDOWN: Marin

San Rafael doesn't exist in a vacuum. While we are leveraging or trying to combat regional, state-wide, national and even international actions and trends, we also have the ability and responsibility to collaborate with other efforts and campaigns. San Rafael is known for collaborating and it's our collective imagination and cooperative efforts that make San Rafael such a successful and wonderful place to be. If you've ever been to a San Rafael City Council meeting or Climate Change Action Plan quarterly forum you will know this first-hand.

The State of California established the [Six Pillars](#) framework in 2015 when Governor Jerry Brown was inaugurated for his second term as governor. These include (1) reducing today's petroleum use in cars and trucks by up to 50%; (2) increasing from one-third to 50% our electricity derived from renewable sources; (3) doubling the energy efficiency savings achieved at existing buildings and making heating fuels cleaner; (4) reducing the release of methane, black carbon, and other short-lived climate pollutants; (5) managing farm and rangelands, forests and wetlands so they can store carbon; and (6) periodically updating the state's climate adaptation strategy: Safeguarding California. The measures contained in this Climate Change Action Plan are designed to support and implement the Six Pillars and the goals of [California's 2017 Climate Change Scoping Plan](#) on a local level.



# CALIFORNIA CLIMATE STRATEGY

*An Integrated Plan for Addressing Climate Change*



## VISION

**Reducing Greenhouse Gas Emissions  
to 40% Below 1990 Levels by 2030**

## GOALS



IMAGE: CALIFORNIA'S 6 PILLARS CLIMATE STRATEGY

The County of Marin, noting the need for all residents and businesses to actively reduce emissions and plan for climate adaptation has created an engagement framework based on the research and book by local author, entrepreneur, and environmentalist [Paul Hawken](#) called [DRAWDOWN: Marin](#).

DRAWDOWN: Marin is a comprehensive, science-based, community-wide campaign to do our part to slow the impacts of climate change. It is an effort to recognize our need to reduce our "carbon footprint" and to provide a road map to doing so. Like the State's Six Pillars, there are six areas of focus: (1) 100% Renewable Energy, (2) Low-Carbon Transportation, (3) Energy Efficiency in Buildings and Infrastructure, (4) Local Food and Food Waste, (5) Carbon Sequestration, and (6) Climate Resilient Communities.



IMAGE: DRAWDOWN: MARIN

## Actions to Reduce Greenhouse Gas Emissions

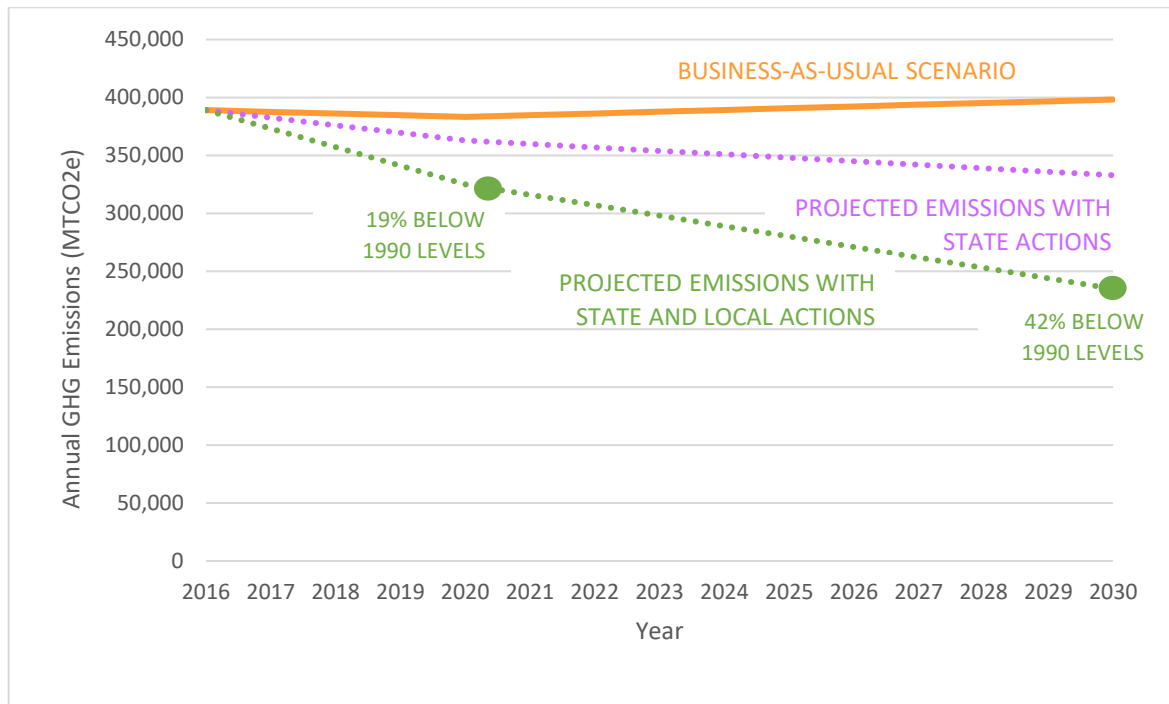
The Climate Change Action Plan includes a variety of regulatory, incentive-based and voluntary strategies that are expected to reduce emissions from both existing and new development in San Rafael. Several of the strategies build on existing programs while others provide new opportunities to address climate change. State actions will have a substantial impact on future emissions. Local strategies will supplement these State actions and achieve additional GHG emissions reductions. Successful implementation will rely on the combined participation of City staff along with San Rafael residents, businesses and community leaders.

The following sections identify the State and local strategies included in the Climate Change Action Plan to reduce emissions in community and government operations. Emissions reductions are estimated for each strategy; combined, they show that the City could reduce emissions 19% below 1990 levels by 2020 (equivalent to 31% below 2005 levels), and 42% below 1990 levels by 2030, which is enough to surpass the City and State goals for those years. Community emissions are projected to be 233,920 MTCO<sub>2</sub>e in 2030 with all State and local actions implemented, while the reduction target is 241,455 MTCO<sub>2</sub>e.<sup>1</sup> As shown in Figure 4, State actions represent about 40% of the reduction expected through implementation of the Climate Change Action Plan while local actions represent about 60%.

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<sup>1</sup> Some of the local measures included in the plan – specifically, LCT-C10, EE-C2, EE-C3, EE-C4 and WR-C5 – are actions that may be taken after additional study and analysis is undertaken. Estimated GHG reductions from these measures total 5,090 MTCO<sub>2</sub>e. Excluding these measures results in community emissions of 239,941 MTCO<sub>2</sub>e in 2030, which is still lower than the reduction target of 241,455 MTCO<sub>2</sub>e.

**FIGURE 4: CUMULATIVE IMPACT OF REDUCTION STRATEGIES**



## Summary of State Actions

The Climate Change Action Plan incorporates State reduction strategies that have been approved, programmed and/or adopted and will reduce local community emissions from 2016 levels. These programs require no local actions. As such, the State actions are first quantified and deducted from projected community emissions in order to provide a better picture of what still needs to be reduced at the local level to get to the overall reduction targets. State actions and emissions reductions are shown in Table 1 and detailed in the appendix.

**TABLE 1: EMISSIONS REDUCTIONS FROM STATE ACTIONS**

State Action	Emissions Reductions by 2030 (MTO <sub>2</sub> e)
Light and Heavy-Duty Vehicle Regulations	56,880
Renewable Portfolio Standard	4,540
Title 24 Energy Efficiency Standards	2,870
Lighting Efficiency	980
Residential Solar Water Heaters	30
<b>Total</b>	<b>65,300</b>

*Note: Numbers may not total due to rounding.*

## Summary of Local Strategies

The local mitigation measures presented in the following sections, and as summarized in Table 2 below, achieve greenhouse gas emissions reductions in the community of approximately 37,800 MTCO<sub>2</sub>e in 2020 and 98,085 MTCO<sub>2</sub>e in 2030.

**TABLE 2: LOCAL EMISSIONS REDUCTION STRATEGIES**

Strategy	GHG Reductions by 2030 (MTCO <sub>2</sub> e)	Percent of Reductions
Low Carbon Transportation	37,030	38%
Energy Efficiency	18,280	19%
Renewable Energy	31,925	33%
Waste Reduction	10,025	10%
Water Conservation	830	1%
Sequestration and Adaptation	n/a	n/a
Community Engagement	n/a	n/a
Implementation and Monitoring	n/a	n/a
<b>Total</b>	<b>98,085</b>	<b>100%</b>

*Note: Percentages may not total 100% due to rounding.*

These local strategies will be detailed in the following sections. Together, the projected reductions from State and local actions total 163,385 MTCO<sub>2</sub>e by 2030. Community emissions are projected to be 234,850 MTCO<sub>2</sub>e in 2030 with the full implementation of the CCAP. This is 42% below 1990 levels and exceeds the reduction target set by the State.

## SECTION 2: MEASURES

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### Local Measures to Reduce Greenhouse Gas Emissions

Each of the following sections provide a summary table of local measures and associated GHG reductions, followed by a description of the specific actions the City will undertake to implement each measure. The methodologies and implementation targets used to calculate emissions reductions are described in the appendix. Sometimes, there is no direct or reliable way to estimate GHG savings for a particular measure or the savings are embedded in another measure. In this case, the GHG reduction is identified as “not applicable” or “n/a.” For example: Community Engagement is essential for success in many of the measures set forth throughout the Plan but counting savings in this section would then be double-counting savings from other measures such as those in Low Carbon Transportation or Energy. People need to know about a program to take advantage of it, but the actual emissions reductions will come from participating in the program itself. Therefore, the savings is counted for that program.

### Economy and Social Equity

Cities deal with a wide array of issues and pressures and must take all these issues into account when budgeting resources and balancing priorities. Housing, business retention, health and safety, and traffic congestion are some examples. Climate action can address these problems or make them worse, depending on how they are approached. A major theme in the Working Group deliberations and community feedback was around unintended consequences and making sure that measures and programs benefitted the most, not just a few. Sustainability has been described as a three-legged stool, pointing to the need to address not just the environment, but the economy and social equity as well.

One definition of social equity is the “just and fair inclusion into a society in which all can participate, prosper, and reach their full potential” (PolicyLink). Equity is the means to ensure equality for all. An example of how that might work with climate action measures is with energy efficiency. Giving rebates to homeowners to swap out inefficient appliances helps reduce energy consumption and therefore greenhouse gas emissions. But if financial incentives are only available to those with means to purchase new appliances it leaves out a section of the community without means. Programs such as the [Green and Healthy Homes Initiative](#) acknowledges this and works with landlords to upgrade common areas of apartment complexes with the commitment to provide free appliance and building envelope upgrades to renters so that there is a double benefit. First, the property owner can see energy reductions, and second the renter can not only see energy reductions but can also enjoy a healthier home environment, often by increasing comfort, decreasing health hazards such as mold, and providing more reliable appliances.

The economy is the driver of prosperity and equity in a city and provides the revenue necessary for local government to enact programs that are beneficial to the whole community. Half of our community-wide emissions come from the business and commercial sector. But increased regulation can have the unintended consequence of driving up costs, deterring innovation and job growth, and stagnating

business development. However, many measures related to climate action can also have significant return on investment and end up being great business prospects. There is a delicate balance between mandating, incentivizing, and enabling businesses to reduce greenhouse emissions. On the flip side, there is great potential to work together to ensure a robust low-carbon economy that creates good jobs and benefits the whole community. California as a whole is a great example: State emissions have declined 9% since 2006, while the economy has grown 16%.

Throughout the following measures, care was taken to avoid unintended consequences for our under-represented and disadvantaged community members, as well as our business sector, and to enhance the opportunity for equity and prosperity. It is important to consider and include our diverse community members and business interests in the development and implementation of the measures in this plan.



## LOW CARBON TRANSPORTATION

*38% of potential reductions*

More than 60% of San Rafael’s community emissions comes from transportation, and up until the recent commercial success of electric vehicles, it’s been hard to see how we were going to reduce transportation emissions. Sure, improvements in fuel efficiency have driven emissions down – the passenger vehicle fleet in Marin County is about 17% more fuel efficient than it was ten years ago – but vehicle miles traveled by passenger vehicle trips starting and/or ending in San Rafael have actually gone up about 2% over the same period. Surveys show that alternative transportation rates have hardly budged over the years, despite improvements in the bicycle and pedestrian network and public information campaigns to get people to carpool, bicycle, walk and take transit.

All of that is now changing with the viability of zero emission vehicles (ZEVs), especially here in San Rafael where electricity is pretty clean and expected to get cleaner. ZEVs include all-battery as well as plug-in hybrid vehicles. Marin County is a leader in ZEV adoption rates – second only to Santa Clara County – and ZEVs already comprise about 2% of all registered passenger vehicles in Marin. Our plan is to increase that rate to 25% by 2030 by building out the EV charging infrastructure and encouraging ZEV ownership through incentives, public education, and development requirements. This is an aggressive target, but one that complements the State’s goal to put 5 million ZEVs on the road by 2030. Improvements in battery and charging technology, expected cost reductions, and automakers’ commitments to significantly expand ZEV offerings point to an all-electric future. Of course, new cars are typically out of the reach of low-income household budgets, but programs that incentivize used EV car purchases and installation of EV chargers in lower-income neighborhoods can help ensure the benefits of EV ownership are shared by all. That said, we can’t rely on ZEV’s alone to meet our transportation reductions; reducing congestion, enabling better biking and walking opportunities, and incentivizing public transit all carry co-benefits and can be enjoyed by all.

### What You Can Do

- #1 Drive an all-electric or plug-in hybrid vehicle.
- #2 Bike, walk or take transit whenever possible.
- #3 Shut your car off when waiting in line at the ATM or school pick up/drop off lane.
- #4 Better yet, have your child walk or bike to school.
- #5 Use an electric leaf blower and lawn mower.

The City will take the following actions to reduce emissions from transportation sources.

**TABLE 3: LOW CARBON TRANSPORTATION MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
LCT-C1	Zero Emission Vehicles	30,345	83%
LCT-C2	Bicycling	1,910	5%
LCT-C3	Walking	575	2%
LCT-C4	Safe Routes to School	320	1%
LCT-C5	Public Transit	1,035	3%
LCT-C6	Employee Trip Reduction	1,030	3%
LCT-C7	Parking Requirements	55	<1%
LCT-C8	Traffic System Management and Vehicle Idling	1,075	3%
LCT-C9	Smart Growth Development	n/a*	n/a
LCT-C10	Electric Landscape Equipment	110	<1%
<b>TOTAL</b>		<b>36,455</b>	<b>100%</b>

*\*Emissions reductions due to smart growth development are embedded in vehicle miles traveled projections utilized in the development of the emissions forecast. In order to avoid double-counting, they are not included here.*

**LCT-C1: Zero Emission Vehicles**

Develop a Zero Emission Vehicle Plan that will result in 25% of passenger vehicles in San Rafael to be zero emission vehicles (ZEVs), including plug-in electric vehicles (EVs) and hydrogen fuel cell electric vehicles, by 2030. Incorporate the following actions in the plan as feasible:

- a. Provide free parking for ZEVs at City parking lots and metered parking spaces.
- b. Provide wayfinding signage to public EV chargers.
- c. Work with PG&E and other entities to identify multi-family and workplace charging sites appropriate for available incentive programs, such as EV Charge Network.
- d. Participate in a countywide effort by MCE, PG&E and others to provide rebates for new or used electric vehicles and/or charging stations.
- e. Pursue opportunities to expand the City’s EV charging network through innovative programs, such as installing chargers at existing streetlight locations.
- f. Require new and remodeled commercial and multi-family projects to install a minimum number of electric vehicle chargers for use by employees, customers, and residents.
- g. Require new and remodeled single-family and multi-family projects to install electrical service and conduits for potential electric vehicle use.
- h. Consider requiring new and remodeled gas stations to provide EV fast chargers and hydrogen fueling stations.
- i. Participate in regional efforts and grant programs to encourage widespread availability of EV charging stations.
- j. Target policies to support ZEV adoption, including used vehicles, in low income and disadvantaged communities.
- k. Participate in programs to promote EV adoption, including "Drive an EV" events and other media and outreach campaigns.



- l. Encourage or require, as practicable, ride hailing and delivery service companies to utilize zero emission vehicles.
- m. Promote adoption of electric bicycles, scooters and motorcycles.

#### **LCT-C2: Bicycling**

Encourage bicycling as an alternative to vehicular travel through outreach channels and partner agencies. Establish and maintain a system of bicycle facilities that are consistent with the City's Bicycle and Master Pedestrian Plan and Complete Streets policies.

- a. Provide bicycle racks and lockers for public use.
- b. Participate in a bike share program.

#### **LCT-C3: Walking**

Encourage walking as an alternative to vehicular travel through outreach channels and partner agencies. Establish and maintain a system of pedestrian facilities that are consistent with the City's Bicycle and Pedestrian Master Plan and Complete Streets policies.

#### **LCT-C4: Safe Routes to School**

Continue to support the Safe Routes to School Program and strive to increase bicycling, walking, carpooling, and taking public transit to school.

- a. Promote school and student participation.
- b. Identify issues associated with unsafe bicycle and pedestrian facilities between neighborhoods and schools, apply for Safe Routes to School grants, and execute plans to improve pedestrian and bicycle facilities.

#### **LCT-C5: Public Transit**

Support and promote public transit by taking the following actions:

- a. Work with Marin Transit and Golden Gate Transit to maximize ridership through expansion and/or improvement of transit routes and schedules.
- b. Work with SMART, TAM, employers and others to provide first and last mile programs to maximize utilization of the train, including shuttle buses.
- c. Support the development of an attractive and efficient multi-modal transit center and provide safe routes to the transit center that encourage bicycle and pedestrian connections.
- d. Support a "Yellow School Bus" program and student use of regular transit to reduce school traffic.
- e. Encourage transit providers, including school buses, to use renewable diesel as a transition fuel and to purchase electric buses whenever replacing existing buses.

#### **LCT-C6: Employee Trip Reduction**

Reduce vehicle miles traveled commuting to work through the following actions:

- a. Work with the Transportation Authority of Marin, the Metropolitan Transportation Commission, and the Bay Area Air Quality Management District (BAAQMD) to promote transportation demand programs to local employers, including rideshare matching programs, vanpool incentive programs, emergency ride home programs, telecommuting, transit use discounts and subsidies,

showers and changing facilities, bicycle racks and lockers, and other incentives to use transportation other than single occupant vehicles.

- b. Update the City's Trip Reduction Ordinance to reflect the most recent BAAQMD regulations and to increase the number of employers subject to the ordinance.
- c. Embark on a behavior change and educational campaign to encourage employees to reduce vehicle trips.

**LCT-C7: Parking Requirements**

Promote a walkable city by reducing parking requirements wherever feasible. Allow new development in the Downtown area to reduce minimum parking requirements by 20 percent from current levels. Elsewhere, reduce parking requirements based on robust transportation demand programs and proximity and frequency of transit services. Encourage unbundling of parking costs.

**LCT-C8: Traffic System Management and Vehicle Idling**

- a. Implement signal synchronization to minimize wait times at traffic lights and to reduce congestion through increased traffic flow.
- b. Utilize intelligent traffic management systems to improve traffic flow and guide vehicles to available parking.
- c. Encourage drivers and autonomous vehicles to limit vehicle idling through implementing behavior change and engagement campaigns.
- d. Investigate adopting an ordinance to regulate idling beyond State requirements.

**LCT-C9: Smart Growth Development**

Prioritize infill, higher density, transit-oriented, and mixed-use development.

**LCT-C10: Electric Landscape Equipment.** Encourage the use of electric landscape equipment instead of gasoline-powered equipment through engagement campaigns.

**TABLE 4: LOW CARBON TRANSPORTATION MEASURES TO REDUCE GOVERNMENT OPERATIONS EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2e</sub> )	Share of Reductions
LCT-M1	Zero and Low Emission City Vehicles	275	48%
LCT-M2	Low Carbon Fuels	270	47%
LCT-M3	City Employee Commute	20	4%
LCT-M4	Municipal Electric Landscape Equipment	5	1%
<b>TOTAL</b>		570	100%

**LCT-M1: Zero and Low Emission City Vehicles**

Purchase or lease zero-emission vehicles for the City fleet whenever feasible, and when not, the most fuel-efficient models available. Promote City adoption and procurement of zero-emission vehicles and charging infrastructure to the public.

**LCT-M2: Low Carbon Fuels**

Use low-carbon fuel such as renewable diesel as a transition fuel in the City's fleet and encourage the City's service providers to do the same, until vehicles are replaced with zero-emissions vehicles.

**LCT-M3: City Employee Commute**

Continue to provide City employees with incentives and/or reduce barriers to use alternatives to single occupant auto commuting, such as transit use discounts and subsidies, bicycle facilities, showers and changing facilities, ridesharing services, vanpools, emergency ride home service, flexible schedules, and telecommuting when practicable.

**LCT-M4: Municipal Electric Landscape Equipment**

Replace gas-powered leaf blowers and other landscape equipment with electric models.



