City of

SAN MATEO

2020 CLIMATE ACTION PLAN

City of San Mateo
Climate Action Plan

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April 2020

Prepared for the City of San Mateo by:

PlaceWorks in collaboration with DNV GL

City of San Mateo
Climate Action Plan

ACKNOWLEDGEMENTS

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Sidewalk art from the City's 2014 Downtown Cleanup.

Photo by City of San Mateo

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Acronym	Term
AB	Assembly Bill
ABAG	Association of Bay Area Governments
BAAQMD	Bay Area Air Quality Management District
BAU	business-as-usual
CALGreen	California Green Building Standards
CAP	Climate Action Plan
CARB	California Air Resources Board
C/CAG	City/County Association of San Mateo County
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CO_2	carbon dioxide
EIR	environmental impact report
GHG	greenhouse gas
kW	kilowatt
kWh	kilowatt-hour
LCFS	Low Carbon Fuel Standard
MPO	metropolitan planning organization
MTC	Metropolitan Transportation Commission
$MTCO_2e$	metric tons of carbon dioxide equivalent
OPR	Office of Planning and Research
PCE	Peninsula Clean Energy
PG&E	Pacific Gas and Electric

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RICAPS	Regionally Integrated Climate Action Planning Suite
RPS	Renewables Portfolio Standard
SB	Senate Bill
SCS	sustainable communities strategy
TDM	Transportation Demand Management
TMA	transportation management agency
TNC	Transportation network company
TOD	transit-oriented development
VMT	vehicle miles traveled

Executive Summary

Purpose of the Climate Action Plan

The 2020 Climate Action Plan (CAP) is San Mateo's comprehensive strategy to reduce greenhouse gas (GHG) emissions. It demonstrates the leadership of community members and the City on sustainability and GHG reduction. San Mateo's General Plan directs the preparation, ongoing implementation and update of the CAP, providing the framework for San Mateo to reduce its community-wide GHG emissions in a manner consistent with state reduction targets and goals for 2020, 2030, and 2050. The CAP is prepared consistent with the California Environmental Quality Act (CEQA) Guidelines for Plans for the Reduction of Greenhouse Gas Emissions (CCR 15183.5). This allows the 2020 CAP to support and possibly streamline environmental review of GHG emissions related to future development projects within the city.

The 2020 CAP is a direct update to the 2015 CAP. The 2020 CAP analyzes San Mateo's progress to date in meeting its GHG reduction targets and contains new information to achieve more significant and longer-term GHG reductions. It also presents a work plan and monitoring program for the City to track progress over time and maintain the status of the CAP as a qualified GHG reduction strategy for the purposes of CEQA streamlining.

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Local Leadership

San Mateo has an extensive history of action on GHG reduction and other environmental sustainability actions. The 2020 CAP allows community members, City staff and officials, and other stakeholders to understand San Mateo's existing planning efforts and strategies to achieve its GHG reduction goals. It builds on several earlier efforts, including the 2007 Sustainable Initiatives Plan, the Greenhouse Gas Emissions Reduction Program, the Climate Action Plan for Operations and Facilities, the 2015 CAP, and many other local accomplishments to date.

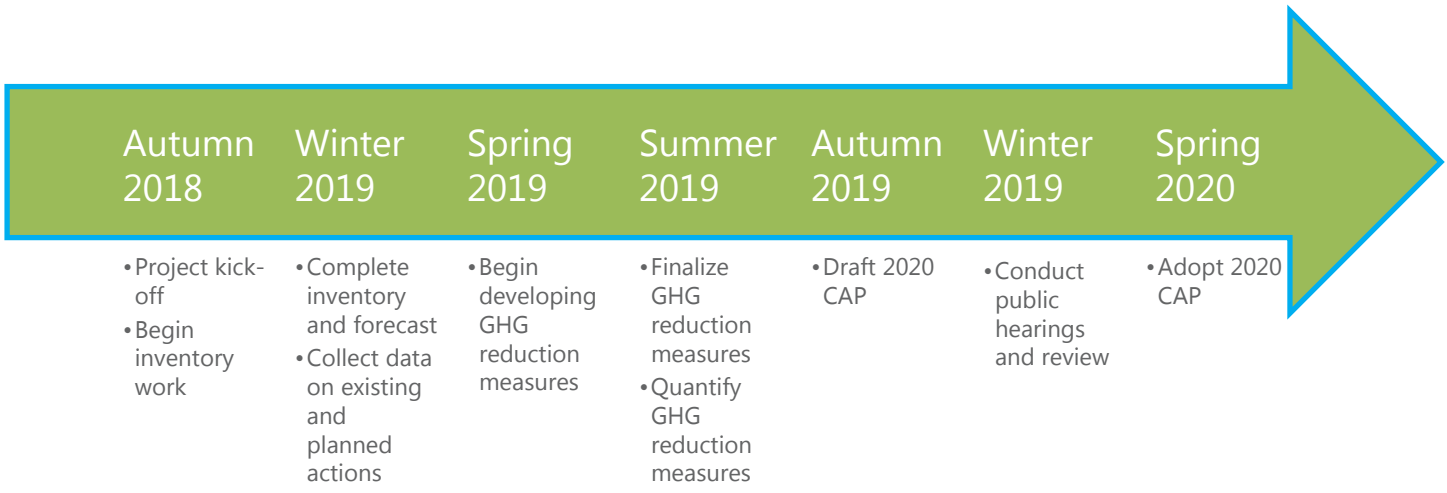
Planning Process

The City prepared the 2020 CAP as a collaborative effort between City staff, City officials, members of the public, and agency partners. San Mateo's existing GHG accomplishments is a core foundation of the 2020 CAP. From 2005 to 2017, San Mateo achieved an 18 percent decrease in GHG emissions. Programs such as Peninsula Clean Energy, composting and other waste reduction efforts, increased adoption of electric and more fuel-efficient vehicles, and improved energy efficiency and water conservation have all helped to achieve this reduction. By 2020, these local efforts are expected to reduce San Mateo's GHG emissions 5 percent below projected levels, not including steps San Mateo has taken since 2017 to reduce its local emissions.

Starting with these existing efforts, City staff and community members identified opportunities for new and expanded GHG reduction programs in San Mateo, touching on all major sources of GHG emissions in the community and leveraging new opportunities for GHG reductions that were not available when the City was preparing the 2015 CAP. Through conversations with other City staff members, a public open house meeting, and discussions with the Sustainability and Infrastructure Commission, the project team revised this list to produce a final list of GHG reduction measures and the volume of reductions they enable. The 2020 CAP allows San Mateo to meet and, in some instances, exceed the state-recommended targets for local communities. This CAP also includes an implementation and monitoring work plan for City staff to put these measures into effect and to track their effectiveness.

Figure **ES-1** shows the timeline for the 2020 CAP.

Figure ES-1:2020 CAP Timeline



KEY OUTCOMES OF THE CAP

The CAP includes two major sets of technical analyses. The first is an inventory of San Mateo's recent GHG emissions and a forecast of how these emissions may change in the future. The second is a set of calculations (known as quantification) showing how the CAP measures, as well as existing and planned efforts, can reduce GHG emissions consistent with the City's targets.

Community GHG Inventories

GHG inventories are assessments of San Mateo's GHG emissions from a variety of sources over the course of a calendar year. San Mateo has several previous GHG inventories, including ones for the calendar years 2005, 2010, and 2015. As part of this CAP, the project team prepared a fourth inventory, for the calendar year 2017. The project team updated the previous year inventories to uses the same methods and data sources as the 2017 inventory, informed by State guidance and best practices. This ensures that all four inventories are consistent and provide an accurate assessment of how San Mateo's GHG emissions have changed over time.

San Mateo's GHG emissions are caused by activities that take place within the city limits, even if the emissions are physically emitted elsewhere. For example, GHG emissions caused by the decomposition of trash thrown away in San Mateo are counted in these inventories, even though the decomposition (and resulting emission of GHGs) occurs in a landfill that is not located in San Mateo. All measurements of GHG emissions are in the common unit of metric tons of carbon dioxide equivalent ($MTCO_2e$), which allows for the different strengths of various GHGs to be expressed in a single unit.

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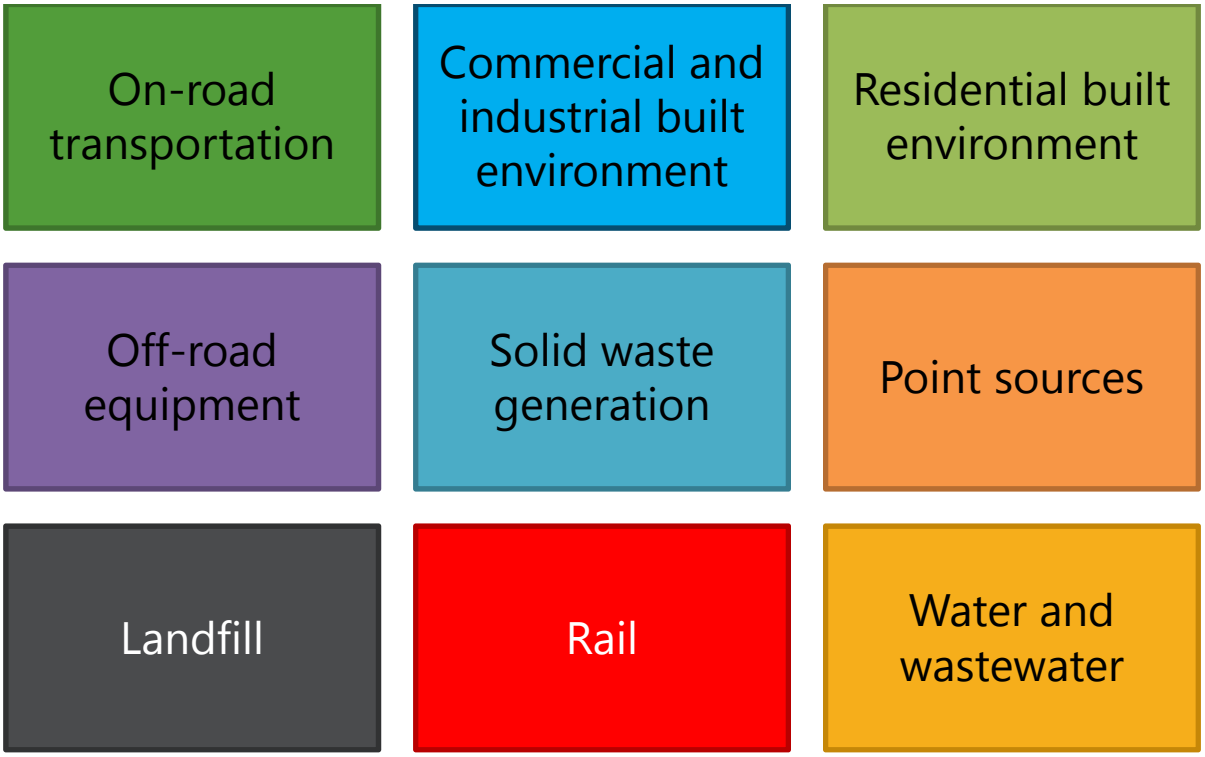
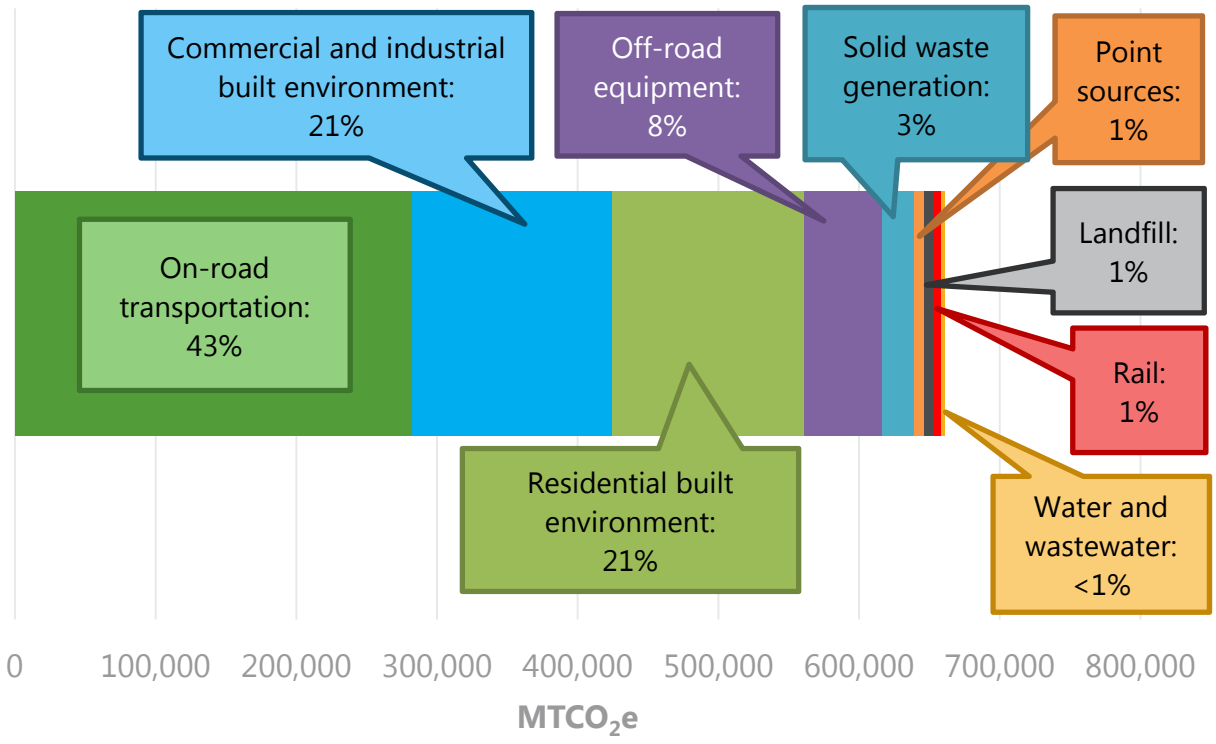
Figure ES-2 shows the nine sources (sectors) of GHG emissions included in the inventories in this CAP.

Figure ES-2:GHG Inventory Sectors



In 2005, San Mateo's GHG emissions totaled 660,600 $MTCO_2e$. These emissions fell to 646,920 $MTCO_2e$ in 2010, 590,850 $MTCO_2e$ in 2015, and 541,960 $MTCO_2e$ in 2017, a decline of 2 percent, 11 percent, and 18 percent relative to 2005 levels respectively. In all years, the on-road transportation sector is the largest source of emissions, followed by emissions from the two built environment sectors, off-road equipment, solid waste generation, and point sources. Landfill, rail, and water and wastewater emissions were consistently the smallest sources. **Figure ES-3** shows emissions by sector for 2005.

Figure ES-3: Baseline (2005) GHG Emissions



The 2020 CAP not only looks at the total emissions from San Mateo's sectors, but also the average emissions per San Mateo resident, known as per-capita emissions. The CAP calculates per-capita emissions by dividing the total emissions level by the number of residents in the community. In 2005, San Mateo's per-capita emissions were 7.1 $MTCO_2e$ per-capita. These numbers fell to 6.7 $MTCO_2e$ per-capita in 2010, 5.8 $MTCO_2e$ per-capita in 2015, and 5.2 $MTCO_2e$ per-capita in 2017, a decline of 26 percent.

Forecast

The forecast is a projection of future GHG emissions, showing how these emissions would change over time if no action is taken at the federal, State, or local level to reduce them. In the forecast, changes in emissions are caused by changes in population. As San Mateo is expected to continue to grow through 2050, the forecast projects an increase in emissions. The 2020 CAP projects emissions to grow to 559,420 $MTCO_2e$ by 2020, 618,670 $MTCO_2e$ by 2030, and 667,470 $MTCO_2e$ by 2050 if no action is taken, a total increase of 23 percent from 2017 levels. Per-capita emissions are expected to fall to 4.6 $MTCO_2e$ per-capita by 2050, an 11 percent decline from 2017 levels.

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Targets

The 2020 CAP sets substantial GHG reduction goals for San Mateo, consistent with the City's role as a sustainability leader. The CAP relies on the recommended GHG reduction goals in the State's Climate Change Scoping Plan, adapted to ensure that they are appropriate for San Mateo and meet the CEQA requirements for community-wide plans as well as individual development projects. These targets are:

- 2020: Reduce emissions to 1990 levels (15% below baseline levels), equal to 561,510 $MTCO_2e$ or 5.1 $MTCO_2e$ per-capita.
- 2030: Reduce emissions to 4.3 $MTCO_2e$ per-capita, equal to 529,760 $MTCO_2e$.
- 2050: Reduce emissions to 1.2 $MTCO_2e$ per-capita, equal to 172,310 $MTCO_2e$.

Existing and Planned Accomplishments

The forecast represents a "worst case" scenario if no action is taken to reduce GHG emissions. However, San Mateo, along with regional and State agencies, have already taken actions to reduce GHG emissions below their 2017 limit and to close the gap to the City's GHG reduction targets. The 2020 CAP identifies the GHG reductions from these existing and planned accomplishments. **Table ES-1** shows the reductions from these accomplishments and San Mateo's projected future emissions affect taking these accomplishments into account.

Table ES-1:Reductions from Existing and Planned Accomplishments

	2020	2030	2050
Forecasted Emissions	559,420 $MTCO_2e$ (5.1 $MTCO_2e$ per-capita)	618,670 $MTCO_2e$ (5.0 $MTCO_2e$ per-capita)	667,470 $MTCO_2e$ (4.6 $MTCO_2e$ per-capita)
Reductions from State existing and planned accomplishments	-24,080 $MTCO_2e$ (-0.2 $MTCO_2e$ per-capita)	-107,780 $MTCO_2e$ (-0.9 $MTCO_2e$ per-capita)	-194,570 $MTCO_2e$ (-1.4 $MTCO_2e$ per-capita)
Reductions from local and regional existing and planned accomplishments	-23,700 $MTCO_2e$ (-0.2 $MTCO_2e$ per-capita)	-32,470 $MTCO_2e$ (-0.3 $MTCO_2e$ per-capita)	-4,120 $MTCO_2e$ (Less than -0.1 $MTCO_2e$ per-capita)
Emissions with existing and planned accomplishments	511,640 $MTCO_2e$ (4.7 $MTCO_2e$ per-capita)	478,350 $MTCO_2e$ (3.9 $MTCO_2e$ per-capita)	468,720 $MTCO_2e$ (3.3 $MTCO_2e$ per-capita)

Reduction Measures

The 2020 CAP builds on the GHG reduction measures in the 2015 CAP, as well as the existing and planned accomplishments, to provide an updated suite of GHG reduction measures that meet the City's targets. These measures are informed by several sources, including discussions with City staff, feedback from public engagement efforts, and direction from the Sustainability and Infrastructure Commission. The 2020 CAP contains 29 GHG reduction measures, all of which also provide additional community benefits such as financial savings and improvements to public health. **Table ES-2** shows these measures and the GHG reductions they allow.

