TOWN OF FAIRFAX
STAFF REPORT
October 6, 2022

TO: Mayor and Town Council

FROM: Sean Youra, Climate Action Coordinator

SUBJECT: Receive Climate Action Department Quarterly Update

RECOMMENDATION

Receive the Climate Action Update report.

BACKGROUND

The quarterly Climate Action Update report details progress made by staff in implementing the Town's Climate Action Plan (CAP).

DISCUSSION

This report details progress made in implementing the CAP since the last report provided to Council on August 3, 2022. The table below details actions taken by staff during the past quarter to implement the CAP and reduce greenhouse gas (GHG) emissions. The applicable measures from the CAP along with the estimated GHG emissions reduction that would result from achieving the targets for each of the applicable measures are provided for reference for each action taken.

Action	CAP Measure	Estimated GHG Emissions Reduction in 2030 (in MTCO2e)
Drafted a Resolution to establish a landscape equipment trade-in and rebate program to aid in the community's transition to electric landscape equipment, which was adopted by Council.	R-6: Electrify All Landscape Equipment	191
Created a new Landscape Equipment webpage on the town website and developed rebate program instructions and an online rebate application as part of launching the trade-in and rebate program. The Climate	R-6: Electrify All Landscape Equipment	191

Action Commission (CAC) and staff also developed outreach materials to promote the program.	O-2: Community Outreach	N/A
Made progress on getting EV chargers installed for public works and police department use including meeting with electricians and PG&E staff to determine needed electrical panel upgrades at the public works building to support EV charging infrastructure.	T-1: Zero Emission Vehicles	10,648
Met with Transportation Authority of Marin (TAM) staff about moving pilot fleet electrification and charging infrastructure projects forward and potentially launching some of them in early 2023. TAM also submitted staff's pilot project proposals to the Metropolitan Transportation Commission (MTC) to potentially receive additional funding and technical assistance for these projects.	T-1: Zero Emission Vehicles	10,648
	I-3: Identify and Secure Funding Sources	N/A
Volunteered to join the Fairfax Library's Community Resiliency Center (CRC) team and provided support in submitting an application to BayREN's Resilient Libraries Network Pilot program. Wrote a staff report for the Council to send a letter of support for the Fairfax Library application to the pilot program.	R-4: Renewable Energy Generation and Storage	164
	R-7: Innovative Technologies	N/A
	I-3: Identify and Secure Funding Sources	N/A

Conducted community outreach to gather feedback on the Marin Countywide EV Acceleration Strategy, which will help Marin communities reduce GHG emissions, lower vehicle operating and fuel costs, and improve air quality by encouraging the use of EVs and transitioning municipal fleets to EVs.	T-1: Zero Emission Vehicles	10,648
	O-2: Community Outreach	N/A
Ordered landfill, recycling, and compost waste receptacles with signage for public use outside of Fairfax food businesses.	W-4: Commercial Organic Waste	537
Hired the town's first shared Climate Action Fellow through the Climate Corps AmeriCorps program who will assist in the implementation of both Fairfax's and San Anselmo's CAPs.	N/A	N/A
Participated in several Green Building Steering Committee meetings and community workshops led by the County's Sustainability team to assist with outreach and engagement regarding cross-jurisdictional building reach code development and implementation. Continuing to gather community, staff, and CAC feedback on the model reach code.	E-1: Ordinances for Construction of Energy-Efficient Buildings	17
	O-2: Community Outreach	N/A
Completed the CalRecycle Electronic Annual Report (EAR) for the town that required collaboration with public works and other departments to gather the necessary SB 1383 and other waste regulation data.	W-1: Residential Organic Waste and Waste Diversion	1,201
	W-3: Commercial Edible Food Recovery	46
	W-4: Commercial Organic Waste	537

	W-5: Mandatory Commercial Waste Elimination and Diversion	N/A
Conducted significant research on SB 1383 requirements and trained staff on the relevant requirements. Began establishing a baseline for current recovered organic waste products procurement and investigating opportunities to increase compost/mulch usage to try to meet the town's required procurement target. Staff is also collaborating with other Marin jurisdiction staff on strategies to meet the procurement targets including a potential study to identify compost/mulch application potential on public and private lands.	W-5: Mandatory Commercial Waste Elimination and Diversion	N/A
	S-1: Urban Forests and Ecosystems	18
	S-2: Habitat Restoration and Soil Regeneration	N/A
Reviewed and provided feedback on the town's 2020 GHG Inventory Report prepared by Christine O'Rourke, Sustainability Coordinator for MCEP. The inventory shows that Fairfax's emissions declined 27% over the period from 2005 to 2020. An additional 29,348 MTCO2e reduction is required by 2030 for Fairfax to meet its zero emissions goal (final inventory report attached for reference).	I-2: Update GHG Emissions Inventories	N/A
Submitted a grant application in collaboration with ReadySetReplace (RSR) for	R-1: Building and Appliance Electrification	9,138

a TECH Quick Start grant. Staff and CAC members have been working with RSR to develop a Water Heating Electrification Campaign Program to help residents in both Fairfax and San Anselmo get electric-ready and install heat pump water heaters, which the grant would help fund.	E-4: Energy Efficiency Programs	1,369
	I-3: Identify and Secure Funding Sources	N/A
Got the town to join as a sponsor for the Marin Green Home Tour on October 19 and 20, which is a free virtual tour event that will showcase what Marin residents are doing to combat climate change, improve air quality, save water, and make their homes resilient. Staff will be promoting the event in the town's newsletter and social media.	O-1: Community Education	N/A
	O-2: Community Outreach	N/A
Replaced the gas stove in the Women's Club with a new electric induction stove.	R-2: Municipal Building and Appliance Electrification	19
	E-6: Municipal Energy Efficiency Retrofits	7

In addition, staff is continuing to:

- Serve as a staff liaison to the CAC, provide updates on CAP implementation during the CAC monthly meetings, and provide feedback on CAC proposed initiatives.
- Identify new climate action funding opportunities and manage existing grant funds (Applicable to CAP Measure O-5: Funding Strategies, and Measure I-3: Identify and Secure Funding Sources).
- Educate community members about climate action-related incentives, programs, events, and regulations through the Town's newsletter, social media, and website (Applicable to CAP Measure O-1: Community Education, and Measure O-2: Community Outreach).
- Coordinate with MCEP members to discuss and develop plans, policies, programs, and strategies that can assist in CAP implementation across all Marin jurisdictions.
- Monitor CAP implementation progress and prioritize projects to meet the CAP goals.

- Stay abreast of new climate-related state and federal regulations, technological innovations, and opportunities to further the Town's climate action efforts.