## ENERGY EFFICIENCY

*19% of potential reductions*

Increasing the efficiency of buildings is often the most cost-effective approach for reducing greenhouse gas emissions. Energy efficiency upgrades, such as adding insulation and sealing heating ducts, have demonstrated energy savings of up to 20 percent, while more aggressive “whole house” retrofits can result in even greater energy savings. Many “low-hanging fruit” improvements can be made inexpensively and without remodeling yet can be extremely cost-efficient, such as swapping out incandescent bulbs to LED bulbs, sealing air leaks, and installing a programmable thermostat. Energy Star-certified appliances and office equipment, high-efficiency heating and air conditioning systems, and high-efficiency windows not only save energy but reduce operating costs in the long run. Nonetheless, some upgrades can be expensive, particularly for low-income households, so the City participates in programs that provide rebates, free energy audits, and financing options for residents and businesses.

New construction techniques and building materials, known collectively as “green building,” can significantly reduce the use of resources and energy in homes and commercial buildings. Green construction methods can be integrated into buildings at any stage, from design and construction to renovation and deconstruction. The State of California requires green building energy-efficiency through the Title 24 Building codes. The State updates these codes approximately every three years, with increasing energy efficiency requirements since 2001. The State’s energy efficiency goals are to have all new residential construction to be zero net electricity by 2020 and all new residential and commercial construction to be zero net energy by 2030. Local governments can accelerate this target by adopting energy efficiency standards for new construction and remodels that exceed existing State mandates, or by providing incentives, technical assistance, and streamlined permit processes to enable quicker adoption.

The City will take the following actions to reduce emissions in the built environment.

### What You Can Do

- #1 Replace indoor and outdoor lights with LED bulbs, and turn them off when not in use.
- #2 Have an energy assessment done for your home or business.
- #3 Upgrade insulation, seal leaks, and install a programmable thermostat.
- #4 Purchase Energy Star appliances and equipment.
- #5 Unplug electronic appliances when not in use and set the thermostat to use less heat and air conditioning.

**TABLE 5: ENERGY EFFICIENCY MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
EE-C1	Energy Efficiency Programs	17,335	96%
EE-C2	Energy Audits	260	1%
EE-C3	Cool Pavement and Roofs	275	2%
EE-C4	Green Building Reach Code	225	1%
EE-C5	Streamline Permit Process and Provide Technical Assistance	n/a	n/a
<b>TOTAL</b>		18,095	100%

**EE-C1: Energy Efficiency Programs**

Promote and expand participation in residential and commercial energy efficiency programs.

- a. Work with organizations and agencies such as the Marin Energy Watch Partnership, the Bay Area Regional Network, Resilient Neighborhoods, and the Marin Climate & Energy Partnership to promote and implement energy efficiency programs and actions.
- b. Continue and expand participation in energy efficiency programs such as Energy Upgrade California, California Energy Youth Services, and Smart Lights.
- c. Promote utility, state, and federal rebate and incentive programs.
- d. Participate and promote financing and loan programs for residential and non-residential projects such as Property Assessed Clean Energy (PACE) programs, PG&E on-bill repayment, and California Hub for Energy Efficiency Financing (CHEEF) programs.

**EE-C2: Energy Audits**

Investigate requiring energy audits for residential and commercial buildings prior to completion of sale, including identification of cost savings from energy efficiency measures and potential rebates and financing options.

**EE-C3: Cool Pavement and Roofs**

Use high albedo material for roadways, parking lots, sidewalks and roofs to reduce the urban heat island effect and save energy.

- a. Evaluate the use of high albedo pavements when resurfacing City streets or re-roofing City facilities.
- b. Encourage new development to use high albedo material for driveways, parking lots, walkways, patios, and roofing through engagement and behavior change campaigns.

**EE-C4: Green Building Reach Code**

Investigate adopting a green building ordinance for new and remodeled commercial and residential projects that requires green building methods and energy efficiency savings above the State building and energy codes. Consider utilizing the County's green building ordinance as a model and including the use of photovoltaic systems and all-electric building systems as options to achieve compliance.

**EE-C5: Streamline Permit Process and Provide Technical Assistance**

Analyze current green building permit and inspection process to eliminate barriers and provide technical assistance to ensure successful implementation of green building requirements. Work county-wide to make it easier for contractors and building counter staff to simplify applications and identify incentives.

**TABLE 6: ENERGY EFFICIENCY MEASURES TO REDUCE GOVERNMENT OPERATIONS EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
EE-M1	Streetlights	110	58%
EE-M2	Energy Efficiency Audit and Retrofits	45	23%
EE-M3	Energy Conservation	35	19%
<b>TOTAL</b>		185	100%

**EE-M1: Streetlights**

Complete replacement of inefficient street, parking lot and other outdoor lighting with LED fixtures.

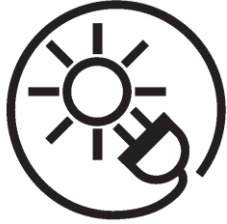
**EE-M2: Energy Efficiency Audit and Retrofits**

Work with the Marin Energy Management Team to identify and implement energy efficiency projects in municipal buildings and facilities and electrification of existing building systems and equipment that use natural gas.

**EE-M3: Energy Conservation**

Reduce energy consumption through behavioral and operational changes.

- a. Establish energy efficiency protocols for building custodial and cleaning services and other employees, including efficient use of facilities, such as turning off lights and computers, thermostat use, etc.
- b. Incorporate energy management software, electricity monitors, or other methods to monitor energy use in municipal buildings.
- c. Investigate 9/80 work schedule for City facilities where feasible and where facilities can be shut down entirely.



## RENEWABLE ENERGY

*33% of potential reductions*

Energy that comes from renewable sources, including solar, wind, geothermal, and small hydroelectric, are the cleanest and most-environmentally friendly energy sources. Here in San Rafael, where there is an abundance of sunny days, solar energy is a particularly good energy source. According to [Project Sunroof](#), 94% of San Rafael buildings have roofs that are solar-viable. These 14,700 roofs could generate over 470 million kWh per year, which is more than the total electricity usage in San Rafael in 2016. Solar system costs keep falling, too, which make them an attractive option for home and commercial building owners. Our Climate Change Action Plan projects that we can get about 24% of our electricity from locally produced solar energy systems by 2030, up from about 4% currently, just by maintaining the current growth rate.

When solar is not an option, due perhaps to a shady roof or a reluctant landlord, residents and business owners can purchase 100% renewable electricity from MCE Clean Energy and PG&E. MCE and PG&E electricity have a high percentage of renewable and GHG-free content, which means it's some of the cleanest electricity in the country. What's more, MCE's goal is provide 100% renewable and GHG-free electricity to all its customers by 2025. Considering that MCE currently carries about two-thirds of the total electricity load in San Rafael, that action alone will significantly reduce emissions.

Since our electricity is so clean, and getting cleaner, it's a great idea to swap out appliances and heating and cooling systems that use natural gas for ones that use electricity. If you're constructing a new home or building, consider going all-electric. Battery prices are falling, and will soon be a cost-effective option, too. Eventually, we'll need to replace the majority of natural gas appliance and equipment if we're going to hit our long-term goals. Fortunately, ongoing research and development of energy storage systems are creating new business opportunities and making an all-electric, 100% renewable future possible.

The City will take the following actions to reduce emissions from energy use.

### What You Can Do

#1 Switch to MCE Deep Green or PG&E Solar Choice 100% renewable electricity option.

#2 Install a solar energy system on your home or business.

#3 Replace appliances that use natural gas for ones that use electricity.

#4 Investigate electric hot water heaters and heat pumps so you can swap out heaters and furnaces that use natural gas when it's time to replace them.

**TABLE 7: RENEWABLE ENERGY MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
RE-C1	Renewable Energy Generation	10,940	35%
RE-C2	GHG-Free Electricity	19,560	62%
RE-C3	Building and Appliance Electrification	895	3%
RE-C4	Innovative Technologies	n/a	n/a
<b>TOTAL</b>		<b>31,415</b>	<b>100%</b>

**RE-C1: Renewable Energy Generation**

Accelerate installation of residential and commercial solar and other renewable energy systems.

- a. Provide permit streamlining and reduce or eliminate fees, as feasible.
- b. Amend building codes, development codes, design guidelines, and zoning ordinances, as necessary, to facilitate small, medium, and large-scale installations.
- c. Encourage installation of solar panels on carports and over parking areas on commercial projects and large-scale residential developments through ordinance, engagement campaigns, or agency incentives.
- d. Participate and promote financing and loan programs for residential and non-residential projects such as Property Assessed Clean Energy (PACE) programs and California Hub for Energy Efficiency Financing (CHEEF) programs.
- e. Encourage installation of battery storage in conjunction with renewable energy generation projects through engagement campaigns and partner agency incentives.

**RE-C2: GHG-Free Electricity**

Encourage residents and businesses to switch to 100 percent renewable electricity (MCE Deep Green, MCE Local Sol, and PG&E Solar Choice) through engagement campaigns and partner agency incentives and work with MCE Clean Energy to assure that it reaches its goal to provide electricity that is 100 percent GHG-free by 2025.

**RE-C3: Building and Appliance Electrification**

Promote electrification of building systems and appliances that currently use natural gas, including heating systems, hot water heaters, stoves, and clothes dryers.

**RE-C4: Innovative Technologies**

Investigate and pursue innovative technologies such as micro-grids, battery storage, and demand-response programs that will improve the electric grid’s resiliency and help to balance demand and renewable energy production.



**TABLE 8: RENEWABLE ENERGY MEASURES TO REDUCE GOVERNMENT OPERATIONS EMISSIONS**

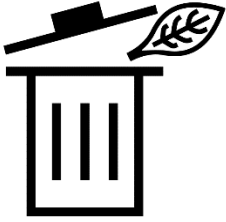
ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
RE-M1	Solar Energy Systems	140	28%
RE-M2	Deep Green Electricity	365	72%
TOTAL		505	100%

**RE-M1: Solar Energy Systems for Municipal Buildings**

Install solar energy systems at municipal buildings and facilities where feasible and investigate and pursue innovative technologies such as battery storage and demand response programs.

**RE-M2: Municipal Deep Green Electricity**

Continue to purchase MCE Deep Green electricity for all City facilities.



## WASTE REDUCTION

*10% of potential reductions*

The things we buy, consume, and throw away generate a lot of greenhouse gas emissions during manufacturing, transport, distribution and disposal. The best way to reduce emissions is to purchase and consume less stuff in the first place, and then find someone who can reuse whatever you no longer need before considering recycling or disposal.

Due to the way we account for community emissions, our Climate Change Action Plan does not take credit for reducing upstream emissions. Instead, our GHG accounting is directly concerned with emissions that are created from the anaerobic decomposition of organic waste in the landfill. The decomposition process creates methane, which is 28 time more potent as a greenhouse gas than carbon dioxide. Although landfills capture most of the methane, and some like Redwood Landfill use that methane to create biogas or electricity, about one-quarter of it escapes into the atmosphere.

The good news is that it is relatively easy to divert organic material from the landfill. Paper and cardboard can be recycled. Food scraps, some paper (like napkins and paper towels), and yard waste can be composted, either at home or at the landfill. Surplus food can be donated to non-profits that distribute it to the needy. About half of the organic material that is put into the landfill is “recoverable.” The measures below are geared to making that happen by 2030, starting with encouraging residents and businesses to divert, recycle and compost organic waste. To meet our diversion target, the City will consider adopting an ordinance that mandates recycling and, as a last resort, setting trash collection fees that enable the waste hauler to invest in machinery that can sort trash and recover all compostable and recyclable materials before they are sent to the landfill.

The City will take the following actions to reduce emissions from waste.

### What You Can Do

- #1 Buy only as much as you need.
- #2 Buy locally grown food and eat less meat.
- #3 Put your food scraps in the green can and/or compost them at home.
- #4 Donate extra food and used clothing and housewares to charities.
- #5 Don't be a “wishful” recycler. Be scrupulous about how you sort your recyclables.

**TABLE 9: WASTE REDUCTION MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
WR-C1	Commercial Organic Waste	1,505	16%
WR-C2	Residential Organic Waste	795	8%
WR-C3	C&D and Self-Haul Waste	170	2%
WR-C4	Mandatory Waste Diversion	2,990	31%
WR-C5	Waste Processing Infrastructure	4,220	44%
WR-C6	Extended Producer Responsibility	n/a	n/a
WR-C7	Inorganic Waste	n/a	n/a
TOTAL		9,680	100%

**WR-C1: Commercial Organic Waste**

Work with Zero Waste Marin, Marin Sanitary Service, and non-profits such as Extra Food to divert commercial organic waste from the landfill through recycling, composting, and participation in waste-to-energy and food recovery programs.

- a. Conduct outreach and education to businesses subject to State organic waste recycling mandates (AB 1826) and encourage or enforce compliance with the law.
- b. Refer new and major remodel commercial and multi-family residential project proposals to the City's waste hauler for review and comment and require projects to provide adequate waste and recycling facilities and access as feasible.
- c. Encourage and facilitate commercial and multi-family property owners to require responsible use of on-site recycling facilities in lease and rental agreements and to train and regularly evaluate janitorial, landscape, and other property management services.

**WR-C2: Residential Organic Waste**

Work with Zero Waste Marin, Marin Sanitary Service, and other organizations to educate and motivate residents to utilize curbside collection services and home composting for food waste.

**WR-C3: Construction & Demolition Debris and Self-Haul Waste**

Require all loads of construction & demolition debris and self-haul waste to be processed for recovery of materials as feasible. Investigate creation of an ordinance requiring deconstruction of buildings proposed for demolition or remodeling when materials of significant historical, cultural, aesthetic, functional or reuse value can be salvaged.

**WR-C4: Mandatory Waste Diversion**

Adopt an ordinance requiring mandatory subscription to and participation in waste diversion activities, including recycling and organics collection provided by Marin Sanitary Service. Consider including phased implementation of the ordinance, penalties, and practical enforcement mechanisms.

**WR-C5: Waste Processing Infrastructure**

Review and revise the City’s franchise agreement with Marin Sanitary Service to ensure waste reduction and diversion targets are met. Conduct a feasibility study and consider investing in new solid waste processing infrastructure to remove recoverable materials (recycling and organics) from the waste stream and reduce contamination. Require regular residential and commercial waste audits and waste characterization studies to identify opportunities for increased diversion and to track progress in meeting targets.

**WR-C6: Extended Producer Responsibility.** Encourage the State to regulate the production and packaging of consumer goods and take-back programs. Encourage on-demand delivery services like Amazon and Blue Apron to reduce packaging waste and investigate requirements and incentives for same through ordinance or engagement campaigns.

**WR-C7: Inorganic Waste.** Promote reuse, repair, and recycling of inorganic materials, and encourage reduced use of packaging and single use items through engagement campaigns. Investigate supporting a local building material reuse center.

**TABLE 10: WASTE REDUCTION MEASURES TO REDUCE GOVERNMENT OPERATIONS EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
WR-M1	Waste from Public Facilities	260	76%
WR-M2	Waste from City Operations	85	24%
TOTAL		345	100%

**WR-M1: Waste from Public Facilities**

Increase opportunities for recycling, reuse, and composting at City facilities.

**WR-M2: Waste from City Operations**

Embark on an educational and social marketing-based campaign to increase recycling, composting, reuse, and waste reduction within municipal operations. Conduct periodic waste audits of City facilities to understand where opportunities for increased diversion lie and to track progress.



## WATER CONSERVATION

*1% of potential reductions*

San Rafael is no stranger to periodic droughts and the need to conserve water, and the community has responded by reducing per capita water use by about 25%, from 152 gallons per person per day (gpcd) in 2005 to 114 gpcd in 2016. In addition to installing low-flow fixtures (showerheads, faucets and toilets) and water-efficient appliances (clothes washers and dishwashers), residents and businesses are planting native, drought-tolerant species and even replacing lawns with attractive, low-water use gardens. Good thing, because as temperatures continue to rise, we will experience more droughts and more intense heat waves than before.

Our Greenhouse Gas Inventory counts emissions that are generated from the energy used to pump, treat and convey water from the water source to San Rafael water users. Far more emissions are created from the energy that is used to heat water, but those emissions are counted in the residential and commercial sectors. Therefore, the water sector comprises a much smaller share of community emissions than one might expect.

The water agencies that supply San Rafael's water are committed to using 100% renewable energy in their operations. Marin Municipal Water District (MMWD) began purchasing Deep Green electricity from MCE in 2017, and Sonoma County Water Agency, which provides 20-25% of MMWD's water, started purchasing 100% renewable electricity in 2015. As a result, emissions from the water sector will go down to nearly zero, but the overall contribution to community emissions reduction is small.

The City will take the following actions to reduce emissions from water use.

### What You Can Do

#1 Replace your lawn with a drought-tolerant garden.

#2 Install a drip irrigation system and check it regularly for leaks.

#3 Install low water flow faucets, showerheads and toilets.

#4 Buy water-efficient dishwashers and clothes washers when it's time to replace them.

**TABLE 11: WATER CONSERVATION MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
WC-C1	Community Water Use	830	100%

**WC-C1: Community Water Use**

Reduce indoor and outdoor water use in residential and commercial buildings and landscaping.

- a. Work with Marin Municipal Water District (MMWD) and other organizations to promote water conservation programs and incentives.
- b. Educate residents and businesses about local and State laws requiring retrofit of non-compliant plumbing fixtures during remodeling and at resale.
- c. Ensure all projects requiring building permits, plan check, or design review comply with State and MMWD regulations.
- d. Encourage the installation of greywater and rainwater collection systems and the use of recycled water where available through ordinance or engagement campaigns.

**TABLE 12: WATER CONSERVATION MEASURES TO REDUCE GOVERNMENT OPERATIONS EMISSIONS**

ID	Measure	GHG Reduction by 2030 (MTCO <sub>2</sub> e)	Share of Reductions
WC-M1	Municipal Water Use	<1	100%

**WC-M1: Municipal Water Use**

Reduce indoor and outdoor water use in municipal facilities and operations.

- a. Replace high water use plants and inefficient irrigation systems with water-efficient landscaping.
- b. Investigate synthetic turf that uses organic infill for ball fields and parks to reduce water, herbicide use, and maintenance costs, while increasing field use throughout the year.
- c. Replace inefficient plumbing fixtures with high-efficiency fixtures.
- d. Use recycled water as available and practicable.



## SEQUESTRATION AND ADAPTATION

California is already experiencing the effects of climate change. Every year, it seems like the news gets grimmer: more wildfires, more heat waves, longer droughts, more intense storms, less snow pack, and less fresh water. Annual average air temperatures have already increased by about 1.8 °F in California, and that number will likely double even if the world can reduce emissions 80% by 2050. San Rafael needs to be prepared for the likely impacts of climate change, including flooding from more intense storms and sea level rise, health impacts from heat exposure and poor air quality, and safety risks from the increased likelihood of wildfires and landslides.

Sea level rise is a particular concern to San Rafael, where many homes, businesses, and industrial and recreational facilities are at risk for flooding. Sea level has already risen 8” in San Francisco Bay and is expected to rise another 10 inches by 2040. Within this short time period, the Canal area, the Kerner Business District, and other shoreline development will likely experience tidal flooding. The Canal neighborhood residents, the majority of whom are lower-income and Latino, will be some of the first people impacted by sea level rise at their front doors.

Storm surges coupled with a 10” sea level rise could flood a greater area – up to 10% of San Rafael’s land area – including Peacock Gap and the industrial and commercial area of Anderson Drive. By the end of the century, sea level is projected to rise 2.4 to 3.4 feet, and possibly as much as 5 feet. At the higher end, nearly 2,500 buildings, or 13% of all San Rafael buildings, could face some level of tidal flooding. A comprehensive assessment of San Rafael’s vulnerable assets was completed in 2017. For more information, see the [Marin Shoreline Sea Level Rise Assessment](#). While the Climate Change Action Plan contains some measures that address adaptation, a more complete set of goals, policies and programs are contained in the [San Rafael Local Hazard Mitigation Plan](#) and will be incorporated in the City’s updated General Plan.

In addition to adaptation strategies, this section contains measures to sequester carbon dioxide through planting and preservation of trees and other vegetation and the development of carbon-rich soils. Carbon offsets are often used to fund these types of carbon sequestration projects and can be purchased to offset emissions that are difficult to otherwise mitigate, such as airplane flights. We haven’t credited emission reductions for these actions because we don’t count sequestered carbon in the community greenhouse gas inventory, but we recognize that sequestration is a critical component to meeting our carbon reduction goals.

The City will take the following actions to sequester carbon dioxide and adapt to climate change.

### What You Can Do

#1 Plant trees appropriate to your situation.

#2 Add compost to your soil.

#3 Purchase carbon offsets for airplane flights and other emissions that are difficult to mitigate.

#4 Find out if your home or business is vulnerable to sea level rise at [Our Coast Our Future](#).

**TABLE 13: SEQUESTRATION AND ADAPTATION MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure
SA-C1	Urban Forest
SA-C2	Carbon Sequestration
SA-C3	Carbon Offsets
SA-C4	Sea Level Rise
SA-C5	Climate Change Adaptation

**SA-C1: Urban Forest**

Increase carbon sequestration and improve air quality and natural cooling through increasing tree cover in San Rafael.