Table ES-2:Reductions by Measure

Measure	2020	2030	2050
BE 1: All-electric new construction	-880	-4,640	-7,420
BE 2: All-electric existing buildings	-620	-13,950	-85,960
RE 1: Peninsula Clean Energy	-380	-1,060	0
RE 2: Renewable energy systems for new and existing residences	-60	-170	0
RE 3: Renewable energy systems for new and existing nonresidential buildings	-10	-70	0
EE 1: Residential energy efficiency retrofits	-410	-6,030	-17,860
EE 2: Nonresidential energy efficiency retrofits	-840	-9,930	-17,040
EE 3: Residential tree planting	-<10	-<10	-<10
ME 1: Energy efficiency for new municipal buildings	Supportive (no measurable GHG reductions)		
ME 2: Energy efficiency at existing municipal buildings	-<10	-20	-70
ME 3: All-electric municipal buildings	0	-110	-210
CF 1: Electric vehicle charging infrastructure	-2,650	-29,630	-71,150
CF 2: Electric vehicle education and outreach	-980	-17,050	-17,120
CF 3: Clean city fleet	-30	-170	-420
CF 4: Clean fuel and vehicle emissions	-20	-3,130	-7,000
ST 1: Bicycle mode share	-40	-240	-670

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Measure	2020	2030	2050
ST 2: Pedestrian mode share	-390	-760	-1,110
ST 3: Micromobility and shared mobility	Supportive (no measurable GHG reductions)		
ST 4: Public transit service	-830	-9,130	-25,110
ST 5: Commuter programs	0	-130	-3,420
ST 6: Transportation Demand Management	-60	-2,330	-8,460
ST 7: Transit-oriented development	-160	-990	-2,370
SW 1: Composting program	-950	-12,650	-14,850
SW 2: Expanded recycling service	-810	-5,360	-8,530
SW 3: Waste awareness and source reduction	-420	-1,910	-5,510
WW 1: Water efficiency retrofits for existing buildings	-20	-100	-230
WW 2: Water-efficient landscaping	-<10	-<10	0
WW 3: Water efficiency in new construction	0	-<10	-10
OR 1: Alternative fuel lawn and garden equipment	0	-200	-1,140
Total	**-10,560**	**-119,760**	**-295,660**

Note: Due to rounding, totals may not equal the sum of the component parts.

When the 2020 CAP is fully implemented, it is projected to reduce GHG emissions to meet or exceed San Mateo's reduction targets:

- Projected 2020 emissions with the CAP are 501,110 $MTCO_2e$, well below the reduction target of 561,510 $MTCO_2e$.
- Projected 2030 emissions with the CAP are 2.9 $MTCO_2e$ per-capita (358,610 $MTCO_2e$), well below the reduction target of 4.3 $MTCO_2e$ per-capita.
- Projected 2050 emissions with the CAP are 1.2 $MTCO_2e$ per-capita (173,080 $MTCO_2e$), meeting the City's reduction target.

Implementation

Successfully achieving these GHG reductions depends on effective implementation of the 2020 CAP. The CAP includes a work plan to help identify the lead City department(s), timeframe, and estimated staff time for each of the GHG reduction measures, which will help prioritize the measures and identify a work program. City staff will monitor implementation of the 2020 CAP, report annually on CAP implementation, and will revise the work program as needed to ensure the best use of City and community resources. This approach will help ensure that San Mateo stays on track to meet or exceed its GHG reduction targets and will make it easier to update the CAP in future years as necessary.

New and emerging technologies, such as systems that track real-time energy use and suggest ways to improve energy efficiency, can help San Mateo continue to reduce its GHG emissions.

Photo by Dennis Schroeder/NREL (22290)

EXECUTIVE SUMMARY

Addressing climate change will help provide numerous benefits to San Mateo community residents, including supporting the conservation of San Mateo's outdoor resources.

Photo by City of San Mateo

Chapter 1

Introduction

This Climate Action Plan (CAP) demonstrates the City of San Mateo's leadership and commitment to reduce greenhouse gas (GHG) emissions.

This CAP is a comprehensive strategy to reduce GHG emissions and streamline the environmental review of GHG emissions of future development projects in the City of San Mateo, consistent with the California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b). The CAP identifies a strategy, reduction measures, and implementation actions the City will use to achieve targets consistent with State recommendations of 15% below 2005 emissions levels by 2020, 4.3 metric tons of carbon dioxide equivalent ($MTCO_2e$) per person by 2030, and 1.2 $MTCO_2e$ per person by 2050.

GHG Reduction Targets

This CAP implements a key goal of the City's 2030 General Plan by achieving the City's adopted GHG reduction targets for 2020 and 2030. It also achieves the State-recommended GHG reduction goal for 2050.

CHAPTER 1

PURPOSE

The City of San Mateo first adopted a CAP in 2015, based on a long-standing commitment to environmental stewardship and sustainability. This CAP consolidated and updated multiple earlier plans, consistent with the City's 2030 General Plan, including the Sustainable Initiatives Plan (adopted in 2007), Greenhouse Gas Emissions Reduction Program (adopted in 2010), and the Climate Action Plan for Operations and Facilities (adopted in 2008). Regionally, the 2015 CAP drew on the City's involvement with countywide climate action planning efforts. The 2015 CAP integrated early and ongoing efforts into a single plan that supported the General Plan and followed CEQA and air quality guidelines set by the State and BAAQMD.

> Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.
> – IPCC Fifth Assessment Report

The 2015 CAP recommended that the documented be updated at least once every five years to address emerging issues and changing best practices related to GHG emissions, including new regulations, the availability of new technologies, and changes to development patterns. The City began an update to the CAP in 2018. This CAP preserves the structure and format of the 2015 document while providing updated information, an expanded set of GHG reduction measures, and a longer-term planning horizon. As a result, the 2020 CAP provides a revised framework for addressing GHG emissions in the community, including an updated consolidated framework for the review and analysis of GHG emissions from new development activities.

The CAP allows City decision-makers and the community to understand the sources and magnitude of local GHG emissions, establish goals to reduce GHG emissions, and prioritize steps to achieve emissions reduction targets. The CAP updates and expands the City's goals, measures, and actions to addresses GHG emissions from the energy, water, transportation, solid waste, and off-road equipment sectors. It also revises San Mateo's implementation program and framework to monitor and report progress.

CLIMATE CHANGE SCIENCE

To make meaningful and effective decisions regarding GHG emissions reductions, it is important to understand the scientific and regulatory framework under which this Plan has been developed. This section provides a brief introduction to the scientific research efforts to understand how climate change occurs and its global implications, and describes the federal, State, regional, and local regulations that provide guidance and inform the development of this Plan.

Since the early 1990s, scientific consensus holds that the world's population is releasing GHGs faster than the earth's natural systems can absorb them. These gases are released as byproducts of fossil fuel combustion,

waste disposal, industrial processes, land-use changes, and other human activities. While often used interchangeably, there is a difference between the terms "climate change" and "global warming." According to the National Academy of Sciences, climate change refers to any significant, measurable change of climate lasting for an extended period that can be caused by both natural factors and human activities. Global warming, on the other hand, is an average increase in the temperature of the atmosphere caused by increased GHG emissions. The use of the term "climate change" is more accurate because it encompasses all changes to climate, not just temperature.

Greenhouse Effect

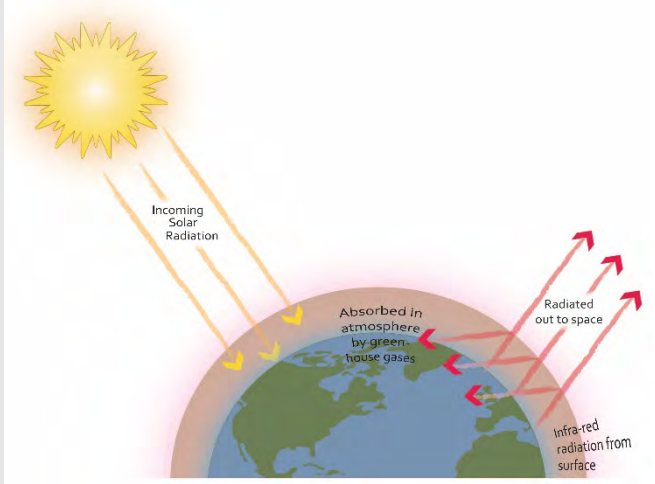
The release of gases, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), creates a blanket around the earth that allows light to pass through but traps heat at the surface preventing its escape into space (**Figure 1).** These gases function similarly to the glass panes of a greenhouse, which allow sunlight to pass into the building but trap heat inside, hence the name for this process: the greenhouse effect. While the greenhouse effect is a naturally occurring process that is vital for the existence of life, human activities have accelerated the generation of GHGs beyond natural levels. The overabundance of the gases that cause this effect, known as greenhouse gases, in the atmosphere has led to an unexpected warming of the earth and has the potential to severely impact the earth's climate system.

Climate Change Impacts

The continued release of GHGs at or above the current rate will continue to increase average temperatures around the globe. These increases in global temperatures are likely to change our planet's climate in ways that will have significant global, regional, and local long-term effects.

CHAPTER 1

Figure 1: The Greenhouse Effect



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. 2008. NOAA Satellite and Information Service.

It is extremely likely [at least a 95% probability] that human influence has been the dominant cause of the observed warming since the mid-20th century.
– IPCC Fifth Assessment Report

Global Climate Change Impacts

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report summarizes the most recent scientific understanding of global climate change and projects future conditions using the most comprehensive set of recognized global climate models. The report, released in 2013, considers all impacts human activities have on global temperature, and states that there is at least a 95% probability that "human influence has been the dominant cause of the observed warming since the mid-20th century." The Fifth Assessment Report projects four different temperature scenarios, all of which project 2016–2035 temperatures 0.54 to 1.26°F warmer than the 1986–2005 average temperature, and potentially over 7.2°F by 2100 under the most aggressive scenario.

As asserted in the IPCC Fifth Assessment Report and other scientific studies, if trends remain unchanged, continued GHG emissions above current rates will induce further warming changes in the global climate system and pose even greater risks than those currently witnessed. **Figure 2** shows the effects of additional warming on global temperatures**.** Given the scientific basis of climate change and expected trends, the challenge remains to prepare for and mitigate climate change through deliberate global and local action.

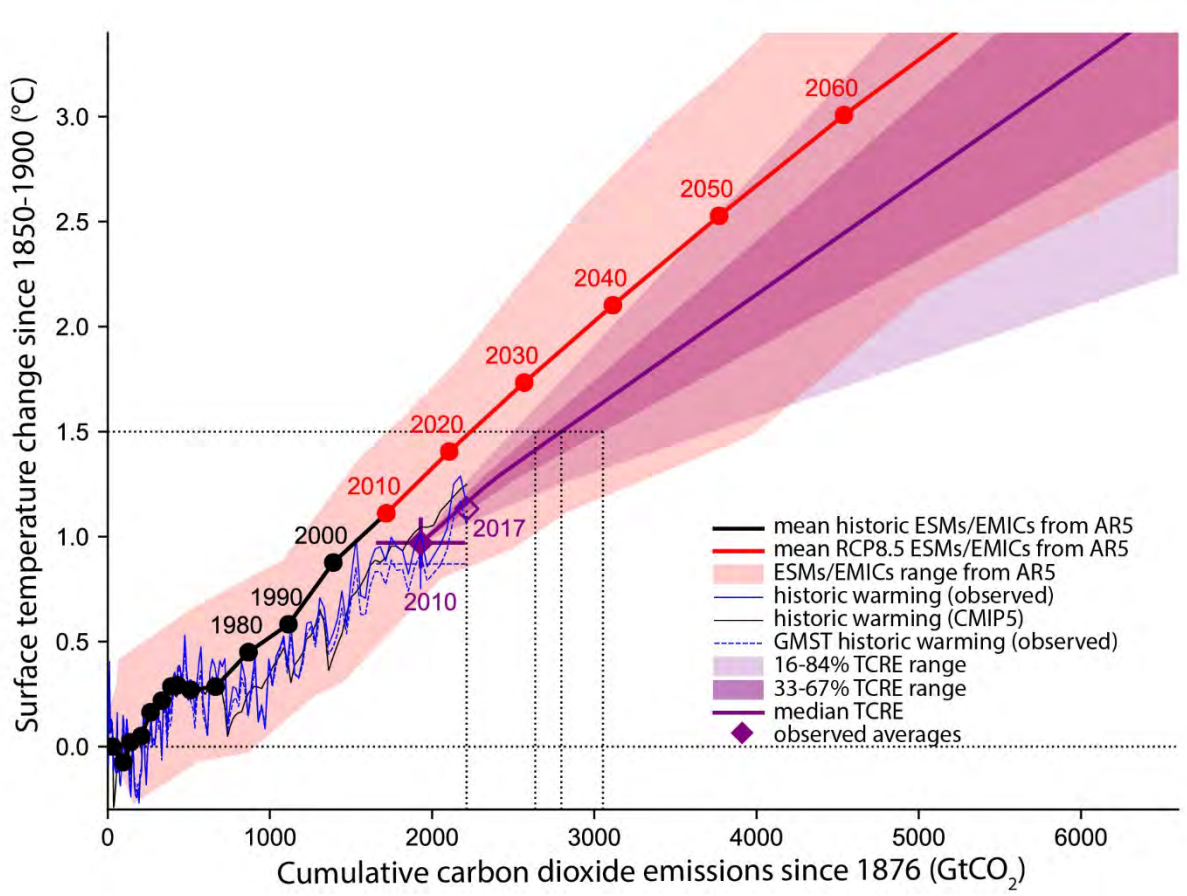
Emission Scenarios

The future severity of climate change depends on future GHG emission trends worldwide. If GHG emissions drop quickly and significantly, scientists project that there will be fewer substantial changes in future climate conditions. If emissions continue to increase, or only decline slowly and in the more distant future, severe climate change is more likely. These emission trends depend on political actions, economic conditions, individual behavior, and many other factors.

The global scientific community commonly uses four scenarios, called Representative Concentration Pathways (RCPs). In California, the best available data is for two of these scenarios: RCP 4.5 (a medium-low emissions scenario) and RCP 8.5 (a high emissions scenario). For the sake of a conservative analysis that identifies the greatest potential range of climate change effects, this section presents results of the RCP 8.5 scenario.

CHAPTER 1

Figure 2: Potential Global Temperature Increases



Historic and potential future global temperatures, depending on different levels of future GHG emissions. The red line shows the expected temperature trend without significant worldwide action to reduce GHG emissions

Source: Intergovernmental Panel on Climate Change, 2019

Climate Change Impacts to California and the City of San Mateo

The City of San Mateo, like most communities in California, is expected to experience multiple direct impacts as a result of climate change, including potential flooding, sea level rise, wildfires, drought, extreme heat, and negative effects on public health and biodiversity. Research suggests that California will experience hotter and drier conditions, reductions in winter snow and increases in winter rains, sea level rise, significant changes to the water cycle, and an increased occurrence of extreme weather events. Such compounded impacts will affect economic systems throughout the State, with likely ramifications in the City of San Mateo. To refrain from action is costly and risky; the California Fourth Climate Change Assessment estimates that no action to address

the potential impacts of climate change will lead to economic losses of "tens of billions of dollars per year in direct costs" and "expose trillions of dollars of assets to collateral risk." **Table 1** summarizes potential impacts in California due to climate change.

Table 1: California Climate Change Impacts

Climate Impact	Historical Trends	Future Direction of Change	Confidence for Future Change
Temperature	Warming	Warming	Very High
Sea Level Rise	Rising	Rising	Very High
Snowpack	Declining	Declining	Very High
Annual Precipitation	No Significant Trends	Unknown	Low
Intensity of Heavy Precipitation Events	No Significant Trends	Increasing	Medium-High
Frequency of Droughts	No Significant Trends	Increasing	Medium-High
Frequency and Intensity of Santa Ana Winds	No Significant Trends	Unknown	Low
Marine Layer Clouds	Some Downward Trends	Unknown	Low
Acres Burned by Wildfire	Increasing	Increasing	Medium-High

Source: Bedsworth, Louise, Dan Cayan, Guido Franco, Leah Fisher, Sonya Ziaja. (California Governor's Office of Planning and Research, Scripps Institution of Oceanography, California Energy Commission, California Public Utilities Commission). 2018. Statewide Summary Report. California's Fourth Climate Change Assessment. Publication number: SUMCCCA4-2018-013.

Decreased Supply of Fresh Water

The State's water supply is already under stress and is anticipated to shrink under even the most conservative climate change scenario. Warmer average global temperatures cause more rainfall than snowfall, making the winter snowfall season shorter and accelerating the rate at which the snowpack melts in the spring. The Sierra snowpack is estimated to decline by at more than two-thirds below its historical average by 2050. **Figure 3** shows anticipated changes in snowpack levels above the Hetch Hetchy reservoir watershed, the source of most of the water used in San Mateo, under a high GHG emissions scenario. With rain and snow events becoming less predictable and more variable, the rate of flooding could increase and California's ability to store and transport fresh water for consumption could decrease. Further, warmer weather will lead to longer growing seasons and increased agricultural demand for water.

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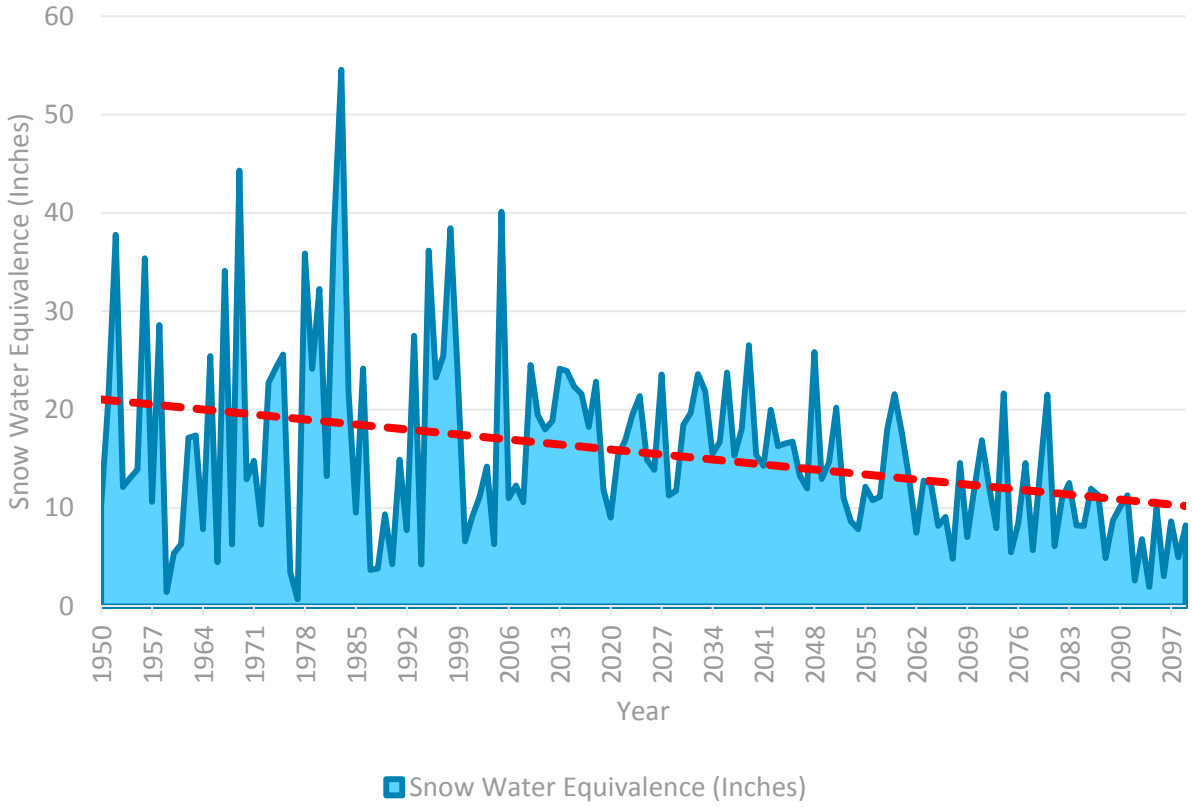
Figure 3: Historic and Projected Snowpack Levels Impacting San Mateo's Water Supply



Source: Cal-Adapt 2019.