FISCAL IMPACT
None

ATTACHMENT
2020 GHG Inventory Report

TOWN OF FAIRFAX

GREENHOUSE GAS INVENTORY FOR COMMUNITY EMISSIONS FOR THE YEAR 2020

September 2022

Prepared by the
Marin Climate & Energy Partnership

MARIN CLIMATE & ENERGY PARTNERSHIP

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EXECUTIVE SUMMARY

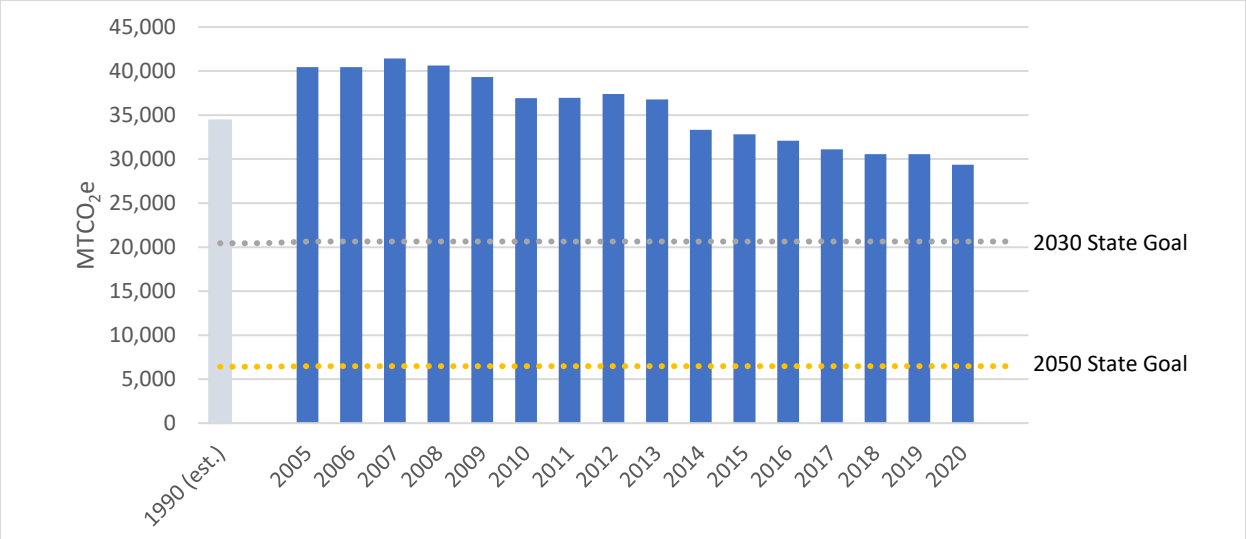
THE TAKEAWAY:

COMMUNITY EMISSIONS DOWN 27% SINCE 2005

Fairfax publishes annual community greenhouse gas (GHG) emissions estimates through the Marin Climate & Energy Partnership (MCEP). Annual inventories help the Town to monitor its progress more closely in meeting its local GHG reduction goals to reduce emissions to zero by 2030 and to meet the statewide goal to reduce emissions 40% below 1990 levels by 2030. In addition to the community inventories, MCEP periodically prepares inventories for government operations emissions.

This report reviews emissions generated from the community from 2005 through 2020, the most recent year data is available. The inventory shows that the Fairfax community reduced emissions 27% since 2005, which is equivalent to 15% below estimated 1990 levels. Emissions dropped from about 40,468 metric tons carbon dioxide equivalents ($MTCO_2e$) in 2005 to 29,348 $MTCO_2e$ in 2020. The community emissions trend and targets are shown below. Fairfax needs to reduce emissions another 8,710 $MTCO_2e$ to meet the State target for 2030 and another 22,874 $MTCO_2e$ to meet the State target for 2050, which is 80% below 1990 levels.

FIGURE 1: COMMUNITY EMISSIONS TREND



Recognizing the need for a collaborative approach to greenhouse gas reductions, city and county leaders launched the Marin Climate and Energy Partnership (MCEP) in 2007. The Town of Fairfax is a member of MCEP and works with representatives from the County of Marin and the other Marin cities and towns to address and streamline the implementation of a variety of greenhouse gas reduction measures. Funding for this inventory was provided by the Marin County Energy Watch Partnership, which administers public goods charges collected by PG&E. Community inventories are available on the MCEP website at marinclimate.org and are used to update the Marin Sustainability Tracker.

INTRODUCTION

PURPOSE OF INVENTORY

The objective of this greenhouse gas emissions inventory is to identify the sources and quantify the amounts of greenhouse gas emissions generated by the activities of the Fairfax community in 2020. This inventory provides a comparison to 2005 and estimated 1990 emissions and identifies the sectors where significant reductions in greenhouse gas emissions have occurred. In some instances, previous year emissions were updated with new data and/or recalculated to ensure the same methodology was employed for all inventory years.

GENERAL METHODOLOGY

This inventory uses national standards for the accounting and reporting of greenhouse gas emissions. The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, version 1.2 (July 2019) was used for the quantification and reporting of community emissions. Quantification methodologies, emission factors, and activity and source data are detailed in the appendix.

Community emissions are categorized according to seven sectors:

- Built Environment - Electricity
- Built Environment – Natural Gas
- Transportation
- Off-Road Vehicles and Equipment
- Waste
- Water
- Wastewater

CALCULATING EMISSIONS

Emissions are quantified by multiplying the measurable activity data – e.g., kilowatt hours of electricity, therms of natural gas, and gallons of diesel or gasoline – by emissions factors specific to the energy source. Most emissions factors are the same from year to year. Emission factors for electricity, however, change from year to year due to the specific sources that are used to produce electricity. For example, electricity that is produced from coal generates more greenhouse gases than electricity that is generated from natural gas and therefore has a higher emissions factor. Electricity that is produced solely from renewable energy sources such as solar and wind has an emissions factor of zero.

This inventory calculates individual greenhouse gases – e.g., carbon dioxide, methane, and nitrous oxide – and converts each greenhouse gas emission to a standard metric, known as "carbon dioxide equivalents" or CO_2e, to provide an apple-to-apples comparison among the various emissions. Table 1 shows the greenhouse gases identified in this inventory and their global warming potential (GWP), a measure of the amount of warming each gas causes when compared to a similar amount of carbon dioxide. Methane, for example, is 28 times as potent as carbon dioxide over 100 years; therefore, one metric ton of methane is equivalent to 28 metric tons of carbon dioxide. Greenhouse gas emissions are reported in this inventory as metric tons of carbon dioxide equivalents, or $MTCO_2e$.