- a. Plant additional trees on City-owned land, including public parks, open space, medians, and rights of way, where feasible.
- b. Review parking lot landscape standards to maximize tree cover, size, growth, and sequestration potential.
- c. Regulate and minimize removal of large trees and require planting of replacement trees.
- d. Require that the site planning, construction and maintenance of new development preserve existing healthy trees and native vegetation on site to the maximum extent feasible. Replace trees and vegetation not able to be saved.
- e. Encourage community members to plant trees on private land. Consider creating a tree giveaway event or providing lower-cost trees to the public through a bulk purchasing program.
- f. Encourage the creation of community gardens on public and private lands by community groups.
- g. Provide information to the public, including landscape companies, gardeners and nurseries, on carbon sequestration rates, drought tolerance, and fire resistance of different tree species.
- h. Manage trees and invasive species in the open space for forest health and reduction of fuel load.
- i. Require new development, redevelopment, and infrastructure projects to implement best management practices as feasible, including low-impact development techniques, the minimal use of non-pervious surfaces in landscape design, and the integration of natural features into the project design, to naturally filter and biodegrade contaminants and to minimize surface runoff into drainage systems and creeks.

**SA-C2: Carbon Sequestration**

Increase carbon sequestration in the built environment, developed landscapes, and natural areas.

- a. Encourage use of building materials that store carbon, such as wood and carbon-intensive concrete through agency partnerships and engagement campaigns.
- b. Encourage and support composting to develop healthy, carbon-rich soils.
- c. Manage parks and open spaces to steadily increase carbon in vegetation and soil.
- d. Increase the extent and carbon sequestration potential of bay wetlands, through improvements such as horizontal levees.



### **SA-C3: Carbon Offsets**

Reduce the impact of greenhouse gas emissions through the purchase of carbon offsets.

- a. Encourage community members to purchase carbon offsets to reduce their carbon footprint through engagement campaigns.
- b. Consider partnering with a local non-profit organization to promote a carbon offset program.
- c. Focus on offsetting emissions that are difficult to mitigate otherwise, such as airplane travel.

### **SA-C4: Sea Level Rise**

Prepare for and adapt to a rising sea level.

- a. Consider the potential for sea level rise when processing development applications that might be affected by such a rise. Use current Flood Insurance Rate Maps and National Oceanic and Atmospheric Administration (NOAA) recommendations associated with base flood elevation adjustments for sea level rise in the review of development proposals. Adopt requirements to assess sea level rise risks on new development, infrastructure, and transit corridors.
- b. Prepare a guidance document for incorporating sea level rise into the City's capital planning process.
- c. Work with local, County, state, regional, and federal agencies with Bay and shoreline oversight and with owners of critical infrastructure and facilities in the preparation of a plan for responding to rising sea levels. Make sure all local stakeholders are kept informed of such planning efforts.
- d. Investigate developing flood control projects and modifying the City's land use regulations for areas subject to increased flooding from sea level rise.
- e. Update GIS (Geographic Information System) maps to include new data as it becomes available; utilize GIS as a tool for tracking sea level rise and flooding and make available to the public.
- f. Study the creation of a Bayfront overlay zone or similar that would establish standards for developing in areas subject to flooding from SLR.

### **SA-C5: Climate Change Adaptation**

Prepare for and respond to the expected impacts of climate change.

- a. Continue to incorporate the likelihood of sea level rise and increased risk of wildfire and extreme heat and storm events in the City's Local Hazard Mitigation Plan.
- b. Incorporate the likelihood of climate change impacts into City emergency planning and training.
- c. Coordinate with water districts, wildlife agencies, flood control and fire districts, Marin County, and other relevant organizations to develop a comprehensive plan addressing climate change impacts and adaptation strategies. Address human health and the health and adaptability of natural systems, including the following:
  - Water resources, including expanded rainwater harvesting, water storage and conservation techniques, water reuse, water-use and irrigation efficiency, and reduction of impervious surfaces.
  - Biological resources, including land acquisition, creation of marshlands/wetlands as a buffer against sea level rise and flooding, and protection of existing natural barriers.

- Public health, including heat-related health plans, vector control, air quality, safe water, and improved sanitation.
  - Environmental hazard defenses, including seawalls, storm surge barriers, pumping stations, and fire prevention and suppression.
- d. Ensure fair and robust inclusion of lower-income households and our diverse communities in the planning and response to climate change impacts, including sea level rise, wildfire, public health, and emergency preparedness.



## COMMUNITY ENGAGEMENT

The Climate Action Plan contains actions that the City can undertake to reduce its own emissions by about 1,500 MTCO<sub>2</sub>e, bringing the emissions from municipal operations down to 56% below 2005 levels. However, since emissions from governmental operations make up less than 1% of community-wide emissions, that is just a drop in the bucket.

The fact is that our residents, businesses, workers, and visitors will have to do their part to ensure we meet our reduction targets. The City can compel some of these actions by adopting ordinances and building regulations, but much of the success of our plan will depend on informing our community members and encouraging them to take action on their own. This section details the ways in which the City will seek public engagement and work with local businesses and community groups to achieve the emissions reductions identified for measures in other sections of the Plan.

### What You Can Do

#1 Sign up for Resilient Neighborhoods and join a Climate Action Team.

#2 Commit to reducing your carbon footprint by taking the actions identified in this Plan.

The City has been partnering with [Resilient Neighborhoods](#) since 2009 to educate San Rafael residents on ways they can reduce their carbon footprint. The program organizes Climate Action Teams of up to 12 households that meet five times over two months to learn about strategies and resources to improve home energy efficiency, shift to renewable energy, use low-carbon transportation, conserve water, reduce waste, and adapt to a changing climate. To start, participants calculate their household carbon footprint and then take actions to reduce their greenhouse gas emissions by at least 5,000 pounds or 25%. Over 350 San Rafael residents have participated in the program.

The City will take the following actions to engage the community to reduce emissions.

**TABLE 14: COMMUNITY ENGAGEMENT MEASURES TO REDUCE COMMUNITY EMISSIONS**

ID	Measure
CE-C1	Community Education
CE-C2	Community Engagement
CE-C3	Advocacy
CE-C4	Innovation and Economic Development
CE-C5	Green Businesses

**CE-C1: Community Education**

Work with community-based outreach organizations, such as Resilient Neighborhoods, to educate and motivate community members on ways to reduce greenhouse gas emissions in their homes, businesses, transportation modes, and other activities.

**CE-C2: Community Engagement**

Implement a communitywide public outreach and behavior change campaign to engage residents, businesses, and consumers around the impacts of climate change and the ways individuals and organizations can reduce their GHG emissions and create a more sustainable, resilient, and healthier community. Create an overarching theme to articulate a long-term goal, motivate community members, and brand a comprehensive suite of GHG-reduction programs. Prioritize promotion of programs that have the greatest greenhouse gas reduction potential while utilizing the latest social science on behavior change. Emphasize and encourage citizens' involvement in reaching the community's climate goals, including innovative means of tracking milestones and comparing San Rafael's performance with other communities and with state, national and global benchmarks.

- a. Conduct outreach to a wide variety of neighborhood, business, educational, faith, service, and social organizations.
- b. Conduct outreach and education to the Latino community by using media, organizations, and gathering places favored by Latinos and translating materials into Spanish.
- c. Inform the public about the benefits of installing energy and water efficient appliances and fixtures, electrifying homes and commercial buildings, installing solar energy systems, and purchasing 100% renewable electricity.
- d. Inform the public about the benefits of using carbon-free and low-carbon transportation modes, such as driving electric vehicles, walking, bicycling, taking public transportation, and ridesharing.
- e. Utilize and tailor existing marketing materials when available.
- f. Inform the public about the environmental benefits of eating less meat and dairy products, growing food at home, and purchasing locally-produced food.
- g. Partner with MCE, PG&E, MMWD, Marin Sanitary Service, Transportation Authority of Marin, Marin Transit, Golden Gate Transit, SMART, and other entities to promote available financing, audits, rebates, incentives, and services to the San Rafael community.
- h. Utilize the City's website, newsletters, social media, bill inserts, public service announcements and advertisements, recognition programs, and other forms of public outreach.
- i. Create stories and "shareable content" that can be used by bloggers, businesses, non-profits, social media, and traditional media.
- j. Use creative methods to engage the public, such as games, giveaways, prizes, contests, simple surveys, digital tools, and "pop-up" events.
- k. Develop pilot programs using community-based social marketing and other social science-based techniques to effect behavior change.
- l. Participate in countywide outreach and education efforts, such as Drawdown Marin.

**CE-C3: Advocacy**

Advocate at the state and federal levels for policies and actions that support the rapid transition to GHG-free energy sources, electrification of buildings and the transportation fleet, and other impactful measures to sharply reduce greenhouse gas emissions.

**CE-C4: Innovation and Economic Development**

Convene an economic development and innovation working group to explore public-private partnerships and develop ways to decarbonize our local economy while spurring sustainable enterprise and equitable employment.

**CE-C5: Green Businesses**

Encourage local businesses to participate in the Marin County Green Business Program through partnerships with the County, Chamber, and other business groups.



## IMPLEMENTATION AND MONITORING

Plans are only effective if they're implemented and results are carefully evaluated. The City will prepare an annual assessment of the progress it is making on implementing the measures contained in this Climate Change Action Plan and continue to quantify community and greenhouse gas emissions to determine if we are on track to meet our reduction targets.

The City will take the following actions to implement and monitor the Climate Change Action Plan.

### What You Can Do

#1 Get involved! Attend City Council meetings, Climate Action Plan implementation forums, and other public forums to voice your support for actions contained in this Plan.

TABLE 15: IMPLEMENTATION AND MONITORING MEASURES TO REDUCE COMMUNITY EMISSIONS

ID	Measure
IM-C1	Annual Monitoring
IM-C2	Update GHG Emissions Inventories
IM-C3	Funding Sources
IM-C4	Update the Climate Change Action Plan
IM-C5	Project Compliance Checklist

### IM-C1: Annual Monitoring

Monitor and report on the City's progress annually. Create an annual priorities list for implementation.

### IM-C2: Update GHG Emissions Inventories

Update the greenhouse gas emissions inventory for community emissions annually and every five years for government operations.

### IM-C3: Funding Sources

Identify funding sources for recommended actions, and pursue local, regional, state and federal grants as appropriate. Investigate creation of a local carbon fund or other permanent source of revenue to implement the Climate Change Action Plan.

### IM-C4: Update the Climate Change Action Plan

Update the Climate Change Action Plan regularly to incorporate new long-term reduction targets and strategies to meet those targets.

### IM-C5: Project Compliance Checklist

Develop a project compliance checklist to use when reviewing development proposals, use permit applications, and building permit applications to ensure compliance with Climate Action Plan measures.

# ACKNOWLEDGMENTS

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## **City Council**

Gary Phillips, Mayor  
Kate Colin, Sustainability Liaison  
Maribeth Bushey  
John Gamblin  
Andrew McCullough

## **Green Ribbon Working Group**

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Funded by the Marin Climate and Energy Partnership & the City of San Rafael.

*Special thanks to participants of our quarterly community implementation forums and everyone who participated in the CCAP community workshops and surveys.*

# APPENDICES

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APPENDIX A – PROGRAM CALCULATIONS

GHG EMISSIONS REDUCTION SUMMARY			
City of San Rafael Climate Change Action Plan			
	Measure	2020 GHG Emissions Reductions (MTCO <sub>2</sub> e/yr)	2030 GHG Emissions Reductions (MTCO <sub>2</sub> e/yr)
<b>Local Actions</b>			
LCT-C1	Zero Emission Vehicles	-2,671	-30,347
LCT-C2	Bicycling	-734	-1,822
LCT-C2A	Bicycle Racks & Lockers	-35	-69
LCT-C2B	Bike Share	-7	-19
LCT-C3	Walking	-278	-577
LCT-C4	Safe Routes to School	-300	-321
LCT-C5	Public Transit	-767	-1,035
LCT-C6	Employee Trip Reduction	-198	-1,028
LCT-C7	Parking Requirements	0	-55
LCT-C8	Traffic System Management and Vehicle Idling	-1,075	-1,075
LCT-C10	Electric Landscape Equipment	-27	-108
LCT-M1	Low Emission City Vehicles	-27	-274
LCT-M2	Low Carbon Fuels	-67	-270
LCT-M3	City Employee Commute	-22	-22
LCT-M4	Municipal Electric Landscape Equipment	-5	-5
EE-C1	Energy Efficiency Programs	-4,239	-17,334
EE-C2	Energy Audits	0	-261
EE-C3	Cool Pavement and Roofs	0	-274
EE-C4	Green Building Reach Code	0	-226
EE-M1	Streetlights	-109	-109
EE-M2	Energy Efficiency Audit and Retrofits	-43	-43
EE-M3	Energy Conservation	-33	-33
RE-C1	Renewable Energy Generation	-1,348	-10,938
RE-C2	GHG-Free Electricity	-22,510	-19,583
RE-C3	Building and Appliance Electrification	-20	-895
RE-M1	Solar Energy Systems for Municipal Buildings	-141	-141
RE-M2	Municipal Deep Green Electricity	-337	-366
WR-C1	Commercial Organic Waste	-959	-1,507
WR-C2	Residential Organic Waste	-74	-795
WR-C3	C&D and Self-Haul Waste	-107	-170
WR-C4	Mandatory Waste Diversion	-639	-2,988
WR-C5	Waste Processing Infrastructure	0	-4,222
WR-M1	Public Waste Facilities	-174	-261
WR-M2	Waste from City Operations	-55	-83
WC-C1	Community Water Use	-793	-830
WC-M1	Municipal Water Use	0	0
<b>TOTAL - LOCAL ACTIONS</b>		<b>-37,796</b>	<b>-98,084</b>

## APPENDIX A – PROGRAM CALCULATIONS

<b>State Actions</b>		
RPS	-1,585	-4,542
TITLE 24	-8	-2,871
Lighting Efficiency (AB 1109)	-980	-980
Residential Solar Water Heaters	-29	-29
Light and Heavy Duty Fleet Regulations	-17,723	-56,878
<b>TOTAL - STATE ACTIONS</b>	<b>-20,326</b>	<b>-65,301</b>
<b>Projected Emissions</b>		
Projected BAU Community GHG Emissions	383,241	398,177
Emissions Reduction from Local and State Actions	-58,122	-163,385
Projected Community Emissions with Local and State Actions Implemented	325,119	234,792
<b>Reduction from 2005 Baseline Emissions</b>		
2005 Community GHG Emissions	473,438	473,438
Community Emissions with Local and State Actions Implemented	325,119	234,792
% Reduction from 2005 Emissions	31%	50%
GHG Target to Meet State Goals	402,422	241,453
% Below 1990 Levels	19%	42%
Emissions per Service Population	3.01	2.08

APPENDIX A – PROGRAM CALCULATIONS

<b>ZERO EMISSION VEHICLES</b> <i>LCT-C1</i>	
Reductions (MTCO <sub>2</sub> e) -2,671 -30,347	2020 2030
Methodology and Assumptions	<p>Marin has approximately 1.5% of all ZEV rebates in California and 198,000 automobiles registered in the County. CARB's proposed strategy is to put 4.2 million ZEVs on the road by 2030, which is approximately 14% of light duty vehicles in California in 2030. In January 2018, Governor Jerry Brown issued Executive Order B-48-18 set a new goal of having a total of 5 million ZEVs in California in 2030.</p> <p>There were 2,795 Clean Vehicle Rebate Project (CVRP) rebates issued to Marin residents through 2016. CARB estimates 69% of eligible Marin vehicle owners participated in the program between Marin 2010 and March 2015. Therefore, we assume there were 4,050 ZEVs in Marin in 2016 and approximately 2% of registered vehicles in Marin. DMV data shows that there were 5,330 ZEVs registered in Marin as of 1/1/18.</p> <p>In 2018, approximately 68% of Clean Vehicle Rebate Project rebates are going to BEVs, 31% are going to PHEVs, and 1% to FCEVs. We assume 69% of EVs are BEVs and 31% are PHEVs in 2020 and 2030.</p> <p>74% of the distance PHEVs drive is electric (Smart et al, 2014).</p> <p>EV kWh/mile is 0.32 (US Dept of Energy).</p> <p>Assuming the same share of ZEV ownership in 2030 as in 2016 (1.5%) means there would be approximately 75,000 ZEVs registered in Marin by 2030, or approximately 37% of existing automobile registrations. We conservatively assume 50,100 ZEVs in Marin in 2030, or 25% of ZEVs registered in Marin. This would require an average annual growth rate of 20%. Electric vehicle sales in California grew by 20% in 2016, followed by 29% growth in 2017 (ICCT, 2018), suggesting that an annual growth rate of 20% is reasonable, especially as the number of models expands and battery technology and charging improves.</p> <p>Passenger VMT is adjusted to reflect the fact that approximately 35% of countywide commute VMT originates from workers who live outside Marin County (TAM). Measure does not apply to VMT generated by San Rafael workers and visitors who do not live in Marin.</p> <p>According to the Department of Energy, towns (population 2,500 to 50,000) need 54 public EV plugs per 1,000 PEVs, which would equal about 2,706 public EV plugs countywide for 50,100 PEVs. San Rafael's share (based on share of countywide households) would be 598 public EV plugs. The analysis assumes 88% of EV charging is done at home. San Rafael had approximately 68 public EV plugs in 2016 and 718 PEVs (95 plugs per thousand).</p> <p>City of San Rafael's Downtown Parking/Wayfinding Study identified 1,297 parking spaces in public lots and garages, and 3,785 parking spaces in private lots, for a total of 5,082 spaces in the Downtown area. This indicates that there is plenty of off-street parking space capacity to accommodate the projected EV charger need.</p>

## APPENDIX A – PROGRAM CALCULATIONS

Sources	<p>California Air Resources Board, 2017 Scoping Plan.</p> <p>Smart, J., Bradley, T., and Salisbury, S., "Actual Versus Estimated Utility Factor of a Large Set of Privately Owned Chevrolet Volts," SAE Int. J. Alt. Power. 3(1):2014, doi:10.4271/2014-01-1803.</p> <p>U.S, Department of Energy, Alternative Fuels Data Center, <a href="https://www.afdc.energy.gov/vehicles/electric_emissions_sources.html">https://www.afdc.energy.gov/vehicles/electric_emissions_sources.html</a>. Sales weighted average of 2016 model year vehicles with sales in 2015: 2015 sales from "U.S. Plug-in Electric Vehicle Sales by Model" (<a href="https://www.afdc.energy.gov/data/vehicles.html">https://www.afdc.energy.gov/data/vehicles.html</a>); MPGs from 2016 Fuel Economy Guide (<a href="https://www.fueleconomy.gov/feg/">https://www.fueleconomy.gov/feg/</a>)</p> <p>The International Council on Clean Transportation, "California's continued electric vehicle market development," May 2018, <a href="https://www.theicct.org/sites/default/files/publications/CA-cityEV-Briefing-20180507.pdf">https://www.theicct.org/sites/default/files/publications/CA-cityEV-Briefing-20180507.pdf</a>.</p> <p>Clean Vehicle Rebate Program Rebate Statistics, <a href="https://cleanvehiclerebate.org/eng/rebate-statistics">https://cleanvehiclerebate.org/eng/rebate-statistics</a>, accessed May 1, 2018.</p> <p>Center for Sustainable Energy, "Clean Vehicle Project Participation Rates: The First Five Years (March 201-March2015), October 2015, <a href="https://cleanvehiclerebate.org/sites/default/files/attachments/2015-10%20CVRP%20Participation.pdf">https://cleanvehiclerebate.org/sites/default/files/attachments/2015-10%20CVRP%20Participation.pdf</a>, accessed May 1, 2018.</p> <p>US Department of Energy, "National Plug-In Electric Vehicle Infrastructure Analysis," September 2017. <a href="https://www.nrel.gov/docs/fy17osti/69031.pdf">https://www.nrel.gov/docs/fy17osti/69031.pdf</a></p> <p>Bay Area Air Quality Management District, Vehicle Miles Dataportal, <a href="http://capvmt.us-west-2.elasticbeanstalk.com/">http://capvmt.us-west-2.elasticbeanstalk.com/</a>, accessed 8/23/18.</p> <p>California Department of Transportation, "California County-Level Economic Forecast 2018-2050," September 2018.</p> <p>California Department of Motor Vehicles, "Estimated Vehicles Registered by County for the Period January 1 through December 31, 2017" and "Fuel Type by County as of 1/1/2018."</p> <p>Personal communication with Derek McGill, Planning Manager, Transportation Authority of Marin, <a href="mailto:dmcgill@tam.ca.gov">dmcgill@tam.ca.gov</a>, August 22, 2018.</p> <p>City of San Rafael, "Downtown Parking/Wayfinding Study Final Report," July 2017.</p>
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APPENDIX A – PROGRAM CALCULATIONS