Increased Severity and Frequency of Flood Events

Forecasts indicate more intense rainfall events, generating more frequent or extensive runoff, and flooding may result from a changing climate. According to Cal-Adapt, historically, these events occurred an average of 11 events per year and are projected to increase to an average of 13 events per year by 2050 and an average of 16 events by 2100. Localized flood events may increase in periods of heavy rain. As explained by the California Fourth Climate Change Assessment, California's water system is structured and operated to balance between water storage for dry months and flood protection during rainy seasons. Although climate change is likely to lead to a drier climate overall, risks from regular, more intense rainfall events can generate more frequent and/or more severe flooding that upsets this managed balance between storage and protection. Additionally, erosion may increase and water quality may decrease as a result of increased rainfall amounts.

Rising Sea Levels

Sea level rise is attributed to the increase of average ocean temperatures and the resulting thermal expansion and the melting of snow and ice contributing to the volume of water held in the oceans. While many effects of climate change will impact the region, sea level rise is one specific impact that has been extensively studied and quantified, and its effects mapped. The speed and amount of sea level rise will be influenced by the increase in average temperatures and rate of melting of glacial ice. While there is a degree of uncertainty in projections, the actual rate of sea level rise is occurring more quickly than many previous projections had estimated.

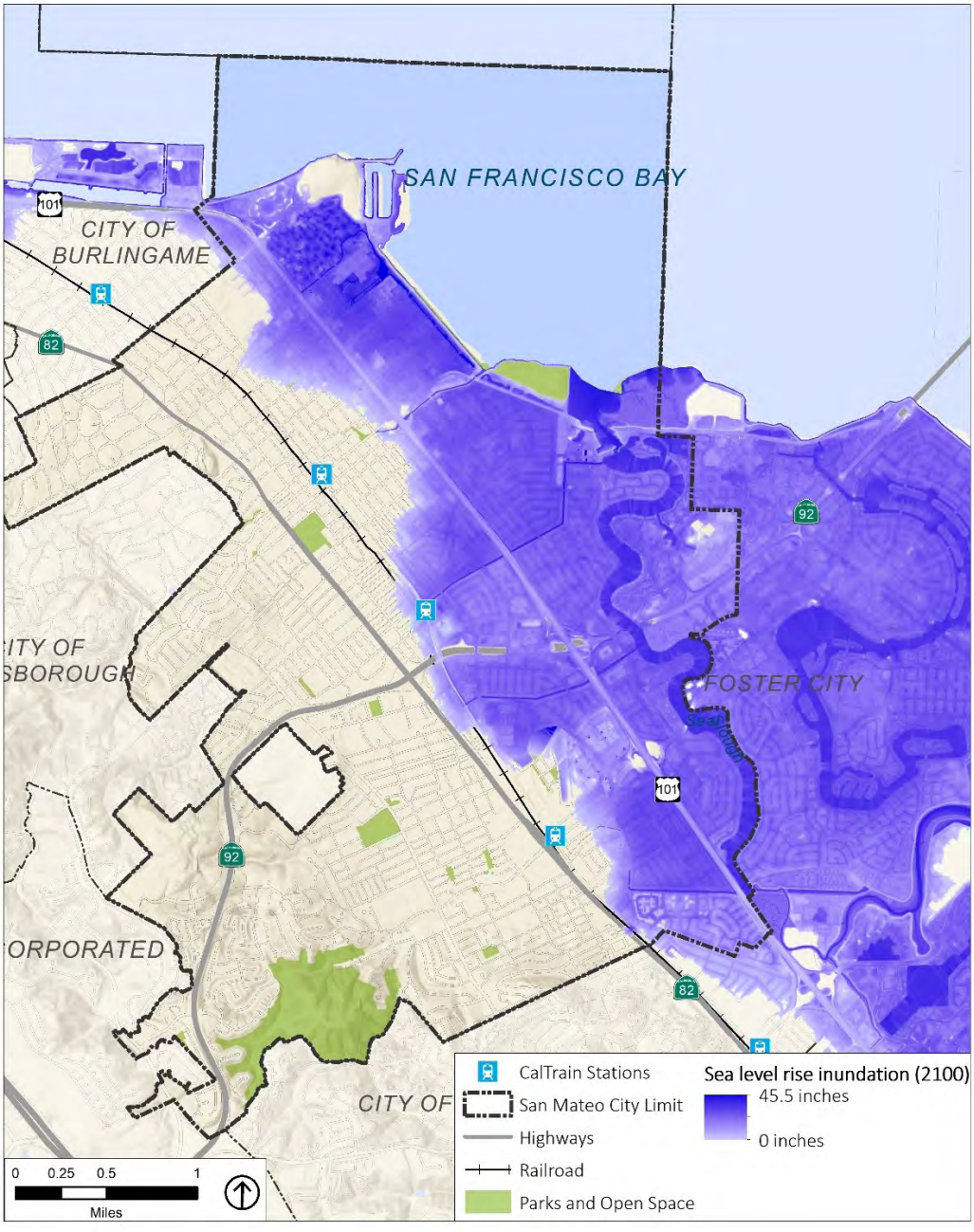
Shoreline areas of San Mateo, such as Ryder Park, may be vulnerable to sea level rise.

Photo by City of San Mateo

The California Natural Resources Agency, in partnership with the California Ocean Protection Council, issued a 2018 update to the State of California Sea-Level Rise Guidance, which states that sea levels in the San Francisco Bay Area may rise 22 inches by mid-century and 82 inches by the end of the century. Because it is in a low-lying coastal area, San Mateo is highly vulnerable to this threat. A sea level rise of 22 inches could inundate areas near Seal Point. If the level of San Francisco Bay rises 82 inches, water is projected to inundate all parts of San Mateo east of Highway 101, the area north of downtown, and large sections of the Hayward Park, Bay Meadows, and Laurie Meadows neighborhoods. **Figure 4** shows the parts of San Mateo that are expected to be inundated by sea level rise by 2100.

CHAPTER 1

Figure 4: Sea Level Rise in San Mateo (2100)



Source: Adapting to Rising Tides 2019, City of San Mateo 2019, San Mateo County 2019, ESRI 2019, PlaceWorks 2019

Deteriorating Public Health

Heat waves are expected to have a major impact on public health, as well as decreasing air quality and increasing mosquito breeding and mosquito-borne diseases. Further, climate change is expected to alter the spread and prevalence of disease-carrying insects, organisms, or people, referred to as vectors, in addition to leading to a possible decrease in food quality and security. Vector control districts throughout the State are already evaluating how they will address the expected changes to California's climate.

According to a report from the California Air Resources Board (CARB), the warming climate will increase ozone levels in California's major air basins, leading to upwards of 6 to 30 more days per year with ozone concentrations that exceed federal clean-air standards.

Cost-effective measures to reduce GHG emissions and protect public health are important for local governments. The new CARB study provides evidence of what is becoming known as the "climate penalty," where rising temperatures increase ground-level ozone and airborne health-damaging particles, despite the reductions achieved by programs targeting smog-forming emissions from cars, trucks, and industrial sources. The elderly, young, and sensitive populations most likely to be impacted by climate change are also those that often lack sufficient resources to adapt. Such vulnerable demographics are likely to need assistance to respond to climate change. Social equity issues related to the unequal distribution of resources and increased costs to address community-wide health risks will need to be addressed proactively to reduce the potential for financial strain on local governments.

Increased Rate of Wildfires

Wildfire risk is based on a combination of factors including rainfall, winds, temperature, and vegetation. According to California Fourth Climate Change Assessment, higher temperatures, longer dry periods, and increased frequency of high velocity winds over a longer fire season will directly increase wildfire risk. Indirectly, wildfire risk will also be influenced by potential climate-related changes in vegetation and ignition potential from lightning. Historically, the annual average area burned in San Mateo was 50 acres. According to Cal-Adapt, under higher emissions scenario, this could increase to an average annual burn area of 73 acres by 2050 and 133 acres by 2100. The hills behind San Mateo are also expected to see an increase in wildfire frequency, and fires in this area could cause damage in the community or impact local air quality.

Negative Impacts on Wildlife

As temperatures rise, species are migrating north in California or to higher elevations. This ecological shift disrupts the food chain and prevents some plant species from being pollinated. Water and food supplies are expected to be more variable and to shift as the seasons change. The California Office of Emergency Services and the California Natural Resources Agency note that those species that are unable to migrate face the danger of extinction: "The amount of future warming expected in California may likely exceed the tolerance of

endemic species (i.e., those that are native to a specific location and that only occur there) given their limited distribution and microclimate."

Reduction in soil moisture will result in early dieback of many plants, potentially leading to conflicts with animal breeding seasons and other natural processes. Many of the potential effects on wildlife are still being studied, but with a limited ability to adapt to new climates and the expected success of invasive species, pests, and pathogens in future climate conditions, there is a potential for severe species loss.

Several potential hydrological changes associated with global climate change could also specifically influence the ecology of aquatic life in California and have several negative effects on cold-water fish. For example, if a rise in air temperature by just a few degrees Fahrenheit occurs, this change could be enough to raise the water temperatures above the tolerance of salmon and trout in many streams, favoring instead non-native fishes such as sunfish and carp. Unsuitable summer temperatures would be particularly problematic for many of the threatened and endangered fish that spend summers in cold-water streams, either as adults or juveniles or both.

LOCAL CONTEXT

The CAP is an implementation program of the City's 2030 General Plan. The City of San Mateo adopted the 2030 General Plan in 2010. As part of the General Plan update, the City prepared and adopted the 2010 Greenhouse Gas Emissions Reduction Program (Program). The 2010 Program was the City's first step to consolidate City efforts into a framework for reducing GHG emissions consistent with the California Global Warming Solutions Act. The 2010 Program was based on the City's Sustainable Initiatives Plan adopted in the early stages of the 2030 General Plan update. The City revised its approach four years later by developing the 2015 CAP, in response to evolving guidance and new protocols. This CAP supersedes the 2015 document.

2030 General Plan

The 2030 San Mateo General Plan presents the City's vision for establishing San Mateo as a diverse community with an exceptional quality and character. The General Plan envisions a preeminent City with balanced commercial and residential growth, with a distinguished downtown and viable, wholesome neighborhoods driven by a solid, healthy economic and financial base.

The City's General Plan contains goals and policies which regulate urban development, the protection of the natural environment, and public safety. It reflects the community's long-term vision and provides a goal and policy framework to guide land use and planning-related decisions, and future funding decisions. The General Plan also enables citizens and those seeking to develop property to understand San Mateo's values and objectives. The General Plan also establishes the City's vision of serving as a leader in addressing the environmental effects of climate change with education, promotion, and fostering sustainable development.

The General Plan establishes a set of GHG reduction goals and directs the City to reduce emissions to achieve these goals by developing a comprehensive GHG reduction strategy. The Sustainable Initiatives Plan initially fulfilled this role, followed by the 2015 CAP. This 2020 CAP will serve as the new GHG reduction strategy for San Mateo.

The City and community members are currently updating San Mateo's General Plan and will replace it with the community's 2040 General Plan called Strive San Mateo. This process began in 2018 and is set to be adopted in 2023. Future updates to the CAP will reflect any new policies or visions in Strive San Mateo.

Sustainable Initiatives Plan

Adopted in 2007, the Sustainable Initiatives Plan was prepared by the City's Sustainability Advisory Committee to the City Council, which was an ad hoc committee created for the sole purpose of developing the plan and has since been disbanded. The Sustainable Initiatives Plan provided the City's overall commitment and framework for reducing GHG emissions and achieving sustainability. This document established the City's first GHG emissions target of reducing emissions below 1990 levels by 2020 and to 80 percent below 1990 levels by 2050, consistent with State-adopted targets and goals at that time. Strategies in the Sustainable Initiatives Plan included a commitment to incorporate sustainability into policies and foster GHG reductions throughout the community. Community strategies suggested in the Sustainable Initiatives Plan addressed a broad array of issues, from increasing bicycle and pedestrian mode share to facilitating energy efficiency and renewable energy throughout the community. The City implemented the Sustainable Initiatives Plan and its companion GHG Reduction Program (presented below), monitored progress, and presented annual updates on this document to City Council.

2010 Greenhouse Gas Emissions Reduction Program

As part of the City's General Plan update in 2010, the City prepared the 2010 Program. Adopted as an appendix to the General Plan and General Plan Environmental Impact Report (EIR), the Program supported the General Plan with an analysis of GHG emissions. Building on the 2007 Sustainable Initiatives Plan, the Program quantified strategies in the Sustainable Initiatives Plan for anticipated impacts on GHG reductions. An implementation plan in the Program also identified the City's strategy to monitor GHG reductions and achieve the 2020 reduction target. Preparation of the Program included the development of a monitoring and reporting tool to track progress over time.

The Program sought to streamline the review of new development by demonstrating consistency with BAAQMD guidance. The City fully analyzed and adopted the Program in the General Plan EIR to facilitate streamlining of new development review. Accordingly, the City used the Program to review and consider new development applications for GHG emissions.

CHAPTER 1

Climate Action Plan for Operations & Facilities

In 2008, San Mateo prepared a Climate Action Plan for Operations & Facilities, which includes a 2006 inventory of emissions from municipal operations and applies the targets identified in the Sustainable Initiatives Plan to the City. It covers emissions from energy use in City buildings, fuel use of City vehicles and equipment, commute habits of City employees, and waste thrown away at City facilities. This plan contains policies and specific capital improvements to help achieve these targets, along with recommendations for adapting to the impacts of climate change and how to educate City staff about reducing emissions. In 2010, the Climate Action Plan for Operations & Facilities was incorporated into San Mateo's General Plan as an appendix.

2015 Climate Action Plan

The City adopted a comprehensive CAP in 2015 that integrated San Mateo's earlier sustainability efforts into a single document. It provided an analysis of San Mateo's community-wide GHG emissions for the years 2005 and 2010, forecasted these emissions out to 2030, and established a new GHG reduction target of 35 percent below 2005 levels by 2030. This target, along with the targets of 15 percent below 2005 levels (equivalent of 1990 levels) by 2020 and 80% below 1990 levels by 2050, were included in the General Plan as part of the 2015 CAP adoption process. The 2015 CAP listed 28 GHG reduction measures to reduce the community's emissions, as well as a set of implementation and monitoring efforts to help put the plan into effect. The 2020 CAP is an update to the 2015 CAP.

Regionally Integrated Climate Action Planning Suite

San Mateo has participated in the Regionally Integrated Climate Action Planning Suite (RICAPS) effort. The City/County Association of San Mateo County (C/CAG) has led this project as a countywide effort to support regional climate action planning. Originally funded by grants from BAAQMD and Pacific Gas and Electric (PG&E), RICAPS provides tools and a forum for ongoing countywide efforts. Tools developed through the RICAPS effort include a template of workbooks and documents available for local use. RICAPS also facilitated preparation of recent year inventories for jurisdictions in San Mateo County, including 2010 and 2015 community-wide GHG inventories for each participating jurisdiction. Jurisdictions in RICAPS continue to coordinate for a regional approach to monitoring GHG emissions and progress to local climate action planning targets.

While the City of San Mateo continues to participate in the RICAPS effort, the City has developed this CAP as an independent, customized CAP for the community shaped by the City's unique background and locally adopted priorities.

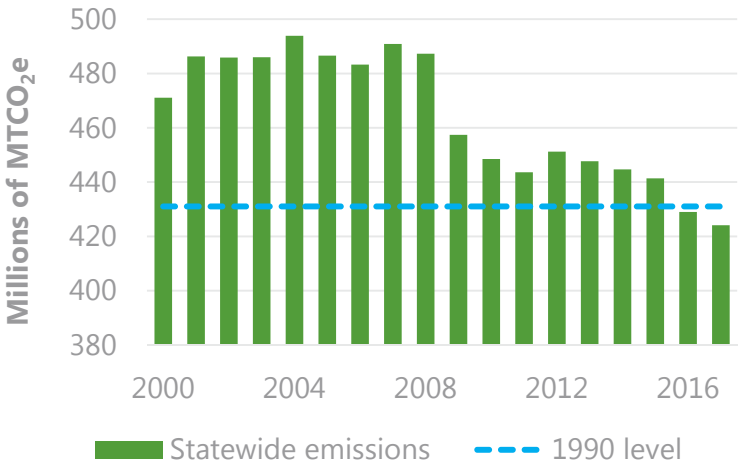
REGULATORY FRAMEWORK

California law first addressed climate change in 1988, when Assembly Bill 4420 directed the State to prepare a GHG inventory and study the impacts of climate change. Since then, California has adopted several laws to assess climate change, analyze GHG emissions and their effects, reduce emissions, and prepare for the impacts of climate change. Many of these laws and associated regulations affect local governments, although only some create specific requirements for individual communities.

Executive Order S-03-05 and Assembly Bill 32 – California Global Warming Solutions Act of 2006

In 2005, former Governor Schwarzenegger issued Executive Order S-03-05, which established the first statewide GHG reduction goals for California: reduce emissions to 2000 levels by 2010, reduce emissions to 1990 levels by 2020, and reduce emissions 80 percent below 1990 levels by 2050.

AB 32, the California Global Warming Solutions Act, was approved by the legislature and signed by former Governor Schwarzenegger in 2006. The landmark legislation requires the California Air Resources Board (CARB) to develop regulatory and market mechanisms that will reduce GHG emissions to 1990 levels by 2020, codifying the 2020 target in Executive Order S-03-05. AB 32 also directed CARB to identify early action items that could be quickly implemented, to develop a scoping plan to identify the most technologically feasible and cost-effective measures to achieve the 2020 target, and create and adopt regulations requiring major emitters to report and verify their emissions.



California's 2020 reduction goal under AB 32 is 431 million $MTCO_2e$. In 2017, the State emitted approximately 424 million $MTCO_2e$, reducing emissions below the State's 2020 target level.