TABLE 1: GREENHOUSE GASES

Gas	Chemical Formula	Emission Source	Global Warming Potential
Carbon Dioxide	CO_2	Combustion of natural gas, gasoline, diesel, and other fuels	1
Methane	CH_4	Combustion, anaerobic decomposition of organic waste in landfills and wastewater	28
Nitrous Oxide	N_2O	Combustion, wastewater treatment	265

Source: IPCC Fifth Assessment Report (2014)

TYPES OF EMISSIONS

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

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

UNDERSTANDING TOTALS

The totals listed in the tables and discussed in the report are a summation of emissions using available estimation methods. Each inventoried sector may have additional emissions sources associated with them that were unaccounted for due to a lack of data or robust quantification methods. For example, greenhouse gas emissions associated with air travel and the production of goods outside the community's boundary are not included in the inventory. Additionally, the community inventory does not include refrigerants released into the atmosphere from the use of air conditioning in cars and buildings.

COMMUNITY INVENTORY

COMMUNITY INVENTORY SUMMARY

In 2005, the activities taking place by the Fairfax community resulted in approximately 40,468 metric tons of CO_2e.[1] In 2020, those activities resulted in approximately 29,348 metric tons of CO_2e, a reduction of 27% from 2005 levels, which is equivalent to 15% below 1990 levels.

The community inventory tracks emissions in seven sectors:

- The **Built Environment – Electricity** sector represents emissions generated from the use of electricity in Fairfax homes and commercial, industrial, and governmental buildings and facilities.
- The **Built Environment – Natural Gas** sector represents emissions generated from the use of natural gas in Fairfax homes and commercial, industrial, and governmental buildings and facilities. Propane used as a primary heating source is also included, although it represents less than 1% of emissions in this sector.
- The **Transportation** sector includes tailpipe emissions from passenger vehicle trips originating and ending in Fairfax, as well as tailpipe emissions generated by medium and heavy-duty vehicles travelling on Marin County roads based on the Town's share of certain truck-generating industries. Emissions from buses serving Fairfax while travelling on roads within the jurisdiction are also included. Electricity used to power electric vehicles is embedded in electricity consumption reported in the Built Environment – Electricity sector.
- The **Waste** sector represents fugitive methane emissions that are generated over time as organic material decomposes in the landfill. Although most methane is captured or flared off at the landfill, approximately 25% escapes into the atmosphere.
- The **Off-Road** sector represents emissions from the combustion of gasoline and diesel fuel from the operation of off-road vehicles and equipment used for construction and landscape maintenance.
- The **Water** sector represents emissions from energy used to pump, treat, and convey potable water from the water source to Fairfax water users.
- The **Wastewater** sector represents stationary, process and fugitive greenhouse gases that are created during the treatment of wastewater generated by the community, as well as emissions created from electricity used to convey and treat wastewater.

Table 2 shows how emissions in each sector have changed since 2005. The greatest reductions have occurred in the Built Environment - Electricity sector (-5,335 $MTCO_2e$), followed by the Transportation sector (-3,340 $MTCO_2e$).

[1] Baseline and historical emissions are recalculated in the annual inventory to integrate new data and improved calculation methodologies and to ensure consistent comparison across each year. For this reason, emission levels may differ from levels reported in previous inventories.

TABLE 2: EMISSIONS SUMMARY BY SECTOR ($MTCO_2E$), 2005 THROUGH 2020

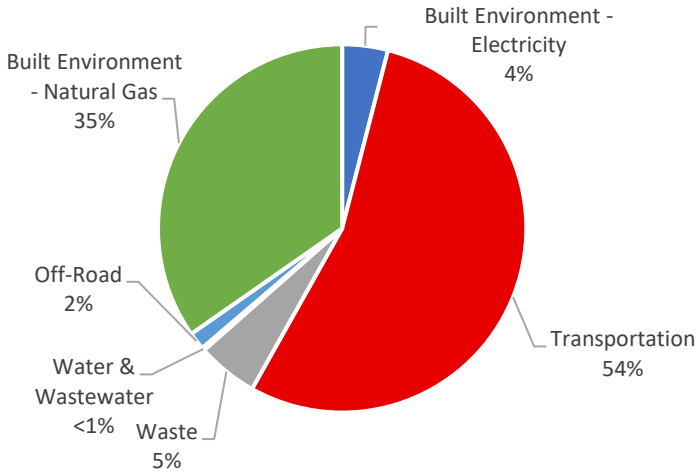
Year	Built Environment - Electricity	Built Environment – Natural Gas	Transportation	Waste	Off-Road	Water	Wastewater	Total	% Change from 2005	% Change from 1990[2]
1990 (est.)[1]								34,398		
2005	6,513	11,089	19,226	2,450	715	305	170	40,468		
2006	6,007	11,461	19,360	2,433	749	267	164	40,442	0%	
2007	7,578	11,185	19,042	2,190	881	359	206	41,442	2%	
2008	7,593	11,153	18,795	1,825	730	331	211	40,639	0%	
2009	7,068	10,970	18,586	1,574	620	334	187	39,339	-3%	
2010	5,299	11,246	17,941	1,548	558	192	153	36,937	-9%	
2011	4,670	11,753	18,206	1,508	541	136	142	36,956	-9%	
2012	4,979	11,277	18,751	1,560	530	146	150	37,394	-8%	
2013	4,464	11,278	18,606	1,582	526	170	148	36,774	-9%	
2014	3,886	9,430	17,621	1,591	521	152	126	33,327	-18%	
2015	3,709	9,582	17,120	1,648	517	119	124	32,820	-19%	
2016	3,008	9,787	16,647	1,941	511	89	113	32,096	-21%	
2017	1,462	10,464	16,555	2,022	502	26	84	31,115	-23%	
2018	1,608	10,260	16,314	1,791	489	9	75	30,546	-25%	
2019	1,792	10,335	16,174	1,700	474	10	63	30,548	-25%	-11%
2020	1,178	10,186	15,886	1,571	452	12	63	29,348	-27%	-15%
Change from 2005	-5,335	-904	-3,340	-879	-263	-293	-107	-11,120		
% Change from 2005	-82%	-8%	-17%	-36%	-37%	-96%	-63%	-27%		

[1] *Per California Air Resources Board guidance, 1990 levels are estimated at 15% below 2005 levels.*

[2] *In 2021, Fairfax adopted a Climate Action Plan that established a goal to reduce emissions 100% below 1990 levels by 2030. This column will track that progress over time.*

Figure 2 shows the relative contribution of emissions from these sectors in 2020. The likely reasons for the largest emissions decreases are described in the remainder of this report.