*Calculation*

	2020	2030
Number of registered Marin ZEVs in 2016	4,050	4,050
Projected number of registered passenger vehicles in Marin	198,831	200,429
Percent of Marin ZEVs in target year	4%	25%
Number of Marin ZEVs in target year	8,500	50,108
Increase in ZEVs	4,450	46,058
Additional ZEVs as a percent of Marin vehicles	2.3%	23.3%
San Rafael passenger VMT	476,148,178 miles	498,984,014 miles
VMT from non-Marin workers and visitors	104,064,441 miles	106,480,775 miles
San Rafael passenger VMT from Marin-based vehicles	372,083,737 miles	392,503,239 miles
VMT from additional ZEVs	8,380,561 miles	91,500,419 miles
VMT driven with electricity	7,705,088 miles	84,125,485 miles
Emissions without EV program	3,052.6 MTCO <sub>2</sub> e	33,734.6 MTCO <sub>2</sub> e
Tailpipe emissions reduction with EV program	2,806.5 MTCO <sub>2</sub> e	31,015.6 MTCO <sub>2</sub> e
Electricity used by ZEVs	2,465,628 kWh	26,920,155 kWh
Electricity emissions from ZEVs	136 MTCO <sub>2</sub> e	668 MTCO <sub>2</sub> e
Emissions reduction	2,671 MTCO <sub>2</sub> e	30,347 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>BICYCLING</b> <i>LCT-C2</i>	
Reductions (MTCO <sub>2</sub> e) -734 -1,822	2020 2030
Methodology and Assumptions	<p>Studies cited by CAPCOA show each additional mile of bike lanes per square mile increases the share of workers commuting by bicycle by 1% (CAPCOA SDT-5). We have applied this to the following population segments:</p> <ul style="list-style-type: none"> <li>• Live in/work in area</li> <li>• Live in/work out of area</li> <li>• Live in area/non-worker</li> <li>• Live out of area/work in area</li> </ul> <p>The City's 2011 Bicycle Pedestrian Plan identifies 8.96 miles of proposed Class I/II bike facilities and 12.07 miles of proposed Class II/III which may or may not be developed as Class II. We assume 8.96 miles for 2020 and 21.03 for 2030.</p>
Sources	<p>City of San Rafael Bicycle &amp; Pedestrian Master Plan 2011 Update.</p> <p>Bay Area Air Quality Management District Vehicle Miles Traveled Dataportal, <a href="http://capvmt.us-west-2.elasticbeanstalk.com/data">http://capvmt.us-west-2.elasticbeanstalk.com/data</a>.</p> <p>California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, 2010.</p>

*Calculation*

VMT generated by targeted population segments	370,860,285 VMT	392,477,729 VMT
Additional Class I/II facilities	9.0 miles	21.0 miles
New bike facilities/sq. mile	0.5	1.3
Reduction in local VMT	2,013,884 VMT	5,002,307 VMT
Emissions reductions	734 MTCO <sub>2</sub> e	1,822.1 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>BICYCLE RACKS AND LOCKERS</b> <i>LCT-C2A</i>					
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; width: 50%;">-35</td> <td style="width: 50%;">2020</td> </tr> <tr> <td style="text-align: right;">-69</td> <td>2030</td> </tr> </table>	-35	2020	-69	2030
-35	2020				
-69	2030				
Methodology and Assumptions	<p>BAAQMD Transportation Fund for Clean Air guidance indicates reduction based on the following:</p> <ul style="list-style-type: none"> <li>• Capacity of lockers x 2 trips per day (assumed 12 lockers with 8 bicycle capacity each)</li> <li>• Capacity of cages x 0.75 trips per day</li> <li>• Capacity of racks x 0.5 trips per day (assumed 12 racks with 12 bicycle capacity each)</li> <li>• 240 days of use</li> <li>• 3 miles per trip</li> </ul> <p>Per the Civic Center Station Area Plan, the City of San Rafael proposed 6 short-term bicycle racks (capacity 12 bicycles) and 8 long-term bicycle lockers (capacity 8 bicycles) at the Civic Center SMART Station. The 2018 bicycle and pedestrian plan update will propose a study of additional long-term bicycle parking at the Civic Center Station.</p> <p>Per the Downtown Station Area Plan, the City of San Rafael proposed a "bike station" at the Downtown SMART Station. The capacity of the proposed bike station is undecided.</p>				
Sources	BAAQMD Transportation Fund for Clean Air Guidance FYE 2018.				

*Calculation*

	2020	2030
Number of racks	6	12
Number of lockers installed	6	12
Reduction in local VMT	95,040 VMT	190,080 VMT
Emissions reductions	35 MTCO <sub>2</sub> e	69 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>BIKE SHARE</b> <i>LCT-C2B</i>	
Reductions (MTCO <sub>2</sub> e) -7 -19	2020 2030
Methodology and Assumptions	<p>The Marin County Bicycle Share Feasibility Study explores three phases of a potential bike share program with 100, 200 and 300 bikes. The number of stations in San Rafael and associated bike trips are: 3 stations and 9,428 trips (Phase 1); 9 stations and 20,530 trips (Phase 2); and 10 stations and 23,605 trips (Phase 3). We assume Phase 1 for 2020 and Phase 3 for 2030.</p> <p>VMT reduction estimated utilizing BAAQMD Transportation Fund for Clean Air Guidance FYE 2018: 1.48 trips per bike; 12% vehicle trips replaced; 260 days at 16 miles average trip; 105 days at 3 miles average trip.</p>
Sources	<p>BAAQMD Transportation Fund for Clean Air Guidance FYE 2018.</p> <p>Alta Planning + Design for the Transportation Authority of Marin, Marin County Bicycle Share Feasibility Study, November 2013, accessed 12/30/17, <a href="https://www.tam.ca.gov/wp-content/uploads/2017/02/Bike-Share-Feasibility-Study_Final-November-2013.pdf">https://www.tam.ca.gov/wp-content/uploads/2017/02/Bike-Share-Feasibility-Study_Final-November-2013.pdf</a></p>

*Calculation*

	2020	2030
Number of bikes in program	100	300
Reduction in local VMT	20,529 VMT	51,398 VMT
Emissions reductions	7 MTCO <sub>2</sub> e	19 MTCO <sub>2</sub> e



APPENDIX A – PROGRAM CALCULATIONS

<b>WALKING</b> <i>LCT-C3</i>					
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; padding-right: 10px;">-278</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-577</td> <td>2030</td> </tr> </table>	-278	2020	-577	2030
-278	2020				
-577	2030				
Methodology and Assumptions	Studies cited by CAPCOA show pedestrian network improvements can reduce VMT 1-2% (CAPCOA SDT-1). We apply this to passenger vehicle trips that start and end in San Rafael and assume a 1% reduction for 2020 and 2% for 2030.				
Sources	California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, 2010. Bay Area Air Quality Management District Vehicle Miles Traveled Data Portal, <a href="http://capvmt.us-west-2.elasticbeanstalk.com/data">http://capvmt.us-west-2.elasticbeanstalk.com/data</a>				

*Calculation*

	2020	2030
Passenger vehicle trips starting and ending in San Rafael	76,251,332 VMT	79,221,020 VMT
% decrease in VMT due to pedestrian improvements	1.0%	2.0%
Annual decrease in VMT	762,513 VMT	1,584,420 VMT
GHG emissions reductions	278 MTCO <sub>2</sub> e	577 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>SAFE ROUTES TO SCHOOL</b> <i>LCT-C4</i>					
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; padding-right: 10px;">-300</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-321</td> <td>2030</td> </tr> </table>	-300	2020	-321	2030
-300	2020				
-321	2030				
Methodology and Assumptions	<p>To demonstrate the benefits of providing Safe Routes to Schools, the Marin County Bicycle Coalition recruited nine pilot schools in four different geographic locations. Initial surveys reported that 62% of the students were arriving by car, with only 14% walking, 7% biking to school, 11% carpool, and 6% arriving by bus. Every school in the pilot program held periodic Walk and Bike to School Days and participated in the Frequent Rider Miles contest, which rewarded children who came to school walking, biking, by carpool or bus.</p> <p>At the end of the pilot program, the participating schools experienced a 57% increase in the number of children walking and biking and a 29% decrease in the number of children arriving alone in a car.</p> <p>We assume an elementary school age population of 4,086 with an average trip length of 1.7 mile, a middle school population of 1,997 with an average trip length of 1.7 miles, a high school population of 2,683 with an average trip length of 2.3 miles, 180 school days, and an existing share of school trips completed in a family vehicle of 47% according to Safe Routes to School surveys taken at participating San Rafael schools in Spring 2017.</p>				
Sources	<p>US Census Bureau, American Community Survey 5-Year Estimates 2012-2016, Table B14001.</p> <p>Safe Routes to School Marin County,  <a href="http://www.saferoutestoschools.org/sr2s_sanrafael.html">http://www.saferoutestoschools.org/sr2s_sanrafael.html</a></p> <p>Safe Routes to School Marin County,  <a href="http://www.saferoutestoschools.org/history.html#success">http://www.saferoutestoschools.org/history.html#success</a></p>				

*Calculation*

	2020	2030
School population miles travel	6,039,659 miles	6,458,025 miles
Percent of miles driven in a family vehicle	47 %	47 %
Potential percent decrease in students driving to school	29 %	29 %
VMT avoided	823,206 VMT	880,229 VMT
Emissions reductions	300 MTCO <sub>2</sub> e	321 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>PUBLIC TRANSIT</b> <i>LCT-C5</i>	
Reductions (MTCO <sub>2</sub> e)	
-767	2020
-1,035	2030
Methodology and Assumptions	Marin Transit reports 2,321,290 miles in FY 16/17. Based on data from Marin Transit, we assign 23.6% of the vehicle miles to San Rafael. We assume 100% of VMT will be driven by buses using renewable diesel in 2020 and 50% will be driven by electric buses utilizing MCE electricity by 2030.
Sources	Derek McGill, Transportation Authority of Marin Robert Betts, Marin Transit

*Calculation*

	2020	2030
Transit miles, BAU	2,321,290 miles	2,321,290 miles
San Rafael's share of passenger revenue miles	547,824 miles	547,824 miles
Average fleet average MPG (diesel)	4.3 MPG	4.3 MPG
Emissions, BAU	1,302 MTCO <sub>2</sub> e	1,302 MTCO <sub>2</sub> e
Renewable diesel VMT	100%	100%
Electric bus VMT	0%	50%
Emissions	534 MTCO <sub>2</sub> e	267 MTCO <sub>2</sub> e
GHG emissions reductions	767 MTCO <sub>2</sub> e	1,035 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>EMPLOYEE TRIP REDUCTION</b> <i>LCT-C6</i>	
Reductions (MTCO <sub>2</sub> e)  -198 -1,028	2020 2030
Methodology and Assumptions	<p>CAPCOA TRT-1 indicates VMT reduction of 5.4% for suburban center location. Employer programs include: carpooling, ride matching, preferential carpool parking, flexible work schedules for carpools, a half-time transportation coordinator, vanpool assistance, bicycle parking, showers, and locker facilities. This measure assumes voluntary employee participation.</p> <p>BAAQMD Transportation Fund for Clean Air guidance indicates a reduction of 0.2% of commute VMT for Guaranteed Ride Home Programs.</p> <p>The San Rafael Chamber of Commerce identified 152 businesses with 30 or more employees, for a total of 15,397. We assume 20% of these employers participate in the program by 2020 and all participate by 2030. We assume 240 work days per year.</p>
Sources	<p>California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, BAAQMD Transportation Fund for Clean Air Guidance FYE 2018.</p> <p>San Rafael Chamber of Commerce.</p>

*Calculation*

	2020	2030
Number of employees working in companies with 30 or more employees	15,436	15,699
Number of employees targeted for program	3,087	15,699
Average daily VMT for San Rafael worker	13.1	13.4
Estimated annual VMT	9,707,879	50,410,924
VMT reduction	5.6%	5.6%
Annual decrease in VMT	543,641	2,823,012
GHG emissions reductions	198	1,028

APPENDIX A – PROGRAM CALCULATIONS

<b>PARKING REQUIREMENTS</b> <i>LCT-C7</i>	
Reductions (MTCO <sub>2</sub> e)	<p style="text-align: center;">0      2020</p> <p style="text-align: center;">-55      2030</p>
Methodology and Assumptions	<p>CAPCOA Measure PDT-1 indicates a VMT reduction range of 2.5% to 12.5%, depending upon the reduction in parking requirement, with 2.5% for a 5% reduction in parking spaces and 12.5% for a 25% reduction in spaces. We assume a 10% reduction in VMT for a 20% reduction in parking spaces.</p> <p>8.5 miles of daily per capita VMT is allocated to San Rafael's community emissions. Consistent with the GHG inventory methodology, we apply a PeMS factor of 350.2 to determine annual VMT.</p>
Sources	<p>California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, 2010. <a href="#">[2]</a></p> <p>Bay Area Air Quality Management District, Vehicle Miles Traveled Dataportal, <a href="http://capvmt.us-west-2.elasticbeanstalk.com/data">http://capvmt.us-west-2.elasticbeanstalk.com/data</a>, accessed 5/14/18.</p>

*Calculation*

	2020	2030
Annual VMT per resident, as attributed in GHG Inventory	2,993 VMT	3,002 VMT
Number of parking spaces subject to program	0 spaces	500 spaces
Number of parking spaces reduced through program	0 spaces	100 spaces
VMT generated by project	0 VMT	1,500,780 VMT
VMT reduced by program	0 VMT	150,078 VMT
Total emissions reductions	0 MTCO <sub>2</sub> e	55 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>TRAFFIC SYSTEM MANAGEMENT AND VEHICLE IDLING</b> <i>LCT-C8</i>	
Reductions (MTCO <sub>2</sub> e)	
-1,075	2020
-1,075	2030
Methodology and Assumptions	<p>Fuel savings for a traffic signal synchronization program are estimated based on a similar program implemented in San Rafael in 2011/12 which reported annual fuel consumption savings of 119,284 gallons.</p> <p>We assume a split of 89% gasoline and 11% diesel based on EMFAC2014 modeling for Marin County in 2015.</p>
Sources	City of San Rafael, Program for Arterial Signal Synchronization Final Project Report, July 31, 2012

*Calculation*

	2020	2030
Fuel savings	119,284 gallons	119,284 gallons
Gasoline fuel savings	106,163 gallons	106,163 gallons
Diesel fuel savings	13,121 gallons	13,121 gallons
Total emissions reductions	1,075 MTCO <sub>2</sub> e	1,075 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>ELECTRIC LANDSCAPE EQUIPMENT</b> <i>LCT-C10</i>	
Reductions (MTCO <sub>2</sub> e) -27 -108	2020 2030
Methodology and Assumptions	Leaf blowers consumed 52,148 gallons of gasoline and 42 gallons of diesel fuel in Marin County in 2016 (OFFROAD2007). Similar to the off-road emissions inventory, we assume 22.2% of emissions are attributable to San Rafael based on its share of countywide households in 2016. We assume a 25% reduction for 2020 due to the City's efforts to encourage use of electric leaf blowers and a 100% reduction in 2030 due to the City's action to ban all gasoline and diesel-powered leaf blowers by 2030.
Sources	OFFROAD2007

*Calculation*

	2020	2030
Leaf blower gasoline consumption, BAU	12,290 gallons	12,135 gallons
Leaf blower diesel consumption, BAU	9 gallons	10 gallons
Emissions from leaf blowers, BAU	109 MTCO <sub>2</sub> e	108 MTCO <sub>2</sub> e
Emissions reductions	27 MTCO <sub>2</sub> e	108 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>ZERO AND LOW EMISSION CITY VEHICLES</b> <i>LCT-M1</i>	
Reductions (MTCO <sub>2</sub> e) -27 -274	2020 2030
Methodology and Assumptions	As vehicles are replaced, there will be opportunities to purchase/lease electric vehicles or improve vehicle fuel efficiency with similar models.
Sources	City of San Rafael

*Calculation*

	2020	2030
City vehicle fleet tailpipe emissions, 2016	612 MTCO <sub>2</sub> e	612 MTCO <sub>2</sub> e
Fuel efficiency improvement for fleet	5 %	50 %
Electricity for EVs	24,528 kWh	245,284 kWh
Electricity emissions	3 MTCO <sub>2</sub> e	32 MTCO <sub>2</sub> e
Emissions reductions	27 MTCO <sub>2</sub> e	274 MTCO <sub>2</sub> e



APPENDIX A – PROGRAM CALCULATIONS

<b>LOW CARBON FUELS</b> <i>LCT-M2</i>	
Reductions (MTCO <sub>2</sub> e) -67 -270	2020 2030
Methodology and Assumptions	Replace 25% of diesel consumption with renewable diesel by 2020 and 100% by 2030.
Sources	City of San Rafael 2016 Greenhouse Gas Emissions Inventory

*Calculation*

	2020	2030
Diesel use, BAU	44,142 gallons	44,142 gallons
Renewable diesel percentage	25%	100%
Emissions from diesel fuel	114 MTCO <sub>2</sub> e	454 MTCO <sub>2</sub> e
Emissions from renewable diesel fuel	46 MTCO <sub>2</sub> e	185 MTCO <sub>2</sub> e
Emissions reductions	67 MTCO <sub>2</sub> e	270 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>CITY EMPLOYEE COMMUTE</b> <i>LCT-M3</i>	
Reductions (MTCO <sub>2</sub> e)	<p style="text-align: right;">-22    2020</p> <p style="text-align: right;">-22    2030</p>
Methodology and Assumptions	<p>CAPCOA Measure TRT-1. VMT reduction is 5.4% for a suburban center location.</p> <p>BAAQMD Transportation Fund for Clean Air guidance indicates a reduction of 0.2% of commute VMT for Guaranteed Ride Home Programs.</p> <p>We assume 230 work days per year per employee, 362 employees, and 13 miles per day per employee.</p>
Sources	<p>California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, 2010.</p> <p>BAAQMD Transportation Fund for Clean Air Guidance FYE 2018.</p>

*Calculation*

	2020	2030
Employee commute VMT, BAU	1,082,380 VMT	1,082,380 VMT
Reduction in VMT	5.6%	5.6%
VMT avoided	60,613 VMT	60,613 VMT
Emissions reduction	22 MTCO <sub>2</sub> e	22 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

MUNICIPAL ELECTRIC LANDSCAPE EQUIPMENT <i>LCT-M4</i>	
Reductions (MTCO <sub>2</sub> e)	
-5	2020
-5	2030
Methodology and Assumptions	Assumes all gasoline-powered leaf blowers are replaced. As of 2017, the City had 18 leaf blowers in its equipment inventory.
Sources	City of San Rafael

*Calculation*

	2020	2030
Gasoline used for leaf blowers	620 gallons	620 gallons
Emissions from leaf blowers	5 MTCO <sub>2</sub> e	5 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>ENERGY EFFICIENCY PROGRAMS</b>	
<i>EE-C1</i>	
Reductions (MTCO <sub>2</sub> e) -4,239 -17,334	2020 2030
Methodology and Assumptions	<p>We are forecasting an annual electricity savings of 1% and an annual natural gas savings of 1% based on the following:</p> <p>The National Action Plan for Energy Efficiency states among its key findings "consistently funded, well-designed programs are cutting annual savings for a given program year of 0.15 to 1 percent of energy sales."</p> <p>The American Council for an Energy-Efficiency Economy (ACEE) reports for states already operating substantial energy efficiency programs, energy efficiency goals of one percent, as a percentage of energy sales, is a reasonable level to target.</p> <p>MCE Clean Energy's Implementation Plan states "MCE's goal is to increase annual savings through energy efficiency programs to two percent (combined MCE and PG&amp;E programs) of annualized electric sales...by the end of 2018."</p> <p>Electricity consumption declined an average of 0.86% per year in San Rafael between 2005 and 2016. Natural gas consumption declined an average of 0.93% per year between 2005 and 2016.</p>
Sources	<p>Marin Clean Energy Revised Community Choice Aggregation Implementation Plan and Statement of Intent, July 18, 2014.</p> <p>National Action Plan for Energy Efficiency, July 2006, Section 6: Energy Efficiency Program Best Practices (pages 5-6).</p> <p>Energy Efficiency Resource Standards: Experience and Recommendations, Steve Nadel, March 2006 ACEEE Report E063 (pages 28-30).</p>

*Calculation*

	2020	2030
Residential and commercial electricity use, 2016	346,842,862 kWh	346,842,862 kWh
Electricity savings less State actions	6,993,339 kWh	41,677,625 kWh
Residential and commercial natural gas use, 2016	15,155,231 therms	15,155,231 therms
Natural gas savings	606,209 therms	2,121,732 therms
GHG emissions reductions	4,239 MTCO <sub>2</sub> e	17,334 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>ENERGY AUDITS</b> <i>EE-C2</i>	
Reductions 0 -261	2020 2030
Methodology and Assumptions	Assumes program will be implemented in 2020 and program will require audits at time of sale but energy efficiency projects will be voluntary. Assumes 5% of audited housing units will implement energy efficiency upgrades based on findings from the City of Berkeley's Building Energy Saving Ordinance. Assume 31% Btu energy use reduction based on demonstrated Energy Upgrade California projects completed in Marin County between June 2010 and May 2017, based on 2005-2017 average (Marin County Assessor).
Sources	Marin County Assessor, <a href="http://www.marincounty.org/depts/ar/divisions/assessor/sales">http://www.marincounty.org/depts/ar/divisions/assessor/sales</a> City of Berkeley, "Building Energy Savings Ordinance (BESO) Findings through Nov. 2016," December 7, 2016, <a href="https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Energy%20Commission%20Presentation%20Berkeley.pdf">https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Energy%20Commission%20Presentation%20Berkeley.pdf</a> Marin County Energy Watch Partnership, Dana Armanino, Sustainability Planner, County of Marin, <a href="mailto:darmanino@marincounty.org">darmanino@marincounty.org</a>

*Calculation*

	2030
Average household electricity use 2016	5,319 kWh
Average household natural gas use 2016	408 therms
Number of housing units sold annually	584 units
Number of housing units provided energy audits	5,841 units
Percent of participating housing units	5%
Number of housing units implementing energy efficiency projects	292 units
Electricity reduction	31%
Natural gas reduction	31%
Annual electricity savings	481,536 kWh
Natural gas savings	36,902 therms
Electricity emissions reduction	64 MTCO <sub>2</sub> e
Natural gas emissions reduction	196 MTCO <sub>2</sub> e
Total GHG emissions reduction	261 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>COOL PAVEMENT AND ROOFS</b> <i>EE-C3</i>	
Reductions (MTCO <sub>2</sub> e)	
0	2020
-274	2030
Methodology and Assumptions	<p>On average, for metropolitan areas studied, vegetation covers about 29-41% of the area, roofs 19-25%, and paved surfaces 29-39% (Akbari, 2008). For San Rafael, assumed paved surfaces cover 29%. Assume 10% will be replaced with high albedo content by 2030. Pavement has a potential for a 0.15 to 0.25 increase in albedo (Akbari, 2008); we have conservatively assumed a 0.15 change in albedo. <math>0.29 * 0.15 * 0.15 =</math> Net change of 0.006525 for 2020.</p> <ul style="list-style-type: none"> <li>- a 10K decrease in temperature for a 0.25 increase in albedo (Akbari)</li> <li>- 10 Kelvin = 10 Celsius</li> <li>- Electricity demand in cities increases by 2–4% for each 1 degree Celsius increase. Assume 3% for San Rafael.</li> </ul>
Sources	Akbari, Hashem and Rose, Leanna Shea, "Urban Surfaces and Heat Island Mitigation Potentials," Journal of the Human-Environmental System, Vol. 11; No. 2: 85-101, 2008.