The Climate Change Scoping Plan (first adopted in 2009 and then updated in 2014 and 2017) employs a variety of GHG reduction measures that include direct regulations, alternative compliance mechanisms, incentives, voluntary actions, and market-based approaches like a cap-and-trade program. The plan identifies local governments as strategic partners to achieving the State goal and translates the reduction goal to a 15 percent reduction of "existing" emissions by 2020. Although "existing emission levels" is not formally defined by the Scoping Plan, agencies throughout California have often interpreted it as referring to emissions occurring

between 2005 and 2008. San Mateo's GHG reduction strategies have used 2005 emissions as the "existing" level to inform the 2020 target. The 2017 update to the Scoping Plan recommends that local governments adopt per-capita targets for post-2020 GHG reduction efforts. It proposes a 2030 target of 6.0 $MTCO_2e$ per person, and a 2050 target of 2.0 $MTCO_2e$ per person.

Senate Bill 375 – Sustainable Communities and Climate Protection Act of 2008

Senate Bill (SB) 375 builds off AB 32 and aims to reduce GHG emissions by linking transportation funding to land use planning. It requires metropolitan planning organizations (MPO) to create a sustainable communities strategy (SCS) in their regional transportation plans for reducing urban sprawl. Each SCS will demonstrate strategies each region will use to achieve the GHG emissions reduction target set by CARB for 2020 and 2035. In 2013, the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG) adopted Plan Bay Area, consisting of both the region's first SCS and 2040 Regional Transportation Plan. In 2017, MTC and ABAG adopted an updated version of Plan Bay Area. A second update is in progress and is scheduled for adoption by 2021.

Executive Order B-30-15 and Senate Bill 32

In 2015, former governor Jerry Brown signed Executive Order B-30-15, which directed state agencies to take several steps to reduce statewide GHG emissions and adapt to changing climate conditions. One section of this executive order set GHG reduction goal for the state of 40 percent below 1990 levels by 2030. In 2016, SB 32 was passed, codifying this GHG reduction goal into law as an official state target.

Executive Order B-55-18

In 2018, former governor Jerry Brown issued Executive Order B-55-18, which established an additional statewide goal of achieving carbon neutrality (no net GHG emissions) by 2045. Under this goal, any GHGs that are emitted by California must be fully offset by other activities by 2045. While this goal does not yet have the force of law, it does indicate the direction that the state is moving in and may be a reference point for future legislative action.

Bay Area Air Quality Management District CEQA Air Quality Guidelines

Developing a CAP can also provide streamlined environmental review for new projects subject to CEQA. SB 97 directed the Governor's Office of Planning and Research (OPR) to amend the State CEQA Guidelines to address GHG emissions. OPR adopted the CEQA Guidelines in December 2009 and they went into effect March 18, 2010. The updated guidelines include provisions for local governments to use adopted plans for the reduction of GHG emissions to address the cumulative impacts of individual future projects on GHG emissions (see State CEQA Guidelines Section 15183.5(b) (1)).

In response to the updated CEQA Guidelines, BAAQMD amended the BAAQMD Air Quality CEQA Guidelines (most recently updated in 2017), allowing a lead agency to prepare a Qualified GHG Reduction Strategy that reduces emissions to a level that is not cumulatively considerable. If the local agency then determines that a project is determined to be consistent with an adopted Qualified GHG Reduction Strategy, the project is assumed to not have a significant GHG emissions impact under CEQA. Air districts such as BAAQMD do not officially certify Qualified GHG Reduction Strategies, but they play a critical role in providing support to local communities. BAAQMD is the air district with jurisdiction over San Mateo.

The 2020 CAP and accompanying environmental documentation are consistent with the guidelines set forth by BAAQMD for a Qualified GHG Reduction Strategy (which parallel and elaborate upon criteria established in State CEQA Guidelines Section 15183.5(b) (1)). The General Plan seeks to address this guidance with the Greenhouse Gas Emissions Reduction Program, referenced by the General Plan and included as an attachment to it. As stated in the Land Use Element and as previously discussed, the City developed the Greenhouse Gas Emissions Reduction Program to meet the requirements of BAAQMD's guidance and corresponding criteria identified in the CEQA guidelines.

This 2020 CAP continues to meet the CEQA guidelines and commitments in the Land Use Element of the General Plan as outlined below.

- Quantify emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area (see **Chapter 2**).
- Establish a level, based on substantial evidence, below which the contribution of emissions from activities covered by the plan would not be cumulatively considerable (see **Chapter 2**). This CAP identifies three targets, consistent with State guidance, that are further addressed in **Chapter 2.**
  - Reduce emissions to 15% below 2005 levels by 2020
  - Reduce emissions to 4.3 $MTCO_2e$ per capita by 2030
  - Reduce emissions to 1.2 $MTCO_2e$ per capita by 2050.
- Identify and analyze the emissions resulting from specific actions or categories of actions anticipated within the geographic area (see **Chapter 3** and **Chapter 4**).
- Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level (see **Chapter 4**).
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specific levels (see **Chapter 4**). As referenced in the General Plan Land Use Element (page II-40), the City has developed a monitoring and implementation tool to track GHG emission changes over time. This CAP expands and updates the City's monitoring framework with

an implementation plan, updated monitoring tool, and a checklist for new development as described in **Chapter 4** and **Appendix 3**.

- Adopt the GHG Reduction Strategy in a public process following environmental review. The City is adopting this 2020 CAP as an Addendum to the General Plan EIR.

Role of the Climate Action Plan in CEQA Implementation

Consistent with the State CEQA Guidelines, lead agencies may use adopted GHG reduction plans to assess the cumulative impacts of discretionary projects on climate change. In addition, the guidelines provide a mechanism to streamline development review of future projects.

Specifically, lead agencies may use adopted plans consistent with State CEQA Guidelines Section 15183.5 to analyze and mitigate the significant effects of GHGs under CEQA at a programmatic level by adopting a plan for the reduction of GHG emissions. Later, as individual projects are proposed, project-specific environmental documents may tier from and/or incorporate by reference that existing programmatic review in their cumulative impacts analysis. Project-specific environmental documents prepared for projects consistent with the General Plan and the CAP may rely on the programmatic analysis of GHGs contained in this document.

A project-specific environmental document that relies on this CAP for its cumulative impacts analysis must identify specific GHG reduction measures applicable to the project and demonstrate the project's incorporation of the measures. Project applicants and City staff will identify specific measures applicable to each project during project review. If applicable measures are not otherwise binding and enforceable, they must be incorporated as mitigation measures for the project. If substantial evidence indicates that the GHG emissions of a proposed project may be cumulatively considerable, notwithstanding the project's compliance with specific measures in this CAP, an EIR must be prepared for the project. This CAP includes a Consistency Checklist, contained in **Appendix 3**, which City staff can use to keep track of which reduction measures an individual project complies with. This checklist also helps project applicants quickly identify which reduction measures may apply to their project.

CLIMATE ACTION PLANNING PROCESS

The City facilitated a collaborative process to prepare the CAP. City staff, the public, and an appointed advisory body, the Sustainability and Infrastructure Commission, provided ongoing input on CAP development. Stakeholders in San Mateo vetted and recommended appropriate strategies reflective of the community. The outreach process served to develop a plan that responds to community leadership and priorities. The strategies in this CAP reflect those community priorities and recommendations. Engaging the community also allowed the City to build and nurture partnerships necessary to implement the CAP.

Staff Engagement

Many measures in this CAP rely on the City of San Mateo taking action to reduce community-wide GHG emissions. Interdepartmental engagement was essential in the development of the CAP to ensure that goals are attainable and appropriate for each responsible department. Members of the CAP project team consulted with staff from multiple City departments, including Public Works, Community Development, and the City Manager's Office. Drawing on the expertise of these departments helped define actions that the City was both capable and supportive of. Specific measures refined through staff engagement include transit-oriented development, sustainable streets, transportation demand management, recycling and waste reduction, development review, and housing programs.

Sustainability and Infrastructure Commission

In 2014, City Council created the Sustainability Commission and appointed five San Mateo residents. In 2018, the City Council combined the Sustainability Commission with the Public Works Commission, forming the Sustainability and Infrastructure Commission. This body provides recommendations to the City Council for policies and programs related to environmental sustainability, transportation, and infrastructure. Throughout the CAP update process, the project team met with the City of San Mateo Sustainability and Infrastructure Commission five times to provide updates, answer questions, summarize quantitative analyses, and to collaborate on the development of new GHG reduction measures. The Sustainability and Infrastructure Commission was able to lend valuable insight about local priorities and concerns in the development of measures to meet reduction targets. This allowed for refinement of measures that focus on emissions sources and community values specific to San Mateo, helping to shape a CAP that improves the environmental, social, and economic health of the City.

CHAPTER 1

Public Engagement

Residents of San Mateo were invited to contribute ideas and concerns throughout the CAP development process. The project team hosted a community workshop at the San Mateo Public Library. Additionally, five public meetings with the Sustainability and Infrastructure Commission served as a platform for citizens to continue to voice their thoughts about the CAP update and related sustainability topics.

Community Workshop

The City hosted a community workshop at the San Mateo Public Library on June 6, 2019. The goals of the forum were for participants to:

- Become aware of the project and the community's role in the planning process.
- Learn about the CAP and CAP update, and San Mateo's efforts to reduce GHG emissions.
- Learn about the City's contributions to climate change and the threat climate change poses to the community.
- Engage with the CAP update team and share what they are doing to reduce GHGs, where they think more work by the City is needed, and what they think should be in the City's strategy to address climate change.

San Mateo community members participate in the June 6, 2019 CAP workshop.

Photo by PlaceWorks

Approximately 50 people attended the workshop. The event began with a half-hour presentation by members of the CAP update project team that reviewed the sources of San Mateo's GHG emissions, an overview of the City's efforts to implement the CAP since it was first adopted in 2015, and a review of the new opportunities to reduce San Mateo's GHG emissions. After the presentation was an open house session. During this period, the project team seven large posters around the room, and participants were provided with green, yellow, and red sticky dots. Six posters listed potential GHG reduction strategies for the 2020 CAP, and participants were asked to place sticky dots on the posters as a means of voting (green for policies that participants support, yellow for policies that participants would consider but have concerns about, and red for policies that participants do not support). The project team set up blank sheets of paper next to each poster and invited participants to leave more detailed comments. The seventh poster asked participants to write down a "big idea" for GHG reduction or share other open feedback.

During the open house period, participants were free to visit any or all posters in any order. Members of the project team were positioned at the different posters to answer questions and help guide participants through the activity.

Appendix 4 summarizes the results of the community workshop.

San Mateo community members shared their big ideas for GHG reduction at a community workshop.

Photo by PlaceWorks

CHAPTER 1

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Chapter 2

Greenhouse Gas Inventories, Forecasts, and Reduction Targets

Background

State, regional, and local laws, along with agencies tasked with local regulatory oversight, have influenced common methods and provided an impetus for identification of reduction targets in California. A greenhouse gas (GHG) emissions inventory and forecast lays the groundwork for the 2020 CAP, which seeks to align the City's GHG reduction efforts with state-recommended targets. The City is committed to achieving 1990 emissions levels by 2020 (equivalent to a 15 percent reduction below 2005 levels by 2020), emissions of 4.3 $MTCO_2e$ per-capita by 2030, and emissions of 1.2 $MTCO_2e$ per-capita by 2050.

Baseline Greenhouse Gas Emission Inventory

A greenhouse gas inventory is a summary of the GHG emissions occurring as a result of activities that take place within a community. In some instances, the emissions themselves may be emitted within the jurisdiction, such as emissions from a car being driven within the community's boundaries. In other cases, the emissions may occur elsewhere but are included because the activity responsible for generating the emissions took place within the jurisdiction, such as a community member using electricity generated by a power plant in another part of California. Inventories help allow elected officials, City staff, and members of the public to understand what activities generate GHG emissions.

CHAPTER 2

Protocols and Guidance

Reduction targets are developed based on a calculation of current and future GHG emissions, called the GHG inventory. The GHG inventory reflects the GHG emissions associated with everyday activities in the community of San Mateo, such as the electricity used in homes, miles traveled in vehicles, and waste sent to landfills.

Creation of the community inventories is based on emissions factors and methods in an evolving field of science. Over the past several years, organizations in California and throughout the United States have established protocols to assist and guide communities in assessing GHG emissions from government operations and community activities. While these protocols are not regulatory, they identify relevant sources or activities, recommend methods to estimate GHG emissions from each source, and provide consistency in the identification, assessment, and presentation of emission results across multiple jurisdictions.

In California, and as recommended by the Governor's Office of Planning and Research, many communities utilize the 2012 US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, commonly referred to as the US Community Protocol, to identify and assess community activities. The protocol provides guidance on how to measure and report community-wide GHG emissions, including identification of relevant sources or activities, methods to estimate GHG emissions from each source, and consistency in the identification, assessment, and presentation of emissions results across multiple jurisdictions.

The City's community-wide GHG inventory was prepared using protocols and best practices identified within the US Community Protocol, supported by methods in the Local Government Operations Protocol (LGOP) v. 1.1 where appropriate.

Prior Inventories

The 2020 CAP relies on three existing GHG inventories:

1) a 2005 baseline inventory originally developed by ICLEI and revised during the preparation of the 2015 CAP,

2) a 2010 inventory, and

3) A 2015 inventory prepared as part of the regional RICAPS program (as discussed in Chapter 1).

Greenhouse Gas Inventories, Forecast, and Reduction Targets

In order to ensure accurate comparisons across all three existing inventories, the project team adjusted the methods of these past efforts to apply a consistent approach. This also helped ensure that all inventories were fully in compliance with the US Community Protocol. The project team made four key changes to the inventories:

- **Updated Global Warming Potential (GWP) figures:** Previous inventories used GWPs (measurements of how much heat is trapped by a unit of GHGs) reported in the IPCC's Second Assessment Report, first released in 1995. The project team updated these values to use the most recent GWPs from the IPCC's Fifth Assessment Report, which was released in 2013.
- **"Origin-destination" VMT methodology:** In the past, inventories utilized the "in-boundary" methodology for estimating vehicle miles travelled (VMT) in San Mateo. This method includes all VMT that occur within the city boundary, including pass-through traffic, regardless of trip origin or destination. An alternative method, the "origin-destination" method, has been determined to be a more accurate representation of VMT in a city. As a result, the inventories were updated to use this approach. The "origin-destination" VMT methodology only accounts for vehicle trips that begin and/or end within the city boundary and ignores "pass-through" trips that travel though San Mateo but begin and end elsewhere (for example, a person commuting from Redwood City to San Francisco on US-101).
- **Consistent off-road equipment method:** The California Air Resources Board's (CARB) OFFROAD2007 model estimates total emissions from all off-road equipment in a given year at a county level. In the past, inventories assigned emissions from all equipment categories included in this model to the City. However, the project team determined that it would be more accurate to exclude emissions from certain equipment types (e.g. oil drilling, agricultural equipment) that were not relevant to the City. Additionally, County-level off-road construction equipment emissions had previously been allocated to the City using the percent of total County jobs in the City. It was determined to be more accurate to assign off-road equipment emissions to the City using the percent of year-to-year County-level service population change attributable to the City (e.g. if the County service population increased 1,000 in one year and the City service population increased 100 in that same year, 10% of the County's off-road construction equipment emissions would be allocated to the City).
- **Reporting of direct access electricity**: In the past, data on total electricity use associated with direct access customers (customers that purchase electricity directly from a power provider, rather than a utility such as PCE or PG&E) in San Mateo was not available. Historically, direct access electricity consumption was estimated based on County-level direct access electricity consumption data. In recent years, direct access electricity consumption data has become available at the city level and the inventories were updated to reflect this.

CHAPTER 2

2017 Inventory

The project team prepared a 2017 GHG inventory to provide the most up-to-date available measurement of how San Mateo's GHG emissions have changed over time, including since the 2015 CAP. This inventory uses the same methods as the updated prior inventories, ensuring that all four inventories in the 2020 CAP are consistent with each other.

Inventory Results

The community-wide inventories in the 2020 CAP include the following sectors, consistent with guidance in the US Community Protocol:

- **On-road transportation:** on-road vehicle trips on local roads and State highways
- **Commercial/industrial built environment**: electricity and natural gas used in nonresidential settings (e.g., industrial, commercial), including direct access electricity
- **Residential built environment:** electricity and natural gas used in residential settings
- **Off-road equipment**: the use of portable equipment and vehicles that do not travel on roads (e.g., construction or lawn and garden equipment)
- **Solid waste generation**: material produced by the community that is deposited in landfills which decompose and produce methane
- **Point sources**: stationary source emissions resulting from fossil fuel combustion within the county as reported by BAAQMD
- **Landfills**: emissions that occur in the inventory year as a result of waste-in-place at a landfill that is within the community boundary or operated by the City
- **Rail**: emissions resulting from Caltrain trips generated by passengers at three stations: San Mateo, Hayward Park, and Hillsdale, as well as emissions from freight trains
- **Water and wastewater**: energy used to treat and pump water used and wastewater created, along with emissions from the processing of wastewater

This CAP presents some GHG emissions in both absolute (total) and per-capita (emissions per resident) levels. This is because San Mateo's GHG reduction targets, discussed at the end of this chapter, are expressed in both absolute and per-capita forms. Note that per-capita levels vary depending on the population, so changes in the number of residents will cause changes in per-capita emissions even if absolute emissions remain constant. **Table 2** shows the number of residents in San Mateo for the inventory years.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

Table 2: San Mateo Population (2005 – 2017)

Indicator	2005 Value	2010 Value	2015 Value	2017 Value	Percent Change, 2005–2017	Source
Population	93,400	97,110	101,610	103,470	11%	CA Dept. of Finance, ABAG

In the baseline year of 2005, the GHG emissions from the covered activities totaled 660,600 $MTCO_2e$, or 7.1 $MTCO_2e$ per-capita, as shown in **Table 3** and **Figure 5**. The sector with the largest portion of emissions was on-road transportation, which produced 282,380 $MTCO_2e$, or 43 percent of all community emissions. The next largest sector, commercial/industrial built environment, produced 141,960 $MTCO_2e$, 21 percent of the total. The residential built environment was the third largest sector with 21 percent of total emissions (136,680 $MTCO_2e$) followed by the off-road equipment (55,770 $MTCO_2e$ or 8 percent), solid waste generation (22,180 or 3 percent), point sources (7,390 $MTCO_2e$ or 1 percent), and landfill (7,370 $MTCO_2e$ or 1 percent) sectors. Rail emissions totaled 4,350 $MTCO_2e$ (1 percent) and water and wastewater emissions totaled 2,520 $MTCO_2e$ (less than 1 percent of total emissions).