FIGURE 2: EMISSIONS BY SECTOR, 2020

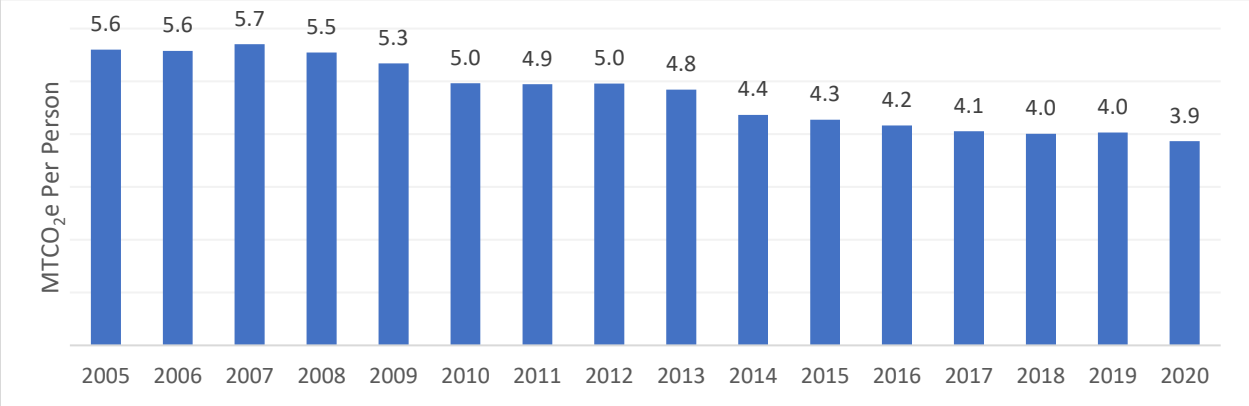


PER CAPITA EMISSIONS

Per capita emissions can be a useful metric for measuring progress in reducing greenhouse gases and for comparing one community's emissions with neighboring cities and against regional and national averages. That said, due to differences in emission inventory methods, it can be difficult to produce directly comparable per capita emissions numbers. Per capita emission rates may be compared among Marin jurisdictions, although some jurisdictions may have higher rates due to the presence of commercial and industrial uses.

Dividing the total community-wide GHG emissions by residents yields a result of 5.6 metric tons CO_2e per capita in 2005. Per capita emissions decreased 31% between 2005 and 2020, falling to 3.9 metric tons per person. Figure 3 shows the trend in per capita emissions over time. It is important to understand that this number is not the same as the carbon footprint of the average individual living in Fairfax, which would include lifecycle emissions, emissions resulting from air travel, the manufacturing and distribution of products and food, etc.

FIGURE 3: EMISSIONS PER CAPITA



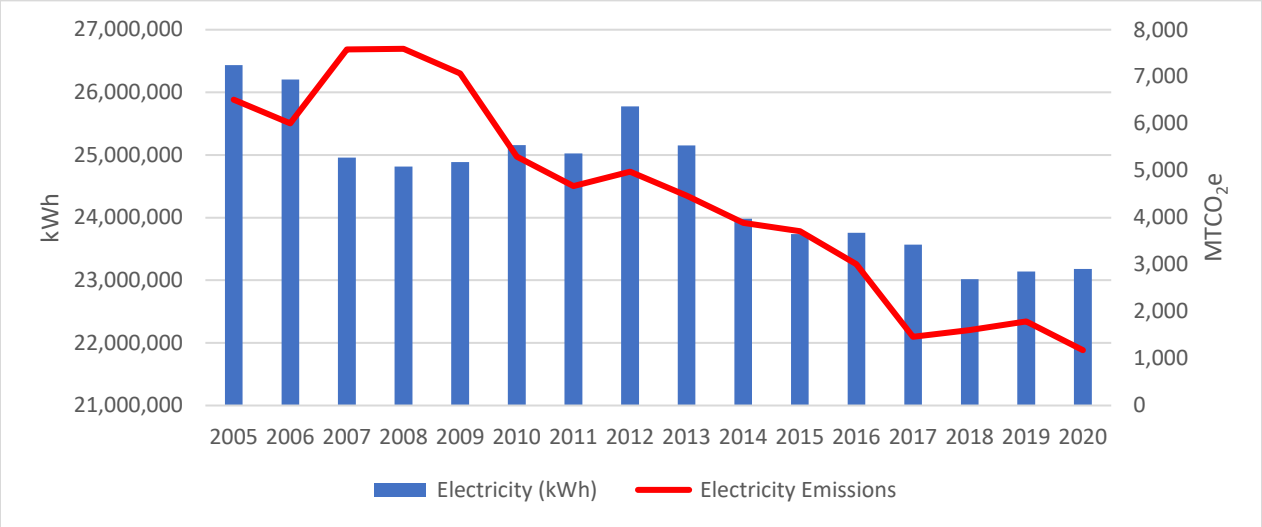
Significant Sources of Emissions

The following sections provide a year-by-year analysis of the changes in GHG emissions from the use of electricity, natural gas, transportation, and water and the disposal of waste. Whenever possible, each section discusses the change in emissions from previous years and the likely influence of state and local programs or policies and external factors on reducing emissions.

Built Environment - Electricity

Purchased electricity use in homes and businesses in Fairfax decreased 12% between 2005 and 2020. Greenhouse gas emissions from purchased electricity consumption decreased 82% since 2005, as shown in Figure 4. This is primarily due to the lower carbon intensity of electricity. PG&E has been steadily increasing the amount of renewable energy in its electricity mix. In 2020, PG&E electricity came from a mix of renewable (31%), large hydroelectric (10%), nuclear (43%), and natural gas (16%) energy sources and was 84% GHG-free.[2] MCE Light Green electricity came primarily from renewable (61%) and hydroelectric (36%) sources and was 98% GHG-free.[3] In 2020, about 12.7% of MCE electricity purchased by Fairfax customers was 100% renewable Deep Green electricity, including electricty purchased by the Town government.

Figure 4: Electricity Use and Emissions



Built Environment - Natural Gas

Natural gas is used in residential, commercial, and industrial buildings to provide space and water heating and power appliances. Use of natural gas is highly variable depending on the weather conditions. This variability has led natural gas use consumption in Fairfax to fluctuate from year to year, from a high of 2.2 million therms in 2011 to a low of