*Calculation*

	2020	2035
Percent of city covered in pavement	29%	29%
Percent of paved area with high albedo	0%	10%
Albedo change	0.000	0.004
Temperature decrease	0.000 Celsius	0.174 Celsius
Reduction in electricity use	0 kWh	1,887,447 kWh
Reduction in emissions	0 MTCO <sub>2</sub> e	274 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>GREEN BUILDING REACH CODE</b> <i>EE-C4</i>	
Reductions (MTCO <sub>2</sub> e) 0 -226	Implementation action: 2020 2030
Methodology	CAPCOA Measure BE-1 used for estimating building energy savings. Assumed ordinance is adopted in 2020.
Sources	California Air Pollution Control Officers Association, "Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures," August, 2010.

*Calculation*

<b>Residential</b>	<b>2020</b>	<b>2030</b>
Percent over Title 24 Energy Requirements	15 %	15 %
New construction electricity use, BAU	0 kWh	6,861,463 kWh
New construction electricity use, after Title 24	0 kWh	0 kWh
Additional reduction in electricity use	0 kWh	0 kWh
New construction natural gas use, BAU	0 therms	525,819 therms
New construction natural gas use, after Title 24	0 therms	262,910 therms
Additional reduction in natural gas use	0 therms	35,095 therms
GHG emissions reductions	0 MTCO <sub>2</sub> e	187 MTCO <sub>2</sub> e

<b>Commercial</b>	<b>2020</b>	<b>2030</b>
Percent over Title 24 Energy Requirements	15 %	15 %
New construction electricity use, BAU	0 kWh	3,814,082 kWh
New construction electricity use, after Title 24	0 kWh	1,907,041 kWh
Additional reduction in electricity use	0 kWh	74,375 kWh
New construction natural gas use, BAU	0 therms	97,148 therms
New construction natural gas use, after Title 24	0 therms	48,574 therms
Additional reduction in natural gas use	0 therms	5,246 therms
GHG emissions reductions	0 MTCO <sub>2</sub> e	39 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>STREETLIGHTS</b> <i>EE-M1</i>	
Reductions (MTCO <sub>2</sub> e)	
-109	2020
-109	2030
Methodology and Assumptions	17% of streetlights converted to LED by end of 2016. Remaining streetlights will be converted by 2018, for a total of 4,400 streetlights.
Sources	City of San Rafael Public Works Department

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*Calculation*

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Electricity savings for 2017-2018 replacement project (approx. 3,663 fixtures)	809,273 kWh
GHG emissions reductions	109 MTCO <sub>2</sub> e



APPENDIX A – PROGRAM CALCULATIONS

<b>ENERGY EFFICIENCY AUDIT AND RETROFITS</b> <i>EE-M2</i>	
Reductions (MTCO <sub>2</sub> e)	
-43	2020
-43	2030
Methodology and Assumptions	<p>Projects to be completed by 2018 are as follows:</p> <p>1) Interior and Exterior Building Lighting Upgrades</p> <p>a) Interior Lighting Upgrades at City Hall, Downtown Library, Parkside Childcare Center, Pickleweed Childcare Center, and Fire Stations 54, 55, 56</p> <p>b) Exterior Lighting Upgrades at the same buildings, excepting exterior lights that are metered separately from the buildings themselves (e.g. Fixtures on PG&amp;E’s LS2 tariff).</p> <p>2) ECM – EMCS (Energy Management and Control System)</p> <p>Replacement of existing stand-alone programmable thermostats controlling the three packaged rooftop HVAC systems serving the Council Chambers and main lobby in City Hall. The new controls for these HVAC systems will be connected to the building’s existing Direct Digital Control (DDC) system and controlled using daily schedules, occupancy detection and advanced energy conservation algorithms.</p>
Sources	City of San Rafael

*Calculation*

Project	Annual Electricity Savings (kWh)	Annual Natural Gas Savings (therms)
Lighting - Interior	163,008	
Lighting - Exterior	46,266	
Energy Management and Control System	26,537	2,338
Total savings	235,811	2,338
Emissions reductions (MTCO <sub>2</sub> e) 2020	31	12

APPENDIX A – PROGRAM CALCULATIONS

<b>ENERGY CONSERVATION</b> <i>EE-M3</i>	
Reductions (MTCO <sub>2</sub> e)	
-33	2020
-33	2030
Methodology and Assumptions	Energy management software is proven to reduce energy consumption by 10% through identifying inefficiencies within operations. A 5% reduction in energy use for miscellaneous behavioral changes by staff and mechanical operations, and upgrading to Energy Star equipment were assumed.
Sources	

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*Calculation*

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Electricity consumption in municipal buildings, 2010	2,128,298 kWh
Electricity use in municipal buildings	277 MTCO <sub>2</sub> e
Natural gas use in municipal buildings	392 MTCO <sub>2</sub> e
Percent reduction in energy use	5%
Reduction in electricity consumption	106,415 kWh
GHG emissions reductions	33 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>RENEWABLE ENERGY GENERATION</b>	
<i>RE-C1</i>	
Reductions (MTCO <sub>2</sub> e) -1,348 -10,938	2020 2030
Methodology and Assumptions	<p>According to Project Sunroof, 89% of San Rafael buildings have roofs that are solar-viable. These 14,500 roofs have the capacity for 282 MW DC and could generate 402,000,000 kWh per year, which is more than the total electricity usage in San Rafael in 2015. Project Sunroof estimates there are 1,400 existing solar installations in San Rafael.</p> <p>Calculation assumes annual growth rates of 15% for residential systems and 15% for non-residential systems based on California Distributed Generation Statistics data, which shows countywide growth of 13.2% for residential systems and 19.7% for commercial systems, excluding government facilities. Growth continues at an annual 15% rate until solar reaches 24% market penetration in 2030 (after reaching 20-30% market penetration, the annual growth rate typically slows until it eventually drops to 4% in a mature market). The estimate of PV to be installed is restricted to installations on existing homes and commercial properties, excluding government facilities.</p>
Sources	<p>Solar Electric Power Association, "Utility Solar Market Snapshot: Sustained Growth in 2014," May 2015, <a href="https://www.solarelectricpower.org/media/322918/solar-market-snapshot-2014.pdf">https://www.solarelectricpower.org/media/322918/solar-market-snapshot-2014.pdf</a></p> <p>Project Sunroof, <a href="https://www.google.com/get/sunroof#p=0">https://www.google.com/get/sunroof#p=0</a>, accessed May 1, 2018.</p> <p>California Distributed Generation Statistics, "NEM Currently Interconnected Data Set," <a href="https://www.californiadgstats.ca.gov/downloads/">https://www.californiadgstats.ca.gov/downloads/</a>, January 31, 2018.</p>

*Calculation*

	2020	2030
Estimated residential PV generation, 2016	8,049,980 kWh	8,049,980 kWh
Annual growth rate	15%	15%
Projected residential PV generation	14,079,465 kWh	56,959,288 kWh
Additional residential PV generation	6,029,485 kWh	48,909,308 kWh
Estimated non-residential PV generation, 2016	4,781,932 kWh	4,781,932 kWh
Annual growth rate	15%	15%
Projected non-residential PV generation	8,363,628 kWh	33,835,542 kWh
Additional non-residential PV generation	3,581,697 kWh	29,053,610 kWh
Additional electricity produced by distributed PV	9,611,182 kWh	77,962,918 kWh
GHG emissions reductions	1,348 MTCO <sub>2</sub> e	10,938 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>GHG-FREE ELECTRICITY</b> <i>RE-C2</i>	
Reductions (MTCO <sub>2</sub> e)	
-22,510	2020
-19,583	2030
Methodology and Assumptions	The MCE 2019 Resource Integration Plan states that MCE electricity is projected to be 94% GHG-free in 2020 and 100% GHG-free by 2022. We have conservatively estimated a future GHG emission factor by assuming the remainder will be system power using the current emission factor set by CARB of 943.57736 lbs CO <sub>2</sub> /MWh. MCE supplied 68.6% of the total electricity load in San Rafael in 2016. Assumes same percentage of Deep Green electricity as in 2016.
Sources	MCE 2019 Integrated Resource Plan (November 2018). <a href="https://www.mcecleanenergy.org/wp-content/uploads/2019/01/MCE-2019-Integrated-Resource-Plan_11-8-2018_V_12-21-18.pdf">https://www.mcecleanenergy.org/wp-content/uploads/2019/01/MCE-2019-Integrated-Resource-Plan_11-8-2018_V_12-21-18.pdf</a>  Personal communication, Justin Kudo, MCE Manager of Account Services, <a href="mailto:jkudo@marinenergyauthority.org">jkudo@marinenergyauthority.org</a> , July 14 and 15, 2016.

*Calculation*

	2020	2030
Electricity use, BAU	349,255,444 kWh	361,579,868 kWh
Electricity saved through State actions	3,855,038 kWh	12,623,542 kWh
Less electricity saved through local energy efficiency and renewable energy actions	18,837,819 kWh	124,317,199 kWh
Net electricity use	326,562,587 kWh	224,639,126 kWh
Projected MCE electricity use (68.6% of total)	224,161,673 kWh	154,198,565 kWh
Electricity emissions w/MCE BAU	28,469 MTCO <sub>2</sub> e	19,583 MTCO <sub>2</sub> e
Electricity emissions w/MCE	5,958 MTCO <sub>2</sub> e	0 MTCO <sub>2</sub> e
GHG emission reductions	22,510 MTCO <sub>2</sub> e	19,583 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>BUILDING AND APPLIANCE ELECTRIFICATION</b>	
<i>RE-C3</i>	
Reductions (MTCO <sub>2</sub> e) -20 -895	2020 2030
Methodology and Assumptions	Potential number of appliance replacements is based on a Marin County grant application for a Building Decarbonization Pilot Program, which proposes to provide cash rebates for natural gas appliance swap-outs. The pilot program application estimates the following number of replacements during the pilot program period: stoves and cooktops, 20; water heaters, 30; and furnaces and heating systems, 60. We assume 22% of the replacements will take place in San Rafael homes based on San Rafael's share of countywide households. We assume the program can grow at an annual rate of 25% with continued rebates and program implementation.
Sources	2009 California Residential Appliance Saturation Study, Volume 2, Page 23. <a href="http://www.energy.ca.gov/2010publications/CEC-200-2010-004/CEC-200-2010-004-V2.PDF">http://www.energy.ca.gov/2010publications/CEC-200-2010-004/CEC-200-2010-004-V2.PDF</a>  County of Marin, Marin County Building Decarbonization Pilot Program for BAAQMD Climate Protection Grant Application, May 8, 2018.

*Calculation*

	2020	2030
Estimated annual natural gas use for stoves and cooktops	31 therms	31 therms
Estimated annual natural gas use for water heaters	188 therms	188 therms
Estimated annual natural gas use for space heating and	213 therms	213 therms
Estimated annual electricity use for stoves and cooktops	71 kWh	71 kWh
Estimated annual electricity use for water heaters	1,382 kWh	1,382 kWh
Estimated annual electricity use for space heating and cooling	3,096 kWh	3,096 kWh
Number of units stoves and cooktops replaced	4 units	187 units
Number of units water heaters replaced	7 units	281 units
Number of furnaces and heating systems replaced	13 units	562 units
Natural gas savings	4,189 therms	178,331 therms
Electricity consumption	50,301 kWh	2,141,571 kWh
GHG emissions reduction	20 MTCO <sub>2</sub> e	895 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>SOLAR ENERGY SYSTEMS FOR MUNICIPAL BUILDINGS</b>	
<i>RE-M1</i>	
Reductions (MTCO <sub>2</sub> e)	
-141	2020
-141	2030
Methodology and Assumptions	Three City facilities currently have PV systems: Department of Public Works 174.9 kW DC, (installed February 2017), Al Boro Community Center (117 kW DC, installed February 2017), and A & C Street Parking Garages (148.4 kW DC, installed July 2017). The City plans to install a PV system on the new Public Safety Building roof (53.4 kW DC) and is currently investigating additional PV at City Hall (273.3 kW DC).
Sources	City of San Rafael

*Calculation*

Electricity generated at DPW location	258,292 kWh
Electricity generated at Al Boro Community Center	141,827 kWh
Electricity generated at parking garages	221,264 kWh
Projected electricity generated at City Hall	380,797 kWh
Projected electricity generated at Public Safety Building	79,619 kWh
Total electricity savings	1,081,800 kWh
GHG emissions reductions	141 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>MUNICIPAL DEEP GREEN ELECTRICITY</b> <i>RE-M2</i>					
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; padding-right: 10px;">-337</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-366</td> <td>2030</td> </tr> </table>	-337	2020	-366	2030
-337	2020				
-366	2030				
Methodology and Assumptions	<p>Calculation assumes electricity consumption is reduced through all other measures first.</p> <p>For City electric vehicles, we assume EVs are replacing vehicles with an average 22 MPG, and .32 kWh/mile.</p> <p>Marin Clean Energy's Deep Green electricity is 100% renewable and 100% greenhouse gas free.</p>				
Sources					

*Calculation*

	2020	2030
Government operations electricity use in 2016	4,802,309 kWh	4,802,309 kWh
Electricity emissions reduced through other measures	2,234,785 kWh	2,234,785 kWh
Additional electricity demand from EVs	24,528 kWh	245,284 kWh
Remaining electricity consumption	2,592,053 kWh	2,812,808 kWh
Reduction in GHG emissions	337 MTCO <sub>2</sub> e	366 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>COMMERCIAL ORGANIC WASTE</b> <i>WR-C1</i>	
<p>Reductions (MTCO<sub>2</sub>e)</p> <p style="padding-left: 20px;">-959</p> <p style="padding-left: 20px;">-1,507</p>	<p>2020</p> <p>2030</p>
<p>Methodology and Assumptions</p>	<p>Passed in 2014, AB 1826 requires businesses to recycle their organic waste, depending on the amount of waste they generate per week. Organic waste means food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper waste that is mixed in with food waste. The law phases in mandatory recycling of commercial organics over time. In 2017, businesses that generate 4 cubic yards of organic waste per week must arrange for organic waste recycling services and divert all organic waste they produce. In 2019, the law extends to businesses that generate 4 cubic yards or more of commercial solid waste. The State law is intended to reduce statewide disposal of organic waste by 50% by 2020. If that target is not met, the law will be extended to cover businesses that generate 2 cubic yards or more of commercial solid waste.</p> <p>Marin Sanitary Service (MSS), the City’s franchised waste hauler, reports that of the 1,500 commercial accounts in San Rafael, only 121 were subject to AB 1826 in 2017. Of these, MSS has identified 84 businesses that are non-compliant, including some of the largest organic waste producers in San Rafael. MSS identifies businesses that do not subscribe to a recycling service as non-compliant. Some of these businesses may self-haul their waste and could potentially be in compliance. In 2019, the law will cover 322 businesses in San Rafael. After 2020, the law could cover 612 businesses in</p> <p>The City can assist Zero Waste Marin (a.k.a., the Marin Hazardous and Solid Waste Joint Powers Authority) and Marin Sanitary Service by conducting outreach, maintaining a registry of all businesses (including self-haulers) to track compliance with AB 1826, and hiring additional MSS or City dedicated to these efforts.</p> <p>According to CalRecycle, 55% of franchised commercial waste is recoverable for compost and mulch and paper recycling.</p> <p>This measure makes the following assumptions: 50% of landfilled waste is generated by commercial uses; 60% of commercial waste will be subject to AB 1826 by 2020; and 90% of commercial waste will be subject to AB 1826 by 2030. Based on current compliance rates, this measure assumes 30% of all businesses that meet the 2019 threshold will be compliant by 2020 and 30% of all business that meet the post-2020 threshold will be compliant by 2030.</p>
<p>Sources</p>	<p>Personal communication with Kim Schiebly, Marin Sanitary Service, Kim.Scheibly@marinsanitary.com</p> <p>CalRecycle, 2014 Disposal-Facility-Based Characterization of Solid Waste in California: Significant Tables and Figures, <a href="https://www2.calrecycle.ca.gov/WasteCharacterization/PubExtracts/2014/SigTableFig.pdf">https://www2.calrecycle.ca.gov/WasteCharacterization/PubExtracts/2014/SigTableFig.pdf</a></p>



APPENDIX A – PROGRAM CALCULATIONS

*Calculation*

	2020	2030
Commercial landfilled waste (excluding self-haul, sludge and municipal waste)	23,504 tons	24,631 tons
Waste generated by covered businesses	14,103 tons	22,168 tons
Recoverable organic waste generated by covered businesses (55%)	7,756 tons	12,192 tons
Percent diverted from landfill	30%	30%
Tons diverted from landfill	2,327 tons	3,658 tons
GHG emissions reduction	959 MTCO <sub>2</sub> e	1,507 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>RESIDENTIAL ORGANIC WASTE</b> <i>WR-C2</i>	
Reductions (MTCO <sub>2</sub> e) -74 -795	2020 2030
Methodology and Assumptions	<p>This measure continues and expands activities already occurring, including quarterly mailings by Marin Sanitary Service (MSS), tabling at community events, a marketing campaign by Zero Waste Marin, and community education by Resilient Neighborhoods. Under this measure, the City will utilize its website, communication tools, and social media to promote these activities and expand their reach, and encourage MSS to increase and expand their outreach through other channels such as on-bill and email response messaging. A 2014 Marin Sanitary Service waste characterization study found that 38% of residential solid waste sent to the landfill was compostable organic waste (30% food scraps, 4% food-soiled paper, and 4% plant debris). MSS reports that 9,589 tons of residential waste was collected in 2015 and estimates that approximately 1% of food waste is currently collected and composted. Curbside collection of food waste has been available in San Rafael since 2010 with weekly service for co-collection of plant debris and food scraps. Based on MSS's experience, this measure assumes an additional 5% of residential organic waste will be diverted by 2020 due to education and outreach activities. Based on the current residential waste diversion rate of 72%, we assume 50% of residential organic waste can be diverted by 2030.</p>
Sources	Personal communication with Kim Schieibly, Marin Sanitary Service, Kim.Scheibly@marinsanitary.com

*Calculation*

	2020	2030
Residential waste collected by MSS (gray cart)	9,739.7 tons	10,414.4 tons
Compostable organic waste generated by residents	3,701.1 tons	3,957.5 tons
Percent diverted from landfill	5%	50%
Tons diverted from landfill	185 tons	1,979 tons
GHG emissions reduction	74 MTCO <sub>2</sub> e	795 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>CONSTRUCTION AND DEMOLITION DEBRIS AND SELF-HAUL WASTE</b>					
<i>WR-C3</i>					
Reductions (MTCO <sub>2</sub> e)	<table border="0"> <tr> <td style="padding-right: 20px;">-107</td> <td>2020</td> </tr> <tr> <td>-170</td> <td>2030</td> </tr> </table>	-107	2020	-170	2030
-107	2020				
-170	2030				
Methodology and Assumptions	<p>San Rafael currently complies with the State’s Green Building Code (CALGreen) by requiring development projects to direct all construction and demolition (C&amp;D) materials to a certified facility that diverts at least 65% of nonhazardous C&amp;D debris to recycle or salvage. However, recoverable material is still deposited in the landfill, primarily due to self-haul activity (clean-up and loads that are generated from projects not covered by CALGreen), and C&amp;D loads that contain low percentages of recoverable material. The City can help to maximize the amount of recoverable material by providing outreach and education to waste generators, and by working with the County and CalRecycle to require processing of all loads for recoverable materials at the landfill or processing facility. MSS already processes all loads, but other facilities may not and/or charge a higher fee to do so, which discourages diversion.</p> <p>According to Zero Waste Marin, 2,058.93 tons of self-haul and debris box waste originating in San Rafael was landfilled in 2016. According to statewide solid waste characterizations studies, self-haul waste contains approximately 28% lumber, 3% paper, and 10% green waste, all of which could be diverted from the landfill. The measure assumes that 50% of this waste can be diverted by 2020 and 75% can be diverted by 2030, based on State mandates (SB 1383).</p>				
Sources	<p>Personal communication with Garth Schultz, R3 Consulting Group, gschultz@r3cgi.com</p> <p>Personal communication with Judith Silver, Zero Waste Marin, jsilver@marincounty.org</p> <p>CalRecycle, "2014 Disposal-Facility-Based Characterization of Solid Waste in California: Significant Tables and Figures," October 6, 2015.</p>				