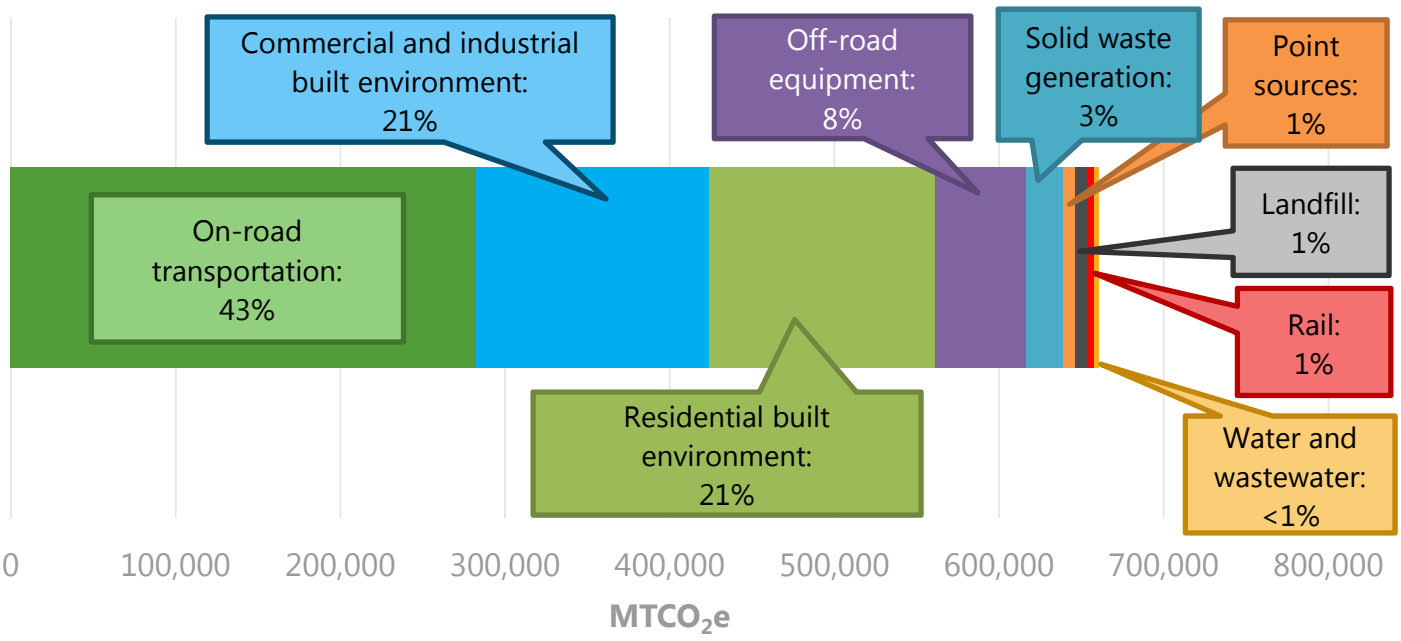
Table 3: San Mateo 2005 Community-Wide GHG Emissions

Sector	$MTCO_2e$ (Absolute)	$MTCO_2e$ (Per-capita)	Percentage
On-road transportation	282,380	3.02	43%
Commercial/industrial built environment	141,960	1.52	21%
Residential built environment	136,680	1.46	21%
Off-road equipment	55,770	0.60	8%
Solid waste generation	22,180	0.24	3%
Point sources	7,390	0.08	1%
Landfill	7,370	0.08	1%
Rail	4,350	0.05	1%
Water and wastewater	2,520	0.03	<1%
Total	**660,600**	**7.1**	**100%**

Note: Due to rounding, totals may not equal the sum of the component parts.

CHAPTER 2

Figure 5: San Mateo 2005 Community-Wide GHG Emissions ($MTCO_2e$)



Interim Inventories

The 2010, 2015, and 2017 inventories show how San Mateo's GHG emissions have changed over time. Total emissions declined from 660,600 $MTCO_2e$ in 2005 to 541,960 $MTCO_2e$ in 2017, a decrease of 18 percent. Emissions from most sectors declined as well, except for emissions from point sources and rail activity. Overall, the relative proportion of emissions from different sectors remained similar (on-road transportation emissions remained the largest source of emissions, followed by residential and commercial/industrial built environment, then off-road equipment, etc.). **Tables 4** and **5** and **Figure 6** show the change in San Mateo's community-wide GHG emissions from 2005 to 2017.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

Table 4: San Mateo 2005-2017 Community-Wide Emissions (Absolute)

Sector	2005 ($MTCO_2e$)	2010 ($MTCO_2e$)	2015 ($MTCO_2e$)	2017 ($MTCO_2e$)	Percent Change, 2005 to 2017
On-road transportation	282,380	287,540	280,560	269,100	-5%
Commercial/industrial built environment	141,960	131,610	119,500	85,840	-40%
Residential built environment	136,680	136,590	109,190	97,730	-28%
Off-road equipment	55,770	53,680	41,470	45,040	-19%
Solid waste generation	22,180	16,580	15,850	17,890	-19%
Point sources	7,390	7,390	11,610	14,230	93%
Landfill	7,370	6,670	6,030	5,800	-21%
Rail	4,350	4,480	4,400	4,520	4%
Water and wastewater	2,520	2,370	2,220	1,800	-29%
Total	**660,600**	**646,920**	**590,850**	**541,960**	-18%

Note: Due to rounding, totals may not equal the sum of the component parts.

Table 5: San Mateo 2005-2017 Community-Wide Emissions (Per-Capita)

Sector	2005 ($MTCO_2e$ per-capita)	2010 ($MTCO_2e$ per-capita)	2015 ($MTCO_2e$ per-capita)	2017 ($MTCO_2e$ per-capita)	Percent Change, 2005 to 2017 *
On-road transportation	3.02	2.96	2.76	2.60	-14%
Commercial/industrial built environment	1.52	1.35	1.18	0.83	-45%
Residential built environment	1.46	1.41	1.07	0.94	-35%
Off-road equipment	0.60	0.55	0.41	0.44	-27%
Solid waste generation	0.24	0.17	0.16	0.17	-27%
Point sources	0.08	0.76	0.11	0.14	74%
Landfill	0.08	0.07	0.06	0.06	-29%
Rail	0.05	0.05	0.04	0.04	-6%
Water and wastewater	0.03	0.02	0.02	0.02	-36%
Total	**7.1**	**6.7**	**5.8**	**5.2**	**-26%**

Note: Due to rounding, totals may not equal the sum of the component parts.

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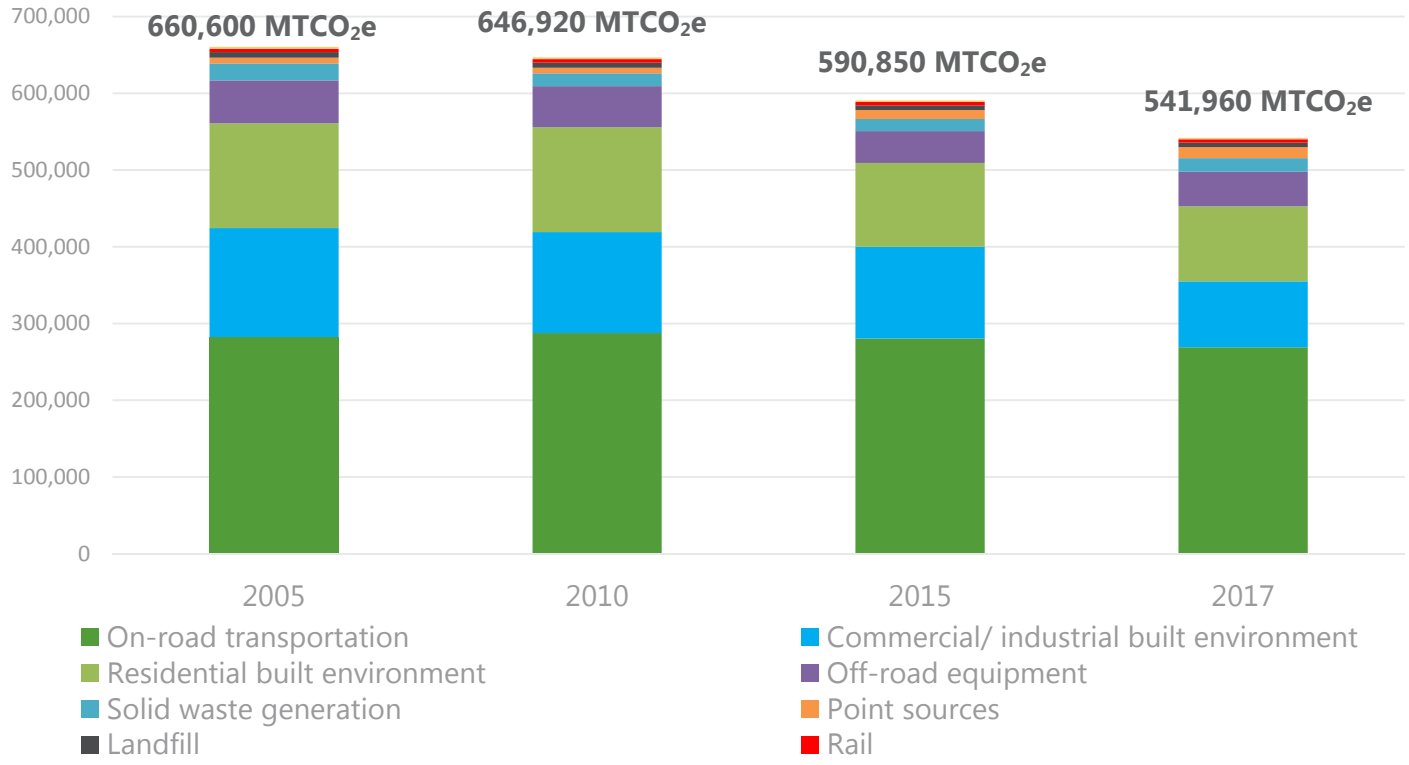
Figure 6: San Mateo 2005-2017 Community-Wide GHG Emissions ($MTCO_2e$)



The decrease in GHG emissions from most sectors is due to less resource use, less GHG-intensive resources, or both. For example, San Mateo buildings used approximately 13 percent less electricity in 2017 than in 2005. Additionally, the electricity used in San Mateo also generated 59 percent fewer GHGs per kilowatt-hour (kWh) in 2017 than in 2005, causing emissions from building electricity use to fall by 64 percent. In another case, San Mateo community members drove 17 percent more miles in 2017 than 2005, but cars became 18 percent cleaner during this period, causing a 5 percent decline in emissions.

GREENHOUSE GAS EMISSIONS FORECAST

A forecast of future GHG emissions helps to ensure consistency with the guidelines for a Qualified GHG Reduction Strategy put forward by BAAQMD, as described in **Chapter 1**. A forecast allows elected officials, City staff, and community members to identify the amount of reductions necessary in order to achieve future GHG reduction targets and can help support long-range community planning efforts. The CAP update includes a forecast for the calendar years 2020, 2030, and 2050.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

An emissions forecast estimates how emissions would grow over time if no action is taken at the federal, State, or local level to reduce them. A set of indicators determines the extent of growth that could occur and how resulting emissions may change. An emissions forecast was prepared for San Mateo using the best available information regarding indicators and growth rates. The forecast relies on growth assumptions from the California Department of Finance and ABAG and were approved by City staff. Activity data rates in the forecast, such as household energy use, vehicle miles travelled, or per person waste disposal, are based on the 2017 emissions inventory.

Table 6 presents these projections for the years 2020, 2030, and 2050.

Table 6: San Mateo 2017, 2020, 2030, and 2050 Growth Indicators

Indicator	2017 Value	2020 Value	2030 Value	2050 Value	Percent Change, 2005–2050	Source
Households	38,950	43,040	48,180	53,630	38%	CA Dept. of Finance, ABAG
Jobs	63,200	62,570	66,510	69,540	10%	US Census, CA Employment Development Dept., ABAG
Population	103,470	109,670	123,200	143,600	39%	CA Dept. of Finance, ABAG
Service population[1]	166,670	172,240	189,710	213,140	28%	

[1] *Service population is the sum of the residential population and the number of jobs.*

Each indicator is used to project future emissions for the following sectors:

- Households: Residential built environment, on-road transportation (personal vehicles), off-road equipment (lawn and garden equipment, pleasure craft, and recreational equipment)
- Jobs: Commercial/industrial built environment, on-road transportation (commercial vehicles), off-road equipment (entertainment equipment, industrial equipment, light commercial equipment, Transport Refrigeration Units)
- Service population: Rail (Caltrain), solid waste generation, water and wastewater.

Residential population is not used as an indicator by itself, but it is combined with jobs to calculate service population. Emissions from direct access electricity, point sources, and freight trains are held constant, and are not projected to change over time. Construction and mining emissions, part of the off-road equipment sector, are forecasted by the change in service population. Landfill emissions are based on decomposition rates provided by CARB and are not forecasted by an indicator.

The project team applied these indicators to forecast future GHG emissions. Relative to 2017 emissions, San Mateo's GHG emissions are expected to rise by more than 23 percent by 2050 if no action is taken. The forecast assumes that each person in San Mateo will continue to contribute the same amount of GHGs to the community's total, so that the amount of GHGs increase as the demographics of the community change. **Tables 7** and **8** show San Mateo's forecasted community-wide GHG emissions

Table 7: San Mateo Community-Wide BAU GHG Emissions Sector Totals (Absolute)

Sector	2017 ($MTCO_2e$)	2020 ($MTCO_2e$)	2030 ($MTCO_2e$)	2050 ($MTCO_2e$)	Percentage Change, 2017–2050
On-road transportation	269,100	295,560	329,970	366,190	36%
Commercial/industrial built environment	85,840	80,420	85,050	88,610	3%
Residential built environment	97,730	101,270	113,360	126,190	29%
Off-road equipment	45,040	37,470	44,100	38,420	-15%
Solid waste generation	17,890	18,490	20,360	22,880	28%
Point sources	14,230	14,230	14,230	14,230	0%
Landfill	5,800	5,460	4,470	3,000	-48%
Rail	4,520	4,660	5,080	5,650	25%
Water and wastewater	1,800	1,860	2,050	2,300	28%
Total	**541,960**	**559,420**	**618,670**	**667,470**	**23%**
Percentage Change from 2005	**-**	**3%**	**14%**	**23%**	

Note: Due to rounding, totals may not equal the sum of the component parts.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

Table 8: San Mateo Community-Wide BAU GHG Emissions Sector Totals (Per-Capita)

Sector	2017 ($MTCO_2e$ per-capita)	2020 ($MTCO_2e$ per-capita)	2030 ($MTCO_2e$ per-capita)	2050 ($MTCO_2e$ per-capita)	Percentage Change, 2017–2050
On-road transportation	2.60	2.69	2.68	2.55	-2%
Commercial/industrial built environment	0.83	0.73	0.69	0.62	-26%
Residential built environment	0.94	0.92	0.92	0.87	-7%
Off-road equipment	0.44	0.34	0.36	0.28	-39%
Solid waste generation	0.17	0.17	0.17	0.16	-8%
Point sources	0.14	0.13	0.12	0.10	-28%
Landfill	0.06	0.05	0.04	0.02	-63%
Rail	0.04	0.04	0.04	0.04	-10%
Water and wastewater	0.02	0.01	002	0.02	-8%
Total	**5.2**	**5.1**	**5.0**	**4.6**	**-11%**
Percentage Change from 2005	**-26%**	**-28%**	**-29%**	**-34%**	

Note: Due to rounding, totals may not equal the sum of the component parts.

GHG Emissions Reduction Targets

The California Environmental Quality Act (CEQA) Guidelines Section 15183.5(b) requires that a Qualified GHG Reduction Strategy contain a goal for substantive GHG reductions, although the guidelines do not set a specific level for what these goals should be. In the Climate Change Scoping Plan (Scoping Plan), the State provides its statewide GHG reduction targets (the targets for statewide emissions) and guidance for local communities. California's statewide targets are absolute levels (a set amount below a specific level), while the guidance for local communities is a mix of absolute and per-capita targets.

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These statewide targets are:

- 2020: Reduce emissions to 1990 levels, codified into law by AB 32 (2006)
- 2030: Reduce emissions 40 percent below 1990 levels, codified into law by SB 32 (2016)
- 2050: Reduce emissions 80 percent below 1990 levels, established by Executive Order S-03-05 (not yet codified into law).

Scoping Plan recommendations for local plan level GHG reduction goals are:

- 2020: Reduce emissions 15% below baseline levels (2005 – 2008 per the AB 32 Scoping Plan)
- 2030: Reduce emissions to 6.0 $MTCO_2e$ per-capita
- 2050: Reduce emissions to 2.0 $MTCO_2e$ per-capita

Since the statewide per-capita targets are based on the statewide GHG emissions inventory that includes all emissions sectors in the State, the Scoping Plan notes it is appropriate for local jurisdictions to derive evidence-based local per capita targets based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per-capita targets. The resulting GHG emissions trajectory should show a downward trend consistent with the statewide objectives. The City determined that the target that the State recommends for local communities for 2020 is consistent with the statewide target for this year, as the Scoping Plan says that 15% below baseline levels for local communities is consistent with returning to 1990 levels. However, the 2030 and 2050 per-capita targets are not entirely appropriate for San Mateo.

Based on the results of the quantification process to identify the GHG reduction potential from the 2020 CAP (see Chapter 3), the City determined that the statewide targets for 2030 and 2050 cannot be directly applied to San Mateo. These targets are not feasible at this time, based on the City's emissions profile and given City staffing and resources, projected population growth, and community characteristics. To ensure that the CAP can continue to serve as a Qualified GHG Reduction Strategy, San Mateo has set its 2030 and 2050 targets based on the State's recommended per-capita targets for local efforts.

According to the Scoping Plan, the per-capita targets are appropriate for community-wide plans, such as a CAP. The State calculated these targets by calculating the absolute emissions level set by the statewide target, and then dividing these levels by the statewide population projections. **Table 9** shows this process.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

Table 9: Calculation Process for State-Recommended Targets

	2030	2050
1990 emissions level	431 million $MTCO_2e$	431 million $MTCO_2e$
Emissions target	260 million $MTCO_2e$ (established in Scoping Plan)	86 million $MTCO_2e$ (estimated, 80 percent below 431 million $MTCO_2e$)
Statewide population projection	43,939,250	49,077,801
Target per-capita (direct calculation)	5.9 $MTCO_2e$ per-capita	1.8 $MTCO_2e$ per-capita
Target per-capita (set in Scoping Plan)	6.0 $MTCO_2e$ per-capita	2.0 $MTCO_2e$ per-capita

However, the 1990 emissions level, and by extension the emissions target and the per-capita levels, include all emission sectors in the State, such as agriculture, petroleum refining, and oil and gas extraction. According to the Scoping Plan, this makes the per-capita thresholds inappropriate for use by individual development projects. As San Mateo's CAP must continue to serve as a Qualified GHG Reduction Strategy, its targets must be appropriate for its emissions, development projects, and the entire community.

The City calculated per-capita targets that are consistent with the State's guidance for local governments by removing inapplicable emission sectors from the State's inventory and recalculating a per capita target based on the same population projections. **Table 10** shows how the City determined per-capita targets.

Table 10: Calculation Process for San Mateo Per-Capita Targets

	2030	2050
Projected emissions with inapplicable sectors removed *	190.7 million $MTCO_2e$ †	57 million $MTCO_2e$ ‡
Statewide population projection	43,939,250	49,077,801
Per-capita target	4.3 $MTCO_2e$ per-capita	1.2 $MTCO_2e$ per-capita

** The inapplicable sectors are Industrial, Oil and Gas Extraction, Petroleum Refining, Agriculture, and Non-Energy GHGs (e.g. refrigerants and emissions from cement production).*

† From the State's 2030 Scoping Plan Pathways scenario.