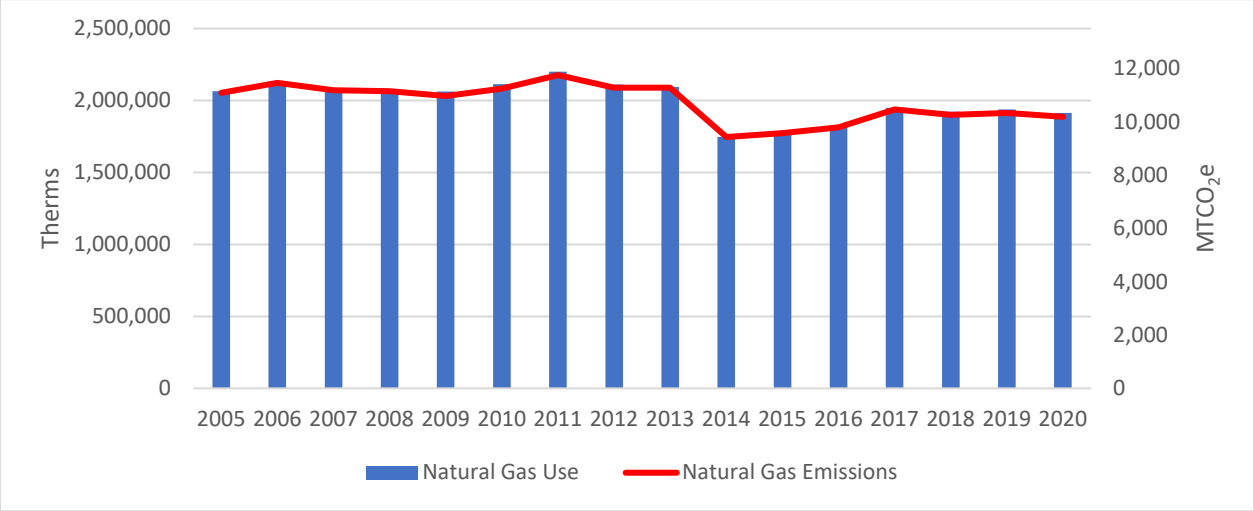
[2] PG&E 2020 Power Content Label, https://www.pge.com/pge_global/common/pdfs/your-account/your-bill/understand-your-bill/bill-inserts/2021/1021-PowerContent.pdf. Nuclear and large hydro sources are considered GHG-free.

[3] MCE 2020 Power Content Label, https://www.mcecleanenergy.org/energy-suppliers/#iLightbox[47d9eefc46030b57d7a]/0.

1.7 million therms in 2014. Reduction in energy use may also be attributed to energy efficiency programs and rebates, local green building ordinances, and State building codes.

Natural gas consumption decreased 1% between 2019 and 2020 and was 7% below the 2005 level in 2020. Unlike electricity emissions which reflect the power content mix, natural gas emissions track the amount of natural gas consumed (Figure 5).

FIGURE 5: NATURAL GAS USE AND EMISSIONS



TRANSPORTATION

Transportation activities accounted for approximately 54% of Fairfax's emissions in 2020. According to the transportation model and annual data the Town uses to calculate passenger and commercial vehicle miles, vehicle miles traveled (VMT) have decreased approximately 2% since 2005 and were flat between 2019 and 2020. However, this data may not accurately reflect recent trends. The transportation model has not been updated for several years (it is currently being revised), and the annual data the Town uses to adjust the model's output provides vehicle counts on state highways but not local roads, where the pandemic most likely reduced VMT.

Transportation emissions have decreased 17% since 2005 due to the reduction in VMT as well as more fuel-efficient and alternatively fueled cars (Figure 6). As shown in Figure 7, most transportation emissions come from passenger vehicles, accounting for 81% of transportation emissions in 2020. Marin County continues to be a leader in zero emission vehicles (ZEVs) – second only to Santa Clara County – with 9,709 ZEVs in Marin at the end of 2020, or 4.7% of registered automobiles. ZEVs include battery electric cars, plug-in hybrid electric cars, hydrogen fuel cell cars, and zero-emission motorcycles. Fairfax had 303 ZEVs by the end of 2020, or 4.6% of registered light-duty vehicles.

While it is difficult to pinpoint exactly how each land use and transportation policy affects emissions, the Town has undertaken many efforts to reduce transportation emissions. The Town encourages workforce housing and has made it easier for residents to use carbon-free modes of transportation, such as bicycling and walking, through improvements to the transportation network.

FIGURE 6: VEHICLE MILES TRAVELED AND TRANSPORTATION EMISSIONS

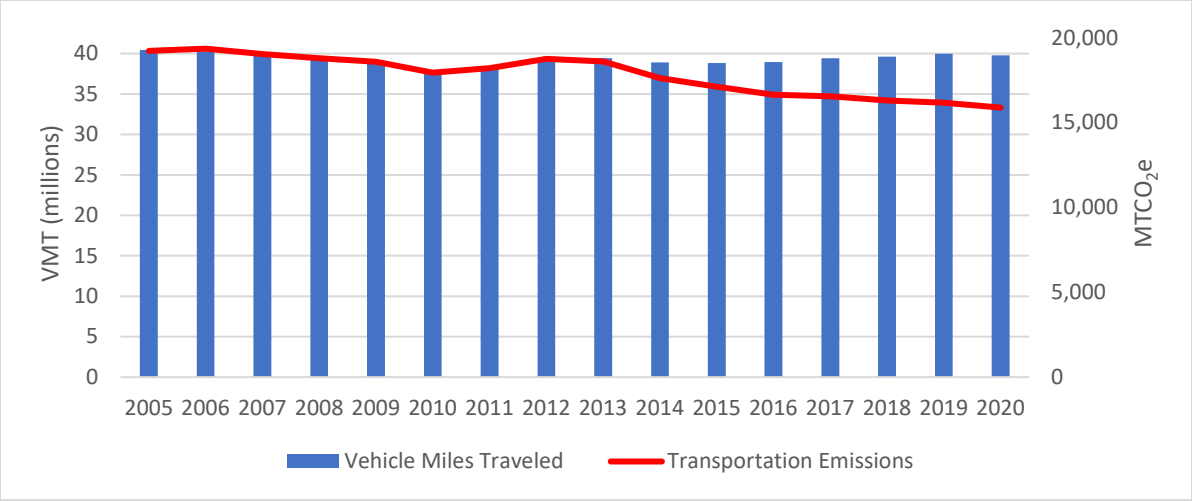
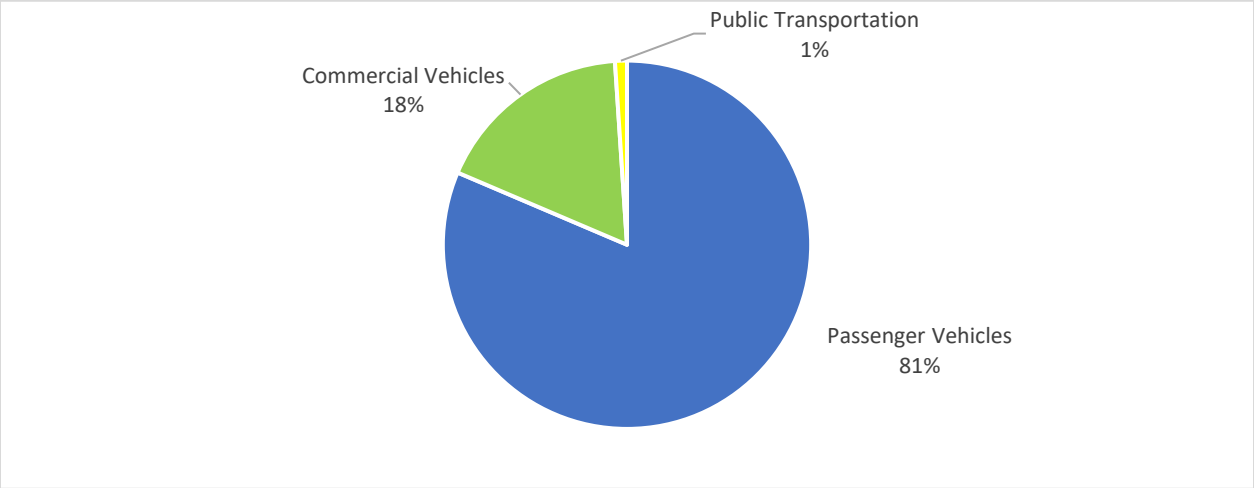