*Calculation*

	2020	2030
Self-haul landfilled waste	2,058.9 tons	2,175.4 tons
Recoverable organic waste (26.4%)	543.6 tons	574.3 tons
Percent organic material diverted from landfill	50%	75%
Tons diverted from landfill	272 tons	431 tons
GHG emissions reduction	107 MTCO <sub>2</sub> e	170 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>MANDATORY WASTE DIVERSION</b> <i>WR-C4</i>	
<p>Reductions (MTCO<sub>2</sub>e)</p> <p style="padding-left: 40px;">-639</p> <p style="padding-left: 40px;">-2,988</p>	<p>2020</p> <p>2030</p>
<p>Methodology and Assumptions</p>	<p>This measure assumes San Rafael will adopt a mandatory waste diversion ordinance similar to the one adopted by the City of Palo Alto in January 2016 (Palo Alto Municipal Code Chapter 5.20). Palo Alto requires all residents, visitors, and businesses to place their discards in the appropriate container – recycle, compost, or garbage. There are four steps to compliance: 1) subscribe to recycle, compost, and garbage service from the city’s contract hauler; 2) set-up color-coded and labeled containers in convenient locations for patrons, employees, and residents; 3) train and educate tenants, residents, contractors and janitors about how to properly sort their waste and to ensure requirements are met; and 4) sort waste into proper containers. Requirements are phased in over time as follows:</p> <p>April 1, 2016: Commercial customers generating 8 cubic yards or more of garbage per week. Multifamily buildings with 5 or more units and shared service. Food service establishments.</p> <p>January 1, 2017: Commercial customers generating 2 cubic yards or more of garbage per week.</p> <p>January 1, 2018: All commercial customers.</p> <p>Drivers perform regular monitoring of contamination in the solid waste, recycle, and compost containers. The City’s waste hauler’s staff may also perform random site visits. Violators are subject to penalties. Residential compliance is based on the honor system.</p> <p>This measure assumes a similar ordinance would require all commercial accounts and multifamily buildings with 5 or more units to comply by 2020. We assume that a mandatory diversion ordinance could increase the AB 1826 compliance rate to 50% by 2030. Assuming that the ordinance is expanded to require residents to comply, we estimate an overall 80% compliance rate for residential compostable organic waste by 2030.</p>
<p>Sources</p>	<p>City of Palo Alto,  <a href="http://www.cityofpaloalto.org/gov/depts/pwd/zerowaste/projects/ordinance.asp">http://www.cityofpaloalto.org/gov/depts/pwd/zerowaste/projects/ordinance.asp</a>                      CalRecycle, "2014 Disposal-Facility-Based Characterization of Solid Waste in California: Significant Tables and Figures," October 6, 2015.</p>

*Calculation*

	2020	2030
Additional commercial organic waste diverted	1,551.3 tons	6,096.2 tons
Additional residential organic waste diverted		1,187.2 tons
GHG emissions reduction	639 MTCO <sub>2</sub> e	2,988 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>WASTE PROCESSING INFRASTRUCTURE</b> <i>WR-C5</i>	
Reductions (MTCO <sub>2</sub> e) 0 -4,222	2020 2030
Methodology and Assumptions	This measure assumes that new solid waste processing infrastructure is procured by 2030, but not 2020. Waste processing infrastructure could ultimately ensure that 95% of all recoverable organic waste collected by the franchised waste hauler is diverted from the landfill by 2030.
Sources	Personal communication with Kim Schiebly, Marin Sanitary Service, Kim Scheibly, Kim.Scheibly@marinsanitary.com CalRecycle, 2014 Disposal-Facility-Based Characterization of Solid Waste in California: Significant Tables and Figures, <a href="https://www2.calrecycle.ca.gov/WasteCharacterization/PubExtracts/2014/SigTableFig.pdf">https://www2.calrecycle.ca.gov/WasteCharacterization/PubExtracts/2014/SigTableFig.pdf</a>

*Calculation*

	2020	2030
Landfilled waste, excluding self-haul and sludge		51,585 tons
Tons diverted by other measures		13,791 tons
Diversion target (95% for 2030)		24,503 tons
Remaining tons to be diverted		10,712 tons
Recoverable organic waste (50% of total)		25,793 tons
GHG emissions reduction		4,222 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>WASTE FROM PUBLIC WASTE FACILITIES</b> <i>WR-M1</i>	
Reductions (MTCO <sub>2</sub> e)	
-174	2020
-261	2030
Methodology and Assumptions	This measure assumes 50% of recoverable organic waste currently landfilled could be diverted by 2020 and 75% could be diverted by 2030.
Sources	Personal communication with Charlie Wicke, Marin Sanitary Service, Charlie.Wicke@marinsanitary.com

*Calculation*

	2020	2030
Waste collected in public containers	1,765 tons	1,765 tons
Recoverable organic waste (50%)	882 tons	882 tons
Percent of organic waste diverted from landfill	50%	75%
Tons organic waste diverted from landfill	441 tons	662 tons
GHG emissions reduction	174 MTCO <sub>2</sub> e	261 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>WASTE FROM CITY OPERATIONS</b> <i>WR-M2</i>	
Reductions (MTCO <sub>2</sub> e)	
-55	2020
-83	2030
Methodology and Assumptions	This measure assumes 50% of recoverable organic waste currently landfilled could be diverted by 2020 and 75% could be diverted by 2030.
Sources	Personal communication with Charlie Wicke, Marin Sanitary Service, Charlie.Wicke@marinsanitary.com

*Calculation*

	2020	2030
Waste generated by City operations	558 tons	558 tons
Recoverable organic waste (50%)	279 tons	279 tons
Percent diverted from landfill	50%	75%
Tons organic waste diverted from landfill	140 tons	209 tons
GHG emissions reduction	55 MTCO <sub>2</sub> e	83 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>COMMUNITY WATER USE</b> <i>WC-C1</i>	
Reductions (MTCO <sub>2</sub> e) -793 -830	2020 2030
Methodology and Assumptions	<p>District-wide Marin Municipal Water District (MMWD) water consumption fell 19.6% between 2005 and 2015, or approximately 2% per year. We conservatively assume water consumption will continue to fall an average of 1% per year based on the following legislation and water conservation programs:</p> <ul style="list-style-type: none"> <li>-The City has adopted CALGreen Tier 1 for residential buildings, which requires additional water conservation actions above the base code.</li> <li>-MMWD's regulations meet or exceed State law that requires single family homes and commercial and multi-family buildings to replace all non-compliant plumbing fixtures when remodeling and upon resale (resale requirement for commercial and multi-family buildings will be in effect on January 1, 2019).</li> <li>-MMWD provides rebates for water-efficient toilets, clothes washers, hot water recirculation systems, turf replacement, pool covers, mulch, graywater systems, and rain barrels.</li> <li>-MMWD provides residential and commercial building and landscape water audits and free-water saving devices (faucet aerators, showerheads, toilet leak test dye tablets, hose nozzles, etc.).</li> <li>-City partners with Rising Sun Energy Center's California Youth Energy Services and MCE's multi-family site survey program to provide water audits and free-water saving devices.</li> <li>-MMWD has adopted a landscape water conservation ordinance which applies to all new construction and rehabilitated landscape projects requiring a building permit, plan check, or design review. Irrigation controllers are required under CALGreen.</li> <li>-New commercial and multi-family construction is required to meet CALGreen code. MMWD requires all plumbing installed, replaced, or moved on any new or existing service to have high efficiency fixtures and meet minimum requirements.</li> <li>-MMWD has adopted a Water Waste Ordinance and requires drinking water and linen washing upon request at restaurants and hotels.</li> <li>-MMWD requires applicants for new water service and applicants requesting an enlarged water service for substantial residential or commercial remodels to install a graywater recycling system to reuse the maximum practicable amount of graywater on site.</li> <li>-MMWD conducts outreach and provides water conservation information to water users on its website.</li> <li>-MMWD provides virtual water-friendly garden tours on its website and the City partners with the Marin Master Gardeners to provide demonstration gardens at Falkirk Cultural Center.</li> </ul>



## APPENDIX A – PROGRAM CALCULATIONS

	<p>GHG reduction calculations are based upon the following:</p> <ul style="list-style-type: none"> <li>-The California Energy Commission estimates that it takes 3,500 kWh of electricity per million gallons to convey, treat and distribute water from the water source to the customer in northern California.</li> <li>-MMWD began purchasing 100% renewable electricity in 2017 and Sonoma County Water agency, which provides approximately 25% of water, began purchasing 100% renewable electricity in 2015. We assume the water agencies will continue this practice.</li> </ul>
Sources	<p>Personal communication with Carrie Pollard, Sonoma Marin Water Saving Partnership</p> <p>The Climate Registry for Sonoma County Water Agency emission factors</p> <p>Refining Estimates of Water-Related Energy Use in California, California Energy Commission, Dec. 2006</p>

### *Calculation*

	2020	2030
Water consumption, BAU	2,553 MG	2,671 MG
Annual water consumption reduction	1 %	1 %
Potential annual water savings	102 MG	374 MG
Electricity saved	357,458 kWh	1,308,795 kWh
GHG emissions reduction from water conservation	32 MTCO <sub>2</sub> e	116 MTCO <sub>2</sub> e
GHG reduction from 100% renewable electricity	761 MTCO <sub>2</sub> e	714 MTCO <sub>2</sub> e
GHG emissions reduction	793 MTCO <sub>2</sub> e	830 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>MUNICIPAL WATER USE</b> <i>WC-M1</i>					
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; padding-right: 10px;">-0.2</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-0.2</td> <td>2030</td> </tr> </table>	-0.2	2020	-0.2	2030
-0.2	2020				
-0.2	2030				
Methodology and Assumptions	<p>Most municipal facilities have high-efficiency plumbing fixtures, but some do not. The Parks Division installs water-efficient landscaping as they repair or replace existing infrastructure.</p> <p>We assume electricity used for irrigation systems will be reduced 20% due to water-efficient landscaping.</p>				
Sources					

*Calculation*

	2020	2030
Electricity used for irrigation	7,432 kWh	7,432 kWh
Reduction in electricity use (20%)	1,486 kWh	1,486 kWh
GHG emissions reduction	0.2 MTCO <sub>2</sub> e	0.2 MTCO <sub>2</sub> e

**APPENDIX A – PROGRAM CALCULATIONS**

<b>LIGHT AND HEAVY DUTY FLEET REGULATIONS</b>					
<i>State Action</i>					
Program Description	<p>Current federal and State regulations and standards will reduce transportation emissions from the light and heavy duty fleet. These include:</p> <ol style="list-style-type: none"> <li>1. Pavley Standards which increase fuel economy standards for light-duty vehicles for 2009-2016 model years.</li> <li>2. Advanced Clean Cars Program which will reduce greenhouse gas and smog emissions for light-duty vehicles sold between 2017 and 2025. New automobiles will emit 34 percent fewer GHG emissions and 75 percent fewer smog-forming emissions.</li> <li>3. ARB Tractor -Trailer Greenhouse Gas Regulations which accelerate the use of low rolling resistance tires and aerodynamic fairing to reduce GHG emissions in the heavy-duty truck fleet.</li> <li>4. Heavy Duty GHG Emissions Standards (Phase One) which establish GHG and fuel efficiency standards for medium duty and heavy duty engines and vehicles for 2014-2018 model years.</li> </ol>				
Reductions (MTCO <sub>2</sub> e)	<table border="0"> <tr> <td style="text-align: right;">-17,723</td> <td>2020</td> </tr> <tr> <td style="text-align: right;">-56,878</td> <td>2030</td> </tr> </table>	-17,723	2020	-56,878	2030
-17,723	2020				
-56,878	2030				
Methodology and Assumptions	Anticipated emissions reductions resulting from implementation of these light and heavy duty fleet regulations are modeled in EMFAC2017. In order to be consistent with the methodology used in City's Greenhouse Gas Inventory, results are adjusted to reflect the global warming potential of methane and nitrous oxide as reported in the IPCC Fifth Assessment Report.				
Sources	<p>California Air Resources Board, EMFAC2017 v.1.0.2.</p> <p>California Air Resources Board, EMFAC2014 Volume III - Technical Documentation, v1.0.7, May 12, 2015</p>				

*Calculation*

	2020	2030
Passenger VMT BAU	476,148,178 VMT	498,984,014 VMT
Passenger VMT, net reductions from other measures	464,070,454 VMT	403,939,571 VMT
Commercial VMT BAU	44,026,930 VMT	44,834,540 VMT
Bus VMT BAU	3,933,965 VMT	3,355,241 VMT
Emissions, BAU	228,032 MTCO <sub>2</sub> e	206,076 MTCO <sub>2</sub> e
Emissions with regulations	210,309 MTCO <sub>2</sub> e	149,198 MTCO <sub>2</sub> e
Reduction in emissions	17,723 MTCO <sub>2</sub> e	56,878 MTCO <sub>2</sub> e

## APPENDIX A – PROGRAM CALCULATIONS

<b>RENEWABLE PORTFOLIO STANDARD</b>					
<i>State Action</i>					
Program Description	Established in 2002 in Senate Bill 1078, the Renewable Portfolio Standard program requires electricity providers to increase the portion of energy that comes from eligible renewable sources, including solar, wind, small hydroelectric, geothermal, biomass and biowaste, to 20 percent by 2010 and to 33 percent by 2020. Senate Bill 350, passed in September of 2015, increases the renewable requirement to 50 percent by the end of 2030. Senate Bill 100, passed in September 2018, accelerated the RPS standard to 60 percent by 2030 and zero-carbon by 2045.				
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right; padding-right: 10px;">-1,585</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-4,542</td> <td>2030</td> </tr> </table>	-1,585	2020	-4,542	2030
-1,585	2020				
-4,542	2030				
Methodology and Assumptions	<p>This State Action assumes PG&amp;E and Direct Access entities will meet the Renewable Portfolio Standard requirements and that these entities will carry the same share of the community's electricity load as in 2016. GHG reductions related to MCE's GHG reduction policies are quantified separately as a local action.</p> <p>California Public Utilities Code Section 454.52 requires each load-serving to procure at least 50 percent eligible renewable energy resources by 2030 and to meet the economywide reductions of 40% below 1990 levels by 2030.</p> <p>The CPUC calculator version 3c provides projected emission factors for 2020. For 2030, the CPUC has set electric sector GHG reductions at a level that represents a 50% reduction from 2015 levels. We therefore apply a 50% reduction to PG&amp;E and DA 2015 emission factors to forecast 2030 emission factors.</p>				
Sources	<p>GHG Calculator, version 3c_Oct2010. <a href="https://ethree.com/public_projects/cpuc2.php">https://ethree.com/public_projects/cpuc2.php</a></p> <p>PG&amp;E, "Greenhouse Gas Emission Factors: Guidance for PG&amp;E Customers," November 2015, <a href="https://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf">https://www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf</a></p> <p>California Public Utilities Commission "CPUC Adopts Groundbreaking Path to Reduce Greenhouse Gases in Electric Sector," Press Release Docket #: R.16-02-007, Feb. 8, 2018.</p>				

### *Calculation*

	2020	2030
Electricity use, BAU	349,255,444 kWh	361,579,868 kWh
Electricity saved through other State actions	3,855,038 kWh	12,623,542 kWh
Electricity saved through local actions	18,837,819 kWh	124,317,199 kWh
Net electricity use (PG&E)	68,929,226 kWh	47,415,723 kWh
Net electricity use (DA)	33,471,688 kWh	23,024,838 kWh
Electricity emissions, BAU	17,289 MTCO <sub>2</sub> e	11,893 MTCO <sub>2</sub> e
Electricity emissions w/RPS	15,704 MTCO <sub>2</sub> e	7,351 MTCO <sub>2</sub> e
GHG emission reductions	1,585 MTCO <sub>2</sub> e	4,542 MTCO <sub>2</sub> e

APPENDIX A – PROGRAM CALCULATIONS

<b>TITLE 24 ENERGY EFFICIENCY STANDARDS</b> <i>State Action</i>					
Program Description	The California Energy Commission (CEC) promotes energy efficiency and conservation by setting the State’s building efficiency standards. Title 24 of the California Code of Regulations consists of regulations that cover the structural, electrical, mechanical, and plumbing system of every building constructed or altered after 1978. The building energy efficiency standards are updated on an approximate three-year cycle, and each cycle imposes increasingly higher demands on energy efficiency and conservation. The California Energy Commission's 2007 Integrated Policy Report established the goal that new building standards achieve "net zero energy" levels by 2020 for residences and by 2030 for commercial buildings.				
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; padding-right: 10px;">-8</td> <td>2020</td> </tr> <tr> <td style="text-align: right; padding-right: 10px;">-2,871</td> <td>2030</td> </tr> </table>	-8	2020	-2,871	2030
-8	2020				
-2,871	2030				
Methodology	We assume that residential buildings will be zero net electricity by 2020 and all buildings will be zero net energy by 2030.				
Sources	<p>California Energy Commission, <a href="http://www.energy.ca.gov/title24/2013standards/background.html">http://www.energy.ca.gov/title24/2013standards/background.html</a></p> <p>California Energy Commission, <a href="http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-5-31-Item-05-Adoption_Hearing_Presentation.pdf">http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2012-5-31-Item-05-Adoption_Hearing_Presentation.pdf</a></p> <p>California Energy Commission, <a href="https://www.lgc.org/wordpress/wp-content/uploads/2016/02/2016-Energy-Standards-Overview-California-Energy-Commission.pdf">https://www.lgc.org/wordpress/wp-content/uploads/2016/02/2016-Energy-Standards-Overview-California-Energy-Commission.pdf</a></p>				

**APPENDIX A – PROGRAM CALCULATIONS**

*Calculation*

<i>Reductions from Title 24 Upgrades</i>	2016 Reductions from 2013 Standards (assumed for development after 2017)	Projected average reduction 2020-2030 from 2015 baseline	
	Energy Savings	Electricity Savings	Natural Gas Savings
Residential New Construction	28.00%	100%	50%
Non-residential New Construction	5.00%	50%	50%

***Projected Residential Development with Title 24 Energy Reductions***

	2017-2020	2021-2030	TOTAL through 2020	GHG Reductions through 2020	TOTAL through 2030	GHG Reductions through 2030
New Residential (units)	0	1,290	0		1,290	
Electricity Use BAU	0	6,861,463	0		6,861,463	
Electricity Use Savings	0	6,861,463	0	0	6,861,463	917
Natural Gas Use BAU	0	525,819	0		525,819	
Natural Gas Use Savings	0	262,910	0	0	262,910	1,398

***Projected Non-Residential Development with Title 24 Energy Reductions***

	2017-2020	2021-2030	TOTAL through 2020	GHG Reductions through 2020	TOTAL through 2030	GHG Reductions through 2030
Electricity Use BAU	561,583	3,814,082	561,583		4,375,665	
Electricity Use Savings	28,079	1,907,041	28,079	4	1,935,120	293
Natural Gas Use BAU	14,304	97,148	14,304		111,452	
Natural Gas Use Savings	715	48,574	715	4	49,289	262

APPENDIX A – PROGRAM CALCULATIONS

<b>LIGHTING EFFICIENCY</b>					
<i>State Action</i>					
Program Description	AB 1109, the Lighting Efficiency and Toxic Reduction Act, tasks the California Energy Commission (CEC) with reducing lighting energy usage in indoor residences by no less than 50% from 2007 levels by 2018, as well as requires a 25% reduction in indoor and outdoor commercial buildings by the same date. To achieve these efficiency levels, the CEC applies its existing appliance efficiency standards to include lighting products, as well as requires minimum lumen/watt standards for different categories of lighting products. The bill also expands existing incentives for energy efficient lighting.				
Reductions (MTCO <sub>2</sub> e)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right; width: 150px;">-980</td> <td>2020</td> </tr> <tr> <td style="text-align: right;">-980</td> <td>2030</td> </tr> </table>	-980	2020	-980	2030
-980	2020				
-980	2030				
Methodology and Assumptions	<p>5.2% of nonresidential electricity is used for outdoor lighting (California Energy Commission 2006)</p> <p>28.9% of nonresidential electricity is used for indoor lighting (California Energy Commission 2006)</p> <p>Residences use 1,342 kWh for indoor lighting on average (U.S. Department of Energy 2012)</p> <p>The CEC reports that between 2008 and 2010, interior residential lighting electricity dropped 7%, and commercial interior lighting electricity dropped 13%, and commercial outdoor lighting dropped 6 percent. We assume 1/4 of the remaining goal will be achieved between 2016 and 2018.</p>				
Sources	<p>Itron, Inc., "California Commercial End-Use Survey," California Energy Commission, March 2006, Publication Number: CEC-400-2006-005, p. 186. Accessed March 26, 2015. &lt;<a href="http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf">http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf</a>&gt;</p> <p>California Lighting Technology Center at UC Davis for the California Energy Commission, "Achieving Energy-Efficient Lighting in California," Sept. 2015, <a href="http://www.energy.ca.gov/2015publications/CEC-500-2015-085/CEC-500-2015-085.pdf">http://www.energy.ca.gov/2015publications/CEC-500-2015-085/CEC-500-2015-085.pdf</a></p> <p>Navigant Consulting, Inc., "2010 U.S. Lighting Market Characterization," U.S. Department of Energy, January 2012, p. 42. Accessed March 26, 2015. &lt;<a href="http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf">http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2010-lmc-final-jan-2012.pdf</a>&gt;</p>				