‡ Estimated by reducing all sectors of the State's 1990 emissions inventory by 80 percent, consistent with the 2050 statewide goal.

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Therefore, San Mateo's GHG reduction targets as established by the 2020 CAP are:

- 2020: Reduce emissions to 1990 levels (15% below baseline levels)
- 2030: Reduce emissions to 4.3 $MTCO_2e$ per-capita
- 2050: Reduce emissions to 1.2 $MTCO_2e$ per-capita

Table 11 shows these emission targets, in both absolute and per-capita levels.

Table 11: San Mateo CAP Emission Targets (2020 – 2050)

	2020	2030	2050
Absolute ($MTCO_2e$)	561,510	529,760	172,310
Per-capita ($MTCO_2e$ per-capita)	5.1	4.3	1.2

These targets are meant to serve as ceilings for future GHG emissions. As discussed in the following chapter, the City has the potential to achieve greater GHG reductions, decreasing emissions below these levels.

Qualified GHG Reduction Strategies

These revised targets help ensure that the 2020 CAP will continue to serve as San Mateo's Qualified GHG Reduction Strategy, which allows developments that are consistent with the CAP to streamline their environmental review. As noted in Chapter 1, the requirements for a Qualified GHG Reduction Strategy are:

- Quantify emissions, both existing and projected over a time period, from activities in a defined area.
- Establish a level, based on substantial evidence, below which the contribution of emissions from activities covered by the plan would not be cumulatively considerable.
- Identify and analyze the emissions resulting from specific actions or categories of actions anticipated within the geographic area.
- Specify measures or a group of persons that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.
- Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specific levels.
- Adopt the GHG reduction strategy in a public process following environmental review.

Greenhouse Gas Inventories, Forecast, and Reduction Targets

The targets in the 2020 CAP can apply to individual development projects as well as the entire community, helping to streamline the environmental review projects that are consistent with San Mateo's GHG reduction efforts.

Photo by City of San Mateo

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Chapter 3

Strategies to Achieve the Targets

To understand the level of action necessary to achieve the City's reduction targets this updated CAP analyzes existing, planned, and future actions. By first looking at these accomplishments, the City can understand progress achieved and outstanding opportunities. Existing and current efforts provide a foundation for this CAP. New measures can further close the gap and guide future programs. Together, these efforts serve as the City's multipronged strategy to achieve reduction targets.

Table 12 shows the GHG emission levels that are expected to result when this CAP is fully implemented, based on the results of the analyses in this chapter, along with the GHG reduction targets.

Table 12: San Mateo Emissions with 2020 CAP Implementation (2020 – 2050)

	2020	2030	2050
Projected Emission level	501,110 $MTCO_2e$ (4.6 $MTCO_2e$ per-capita)	358,610 $MTCO_2e$ (2.9 $MTCO_2e$ per-capita)	173,080 $MTCO_2e$ (1.2 $MTCO_2e$ per-capita)
Target	561,510 $MTCO_2e$	4.3 $MTCO_2e$ per-capita	1.2 $MTCO_2e$ per-capita
Target achieved?	Yes	Yes	Yes
Gap to target	-60,400 $MTCO_2e$	-1.4 $MTCO_2e$ per-capita	0 $MTCO_2e$ per-capita

The CAP achieves these reductions by accounting for the GHG reductions from existing and planned State, regional, and local activities, along with the reduction measures in the CAP itself. **Table 13** shows the reduction levels achieved by the individual measures in the CAP. More details about the measures and all other reductions are given below.

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Table 13: Reductions from CAP Measures (2020 – 2050)

Measure	2020	2030	2050
BE 1: All-electric new construction	-880	-4,640	-7,420
BE 2: All-electric existing buildings	-620	-13,950	-85,960
RE 1: Peninsula Clean Energy	-380	-1,060	-0
RE 2: Renewable energy systems for new and existing residences	-60	-170	-0
RE 3: Renewable energy systems for new and existing nonresidential buildings	-10	-70	-0
EE 1: Residential energy efficiency retrofits	-410	-6,030	-17,860
EE 2: Nonresidential energy efficiency retrofits	-840	-9,930	-17,040
EE 3: Residential tree planting	-<10	-<10	-<10
ME 1: Energy efficiency for new municipal buildings	Supportive (no measurable GHG reductions)		
ME 2: Energy efficiency at existing municipal buildings	-0	-20	-70
ME 3: All-electric municipal buildings	-0	-110	-210
CF 1: Electric vehicle charging infrastructure	-2,650	-29,630	-71,150
CF 2: Electric vehicle education and outreach	-980	-17,050	-17,120
CF 3: Clean city fleet	-30	-170	-420
CF 4: Clean fuel and vehicle emissions	-20	-3,130	-7,000
ST 1: Bicycle mode share	-40	-240	-670
ST 2: Pedestrian mode share	-390	-760	-1,110
ST 3: Micromobility and shared mobility	Supportive (no measurable GHG reductions)		
ST 4: Public transit service	-830	-9,130	-25,110
ST 5: Commuter programs	0	-130	-3,420
ST 6: Transportation Demand Management	-60	-2,330	-8,460
ST 7: Transit-oriented development	-160	-990	-2,370
SW 1: Composting program	-950	-12,650	-14,850

Measure	2020	2030	2050
SW 2: Expanded recycling service	-810	-5,360	-8,530
SW 3: Waste awareness and source reduction	-420	-1,910	-5,510
WW 1: Water efficiency retrofits for existing buildings	-20	-100	-230
WW 2: Water-efficient landscaping	-<10	-<10	0
WW 3: Water efficiency in new construction	0	-<10	-10
OR 1: Alternative fuel lawn and garden equipment	0	-200	-1,140
Total	**-10,560**	**-119,760**	**-295,660**

Note: Due to rounding, totals may not equal the sum of the component parts.

Existing and Planned Accomplishments

Both State and local efforts have achieved additional progress toward the reduction target, reducing the outstanding gap of emissions to achieve the City's reduction targets described in the previous chapter.

As mentioned in Chapter 2, the GHG emissions forecast is based on the results of the 2017 inventory and assumes that per-capita activity remains constant, so that change in projected emissions are based on expected changes in San Mateo's demographics. This approach means that any action taken through 2017 to reduce GHG emissions is already taken into consideration for the forecast. For example, if homes installed solar energy systems in 2016, the effect of that action (lower residential electricity use) will already show up in the 2017 inventory, and by extension will be carried through into the forecast.

State Existing and Planned Accomplishments

Since passing Assembly Bill (AB) 32, the State has enacted regulations and programs to reduce GHG emissions. Although statewide in scope, these actions affect several sources of San Mateo's emissions, and so the local benefits of these State efforts can be "credited" to San Mateo even in cases where the community has not needed to take any action. This CAP includes the local benefits from five State policies:

- **Renewables Portfolio Standard:** The Renewables Portfolio Standard (RPS) was first established in 2002 and has been amended multiple times, mostly recently by SB 100 in 2018. It requires all electricity providers in the State to obtain at least 33% of their electricity from eligible renewable resources by the end of 2020, 60% of their electricity from eligible renewable resources by the end of 2030, and all of their electricity from carbon-free (although not necessarily eligible renewable) resources by the end of 2045. This policy reduces GHG emissions from electricity use, including electricity used to transport and process water and wastewater, and electricity used for electric vehicles.
- **Clean Car Standards:** In 2002, California adopted AB 1493, the New Passenger Motor Vehicle Greenhouse Gas Emission Standards or Pavley standard. It requires a reduction in tailpipe GHG emissions from new vehicles produced from 2009 to 2015. In 2012 CARB adopted an extension of this policy, the Advanced Clean Car Standards, which require more stringent reductions in tailpipe GHG emissions from vehicles produced from 2016 to 2025 [1]. The Clean Car Standards (including the Advanced Clean Car Standards) reduce GHG emissions from on-road transportation.
- **Title 24 Energy Efficiency Standards:** Title 24 is California's energy efficiency standards for new buildings, applied at the local level through the project review process. The standards are strengthened every three years, with the ultimate goal of making new buildings net-zero energy, meaning that they would generate as much energy as they use. The most recent set of Title 24 standards will go into effect on January 1, 2020. This policy will reduce GHG emissions from electricity and natural gas use in new homes and nonresidential buildings.

Renewable and Carbon-Free Electricity

California's RPS establishes requirements for both eligible renewable and carbon-free electricity. Eligible renewable resources are those that are specifically defined under state law, and include solar, wind, geothermal, small-scale hydroelectric, and most forms of bioenergy. Carbon-free sources include eligible renewable sources, as well as others that do not emit GHGs but are not officially defined as renewable, including large-scale hydroelectric and nuclear energy.

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[1] *At time of writing, the federal government has issued regulations that would preempt the Advanced Clean Car Standards, an action that is currently being challenged in court. The 2020 CAP assumes that the Advanced Clean Car Standards remain in effect. Future updates to the CAP can amend the plan in response to the outcomes of this challenge, if necessary.*

- **Local Carbon Fuel Standard:** The Low Carbon Fuel Standard (LCFS) was adopted in 2009 and requires a 10% reduction in the carbon intensity of all transportation and equipment fuels by 2020. This policy reduces GHG emissions from on-road transportation and from off-road equipment.
- **Innovative Clean Transit:** California's Innovative Clean Transit regulation, also known as the zero-emission bus standard, was adopted in 2018. It requires the State's public transit agencies to use all zero-emission buses, such as battery electric and hydrogen fuel cell models, by 2040. This regulation will reduce emissions from on-road transportation activities.

Collectively, the State reduction efforts are expected to reduce San Mateo's GHG emissions below forecasted levels by 24,080 $MTCO_2e$ in 2020, 107,780 $MTCO_2e$ in 2030, and 194,570 $MTCO_2e$ in 2050. **Table 14** shows the emission reductions from the individual State existing activities.

Table 14: San Mateo Community-Wide GHG Emissions Reductions from State Programs

Policy	2020 Emissions ($MTCO_2e$)	2030 Emissions ($MTCO_2e$)	2050 Emissions ($MTCO_2e$)
Forecasted emissions	559,420	618,670	667,470
Clean Car Standards [1]	-20,050	-91,850	-130,530
Renewables Portfolio Standard	-280	-5,380	-46,300
Title 24	-980	-7,260	-14,670
Local Carbon Fuel Standard [2]	-2,770	3,260	-2,850
Innovative Clean Transit	-0	-30	-220
Total reductions from existing State programs	-24,080	-107,780	-194,570
Emissions with existing State programs	**535,340**	**510,880**	**472,900**

1: Includes reductions from the Low Carbon Fuel Standard for transportation fuels
2: Reductions from off-road equipment fuel only.
Note: Due to rounding, totals may not equal the sum of the component parts.

There are other programs that reduce GHG emissions that State agencies have adopted or are planning to put into effect. These are not included in this section because of uncertainty about how these programs will be applied. In many cases, State programs may be implemented by local actions, and reductions associated with these programs are included in the local reduction measures discussed later in this chapter.

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Existing and Planned Local and Regional Accomplishments

The City of San Mateo has a successful history of developing and implementing sustainability policies. The City's adopted plans, along with leadership from community members and businesses have been partially responsible for the decline in GHG emissions since 2005. Several policies are currently in place that are expected to further reduce San Mateo's GHG emissions. Some of these accomplishments were established before the City adopted its first CAP in 2015, while others were implemented in response to the 2015 CAP.

The project team identified the following existing local and regional efforts that are expected to reduce San Mateo's future GHG emissions:

Peninsula Clean Energy provides most of San Mateo's electricity, and offers a cleaner mix of energy sources than PG&E by default.

Photo by City of San Mateo

- **Peninsula Clean Energy:** Peninsula Clean Energy (PCE) is a community choice energy program run by the local governments of San Mateo County that is the default electric provider for the City of San Mateo and provided approximately 73 percent of the community's electricity as of 2017 (expected to grow to more than 90 percent by 2020). First established in 2016, PCE provides electricity to community members from a higher proportion of renewable and carbon-free sources than PG&E. PCE plans to supply 100% carbon-free electricity by 2021 and 100% renewable electricity by 2025.
- **Energy efficiency retrofits:** A number of single-family homes, multi-family homes, and businesses in San Mateo have conducted energy efficiency retrofits. These retrofits involve replacing older appliances with more energy-efficient models, upgrading insulation, improved sealing around windows and doors, and other types of activities. Since the 2015 CAP was adopted, over 1,600 single- and multi-family homes and at least 66 businesses, have completed energy efficiency retrofits through programs such as Energy Upgrade California and the San Mateo County Energy Watch.
- **Solar energy installation:** Since 2016, San Mateo has required in its building code that all new residential and non-residential buildings install solar energy systems. Many existing building owners have also chosen to voluntarily install these systems on their properties, reducing their electricity bills and increasing the amount of renewable energy used by the community. Since the 2015 CAP was adopted, San Mateo has installed close to 800 solar energy systems, capable of generating almost 5 MW of power.

- **Upgraded streetlights program**: San Mateo has replaced over 5,600 streetlights in the community with LED bulbs that use significantly less energy than older bulbs. This program is expected to save approximately 2 million kWh of electricity annually, equal to the yearly electricity use of almost 400 San Mateo homes. These LED bulbs also provide higher quality lighting and reduce light pollution in accordance with the Dark Sky Objectives.
- **Municipal energy efficiency retrofits**: In addition to the Smart Street Light program and retrofits by private property owners, San Mateo has conducted several energy efficiency retrofits at municipal properties. Since 2014, San Mateo has conducted three significant retrofits to City facilities, saving over 650,000 kWh annually. The City has also carried out lighting retrofits at small buildings such as public park restrooms and storage sheds, using a grant from the San Mateo County Energy Watch.
- **Caltrain shuttles:** The regional Peninsula Traffic Congestion Relief Alliance operates three public shuttles in San Mateo, transporting riders from the Hillsdale Caltrain station to employment centers throughout the community. These three shuttles served approximately 58,900 people in 2018, a ridership increase of approximately 7 percent compared to 2017.
- **Electric vehicle adoption:** San Mateo, like many other Bay Area communities, has been a leader in adopting electric vehicles (EVs). When San Mateo's original CAP was adopted in 2015, there were approximately 1,050 EVs registered in the community, including plug-in hybrids. San Mateo adopted requirements for new development that went into effect in 2017, mandating that multi-family and nonresidential developments install EV chargers at a set number of parking spaces. By the end of 2017, the number of EVs had more than doubled to approximately 2,290, making EVs approximately 2 percent of all cars registered in the community. This number is expected to increase in 2018 and beyond, continuing to reduce emissions from on-road transportation activities. San Mateo has adopted a revised building standard code that will go into effect in 2020 and will require more EV chargers and EV-capable spaces at all types of new developments.

Public electric vehicle charging stations at a shopping center in San Mateo.

Photo by PlaceWorks

- **Public-access EV chargers:** The City of San Mateo has installed 18 publicly accessible EV charging stations in the community, including two DC fast chargers that can recharge an electric vehicle in less than an hour. In addition to helping to support EV adoption in San Mateo itself, the presence of publicly accessible EV chargers also helps boost EV adoption in the region, making it easier for people to use EVs for longer trips.

- **Transportation Demand Management:** San Mateo requires that new significant developments along the Caltrain corridor reduce the number of trips they generate relative to a conventional development project. Since 2017, there have been 895 residential units and approximately 158,370 square feet of nonresidential space planned or under construction in San Mateo that are subject to trip reduction requirements.
- **Composting:** San Mateo first established a composting program in 2011, allowing participating residents and businesses to place organic waste in a dedicated waste bin to be picked up by the community waste hauler along with trash and recyclables. Since 2015, almost all single-family homes in San Mateo participated in the program. In recent years, a smaller number of multi-family units and businesses have added composting service.

There are also two planned actions accounted for in this CAP:

- **Caltrain electrification:** This is a plan to install overhead power lines above the tracks on the Caltrain commuter rail line between San Francisco and San Jose, which will allow Caltrain to replace most of its diesel-powered locomotives with electric ones, significantly reducing GHG emissions from Caltrain operations. As of 2019, some electric lines have been installed, but electric trains are not expected to begin carrying passengers until at least 2021. Reductions from this planned activity are not counted in 2020 but are credited for 2030 and 2050.
- **Sustainable Solutions Turnkey program**: The Sustainable Solutions Turnkey (SST) program is a PG&E program that provides engineering design and construction services for nonresidential customers on energy efficiency, water efficiency, and on-site energy generation retrofits. The projects are funded through on-bill financing, allowing customers to pay for the work in installments through additional charges on their energy bills over time. At the end of 2017, the City began working with PG&E to identify potential retrofit activities through the SST program. San Mateo secured approximately $3.2 million in funding for energy efficiency upgrades to municipal facilities that are expected to save approximately 1.7 million kWh and 10,910 therms annually. The project is expected to be completed in 2021, so reductions are credited for 2030 and 2050, but not 2020.

This is not a comprehensive list of all existing and planned local and regional accomplishments that may reduce GHG emissions. The City and its regional partners have implemented many other policies and programs that may contribute to GHG reductions. However, these efforts may not have clearly measurable reductions, or data on their effectiveness may not be available. In these cases, the project team is unable to credit a GHG reduction to these efforts.

As with the State reductions, the 2020 CAP credits reductions from local and regional efforts that go beyond the policies in place as of 2017, as conditions that existed in 2017 are already factored into the forecast. In addition, the 2020 CAP only credits local and regional reduction efforts if they go beyond State policy. For example, San Mateo receives significant reduction credits from EV adoption in 2020 because the local numbers exceed what the State forecasts for the region. However, by 2030, State policies are expected to increase EV adoption to exceed San Mateo's current rate, so the community does not receive any additional GHG reductions from local accomplishments.

Collectively, San Mateo's existing and planned local and regional accomplishments are expected to reduce emissions 23,700 $MTCO_2e$ in 2020, 32,470 $MTCO_2e$ in 2030, and 4,120 $MTCO_2e$ in 2050, in addition to the reductions achieved by State accomplishments. **Table 15** shows the reductions from each local and regional accomplishment.

Table 15: Emissions Reductions from Local and Regional Programs

Policy	2020 GHG Emissions ($MTCO_2e$)	2030 GHG Emissions ($MTCO_2e$)	2050 GHG Emissions ($MTCO_2e$)
Emissions with Existing State Programs	**535,340**	**510,880**	**472,900**
Peninsula Clean Energy	-19,810	-28,730	0
Energy efficiency retrofits	-50	-30	-30
Solar energy installations	-100	-10	0
Caltrain shuttles	-20	-10	-10
Electric vehicle adoption	-3,420	0	0
Public access EV chargers	-30	-30	-30
Transportation Demand Management	-270	-210	-180
Caltrain electrification (planned)	0	-3,450	-3,880
Sustainable Solutions Turnkey program (planned)	0	-60	-60
Total reductions from existing and planned local and regional programs	-23,700	-32,470	-4,120
Emissions with existing and planned local and regional programs	**511,640**	**478,350**	**468,720**

Note: Due to rounding, totals may not equal the sum of the component parts.