FIGURE 7: TRANSPORTATION EMISSIONS BY VEHICLE CATEGORY



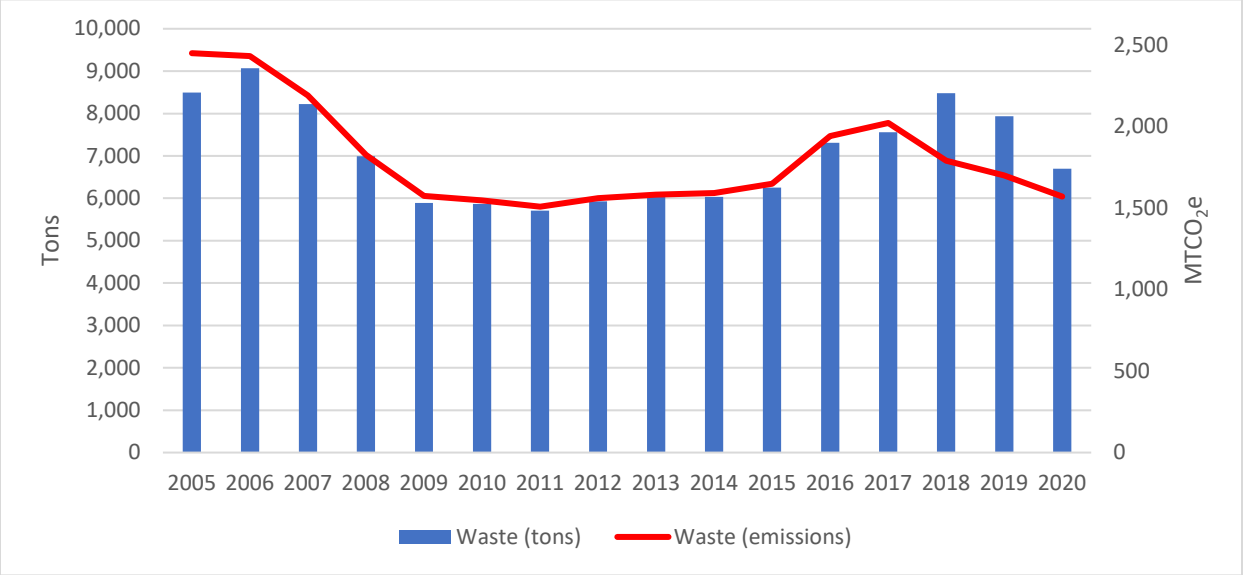
Note: Public transportation represents emissions from Marin Transit and Golden Gate Transit fixed-route buses.

Waste Disposal

Waste generated by the community decreased 16% between 2019 and 2020 and was 21% below the 2005 level by 2020 as shown in Figure 8 (based on countywide disposal data). Total landfilled waste includes alternative daily cover.[4] Emissions from waste disposal decreased 36% due to the lower organic content of landfilled waste and material used for alternative daily cover.

[4] Alternative daily cover is cover material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.