APPENDIX A – PROGRAM CALCULATIONS

*Calculation*

	2020	2030
Residential electricity indoor lighting use, 2016	32,248,260 kWh	32,248,260 kWh
Commercial electricity use, 2016	223,299,292 kWh	223,299,292 kWh
Commercial indoor lighting use, 2016	11,611,563 kWh	11,611,563 kWh
Commercial outdoor lighting use, 2016	64,533,495 kWh	64,533,495 kWh
Reduction in residential electricity use	3,466,688 kWh	3,466,688 kWh
Reduction in commercial indoor lighting use	348,347 kWh	348,347 kWh
Reduction in commercial outdoor lighting use	3,065,341 kWh	3,065,341 kWh
GHG emission reductions	980 MTCO <sub>2</sub> e	980 MTCO <sub>2</sub> e



APPENDIX A – PROGRAM CALCULATIONS

<b>RESIDENTIAL SOLAR WATER HEATERS</b> <i>State Action</i>	
Program Description	The Residential Solar Water Heater Program (AB 1470) created a \$350 million incentive program to encourage the installation of solar water heating systems that offset natural gas and electricity use in homes and businesses throughout the State. The goal is to install 200,000 solar water heaters by 2017.
Reductions (MTCO <sub>2</sub> e)	<p style="text-align: center;">-29      2020</p> <p style="text-align: center;">-29      2030</p>
Methodology and Assumptions	<p>Natural gas solar water heaters reduce natural gas use by 130 therms (U.S. Department of Energy 2010)</p> <p>Electric solar water heaters reduce electricity use by 2,429 kWh (U.S. Department of Energy 2010)</p> <p>An average of 0.013 water heaters per home will be replaced as a result of the strategy in 2020 (California Air Resources Board 2008)</p> <p>85% of California homes use natural gas for water heating, 4% use propane/LPG, and 11% use electricity (U.S. Energy Information Administration 2009)</p> <p>The program began in 2010. We assume 2/7ths of the energy savings will occur by 2017.</p>
Sources	<p>U.S. Department of Energy, "ENERGY STAR Water Heater Market Profile," September 2010, p. 15. Accessed March 27, 2015. &lt;<a href="https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/Water_Heater_Market_Profile_2010.pdf">https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/Water_Heater_Market_Profile_2010.pdf</a>&gt;</p> <p>U.S. Energy Information Administration, 2009 Residential Energy Consumption Survey, Table HC8.11, "Water Heating in U.S. Homes in West Region, Division, and States, 2009." Accessed March 26, 2015. &lt;<a href="http://www.eia.gov/consumption/residential/data/2009/#undefined">http://www.eia.gov/consumption/residential/data/2009/#undefined</a>&gt;</p>

*Calculation*

	2020	2030
Number of housing units, 2016	24,030	24,030
Number of solar water heaters installed, 2017	45	45
Percent electric water heaters	11%	0
Percent natural gas water heaters	89%	1
Reduction in electricity use	11,924 kWh	11,924 kWh
Reduction in natural gas use	5,163 therms	5,163 therms
GHG emission reductions	29 MTCO <sub>2</sub> e	29 MTCO <sub>2</sub> e

APPENDIX B - IMPLEMENTATION MATRIX

**LEGEND**

<b>Action</b>	Require, Implement, Encourage, Develop or Support
<b>Time Frame:</b>	Short = 1-3 years; Long = 3-10 years; Ongoing
<b>Potential GHG Reduction:</b>	Total metric tons of estimated annual greenhouse gas reduction
<b>% Overall GHG Reduction:</b>	Percentage of the overall (all sectors combined) 156,000 MTCO <sup>2</sup> emissions reductions called for by 2030
<b>Staffing Level:</b>	Low = Existing staff can implement without changing current priorities Medium = Existing staff can implement, but will require some reprioritization of current tasks to accommodate new task(s) High = Most likely will require new staff or contract position(s) to implement
<b>Funding Source</b>	General Fund, agency partner funds, grants, etc.
<b>City Control:</b>	Low = mostly City can only encourage or advocate Medium = City can exert some influence through incentives, ordinance, or other strategic influence High = City can create or mandate through process, procedure, or ordinance
<b>Co-Benefits:</b>	Potential added benefits, specifically related to the Economy, Social Equity, or Health such as new job creation or business opportunities, lower pollution levels, greater community connection and resiliency, etc.
<b>Potential Unintended Consequences:</b>	Potential harms in other areas, such as environmental impacts or pollution, economic hardships to residents or businesses, burdensome regulations/bureaucracy or high administrative costs, limiting to long-term adaptation strategies, etc.
<b>How We Measure Progress:</b>	Metrics and outcomes that determine success

**ACTION DEFINITIONS**

**REQUIRE** – These are generally requirements, regulations, ordinances, or other types of mandates.

**IMPLEMENT** – These are generally things we have a lot of control over and could include programs, policies, community engagement, or collaborative activities.

**ENCOURAGE** – These are things where we have less direct control, and may include community engagement, partnerships with other agencies or groups, incentives, or behavior change campaigns.

**DEVELOP** – These are things we may need more information about before implementing or requiring something. This might include general research or a formal analysis.

**SUPPORT** – These are things where our role is limited, or other agencies or groups are responsible for action. Support could run the gamut from conducting outreach to adopting ordinances that reinforce their activities, such as energy efficiency programs.

APPENDIX B - IMPLEMENTATION MATRIX

LOW CARBON TRANSPORTATION

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
LCT-C1	Zero Emission Vehicles	REQUIRE IMPLEMENT ENCOURAGE	SHORT LONG	30,345	HIGH	General Fund Grants	MEDIUM	ECONOMY EQUITY HEALTH	Increased electrical demand may require demand-side management to encourage and/or require consumers to modify their level and pattern of electricity usage.	Number of charging stations installed. Code/ordinances passed. Number of ZEVs registered in San Rafael. Target: 25% of registered automobiles in Marin County are ZEVs by 2030.
LCT-C2	Bicycling	IMPLEMENT ENCOURAGE	SHORT LONG	1,910	HIGH	Gas Tax Grants	LOW	ECONOMY EQUITY HEALTH	Increased bicycle-vehicle collisions.	Completion of Bicycle Pedestrian Master Plan projects, including 21 miles of additional Class 1 and 2 bike facilities, bike share (300 bikes) and bike racks/lockers (12 each) goals.
LCT-C3	Walking	IMPLEMENT ENCOURAGE	LONG	575	HIGH	Gas Tax Grants	LOW	ECONOMY EQUITY HEALTH		Completion of Bicycle Pedestrian Master Plan projects. Target: 2% reduction in passenger trips that start and end in San Rafael.
LCT-C4	Safe Routes to School	SUPPORT IMPLEMENT	SHORT LONG	320	MEDIUM	Gas Tax Grants	LOW	EQUITY HEALTH	Cost to TAM to fund Safe Routes to School program may crowd out funding for other programs.	Safe Routes to School projects completed. Decrease in students driving in a family vehicle from 47% to 29%.
LCT-C5	Public Transit	SUPPORT ENCOURAGE	SHORT LONG	1,035	LOW	Agency Partners General Fund	LOW	ECONOMY EQUITY HEALTH	Additional cost to Marin Transit for renewable diesel and electric buses may crowd out funding for to increase transit frequency or coverage.	Target: all of Marin Transit vehicles use renewable diesel by 2020 and 50% of Marin Transit's VMT is driven by electric buses by 2030.
LCT-C6	Employee Trip Reduction	SUPPORT ENCOURAGE	SHORT	1,030	LOW	Agency Partners General Fund	LOW	ECONOMY EQUITY HEALTH		Number of businesses offering a TDM program. Target: all San Rafael businesses with 30 or more employees offer a TDM program.
LCT-C7	Parking Requirements	REQUIRE	SHORT	55	LOW	General Fund	HIGH	HEALTH	Increased parking congestion and traffic impacts.	Code/ordinance passed. Target: 100 parking spaces reduced.
LCT-C8	Traffic Management System and Vehicle Idling	IMPLEMENT ENCOURAGE	LONG	1,075	MEDIUM	General Fund Grants	HIGH	ECONOMY HEALTH		Number of projects completed. Target: 119,284 gallons of fuel saved.

APPENDIX B - IMPLEMENTATION MATRIX

**LOW CARBON TRANSPORTATION**

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
LCT-C9	Smart Growth Development	ENCOURAGE REQUIRE	LONG	n/a	LOW	General Fund	LOW	ECONOMY EQUITY HEALTH	More traffic and parking impacts	Number of projects completed.
LCT-C10	Electric Landscape Equipment	ENCOURAGE	LONG	110	LOW	General Fund	MEDIUM	HEALTH	More equipment turnover and waste	Decrease in fuel consumption for landscape equipment as reported in OFFROAD models. Target: all leaf blowers are electric.
LCT-M1	Low Emission City Vehicles	IMPLEMENT	SHORT LONG	275	MEDIUM	General Fund Grants Rebates	HIGH	HEALTH	Unreliability and maintenance of new technologies	Number and type of vehicles replaced. Target: 50% reduction in vehicle fleet gasoline consumption.
LCT-M2	Low Carbon Fuels	IMPLEMENT	SHORT	270	LOW	General Fund	HIGH	HEALTH	May create a market for products that are virgin and not just discards. New market stability.	Percentage of fuel switched. Target: all diesel consumption is renewable diesel.
LCT-M3	City Employee Commute	IMPLEMENT ENCOURAGE	SHORT	20	LOW	General Fund	MEDIUM	ECONOMY EQUITY HEALTH		Number of new employees signed up to the programs and using incentives. Target: employee commute VMT reduced by 60,613 miles.
LCT-M4	Municipal Electric Landscape Equipment	IMPLEMENT	SHORT	5	LOW	General Fund	HIGH	HEALTH	More equipment turnover and waste	Percentage of landscape equipment replaced. Target: all leaf blowers are replaced with electric versions.
<b>TOTALS</b>				<b>37,030</b>						

APPENDIX B - IMPLEMENTATION MATRIX

ENERGY EFFICIENCY

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
EE-C1	Energy Efficiency Programs	SUPPORT IMPLEMENT	ONGOING	17,335	MEDIUM	General Fund Grants On-Bill Financing	MEDIUM	ECONOMY EQUITY		Target: 1% annual reduction in electricity and natural gas consumption.
EE-C2	Energy Audits	DEVELOP	LONG	260	LOW	General Fund	HIGH	ECONOMY EQUITY	An energy audit requirement could impact the real estate sales process.	Target: 5% of audited housing units implement energy efficiency projects resulting in 31% energy savings.
EE-C3	Cool Pavement and Roofs	IMPLEMENT DEVELOP ENCOURAGE	LONG	275	LOW	General Fund Grants	HIGH	ECONOMY EQUITY HEALTH	Difficulty seeing pavement markings and wayfinding	Target: 10% of paved areas converted to high albedo surfaces.
EE-C4	Green Building Reach Code	REQUIRE	SHORT	225	LOW	General Fund County	HIGH	HEALTH	Additional time and cost to applicants, unreliability of new technologies.	Reach code ordinance adopted.
EE-C5	Streamline Permit Process and Provide Technical Assistance	DEVELOP IMPLEMENT	SHORT	n/a	HIGH	General Fund Grants	MEDIUM	ECONOMY EQUITY HEALTH		Program implemented.
EE-M1	Streetlights	IMPLEMENT	SHORT	110	LOW	Capital Improvement Program	HIGH	ECONOMY EQUITY HEALTH	Light pollution.	Target: 4,400 light fixtures converted to LED.
EE-M2	Energy Efficiency Audit and Retrofits	IMPLEMENT	SHORT	45	LOW	Capital Improvement Program	HIGH	ECONOMY HEALTH		Complete projects: 1) Interior and Exterior Lighting Upgrades at City Hall, Downtown Library, Parkside Childcare Center, Pickleweed Childcare Center, and Fire Stations 54, 55, 56. 2) Programmable thermostat replacements for City Hall.
EE-M3	Energy Conservation	IMPLEMENT	SHORT	35	LOW	General Fund	HIGH	ECONOMY HEALTH	Mismatch to existing infrastructure / systems.	Reduce energy use 5% through behavioral changes and upgrades to Energy Star equipment.
<b>TOTALS</b>				<b>18,280</b>						

APPENDIX B - IMPLEMENTATION MATRIX

RENEWABLE ENERGY

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
RE-C1	Renewable Energy Generation	ENCOURAGE SUPPORT IMPLEMENT	ONGOING	10,940	LOW	General Fund	MEDIUM	ECONOMY	Degradation to habitat and ecosystems for ground-mount solar.	Target: 15% annual growth rate for residential and commercial solar energy systems and 24% market penetration by 2030.
RE-C2	GHG-Free Electricity	SUPPORT ENCOURAGE	LONG	19,560	LOW	General Fund	MEDIUM	ECONOMY HEALTH	Reduces perceived urgency to complete energy efficiency projects.	Target: MCE electricity is 100% GHG-free by 2025.
RE-C3	Building and Appliance Electrification	SUPPORT	SHORT LONG	895	LOW	General Fund, Grants	MEDIUM	ECONOMY HEALTH	Additional cost to property owner / electrical panel upgrade	Target: 23 appliances / heating systems electrified in first year and 25% growth in installations in each year thereafter.
RE-C4	Innovative Technologies	DEVELOP	LONG	n/a	MEDIUM	General Fund, Grants	HIGH	ECONOMY EQUITY HEALTH	Cost for design and construction of projects may be higher than for proven technologies. May face a greater risk for technical issues, obstacles, and obsolescence.	Projects implemented.
RE-M1	Solar Energy Systems for Municipal Buildings	IMPLEMENT	SHORT	140	MEDIUM	Capital Improvement Program	HIGH	ECONOMY	Maintenance issues for panels, roof	Complete 53.4 kW DC project at the Public Safety Building and 273 kW DC project at City Hall.
RE-M2	Municipal Deep Green Electricity	IMPLEMENT	ONGOING	365	LOW	General Fund	HIGH	ECONOMY	Reduces perceived urgency to complete energy efficiency projects.	Annual purchase of Deep Green electricity.
<b>TOTALS</b>				<b>31,925</b>						

APPENDIX B - IMPLEMENTATION MATRIX

WASE REDUCTION

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
WR-C1	Commercial Organic Waste	ENCOURAGE SUPPORT	SHORT LONG	1,505	LOW	Grants General Fund	LOW	EQUITY	Additional costs to MSS and rate payers. Increased smells and pests.	Target: outreach to 400 businesses by 2020, another 600 businesses after 2020. 30% of businesses are compliant.
WR-C2	Residential Organic Waste	ENCOURAGE SUPPORT	SHORT	795	MEDIUM	Grants, General Fund	LOW	ECONOMY	Increased smells and pests.	Target: 5% diversion by 2020 and 50% by 2030.
WR-C3	Construction & Demolition Debris and Self-Haul Waste	ENCOURAGE SUPPORT	SHORT	170	LOW	Grants, General Fund	MEDIUM	ECONOMY	Burdensome for builders; may deter projects or reduce permits. Increased costs for renters.	Target: 50% diversion by 2020 and 75% by 2030.
WR-C4	Mandatory Waste Diversion	REQUIRE	SHORT	2,990	MEDIUM	General Fund Fees	HIGH	ECONOMY EQUITY	Space and affordability issues. Backlash to mandates. Increased non-franchised entities soliciting rate payers for business.	Target: increase commercial AB1826 compliance rate to 50% and divert 80% of residential organic waste by 2030.
WR-C5	Waste Processing Infrastructure	DEVELOP	LONG	4,220	MEDIUM	General Fund Rate Payers MSS	HIGH		Unacceptably high costs to rate payers. Decreased diversion due to perception that sorting is no longer necessary.	Target: increase diversion rate of recoverable organic waste to 95%.
WR-C6	Extended Producer Responsibility	ENCOURAGE SUPPORT	LONG	n/a	LOW	General Fund	LOW	ECONOMY	Transportation impacts from take-back programs.	Monitor State regulations.
WR-C7	Inorganic Waste	ENCOURAGE DEVELOP	SHORT	n/a	MEDIUM	Grants General Fund	LOW	ECONOMY		Community education and engagement programs implemented.
WR-M1	Waste from Public Facilities	IMPLEMENT	SHORT	260	LOW	Grants General Fund	HIGH		Increased smells and pests. Increased contamination.	50% of recoverable organic waste currently landfilled is diverted by 2020 and 75% is diverted by 2030.
WR-M2	Waste from City Operations	ENCOURAGE IMPLEMENT	SHORT LONG	85	HIGH	Grants General Fund	HIGH		Increased smells and pests. Increased contamination.	50% of recoverable organic waste currently landfilled is diverted by 2020 and 75% is diverted by 2030.
<b>TOTALS</b>				<b>10,025</b>						

GOAL: Reduce organic and paper waste disposal by 50% by 2020 and 75% by 2030.

SB 1383 established targets to achieve a 50% reduction in organic waste by 2020 and a 75% reduction by 2025.

APPENDIX B - IMPLEMENTATION MATRIX

**WATER CONSERVATION**

ID	Measure	ACTION	TIME FRAME	GHG REDUCTION	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
<b>WC-C1</b>	<b>Community Water Use</b>	ENCOURAGE SUPPORT IMPLEMENT	ONGOING	830	LOW	General Fund	LOW	ECONOMY EQUITY	Water restrictions may reduce potential for carbon sequestration in landscapes.	Target: 1% annual water consumption reduction
<b>WC-C2</b>	<b>Municipal Water Use</b>	IMPLEMENT	SHORT	<1	MEDIUM	General Fund	MEDIUM			Target: 20% reduction in electricity used for irrigation
<b>TOTALS</b>				<b>830</b>						



APPENDIX B - IMPLEMENTATION MATRIX

SEQUESTRATION AND ADAPTATION

ID	Measure	ACTION	TIME FRAME	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
SA-C1	Urban Forest	ENCOURAGE IMPLEMENT REQUIRE	LONG	LOW	General Fund; Grants	MEDIUM	ECONOMY EQUITY HEALTH	Tree roots may degrade adjacent pavement and sidewalks. Trees and vegetation may increase fire risk in developed areas. Irrigation requirements may reduce ability to meet water conservation targets. Project costs and time delays.	
SA-C2	Carbon Sequestration	ENCOURAGE IMPLEMENT	LONG	MEDIUM	General Fund; Grants	MEDIUM		Unknown effects of new technologies	
SA-C4	Carbon Offsets	ENCOURAGE DEVELOP	LONG	LOW	General Fund	LOW		Carbon offsets may reduce perceived urgency for direct action through efficiency, conservation, etc.	
SA-C5	Sea Level Rise	SUPPORT IMPLEMENT	LONG	HIGH	General Fund, Grants	HIGH	ECONOMY EQUITY	Gentrification	Projects implemented.
SA-C6	Climate Change Adaptation	SUPPORT DEVELOP IMPLEMENT	LONG	MEDIUM	General Fund	HIGH	ECONOMY EQUITY		Projects implemented.

APPENDIX B - IMPLEMENTATION MATRIX

**COMMUNITY ENGAGEMENT**

ID	Measure	ACTION	TIME FRAME	STAFFING	FUNDING SOURCE	CITY CONTROL	CO-BENEFITS: ECONOMY EQUITY HEALTH	POTENTIAL UNINTENDED CONSEQUENCES	HOW WE WILL MEASURE PROGRESS
CE-C1	Community Education	ENCOURAGE SUPPORT	ONGOING	LOW	General Fund; Grants	MEDIUM	ECONOMY EQUITY HEALTH		Number of people participating in Resilient Neighborhoods and amount of GHG reduced.
CE-C2	Community Engagement	SUPPORT IMPLEMENT DEVELOP	ONGOING	HIGH	General Fund	MEDIUM	ECONOMY EQUITY HEALTH		Results from implemented programs.
CE-C3	Advocacy	ENCOURAGE	ONGOING	LOW	General Fund	LOW	ECONOMY EQUITY HEALTH	Loss of local control	State legislation enacted.
CE-C4	Innovation and Economic Development	ENCOURAGE DEVELOP SUPPORT	SHORT LONG	HIGH	General Fund, Grants	MEDIUM	ECONOMY	Risks of not having tangible outcomes	Working group created and results achieved.
CE-C5	Green Businesses	ENCOURAGE SUPPORT	SHORT LONG	MEDIUM	County Funding, General Fund	LOW	ECONOMY HEALTH		Number of businesses enrolled in the program each year.