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Existing and planned local, regional, and State accomplishments reduce San Mateo's forecasted GHG emissions by a significant amount. **Table 16** shows the benefit of these accomplishments relative to San Mateo's baseline.

Table 16: Emissions with Existing and Planned Efforts

Policy	2020	2030	2050
2005 (baseline) emissions ($MTCO_2e$)	660,600	660,600	660,600
Emissions with existing and planned programs ($MTCO_2e$)	511,640	478,350 (3.9 $MTCO_2e$ per-capita)	468,720 (3.3 $MTCO_2e$ per-capita)
Percent below baseline emissions	-23%	-28%	-29%

REVISED AND NEW GHG REDUCTION MEASURES

A central goal of the CAP update is to achieve additional GHG reductions to work toward the City's 2030 and 2050 reduction target, recognizing that the reduction measures in the 2015 CAP are insufficient to meet these reductions. To identify these additional reductions, the project team began with the 28 GHG reduction measures in the City's 2015 CAP. Some of these measures have been fully implemented, and do not need to be carried forward into the CAP update. Others are still applicable and can be revised or expanded to achieve additional GHG reductions. There are also opportunities to add entirely new measures to address new and emerging issues not covered in the 2015 CAP.

The project team based the revised and new GHG reduction measures on several sources, including:

- San Mateo's inventory and forecast.
- The existing and planned State, regional, and local accomplishments.
- Discussions with City staff to identify past successes and challenges, plans and opportunities, and goals and priorities related to GHG reduction efforts.
- An audit of energy-related strategies being recommended and implemented by communities throughout San Mateo County through the RICAPS program, working with staff from PCE and the San Mateo County Office of Sustainability
- Feedback and direction from Sustainability and Infrastructure Commission members, along with comments provided by members of the public at these meetings.
- Comments and results of the priority voting activity at the June 6, 2019 community workshop.

Calculating Credit

This CAP uses a process called quantification to determine the amount of GHG emissions reduced by each measure. The foundation for the quantification calculations is the baseline GHG inventory and forecast. Activity data from the inventory, such as vehicle miles traveled (VMT) or kilowatt-hours (kWh), are combined with participation rates and data about the reduction in activity data from each action in order to calculate the GHG reduction benefit of each measure. This approach ensures that the GHG reductions from San Mateo's CAP measures are tied to current and future activities that are actually occurring in the community.

Calculations for reductions in activity data come from tools and reports provided by government agencies; these agencies include the US Environmental Protection Agency (EPA), the California Energy Commission (CEC), the California Air Resources Board (CARB), the California Air Pollution Control Officers Association, the US Department of Energy, and local air districts. If accurate data are not available through these sources, the quantification uses case studies from comparable communities and applicable scholarly research. The specific quantification process for each measure is presented in **Appendix 1**, which includes a list of data sources and assumptions.

The project team was able to identify GHG reductions for most of the measures in this CAP. However, there are a few that do not have a specific reduction level due to missing data or the lack of a reliable method. These efforts are still expected to reduce GHG emissions, but the level cannot be accurately determined. These measures are labeled as supportive.

GHG Reduction Measures

Based on the results of this process, the project team identified a total of 29 GHG reduction measures to include in the 2020 CAP. These measures include a mix of education and outreach programs to encourage GHG reduction activities, financial subsidies and other enticements to incentivize GHG reductions, and mandates to require GHG reduction efforts. These 29 measures are organized into nine categories:

1) Building Electrification (BE)
2) Renewable Energy (RE)
3) Energy Efficiency (EE)
4) Municipal Energy Efficiency and Electrification (ME)
5) Off-Road Equipment (OR)
6) Clean Transportation Fuels (CF)
7) Sustainable Transportation (ST)
8) Solid Waste (SW)
9) Water and Wastewater (WW)

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Each measure entry includes a description of the measure, the anticipated 2020, 2030, and 2050 GHG reductions achieved by the measure at the projected performance level, and the recommended actions necessary to implement it. Assumptions, projected performance levels, sources, and metrics used to calculate GHG reductions are given for each measure in **Appendix 1**. Each measure entry also identifies the co-benefits of the measure, which are advantages provided by the measure beyond GHG reduction. **Figure 7** presents the co-benefits assessment for each GHG reduction measure.

Figure 7:CAP Co-Benefits

Building Electrification (BE)

Most buildings, both residential and nonresidential, use electricity and natural gas to operate appliances and other pieces of equipment. While sources of electricity have become much cleaner over time and will continue to become cleaner due to State law and utility policies, the GHG emissions associated with using a unit of natural gas has remained constant, as natural gas is a fossil fuel and cannot become a cleaner energy source. Buildings that receive most or all their energy from electricity instead of natural gas can significantly reduce their GHG emissions as a result. Buildings can be constructed to be mostly-electric or all-electric, or existing buildings can be electrified as part of retrofit activities. Advances in electric appliances, such as those used for space heating, water heating, and cooking, have helped make building electrification easier and more cost-effective.

BE 1: All-electric new construction

As San Mateo property owners construct new residential and nonresidential buildings, they have the option to construct these buildings to receive most or all their energy from electricity rather than natural gas. Not having to install natural gas piping decreases the cost of construction. New buildings in San Mateo must also install solar panels to generate electricity, and so all-electric buildings with solar panels may be able to generate all the energy they need on-site.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	880	4,640	7,420

Recommended actions:

- For each three-year code cycle, adopt a reach code to encourage residential and commercial new construction to be built to an all-electric standard, including electric heating, cooling, and water heating.
- Explore the feasibility of reducing permitting fees if builders elect to construct all-electric buildings instead of buildings that use natural gas.

Co-benefits:


Conserves resources


Improves public health


Promotes equity


Reduces utility bills

CHAPTER 3

BE 2: All-electric existing buildings

Although most existing buildings already have natural gas infrastructure and natural gas devices installed, these systems can be converted to all-electric. Electric appliances that replace natural gas-powered models are highly efficient, readily available, and cost-effective. Many buildings can install these appliances with simple electric wiring and panel upgrades, if upgrades are required at all. The cost of converting existing buildings to mostly- or all-electric can be further reduced if the electrification is done as part of a larger retrofit activity.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	620	13,950	85,960

Recommended actions:

- Encourage residents and businesses to purchase electric technologies (e.g., air source heat pumps, heat pump water heaters, electric dryers, and electric stoves).
- Encourage residents and businesses to upgrade electric panels to accommodate electric technologies including solar PV, battery storage, air source heat pumps, heat pump water heaters, electric dryers, and electric stoves.
- Support training and outreach to residents, businesses, contractors, vendors, and installers about preferable electric equipment replacement technologies.

Co-benefits:


Conserves resources


Improves public health


Promotes equity


Reduces utility bills

Renewable Energy (RE)

Renewable Energy Emissions Reductions in 2050

Measures that only reduce electricity use or increase renewable electricity supplies will show zero GHG reductions in 2050. This is because all electricity sold in California must be carbon-free by 2045, as required by the State's Renewables Portfolio Standard (RPS). Since there will already be no emissions from electricity use in 2050, San Mateo cannot count additional reductions associated with electricity in this year. This CAP already credits reductions from the RPS as an existing State program.

While Peninsula Clean Energy supplies most of San Mateo's electricity and plans to be carbon-free by 2021, some San Mateo customers are still expected to receive their electricity from PG&E or direct access providers. As these providers are not expected to be carbon-free until required by the State, measures that reduce electricity use or increase renewable electricity supplies will show some GHG reductions in 2030, even though most of the community will already use carbon-free electricity.

Remember that local renewable energy systems and energy efficiency measures will continue to provide several co-benefits to the community, including lower electricity bills and increased resiliency against power disruptions, even if there are no measurable additional GHG reductions.

While much of San Mateo's electricity already comes from renewable or carbon-free sources, increasing the amount of energy in the community from renewable sources not only further reduces GHG emissions but also has the potential to reduce the cost of electricity for residents and enhance the local economy. By incentivizing on-site electricity generation and storage and thereby decentralizing the creation of energy, the City of San Mateo also becomes more resilient to grid failures and power shutoffs and helps make the community less dependent on outside resources.

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RE 1: Peninsula Clean Energy

Since beginning operations in 2016, the county-wide Peninsula Clean Energy (PCE) program has been highly successful in increasing the amount of renewable and carbon-free electricity used by the community. As of 2017, more than 97 percent of San Mateo's residents and businesses receive their electricity from PCE. San Mateo can achieve more GHG reductions with PCE by encouraging the remaining residents and businesses to participate in the program and by supporting efforts for customers to upgrade to PCE's ECO 100 service, which provides all electricity from renewable sources.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	380	1,060	0

Recommended actions:

- Encourage residents and businesses to participate in Peninsula Clean Energy.
- Encourage residents and businesses participating in PCE to opt up to ECO 100.
- Support PCE's outreach to direct access customers to encourage use of carbon-free electricity.

Co-benefits:

Enhances local economy

Reduces utility bills

RE 2: Renewable energy systems for new and existing residences

The addition of renewable energy systems to new residential buildings can often meet (and even exceed) the energy demand of the home. State and local regulations already require new homes to install solar panels of a particular size, but homeowners can choose to install larger systems to generate additional power. Existing homes not subject to this requirement can also benefit from installing renewable energy systems. Extra energy can meet any additional electricity needs of the home, or can be sold back to the grid, which helps reduce the amount of energy needed from nonrenewable sources and can help the homeowner finance the project.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	60	170	0

Recommended actions:

- For each three-year code cycle, adopt reach codes to require residential developments to install renewable energy systems, including solar photovoltaic or solar water heating, as needed to exceed State requirements.
- Provide education and outreach to residents and contractors on the benefits of pairing battery storage with solar PV systems.
- Explore the feasibility of reducing or eliminating solar permitting fees.
- Provide information to property owners about discounts, incentives, and financing programs for renewable energy systems, including solar bulk purchase programs and financing programs that allow property owners to incrementally pay for renewable energy systems.
- Provide education and outreach to stakeholders on the benefits of retrofitting existing residential buildings to be zero net energy.
- Promote the installation of renewable energy and energy storage systems as part of major home retrofit projects.

Co-benefits:

Conserves resources

Enhances local economy

Promotes equity

Reduces utility bills

CHAPTER 3

RE 3: Renewable energy systems for new and existing nonresidential buildings

The addition of distributed-generation renewable energy systems to nonresidential buildings helps reduce the amount of energy from nonrenewable sources the building requires, and in some cases may exceed the amount of electricity needed. While San Mateo requires that new nonresidential buildings include renewable energy systems, this requirement does not apply to existing buildings, which can still take advantage of the benefits provided by these systems. New nonresidential buildings can also install larger systems than local standards require, producing an additional amount of renewable energy that can either be used by the building or sold back to the grid. New construction that is built to include such systems helps reduce GHG emissions and may save businesses money on utility costs.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	10	70	0

Recommended actions:

- For each three-year code cycle, adopt reach codes to require nonresidential developments to install renewable energy systems, including solar photovoltaics or solar water heating, as needed to exceed State requirements.
- Promote financing programs that allow developers, property owners, and tenants to incrementally pay for renewable energy systems.
- Explore the feasibility of reducing or eliminating solar permitting fees.
- Work with appropriate property owners to identify potential sites for a microgrid demonstration project. Provide education and outreach to these property owners on the multiple benefits of developing a microgrid, including reliability, cleaner energy, and cost savings.
- Encourage property owners to pair battery storage systems with solar PV systems.
- Support development of a local rebate program for on-site renewable energy systems.

Co-benefits:

Conserves resources

Enhances local economy

Reduces utility bills

Energy Efficiency (EE)

Electricity and natural gas are used to heat, cool, and light buildings, as well as to operate appliances and machinery. This goal seeks to provide opportunities for businesses and residents to conserve energy and maximize efficiency, which in turn reduces energy costs, supports the local economy, and further reduces GHG emissions.

EE 1: Residential energy efficiency retrofits

Older homes, especially those built before incorporation of energy efficiency and green building standards in local and State building codes (generally before 1980), are less energy efficient than newer buildings. Home retrofit programs address a variety of improvements in existing houses and include upgrades to insulation, windows, heating, ventilating, and air conditioning (HVAC) systems, lighting, and appliances, and may reduce the average home's energy use by 33 percent or more. San Mateo residents have already completed a limited number of retrofits, as discussed in the Existing and Planned Accomplishments section, through programs such as Energy Upgrade California.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	410	6,030	17,860

Recommended actions:

- Establish a time of sale residential energy conservation program that requires an energy audit by a certified energy professional. Audits would be disclosed to the buyer.
- Educate homeowners, real estate agents, rental property owners, and tenants about the benefits of residential energy retrofits, the availability of financing options, and how to participate.
- Provide energy retrofit information to project applicants seeking permits for renovation or expansion work on existing houses.
- Host residential energy outreach events such as evening workshops and local learn-at-lunch sessions, provide energy retrofit information at community events, and distribute information on residential energy retrofits online and in public buildings.
- Promote financing programs that allow homeowners, rental property owners, and tenants to incrementally pay for energy efficiency retrofits.
- Provide funding to support energy efficiency education and low-cost retrofits for low-income households.
- Offer low- or no-cost energy audits to rental property owners who agree to disclose a unit's energy efficiency results to tenants.

- Encourage property owners to participate in energy benchmarking efforts.
- Work with tenant groups and property management companies to identify actions tenants can take within the bounds of their lease to improve energy efficiency.
- Promote incentives such as direct subsidies and reduced fee permitting to rental property owners who make energy efficiency improvements to their units beyond any minimum actions required by the adopted energy code.
- Encourage property owners to consider installing cool roofs when reroofing buildings.

Co-benefits:

Conserves resources | Enhances local economy | Reduces utility bills | Saves energy

Home energy audits can identify opportunities to reduce electricity and natural gas use through both retrofit activities and low- or no-cost behavioral changes.

Photo by Dennis Schroeder/NREL (28533)

EE 2: Nonresidential energy efficiency retrofits

As with residential buildings, many of San Mateo's nonresidential buildings have been constructed before the adoption of modern energy efficient building codes. Energy-efficient retrofits can help the City reduce GHG emissions and save businesses money. Retrofits to these structures can reduce energy use by approximately 35% to 45%. Property owners who are substantially remodeling their nonresidential buildings can also bring the structure up to current energy efficiency codes as part of the remodel, which can also significantly decrease the buildings' electricity and natural gas use.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	840	9,930	17,040

Recommended actions:

- Develop policy requiring reporting of energy use (ENERGY STAR performance score) by commercial and multifamily buildings. Apply benchmarking ordinance to smaller commercial and multifamily buildings, below the minimum size threshold for mandatory benchmarking under AB 802 and require commercial buildings to receive an energy assessment every five to ten years depending on size.
- Educate property owners and tenants about energy efficiency retrofit programs and financing options.
- Work with property owners to offer green leases for tenants, allowing tenants to specify energy efficiency improvements to the space or to finance energy efficiency retrofits in exchange for reduced occupancy fees. Promote a green lease addendum template that can be used by nonresidential property owners to incorporate green lease language into future leases.
- Support participation in demand response programs.
- Offer low-cost energy audits for business or office parks, including identification of most cost-efficient savings for weatherization or appliance upgrades.
- Offer reduced fee permitting to project applicants undergoing specifically defined energy retrofit measures, such as a retrofit to achieve Zero Net Energy in an existing building.
- Promote the San Mateo County Green Business program to help encourage energy efficiency and sustainable actions in local businesses.
- Encourage property owners to consider installing cool roofs when reroofing buildings.

Co-benefits:

Conserves resources

Enhances local economy

Reduces utility bills

Saves energy

CHAPTER 3

The windows in this airport building have been retrofitted to electronically darken in bright sunlight, helping to keep the inside of the building cool. Advances such as this can be applied to San Mateo office buildings, reducing the energy use for air conditioning.

Photo by Dennis Schroeder/NREL (54582)

EE 3: Residential tree planting

Shade trees provide several benefits, including reducing the urban heat island effect, reducing runoff during flood events, and providing habitat for wildlife. When properly placed, they can also help keep home interiors cool, reducing the need for homes to run their air conditioners or other cooling equipment. San Mateo can promote tree planting to help decrease home cooling demands.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Recommended actions:

- Establish a City program to provide free or subsidized shade trees for buildings with eastern, western, or southern exposure to reduce energy use associated with cooling homes.
- Partner with community organizations and applicable professional associations to support education and outreach on the benefits and best practices of strategic tree planting to provide shade and cooling. Develop guidance on the preferred tree types and the recommended approach to selecting locations for tree plantings that support energy conservation and efficiency.

Co-benefits:

Improves public health

Reduces utility bills

Saves energy

Street trees can help keep nearby buildings cool, reducing the need for air conditioning during hot days.

Photo by PlaceWorks

CHAPTER 3

Municipal Energy Efficiency and Electrification (ME)

The City of San Mateo strives to serve as an example of efficiency and to embody the commitment to reducing emissions citywide. Measures and actions under this goal save energy and reduce utility bills, which preserves valuable City resources and provides green building case studies for other developments in the community.

ME 1: Energy efficiency for new municipal buildings

The California Energy Commission is considering a goal of having all new nonresidential buildings be zero net energy by 2030. The City can work toward this goal by constructing new municipal facilities to be more energy efficient than State or local regulations require, including achieving zero net energy in advance of the State's target.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	Supportive	Supportive	Supportive

Recommended actions:

- Seek grant funding or low- or no-interest loans to implement energy saving efforts and renewable energy systems at municipal facilities at time of construction or substantial renovation.

Co-benefits:

Conserves resources

Reduces utility bills

Saves energy

ME 2: Energy efficiency at existing municipal buildings

While San Mateo has conducted significant retrofits to existing municipal properties, additional opportunities for reducing energy use exist at City-owned facilities. The Sustainable Solutions Turnkey (SST) program has identified multiple HVAC and lighting retrofits at several City properties, including the Police Department, City Hall, multiple fire stations, and many others. This measure goes beyond the SST program (which is already accounted for as a planned activity) and looks at opportunities for retrofits at additional facilities or for additional retrofits not covered as part of other programs.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	0	20	70

Recommended actions:

- Implement energy efficiency upgrades (including lighting and HVAC systems) at municipal buildings as needed.

Co-benefits:

Conserves resources | Enhances local economy | Reduces utility bills | Saves energy

Although many City buildings have already been retrofitted, there are always opportunities to take advantage of new energy-saving technologies and practices. These municipal retrofits help reduce the amount of public money spent on utility bills, and also allow the City to pilot new ways to reduce energy use.

Photo by City of San Mateo

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ME 3: All-electric municipal buildings

Constructing new buildings or renovating existing ones to receive most or all their energy from electricity, as opposed to a mix of electricity and natural gas, has significant GHG savings. As the City encourages private property owners to construct mostly-electric or all-electric buildings, it can set an example by constructing its new buildings and renovating existing spaces to use electricity only. If these all-electric buildings also have renewable energy and battery storage systems, they can also be protected against power grid failures and intentional shutoffs.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	0	110	210

Recommended actions:

- As feasible, design and build all-electric municipal buildings and facilities, including electric heating, cooling, and water heating.
- Evaluate existing buildings and facilities to identify opportunities for retrofitting them to be all-electric, including electric heating, cooling, and water heating.
- During the development and construction of energy efficiency and renewable energy projects, also consider all-electric technology including electric heating, cooling, and water heating.
- Explore the feasibility of establishing microgrids at new or existing municipal facilities to capture the multiple benefits of microgrids, including reliability, clean energy, and cost savings.