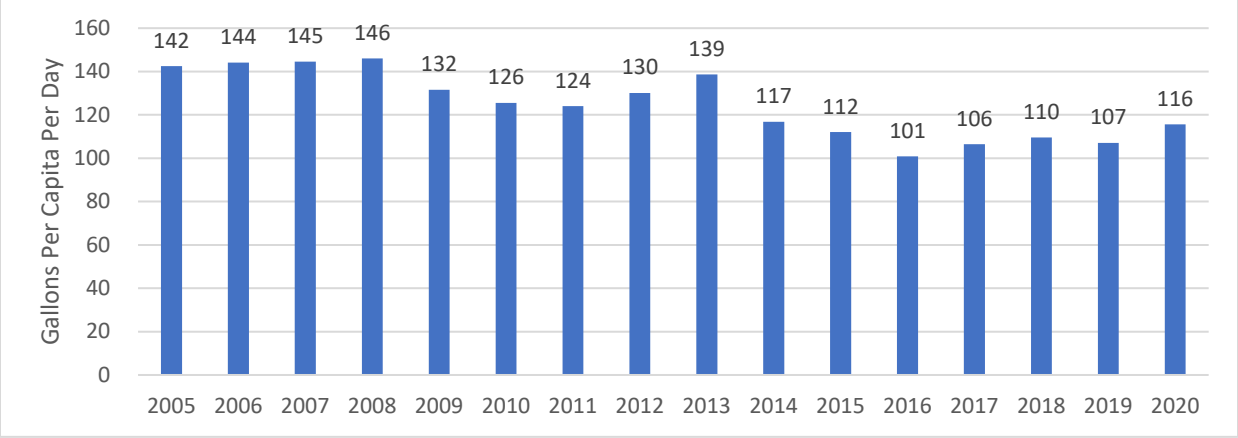
FIGURE 8: DISPOSED WASTE AND EMISSIONS



WATER USE

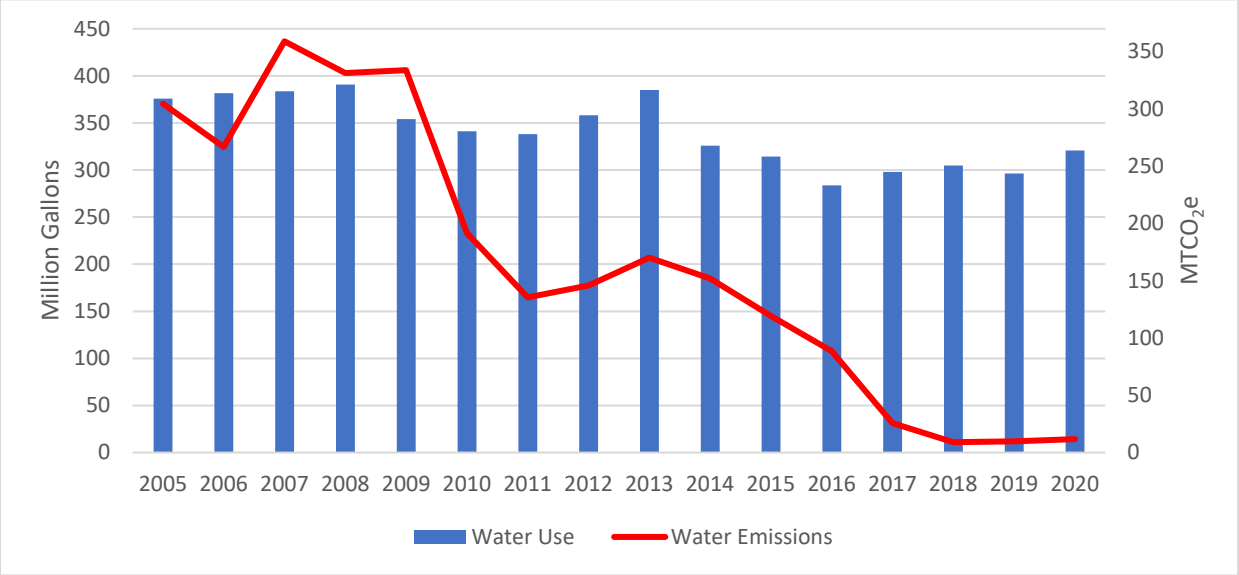
Per capita water use declined 19% since 2005, as shown in Figure 9 (based on MMWD district-wide data). Emissions, which are based on an estimate of energy used to pump, treat, and convey water from the water source to the Town limits, dropped 96% between 2005 and 2020 (see Figure 10). The additional reduction is due to the lower carbon intensity of electricity. The Marin Municipal Water District (MMWD) began purchasing MCE Deep Green electricity in mid-2017. The Sonoma County Water Agency (SCWA), which supplied approximately 27% of MMWD's water in 2020, uses renewable and carbon-free sources for its electricity needs; a small amount of emissions comes from stationary and mobile combustion of fuels used in SCWA's operations.

FIGURE 9: PER CAPITA WATER USE



Source: Marin Municipal Water District

FIGURE 10: COMMUNITY WATER USE AND EMISSIONS



MMWD provides rebates and programs to reduce water use. Rebates are available to replace fixtures with high-efficiency clothes washers and to purchase cisterns and rain barrels. MMWD provides free home and landscape water-use evaluations as well as free high-efficiency showerheads and faucet aerators.

APPENDIX: COMMUNITY INVENTORY

Community GHG Emissions Summary Table

Jurisdiction: Town of Fairfax
Population: 7,590 (CA Department of Finance)
Number of Households: 3,284 (CA Department of Finance)

Inventory Year: 2020
Date Prepared: July 16, 2022
Reporting Framework: Communitywide Activities

ID	Emissions Type	Source or Activity	Included, Required Activities	Included, Optional Activities	Excluded (IE, NA, NO or NE)	Notes	Emissions ($MTCO_2e$)
1.0	Built Environment						
1.1	Use of fuel in residential and commercial stationary combustion equipment	Both	●				10,186
1.2	Industrial stationary sources	Source			NE		
1.3	Power generation in the community	Source			NO		
1.4	Use of electricity in the community	Activity	●			Includes transmission and distribution losses	1,178
1.5	District heating/cooling facilities in the community	Source			NE		
1.6	Use of district heating/cooling facilities in the community	Activity			NE		
1.7	Industrial process emissions in the community	Source			NO		
1.8	Refrigerant leakage in the community	Source			NE		
2.0	Transportation and Other Mobile Sources						
2.1	On-road passenger vehicles operating within the community boundary	Source			IE	Obtained data for preferred activity-based method instead	
2.2	On-road passenger vehicles associated with community land uses	Activity	●				12,933
2.3	On-road freight and service vehicles operating within the community boundary	Source			IE	Obtained data for preferred activity-based method instead	
2.4	On-road freight and service vehicles associated with community land uses	Activity	●				2,787
2.5	On-road transit vehicles associated with community land uses	Activity		●			166
2.6	Transit rail vehicles operating with the community boundary	Source			NO		
2.7	Use of transit rail travel by the community	Activity			NE		

2.8	Inter-city passenger rail vehicles operating within the community boundary	Source			NO		
2.9	Freight rail vehicles operating within the community boundary	Source			NO		
2.10	Marine vessels operating within the community boundary	Source			NO		
2.11	Use of ferries by the community	Activity			NE		
2.12	Off-road surface vehicles and other mobile equipment operating within the community boundary	Source		●			452
2.13	Use of air travel by the community	Activity			NE		
3.0	Solid Waste						
3.1	Operation of solid waste disposal facilities in the community	Source			NO		
3.2	Generation and disposal of solid waste by the community	Activity	●				1,571
4.0	Water and Wastewater						
4.1	Operation of water delivery facilities in the community	Source			IE	Energy use is included in 1.1 and 1.4.	
4.2	Use of energy associated with use of potable water by the community	Activity	●				12
4.3	Use of energy associated with generation of wastewater by the community	Activity	●				0
4.4	Process emissions from operation of wastewater treatment facilities located in the community	Source			NO		
4.5	Process emissions associated with generation of wastewater by the community	Activity	●				63
4.6	Use of septic systems in the community	Source			NE		
5.0	Agriculture						
5.1	Domesticated animal production	Source			NE		
5.2	Manure decomposition and treatment	Source			NE		
6.0	Upstream Impacts of Communitywide Activities						
6.1	Upstream impacts of fuels used in stationary applications by the community	Activity			NE		
6.2	Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the community	Activity			IE	Transmission and distribution losses included in 1.4.	
6.3	Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary	Activity			IE	Included in 4.2 and 4.3.	
6.4	Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community.	Activity			NE		

Legend

IE – Included Elsewhere: Emissions for this activity are estimated and presented in another category of the inventory. The category where these emissions are included should be noted in the explanation.

NE – Not Estimated: Emissions occur but have not been estimate or reported (e.g., data unavailable, effort required not justifiable).
NA – Not Applicable: The activity occurs but does not cause emissions; explanation should be provided.
NO – Not Occurring: The source or activity does not occur or exist within the community.