APPENDIX B - IMPLEMENTATION MATRIX

**IMPLEMENTATION AND MONITORING**

ID	Measure	ACTION	TIME FRAME	STAFFING	FUNDING SOURCE	CITY CONTROL	HOW WE WILL MEASURE PROGRESS
<i>IM-C1</i>	Annual Monitoring	IMPLEMENT	SHORT	LOW	General Fund	HIGH	Annual report and priorities list.
<i>IM-C2</i>	Update GHG Emissions Inventories	IMPLEMENT	SHORT LONG	HIGH	General Fund; Grants	HIGH	Community Inventory updated annually and government operations inventory updated every 5 years.
<i>IM-C3</i>	Funding Sources	IMPLEMENT	SHORT	MEDIUM	General Fund	HIGH	Amount of funding secured.
<i>IM-C4</i>	Update the Climate Action Plan	IMPLEMENT	LONG	HIGH	General Fund; Grants	HIGH	Update CCAP to incorporate new long-term reduction targets.
<i>IM-C5</i>	Project Compliance Checklist	IMPLEMENT	SHORT	LOW	General Fund	HIGH	Number of projects that comply with checklist.

APPENDIX C - 2009 C.C.A.P. PROGRAM STATUS

CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Lifestyles	LF1	(LF1) Implement General Plan policies to increase residential and commercial densities within walking distance of high frequency transit centers and corridors.		X			City Council accepted the Downtown SMART Station Area Plan and Civic Center SMRT Area Plan in 2012/13. Both plans include TOD recommendations, land use changes and improved bike/ped access and connectivity. These recommendations will be addressed in the General Plan 2040 and Downtown Precise Plan, which are underway and are expected to be adopted in 2020.	CD
	LF2-a	(LF2) Encourage the continued funding and development of the Sonoma-Marín Area Rail Transit, which will provide residents and employees of San Rafael an additional transportation alternative to single-occupant vehicles.		X			Service to San Rafael started in 2017. Currently working with SMART to complete the extension to Larkspur.	CM
	LF2-b	(LF2) Modify land uses and transportation systems surrounding the future Civic Center SMART Station to improve bicycle and pedestrian access to site.		X			Council accepted SMART Civic Center Station Area Plan in 2013, which includes specific land use recommendations. These recommendations will be addressed in the General Plan 2040 and Downtown Precise Plan, which are underway and are expected to be adopted in 2020. An updated Bicycle Pedestrian Master Plan was adopted by the City Council in 2018, which includes circulation impacts. The Civic Center Station and Civic Center Drive improvements have been completed, which include complete pedestrian and bicycle improvements.	CD
	LF3	(LF3) Determine areas in need of sidewalk improvements, land use changes, or modified transit stops to create walkable neighborhoods.			X		Bicycle Pedestrian Master Plan adopted in 2018. <a href="https://www.cityofsanrafael.org/bicycle-pedestrian-master-plan/">https://www.cityofsanrafael.org/bicycle-pedestrian-master-plan/</a>	DPW
	LF4-a	(LF4) Require new mixed-use and commercial developments to provide space for locating future bike sharing stations.				X	To be included in CCAP 2030. These recommendations will be addressed in the General Plan 2040 and Downtown Precise Plan, which are underway and are expected to be adopted in 2020.	CD
	LF4-b	(LF4) Conduct a feasibility study to determine the appropriate program scale, costs, and locations for bike-sharing stations.	X				The <a href="#">Marin County Bicycle Sharing Feasibility Study</a> was completed in 2013.	CM
	LF4-c	(LF4) Facilitate the creation of a bike share program, particularly in the Downtown area.			X		The Transportation Authority of Marin and Sonoma Transportation Authority were jointly awarded \$824,000 in funding from MTC in 2017, and are actively pursuing this project for 2019.	CM / DPW

APPENDIX C - 2009 C.C.A.P. PROGRAM STATUS

CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Lifestyles	LF5	(LF5) Support Marin Transit in the planning, funding and implementation of additional transit services that are cost-effective and responsive to existing and future transit demand.			X		Marin Transit continues to refine services and has implemented 15 minute intervals along major transit routes.	CM
	LF6	(LF6) Continue to implement sidewalk and street improvements for the Safe Routes to School program. Encourage the school districts, Marin Transit and the Transportation Authority of Marin to increase funding for school busing programs, promote carpooling and limit vehicle idling.			X		Department of Public Works has completed several projects since 2008 and continues to work with Safe Routes to Schools and other agencies to identify and implement projects.	DPW
	LF7-a	(LF7) Continue to implement the adopted Bicycle and Pedestrian Master Plan.			X		Department of Public Works continues to work with partners and funding agencies to identify and implement projects.	DPW
	LF7-b	(LF7) Provide alternate work schedules and telecommuting opportunities.			X		This is done on a case-by-case basis depending on the need to cover public-facing service counters and other on-site needs.	CM
	LF7-c	(LF7) Provide transit and carpool incentives to City employees.			X		Implemented an employee commute alternatives program in 2013.	CM
	LF8-a	(LF8) Promote the use of Alternative Fuel and Fuel Efficient Vehicles.			X		City promotes programs to employees and general public through a variety of channels, such as co-hosting EV ride-and-drive events.	CM
	LF8-b	(LF8) Support regional efforts to encourage widespread availability of charging stations.			X		City participates in Transportation Authority of Marin's Clean Technology Advisory Working Group and assists with planning efforts.	CM
	LF8-c	(LF8) Revise parking requirements for private parking facilities to provide charging stations.	X				Adopted August 2014	CD
		(LF8) Revise parking requirements for public and new commercial developments to include designated stalls for low-emitting, fuel-efficient vehicles and carpool/vanpool vehicles for a minimum of 8% of total parking capacity and to pre-wire stalls for future electric vehicle charging stations for 2% of total parking capacity.	X				Adopted in 2013 by City Council	CD
	LF8-d	(LF8) Install charging stations for plug-in electric vehicles in City garages and parking lots.			X		Currently the City has charging infrastructure in four City lots and garages with the intention of adding more as lots and garages are resurfaced. City Hall lot will receive chargers in 2019 along with solar installation.	Parking Svcs
	LF9	(LF9) Adopt a policy to limit City vehicle idling where practical. Evaluate equipping trucks with an auxiliary electrical system for illumination and warning signs.			X		City has a vehicle idling policy. Fire department has solar-powered auxiliary electrical systems for fire trucks vehicles.	DPW
LF10	(LF10) Educate and encourage businesses and residents to limit vehicle idling.				X	This will be included in new CCAP	CM	

APPENDIX C - 2009 C.C.A.P. PROGRAM STATUS

CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Lifestyles	LF11	(LF11) Adopt a Zero Waste goal and implement programs to achieve goal in San Rafael.		X			Adopted in 2011 by Resolution. Ongoing efforts to reduce waste through annual grant programs, internships, and work with waste hauler and community.	CM
	LF12	(LF12) Encourage the Marin County Hazardous and Solid Waste JPA to establish a landfill "tipping fee" to fund waste reduction efforts.	X				The JPA established a landfill and hauler fee to fund waste reduction efforts in 2008.	CM
	LF13	(LF13) Facilitate a composting program to assist and educate residents in home-composting and create facilities to convert organic waste (e.g., vegetative or food waste) to energy.	X				Food to Energy program started by Marin Sanitary Service in 2013. Curbside composting for residents started in 2010. Curbside composting for commercial and multi-family customers started in 2014.	CM
	LF14	(LF14) Work with the City's waste franchisee to create additional incentives in the rate structure for waste reduction and recycling and expand the range of recycled products if resale markets exist.		X			Rate structure analysis completed in 2014. No further financial incentives were identified. However, further outreach and education was identified and is being implemented.	CM
	LF15	(LF15) Adopt a construction debris recycling and reuse ordinance.	X				Originally adopted in 2011. Revised for compliance with California Green Building Code in 2016.	CD
	LF16	(LF16) Assist in the development of additional reuse facilities (resale shops, refilling stations, repair shops, and resource recovery yards).				X	Our extremely low vacancy rate in industrial makes this prohibitive in general. City will assist as needed and as opportunities arise.	CM
	LF17	(LF17) Investigate options for banning nonrecyclable single use items, such as plastic bags and polystyrene takeout food containers.	X				Bag ordinance adopted in 2014. EPS ordinance adopted in 2012.	CM
	LF18	(LF18) Modify the City's purchasing practices and policies to become a model for other businesses and organizations.			X		Environmentally Preferable Purchasing Policy adopted in 2013.	CM
	LF-GGRS	(LF-GGRS) Continue to implement existing City policy to purchase alternative fuel vehicles and increase the efficiency of the vehicle fleet.		X			31 of the City's pool vehicles are hybrids, and 5 of the 6 parking vehicles are battery electric. A study is underway to identify all opportunities for greening the fleet as vehicles are replaced every several years.	DPW
Buildings	BU1-a	(BU1) Participate in the Marin Energy Authority Clean Energy (MCE) Program by switching all City accounts over to the Light Green Option in 2010 and the Deep Green Option by 2020.	X				All City (Municipal) accounts were switched to Light Green in 2010, and to Deep Green in 2017.	CM
	BU1-b	(BU1) Support efforts of Marin Energy Authority to increase the proportion of renewable power offered to residents and businesses and to provide financial and technical assistance for energy efficiency upgrades.			X		City supports their efforts and MEA (Now MCE Clean Energy) has been offering these programs. In addition, the City works with PG&E, CESC and others to promote energy efficiency upgrades.	CM

APPENDIX C - 2009 C.C.A.P. PROGRAM STATUS

CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Buildings	BU2	(BU2) Create or participate in an assessment district bond financing program to fund installation of renewable energy systems and energy efficiency measures.	X				Five Property Assessed Clean Energy (PACE) programs authorized to operate in San Rafael in 2012 and 2013.	CM
	BU3-a	(BU3) Adopt zoning allowances for the location of solar collectors in residential zones.	X				Zoning Ordinance Amendments 14.16.305, 307. Solar farms intended to generate energy for the grid are a conditionally permitted use (where utility facilities lists it).	CD
	BU3-b	(BU3) Adopt zoning allowances for solar farms and wind turbines in large commercial parking lots and rooftops of large buildings.		X			Adopted zoning regulations for wind turbines on rooftops of buildings in 2014, but have not adopted regulations for solar farms in large commercial parking lots. To be included in CCAP 2030 implementation.	CD
	BU4	(BU4) Require new construction and remodel projects to comply with policies in the existing green building ordinance.	X				The City adopted first green building ordinance in 2011 and has subsequently updated it and adopted California Green Building Code in 2016. The Building Division will revisit the green building standards again in late 2019 when the 2020 State building codes are reviewed and considered for adoption.	CD
	BU5	(BU5) Develop a program to achieve energy savings in existing buildings, with a goal of decreasing energy use by 20% as of the year 2020.		X			Many changes to existing buildings have taken place as well as new construction and demolition of existing buildings makes it difficult to measure apples to apples. However, multiple projects have been completed from lighting upgrades to HVAC replacements, covering the majority of City facilities. City undertaking an effort to benchmark all buildings once new Public Safety Center is complete in 2020.	DPW
	BU6	(BU6) Continue to implement the City's Green Building Ordinance requiring water conservation measures in new and remodeled buildings, to coordinate with and support the Marin Municipal Water District in implementation and enforcement of the Water Efficient Landscape Ordinance and to encourage water conservation in existing homes and businesses through the Resilient Neighborhoods and Resilient Businesses programs, to reduce water use by 30% by the year 2020.			X		All efforts being conducted. Community water use had decreased 17% by 2016.	CD
	BU7	(BU7) Facility Energy Audit - Complete an energy audit of major City facilities and implement audit recommendations for energy efficiency and renewable energy potential.			X		Some audits conducted by Marin Energy Watch Partnership. Efforts underway to audit all facilities by 2020.	DPW

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CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Buildings	BU-GGRS	(BU-GGRS) Recycled Water - Support the installation of purple pipe infrastructure & expanded use of recycled water by the Marin Municipal Water District.			X		City has purple pipe infrastructure in some areas of North San Rafael in conjunction with MMWD and Las Gallinas Valley Sanitary District.	DPW
	BU-GGRS	(BU-GGRS) Reduce emissions from heavy-duty construction equipment by limiting idling and utilizing cleaner fuels, equipment, and vehicles.				X	This will be included in new CCAP	DPW / CD
Environment	EN1	(EN1) Increase Tree Plantings - Plant new and retain existing trees to maximize energy conservation and carbon sequestration benefits			X		The City conducts ongoing tree plantings and maintenance in accordance with its membership in the Tree City USA program, of which the City has been a member for many years.	DPW
	EN2	(EN2) Adopt ordinances to regulate the removal and replacement of significant trees.				X	This measure will be included in the new CCAP.	DPW
	EN3	(EN3) Update zoning regulations for parking lot landscaping to increase shading and reduce thermal gain.	X				In 2011, the City Council adopted zoning ordinance amendments to include improve regulations and standards for parking lot tree cover.	CD
	EN4	(EN4) Establish a local carbon offset program to support tree planting and maintenance.				X	Analysis did not bear out the wisdom of a local offset program due to high level of administration and costs involved.	CM
	EN5	(EN5) Encourage the creation of home and community gardens, including possible use of surplus City properties for community gardens.			X		The City helped establish two multi-family residential community gardens at private properties in the Canal Neighborhood in 2010. In addition, the City has two community gardens it manages on City property, one in Terra Linda and one in the Canal Neighborhood.	CM
	EN6	(EN6) Continue to promote local farmers markets.			X		The City hosts the Downtown Farmers' Market Festival from April through September every year and promotes it and the Civic Center market, which happens all year long.	ED
	EN7	(EN7) Develop a program of levee analysis, including inventorying heights, testing and maintaining public and private levees.			X		Done on a case by case basis, no active program at this time.	DPW
	EN8	(EN8) Install a sea level rise monitoring gauge to track changes over time.				X	Consider as part of a future adaptation planning and monitoring effort for sea level rise.	DPW
	EN9	(EN9) Participate in Marin County's regional vulnerability assessment, and prepare a local vulnerability assessment for San Rafael.		X			Community Development created a Sea Level Rise White Paper, describing the current situation and outlining next steps toward this goal. BCDC pilot risk assessment completed in 2015 and available on BCDC website. County of Marin completed the BayWAVE Vulnerability Assessment. The City partnered in these efforts. <a href="http://www.marincounty.org/main/baywave/vulnerability-assessment">http://www.marincounty.org/main/baywave/vulnerability-assessment</a>	CM



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CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Environment	EN10	(EN10) Continue to provide emergency planning and community awareness.			X		The Fire Department conducts these and the City has an active CERT program.	FD
	EN-GGRS	(EN-GGRS) Work with BCDC to monitor sea level rise and plan for shoreline defense.			X		Ongoing. The City works with BCDC and other agencies to monitor and plan for sea level rise. City to prepare a Sea Level Rise Adaptation Report to incorporate into the General Plan 2040, which may incorporate basis development regulations. The General Plan 2040 is underway and expected to be adopted in 2020.	CD
	EN-GGRS	(EN-GGRS) Replace Holiday Streetlights with LED lighting.	X				Done in 2010	DPW
	EN-GGRS	(EN-GGRS) Complete the retrofit of yellow bulb City traffic signals with LED lighting and retrofit streetlights with LED fixtures.		X			All traffic signal lights switched to LED's in 2015. Streetlights have been replaced over time with the final streetlights being replaced in 2018.	DPW
Economy	EC1	(EC1) Continue to promote new green business opportunities.			X		City participates regularly in the Chamber's Green Business Committee and promotes the County's Green Business Program, including having two City facilities certified.	CM
	EC2	(EC2) Support and encourage green business opportunities in conjunction with Marin County Green Business Program.			X		See EC1	CM
	EC3	(EC3) Maintain San Rafael's jobs/ housing ratio and seek to achieve sufficient employment opportunities in San Rafael.			X		The City of San Rafael has received approval from the State for the 2015-2023 Housing Element. The Housing Element ensures opportunities for the development of market rate and affordable housing which helps address the jobs/housing ratio. Economic Development staff has been working with Chamber of Commerce on employer retention as well as business recruitment to maintain and grow employment base in San Rafael. BioMarin worked with city staff in 2014 to obtain approvals for the corporate center campus, which increased employment	CD
	EC4	(EC4) Support the creation of environmentally beneficial jobs, particularly for low-income residents.			X		City staff provides funding and works with the Downtown Streets Team to provide jobs for homeless individuals to sweep the streets around downtown San Rafael. This program reduces non-point source runoff to creeks and streams and helps homeless residents transition to employment. City staff support the Conservation Corps North Bay which engages in projects related to the environment – most Corps members are from low-income backgrounds. Includes local hiring projects such as composting at the Farmers' Market Festival and recycling in the City.	ED / CD

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CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Community Outreach	CO1	(CO1) Increase City employees awareness of climate protection issues, and develop internal committees (such as a green purchasing initiative or energy efficiency) to implement plans.			X		Employee Green Team developed Environmental Purchasing Policy, adopted in 2013. Employee Commute Committee started in 2012. Employee Green Team working in all departments to enhance recycling; City Hall is Green Business Certified. City Hall composting started with MSS summer 2014 and is ongoing. City supports Resilient Neighborhoods carbon reduction program and has had three City staff EcoTeams go through the program.	CM
	CO2	(CO2) Use the City's website and City publications and work with community organizations to promote sustainability efforts to both residents and businesses.			X		City works with variety of organizations to promote sustainability efforts such as MMWD, MCE, the County of Marin and Marin Climate Energy Partnership, among others. City uses web site, social media accounts, NextDoor.com, City Manager's Snapshot and other news and information bulletins to promote sustainability.	CM
	CO3	(CO3) Partner with other agencies and organizations to hold an annual "Green Festival" to promote sustainability efforts.				X	City has supported and helped sponsor all EcoFair Marin events and Earth Day Marin events since their inception. EcoFair Marin folded in 2013, but City still supports these types of events when they occur.	CM
	CO4	(CO4) Advocate for state and federal legislation that advance GHG reductions and other sustainability efforts.			X		City continues to send letters supporting or opposing state and federal legislation related to sustainability efforts.	CM
	CO5	(CO5) Continue to provide a leadership role with other local governmental agencies to share best practices and successes.			X		Have served on steering committee of MCEP, including two years as Chair. Worked with Marin waste JPA to develop environmental review and bag ordinances that could be used in all jurisdictions. San Rafael was first city in California to receive Beacon Award for Sustainability from Institute for Local Government. Developed a Sea Level Rise White Paper that other jurisdictions have borrowed from. Provided our GHG Reduction Strategy inventory tool to all local jurisdictions in Marin to do annual inventories. Have been featured on panels and educational events.	CM
	CO-GGRS	(CO-GGRS) Resilient Neighborhoods and Businesses - Implement the resilient neighborhoods and businesses program to encourage behavioral changes to reduce carbon emissions through effective education and peer group support.			X		City has supported the Resilient Neighborhoods program through funding and in-kind donations and through providing staff and intern support, and office space. City implemented Resilient Businesses program in 2011. City has also promoted other similar programs for businesses.	CM

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CATEGORY	MEASURE	DESCRIPTION	COMPLETED	IN PROGRESS	ONGOING	NOT STARTED	NOTES	DEPT
Community Outreach	CO-GGRS	(CO-GGRS) Energy Efficiency Outreach Continue to inform businesses and residents of programs and rebates to conserve energy.			X		City participates in Chamber Green Business Committee. City developed extensive sustainability web pages devoted to business. City works with MCE, Bay Area Regional Energy Network, Marin Energy Watch Partnership, and others to promote programs and rebates like Rising Sun Energy Center's Green House Call program, Community Action Marin's energy efficiency programs, and Resilient Neighborhoods.	CM
		(CO-GGRS) Sustainability circles will be created to work through a structured curriculum and offer households and small businesses opportunities to improve energy and resource use, to reduce waste generation, and to make more informed purchasing decisions.			X		Resilient Neighborhoods is an ongoing program supported by the City. Greening for Profit was a one-year program that has been memorialized on a City web site and case studies that the City makes available online. City works with various agencies and the Chamber to help businesses and residents reduce waste, water, energy, and make improvements to various energy and purchasing related activities.	CM
Implementation	IM1	(IM1) Evaluate future development applications and the City's Capital Improvement Program against compliance with the Climate Change Action Plan.		X			City has a Qualified Greenhouse Gas Reduction Strategy approved by BAAQMD, which carries with it a checklist for compliance for development applications. CIP currently does not have a formal evaluation tool. To be developed in 2019.	CD / DPW
	IM2	(IM2) Prepare an annual report to the Planning Commission and City Council assessing the implementation of the Plan.			X		As part of our Greenhouse Gas Reduction Strategy, a formal presentation is given to City Council annually.	CM
	IM3	(IM3) Hire a Sustainability Coordinator to advance efforts to implement the Climate Change Action Plan.	X				Hired in 2011.	CM
	IM4	(IM4) Appoint a Sustainability Commission to advance efforts to implement the Climate Change Action Plan.				X	This measure was replaced by Quarterly Community Implementation Forums, which are ongoing.	CM
			14	14	31	9	68	

**NOTES**

There were 48 regular measures in the original CCAP.

This grew to 68 total measures when it was developed into the GHG Reduction Strategy.

This was primarily due to breaking measures up into smaller items (a, b, c, etc.) and including some new measures as well (identified by the suffix "-GGRS").