Community Emissions Data Sources and Calculation Methodologies

Sector/ID	Emissions Source	Source and/or Activity Data	Emission Factor and Methodology
1.0 Built Environment			
1.1 Stationary Combustion	Stationary Combustion (CO_2, CH_4 & N_2O)	Known fuel use (meter readings by PG&E) and estimated fuel use (American Community Survey 5-Year Estimates, and U.S. Energy Information Administration Household Site Fuel Consumption data).	Default CO_2, CH_4 & N_2O emission factors by fuel type (U.S. Community Protocol v. 1.1 Tables B.1 and B.3). U.S. Community Protocol v. 1.1, Appendix C, Method BE.1.1 and BE.1.2.
1.4 Electricity Use	Electricity Use (CO_2, CH_4 & N_2O)	Known electricity use (meter readings by PG&E and MCE) and estimated direct access electricity consumption.	Verified utility-specific emission factors (PG&E and MCE) and eGrid subregion default emission factors. U.S. Community Protocol v. 1.1, Appendix C, Method BE.2.1.
	Electric Power Transmission and Distribution Losses (CO_2, CH_4 & N_2O)	Estimated electricity grid loss for Western region from eGrid.	U.S. Community Protocol v. 1.1, Appendix C, Method BE.4.1.
2.0 Transportation and Other Mobile Sources			
2.2 On-Road Passenger Vehicle Operation	On-Road Mobile Combustion (CO_2)	Estimated passenger vehicle miles traveled associated with origin and destination land uses (Metropolitan Transportation Commission, http://capvmt.us-west-2.elasticbeanstalk.com/data).	CO_2 for on-road passenger vehicles quantified in the EMFAC2021 v.1.0.1 model. Passenger vehicle emissions calculated according to U.S. Community Protocol v. 1.1, Appendix D, Method TR.1.A.
	On-Road Mobile Combustion (CH_4 & N_2O)	Estimated vehicle miles traveled associated with origin and destination land uses (Metropolitan Transportation Commission, http://capvmt.us-west-2.elasticbeanstalk.com/data).	CH_4 and N_2O for on-road passenger vehicles quantified in the EMFAC2021 v.1.0.1 model. Passenger vehicle emissions calculated according to U.S. Community Protocol v. 1.1, Appendix D, Method TR.1.A.
2.4 On-Road Freight and Service Truck Freight Operation	On-Road Mobile Combustion (CO_2)	Estimated commercial vehicle miles traveled within the boundary (Metropolitan Transportation Commission utilizing the 2017 Regional Transportation Plan).	CO_2 for on-road commercial vehicles quantified in the EMFAC2021 v.1.0.1 model. Emissions allocated utilizing LEHD data according to U.S. Community Protocol v. 1.1, Appendix D, Method TR.2.A.
	On-Road Mobile Combustion (CH_4 & N_2O)	Estimated commercial vehicle miles traveled within the boundary (Metropolitan Transportation Commission utilizing Plan Bay Area 2040 and the 2017 Regional Transportation Plan).	CH_4 and N_2O for on-road commercial vehicles quantified in the EMFAC2021 v.1.0.1 model. Emissions allocated utilizing LEHD data according to U.S. Community Protocol v. 1.1, Appendix D, Method TR.2.A.
2.5 On-Road Transit Operation	On-Road Mobile Combustion (CO_2)	Estimated vehicle miles traveled within the boundary (Marin Transit and Golden Gate Transit) and estimated diesel fuel efficiency for transit fleet (Golden Gate Transit). Fuel type provided by Marin Transit and Golden Gate Transit.	Renewable diesel emission factor provided by NEXGEN. U.S. Community Protocol v. 1.1, Appendix D, Method TR.4.A.
	On-Road Mobile Combustion (CH_4 & N_2O)	Estimated vehicle miles traveled within the boundary (Marin Transit and Golden Gate Transit) and estimated diesel fuel	Renewable diesel emission factor provided by NEXGEN. U.S. Community Protocol v. 1.1, Appendix D, Method TR.4.B.

		efficiency for transit fleet (Golden Gate Transit). Fuel type provided by Marin Transit and Golden Gate Transit.	
2.12 Off-Road Vehicles and Equipment	Off-Road Mobile Combustion (CO_2)	Estimated fuel use from OFFROAD 2021 v.1.0.1 for Lawn and Garden and Construction equipment. All categories are allocated by share of countywide households.	CO_2 emissions calculated according U.S. Community Protocol v. 1.1, Appendix D, Method TR.8. Emission factors provided in Table TR.1.6.
	Off-Road Mobile Combustion (CH_4 & N_2O)	Estimated fuel use from OFFROAD 2021 for Lawn and Garden and Construction equipment. All categories are allocated by share of countywide households.	CH_4 and N_2O emissions calculated according to U.S. Community Protocol v. 1.1, Appendix D, Method TR.8. Emission factors provided in the Local Government Operations Protocol Table G.11 and G.14.
3.0 Solid Waste			
3.2 Solid Waste Generation and Disposal	Fugitive Emissions from Landfilled Waste (CH_4)	Estimated landfilled tons based on reporting to CalRecycle by Marin County Solid and Hazardous Waste JPA and allocated to jurisdiction based on share of countywide population. Waste characterization based on the Statewide Waste Characterization Study (2008, 2014 and 2018) and Alternative Daily Cover by Jurisdiction of Origin and Material Type as reported to CalRecycle.	Emission factors calculated utilizing U.S. Community Protocol for Accounting and Report of Greenhouse Gas Emissions, Version 1.1, July 2013, Appendix E, Method SW.4.
4.0 Water and Wastewater			
4.2 Water Supply & Conveyance, Treatment and Distribution	Electricity Use (CO_2)	Water consumption (district-wide gpcd) and electricity consumption provided by Marin Municipal Water District (MMWD). Sonoma County Water Agency (SCWA) water delivery amount provided by SCWA.	Verified utility-specific emission factors (PG&E, MCE and SCWA). Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.14.
	Electricity Use (CH_4 & N_2O)	Water consumption (district-wide gpcd) provided by Marin Municipal Water District (MMWD). Electricity consumption data provided by MMWD.	eGrid subregion default emission factors. Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.14.
4.5 Treatment of Wastewater	Stationary Emissions from Combustion of Digester Gas (CH_4)	Known amount of digester gas produced per day and known percent of methane in digester gas provided by Central Marin Sanitation Agency.	Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.1.a.
	Stationary Emissions from Combustion of Digester Gas (N_2O)	Known amount of digester gas produced per day and known percent of methane in digester gas provided by Central Marin Sanitation Agency.	Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.2.a.

	Process Emissions from Wastewater Treatment Plant without Nitrification or Denitrification	Estimated population served by wastewater treatment plant provided by Central Marin Sanitation Agency.	Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.8.
	Fugitive Emissions from Effluent Discharge (N_2O)	Estimated population served by wastewater treatment plant provided by Central Marin Sanitation Agency. Assumed significant industrial or commercial input.	Emissions calculated according to U.S. Community Protocol v. 1.1, Appendix F, Method WW.12(alt).