Co-benefits:

Conserves resources

Enhances local economy

Reduces utility bills

Clean Transportation Fuels (CF)

The promotion of clean transportation fuels, such as electricity or hydrogen, can ease a transition away from reliance on vehicles fueled by gasoline or diesel fuel. Providing increased support for vehicles that use these clean transportation fuels through public and private infrastructure makes it easier for residents who want to purchase one of these vehicles.

CF 1: Electric vehicle charging infrastructure

Widespread availability of electric vehicle (EV) charging stations is critical to ensuring that EV drivers can quickly and easily charge up their vehicles. This helps reduce both real and perceived barriers to EV adoption, increasing the rate of EV ownership in the community. A large number of EV charging stations can also encourage EV drivers from other communities to stop in San Mateo, which can provide economic opportunities. The City can ensure that EV drivers are not challenged to find a charging station at both public and private facilities.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	2,650	29,630	71,150

Recommended actions:

- For each three-year code cycle, update reach codes to exceed the state-mandated minimum percentage of EV parking spaces designed to accommodate the future installation of electric vehicle supply equipment in new residential and commercial development.
- Promote incentives to encourage the expansion of EV charging infrastructure in existing public and private properties, including parking structures, hotels and motels, multi-unit dwellings, and workplaces.
- Partner with other agencies to incentivize property owners to install EV charging stations.
- Install additional public EV charging stations in desirable, high-volume, and prominent City-owned locations.
- Encourage the expansion of EV charging infrastructure in existing buildings.
- Encourage pairing EV charging infrastructure with battery storage systems.
- Explore options to reduce or eliminate permit fees for the installation of EV charging infrastructure.

CHAPTER 3

Co-benefits:

Conserves resources | Enhances local economy | Improves public health | Promotes equity

Dedicated areas for electric vehicle charging at residential complexes and businesses help encourage EV adoption, reducing GHG emissions from transportation.

Photo by Dennis Schroeder/NREL (26765)

CF 2: Electric vehicle education and outreach

EVs, including plug-in hybrids (PHEVs) are becoming increasingly widespread and cost-effective to California residents. San Mateo can improve the adoption of EVs among City residents by promoting these vehicles through media and in-person events. The City can encourage property owners who are not required to install EV chargers to do so and can publicize the availability of incentives.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	980	17,050	17,120

Recommended actions:

- Provide information about the benefits of EVs and PHEVs through the City's electronic media systems and at public events, including creating opportunities for public EV/PHEV test drives.
- Conduct educational outreach to homeowners, commercial property owners, and developers about the benefits of EV charging stations.
- Identify and distribute resources to assist community members seeking to install an EV charging station on their properties.
- Work with local and regional partners to explore providing additional incentives to community members who purchase an EV or PHEV.
- Evaluate opportunities to regulate or incentivize transportation network companies (TNCs) to increase adoption of electric vehicles as regulatory conditions allow.

Co-benefits:

Conserves resources

Improves public health

Promotes equity

CHAPTER 3

CF 3: Clean City fleet

San Mateo can further demonstrate its leadership on GHG reduction by increasing the number of vehicles in the municipal fleet that use clean transportation fuels. The City has already purchased vehicles that run off biomethane, a substitute for compressed natural gas (CNG) generated from waste products at the San Mateo Wastewater Treatment Plant. As EVs become more widely available, the City has more opportunities to replace its gasoline and diesel-fueled cars and trucks.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	30	170	420

Recommended actions:

- Purchase EVs or PHEVs as replacements for gasoline, diesel, or conventional hybrid City fleet vehicles that have not been converted to compressed natural gas (CNG) vehicles, as available and cost-effective.
- Update the Vehicle and Fleet Equipment policy and explore an "Electric Vehicle First" procurement policy.

Co-benefits:

Conserves resources

Improves public health

Methane is produced as a by-product of treating the community's wastewater. The City collects this methane and processes it to produce a natural gas substitute called biomethane, which is used to fuel municipal vehicles. The City can expand its use of biomethane, as well as other clean fuels, to operate its fleet.

Photo by City of San Mateo

CF 4: Clean fuel and vehicle emissions

Beyond electricity and biomethane, other clean vehicle fuels are available, such as hydrogen and biofuels from sustainable sources. Although these fuels are available in limited places and quantities, they are likely to become more widespread in coming years as California seeks to substantially cut GHG emissions from transportation. San Mateo can encourage adoption of these additional clean vehicle fuels by making it easier for fueling stations that supply them to locate in the community.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	20	3,130	7,000

Recommended actions:

- Support efforts to build fueling stations in San Mateo for other clean fuels, including hydrogen and sustainably-sourced biofuels, as supported by market conditions.
- Explore ways to reduce vehicle idling in selected areas with large numbers of vehicle drop-offs and pick-ups, such as schools.
- Explore signal light optimization to reduce vehicle idling at traffic signals.

Co-benefits:

Conserves resources

Enhances local economy

Improves public health

Promotes equity

CHAPTER 3

Sustainable Transportation (ST)

Increasing the number of transportation modes available to San Mateo residents creates a healthier community, promotes equity, and reduces emissions. By providing individuals with a range of safe, reliable options to get to work, school, shopping, and other important destinations that are more sustainable than personal vehicles, the City can ensure that other modes of transportation are a feasible and effective alternative. This reduces dependence on personal vehicles in San Mateo, improving mobility options for all community members.

ST 1: Bicycle mode share

Bicycles currently make up an estimated 0.90% of San Mateo trips, using the approximately 57 miles of dedicated bike trails and lanes within the community. Efforts to increase this are currently under way, with the ongoing implementation of the Bicycle Master Plan, which was adopted in 2011 and is currently being updated. These efforts include dedicated bicycle parking, new bike lanes, and improvements to existing bicycle infrastructure, along with educational and outreach efforts. Such efforts are supported by the 2015 Sustainable Streets Plan, which includes standards for complete streets, and the 2019 Green Infrastructure Plan, which supports beneficial landscaping and other green infrastructure components that can make bicycling a more safe and pleasant experience.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	40	240	670

Recommended actions:

- Host bicycle safety and awareness efforts for bicyclists, pedestrians, and drivers.
- Support bike-to-school commutes through the Safe Routes to School program.
- Install bike racks and long-term bike storage lockers in the public right-of-way and at City facilities and transit facilities.
- Secure funding for design and construction of the infrastructure improvements identified in the updated Bicycle Master Plan (adoption anticipated in Spring 2020).

Co-benefits:

Conserves resources

Enhances local economy

Improves public health

Promotes equity

ST 2: Pedestrian mode share

The San Mateo Pedestrian Master Plan, adopted in 2012, seeks to create a pedestrian-friendly environment throughout the community to encourage walking and contribute to the community's ambitious 2020 mode share target. By focusing new development in existing areas of higher density rather than low-density residential areas, San Mateo can support increased pedestrian activity by locating homes within walking distance of key facilities such as shops, offices, and schools. Such efforts are supported by the Sustainable Streets Plan and the Green Infrastructure Plan which includes standards for complete streets and pedestrian-friendly landscaping improvements such as low-impact development.

Pedestrian-friendly areas, such as Downtown San Mateo, encourage people to walk rather than drive.

Photo by City of San Mateo

	2020	2030	2050
GHG reduction ($MTCO_2e$)	390	760	1,110

Recommended actions:

- Improve pedestrian safety through education and outreach efforts.
- Support walk-to-school efforts through the Safe Routes to School program.
- Secure funding for design and construction of the infrastructure improvements identified in the adopted Pedestrian Master Plan and Green Infrastructure Plan.

Co-benefits:

Conserves resources

Enhances local economy

Improves public health

Promotes equity

CHAPTER 3

ST 3: Micromobility and shared mobility

Micromobility refers to the use of electric scooters, uni-skates, etc. to travel short distances. It is a growing trend for individuals to own their own personal micromobility devices to connect to transit and job centers. Shared mobility options, such as a bike share program, allow community members an easy way to make shorter trips without owning their own devices. People who do not have access to a bike, scooter, or other mobility device of their own can rent one from various private shared mobility operators. In 2019, San Mateo adopted a Shared Mobility Permit Program, establishing regulations that would allow these companies to begin operating in the community. Providing shared mobility devices helps make more sustainable transportation modes available to more people while ensuring that shared mobility companies operate in a safe and responsible manner.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	Supportive	Supportive	Supportive

Recommended actions:

- Identify operators for a shared mobility program to provide first- and last-mile connections for residents and commuters.
- Work closely with shared mobility operator(s) to monitor program and encourage ridership.
- Support infrastructure improvements that encourage the use of personal micromobility devices in alignment with the updated Bicycle Master Plan (adoption anticipated in Spring 2020).

Co-benefits:

Conserves resources

Enhances local economy

Improves public health

Promotes equity

ST 4: Public transit service

Multiple public transit providers operate in San Mateo, including the county-wide SamTrans bus network, the Caltrain commuter rail line between San Francisco and San Jose/Gilroy, and AC Transit's bus connections to Hayward and Castro Valley. In partnership with these regional service providers, San Mateo can support efforts to increase the frequency and speed of transit service, improve the quality of public transit infrastructure, and support additional service as needed. Educational and incentive programs can also encourage people to increasingly use public transit, helping to get cars off the road and reducing congestion while simultaneously decreasing GHG emissions.

Improvements to San Mateo's public transit service help reduce congestion as well as community GHG emissions.

Photo by PlaceWorks

	2020	2030	2050
GHG reduction ($MTCO_2e$)	830	9,130	25,110

Recommended actions:

- Support the development of new rapid bus transit routes.
- Work with transit providers to improve the safety and comfort at transit stops.
- Work with Caltrain to improve the frequency of Caltrain services, particularly to the Hayward Park station.
- In partnership with transit providers, explore the feasibility of transit priority signals and other infrastructure improvements to speed up transit service.
- Increase ridership for public transit by enhancing pedestrian and bicycle access to high-quality transit and encourage incentive programs to decrease reliance on single-occupancy vehicles.

Co-benefits:

Conserves resources | Enhances local economy | Improves public health | Promotes equity

ST 5: Commuter programs

San Mateo's efforts to encourage walking, bicycling, and public transit use can work in concert with other transit services, such as private shuttles and vanpools, to reduce vehicle trips associated with employee commutes. Existing businesses can encourage employees to adopt more sustainable commute options, including increased use of telecommuting, to reduce GHG emissions and congestion in the community. San Mateo's existing Transportation Demand Management program can offer a model for how to reduce commute-related trips for existing businesses.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	0	130	3,420

Recommended actions:

- Conduct an outreach campaign to San Mateo residents and employees about available shuttle and vanpool options to support increased use of these existing programs.
- Work with regional partners and employers to offer microtransit services to provide first-mile and last-mile connections with key job and housing centers.
- Provide outreach for carpool incentive programs to San Mateo residents and employees.
- Encourage existing employers to participate in Transportation Demand Management efforts.
- Support efforts by employers to provide telecommuting as a viable option for appropriate employees.

Co-benefits:

Conserves resources

Improves public health

Promotes equity

ST 6: Transportation Demand Management

Transportation Demand Management (TDM) is a suite of strategies intended to reduce the amount of single-occupancy vehicle trips generated and vehicle miles traveled, particularly during peak commute times. TDM can include increased use of public transit, non-motorized transportation, carpools and ridesharing, and telecommuting, among many others. In San Mateo, new developments in the Hillsdale and Hayward Park transit-oriented development areas are required to reduce the number of trips they generate. The City is looking to establish similar requirements for significant new developments in the downtown area and can also encourage participation in TDM programs for developments in other parts of the communities. Developments implementing TDM measures generally have the freedom to choose the strategies that suit their needs.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	60	2,330	8,460

Recommended actions:

- Require new developments of at least six multi-family units and/or 10,000 square feet of nonresidential space to implement a suite of TDM strategies to comply with the appropriate trip reduction target identified in applicable area plans.
- Require developments of at least 20 multi-family units and/or 50,000 square feet of nonresidential space undergoing additions or alterations (as defined in San Mateo Municipal Code Section 23.06.012) to implement TDM strategies consistent with the targets in relevant area plans.
- Educate developers working on projects in San Mateo not located in a TDM area about ways to reduce vehicle miles traveled and the resultant benefits.
- Publicize developments and businesses with successful TDM programs.
- Work with regional partners to fund successful TDM strategies for existing developments that can be implemented with little or no cost to property owners.

Co-benefits:

Conserves resources

Improves public health

Promotes equity

CHAPTER 3

ST 7: Transit-oriented developments

Transit-oriented developments (TODs) are development projects located in areas close to high-quality transit services, such as commuter rail stations or bus stops with rapid and frequent service, and are designed to encourage community members living and working in these projects to use public transit as an alternative to driving. Many TODs in San Mateo are in areas already covered by TDM requirements that also support reduced vehicle use. The City can also encourage TODs in other parts of the community, further decreasing congestion on local roads and highways.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	160	990	2,370

Recommended actions:

- Increase transit-oriented developments along El Camino Real, within one-half mile of Caltrain stations, and in the Rail Corridor Transit Oriented Development and Hillsdale Station Area Plan areas.

Co-benefits:

Conserves resources

Enhances local economy

Improves public health

Transit-oriented developments encourage community members to use public transit for many of their trips.

Photo by City of San Mateo

Solid Waste (SW)

Efforts to divert waste away from landfills not only reduce emissions, but also provide residents with an opportunity to focus on comprehensive sustainability and exercising awareness of individual impact on the environment, including minimizing waste generation and encouraging source reduction. These measures build on the City of San Mateo's active leadership to date reducing waste through innovative programs.

SW 1: Composting program

Decomposing landfill waste emits methane, which is a potent GHG. Diverting compostable materials from traditional waste streams may reduce these emissions. San Mateo and a number of other surrounding communities instituted a curbside composting program in 2011 in conjunction with the local waste hauler. This voluntary program allows residents and businesses to deposit food scraps into a green bin to be composted and turned into fertilizer. Previously, this material would have gone to the landfill, producing GHGs as it decomposed. Virtually all of San Mateo's single-family households currently participate in the program, along with some multi-family households and businesses. Increasing the participation rate of this program can decrease GHG emissions and help educate residents about waste generation.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	950	12,650	14,850

Recommended actions:

- Provide educational outreach materials to multifamily residents about urging HOA/property managers to support composting programs.
- Work with Recology San Mateo County to include information about adding composting services in monthly garbage and recycling bills to existing BizSMART customers.
- Work with food service facilities to understand barriers to using existing composting programs. Use this clearer perception of roadblocks to mitigate concerns and target incentives more specifically at high food-waste facilities.
- Work with multifamily and commercial property owners to minimize any potential health or cleanliness impacts associated with compost collection bins.
- Explore alternative off-site collection or sorting methods to capture compostable materials from multifamily units.
- Continue to provide a diversion discount to participating commercial and multifamily users to properly incentivize and fully use compost services.

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Co-benefits:

Conserves resources

Food waste and other organics is one of the most common materials in California's trash. Composting programs help keep this waste out of landfills, reducing GHG emissions and providing useful, nutrient-rich soil as a co-benefit.

Photo by U.S. EPA

SW 2: Expanded recycling service

Beyond food waste and other organics, San Mateo residents can recycle many other types of materials. However, if materials are not placed in the correct bin, they may be accidentally landfilled, leading to increased GHG emissions. Proper sorting and other educational efforts can ensure that recyclable materials end up where they are supposed to. The City's waste hauler may also be able to accept additional types of materials for recycling at a future time, depending on market conditions.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	810	5,360	8,530

Recommended actions:

- Allow expanded recycling programs to accommodate additional material types as economic conditions allow.
- Improve educational efforts around proper waste sorting.

Co-benefits:

Conserves resources

CHAPTER 3

SW 3: Waste awareness and source reduction

While it is important to sort waste properly and use recyclable/compostable products whenever possible, it is also helpful for community members to minimize the amount of materials that they throw away at all, regardless of the bin it ends up in. These efforts to decrease the overall amount of waste produced in the community not only decreases GHG emissions but can help keep harmful materials out of the environment and provide an opportunity for increased community education.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	420	1,910	5,510

Recommended actions:

- Work with partners to establish a source reduction program.
- Work with partners to establish a materials reuse program.
- Explore a ban on specific types of single-use or disposable plastics.
- Work with waste haulers and the South Bayside Waste Management Authority to minimize recycling contamination.
- Continue to promote the Team Up to Clean Up program.
- Encourage local restaurants to partner with food rescue organizations to divert food that would otherwise be thrown away to non-profit organizations for distribution to those in need.

Co-benefit:

Conserves resources

Enhances local economy

Water and Wastewater (WW)

Increasing the efficiency of water usage reduces emissions and helps conserve valuable resources, saving money for the City and its residents, reducing dependence on outside resources, and increasing resilience to water shortages.

WW 1: Water efficiency retrofits for existing buildings

Older buildings often have opportunities to improve water efficiency by replacing old fixtures (sinks, showerheads, toilets, etc.). Especially in periods of drought, optimizing indoor water efficiency may greatly reduce GHG emissions from conveyance and treatment of water. New buildings are required to use water-efficient fixtures under State law. These buildings can incorporate fixtures that exceed California standards to achieve additional water use reductions.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	20	100	230

Recommended actions:

- Provide educational materials and outreach to encourage indoor water conservation.
- Work with Cal Water and Bay Area Water Supply & Conservation Agency (BAWSCA) to promote rebate offerings for high efficiency toilets, washing machines, rain barrels, and other water-conserving appliances.
- Work with Cal Water to offer low-cost or free water audits to businesses and homeowners. Explore ways to encourage installation of greywater systems in existing buildings, especially as part of significant retrofits.

Co-benefits:

Conserves resources

Reduces utility bills

WW 2: Water-efficient landscaping

Treating and conveying water requires large amounts of energy. Minimizing the amount of water used on nonessential applications, such as landscaping and turf grass, helps reduce GHG expenditures and increases resiliency in periods of drought.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Recommended actions:

- Provide educational materials to the community about drought-tolerant landscaping.
- Host educational workshops on drought-tolerant and native landscaping
- Partner with Cal Water and/or BAWSCA to host a trade-in program for inefficient sprinklers for more efficient drip irrigation systems.
- Retrofit City-owned landscapes to increase the amount of drought-resistant and/or native plant landscaping.

Co-benefits:

Conserves resources

Reduces utility bills

Water-efficient landscaping is an increasingly common choice throughout San Mateo to reduce water use and improve resilience to drought conditions.

Photos by City of San Mateo

WW 3: Water efficiency in new construction

The California Building Standards Code already requires new buildings to be highly water efficient. The City can encourage new buildings to go beyond these requirements to meet the voluntary standards in the California Green Building Code, improving community-wide water efficiency. San Mateo can also promote the availability of greywater systems, allowing water to be reused in a safe and hygienic way to further improve water efficiency.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	0	Less than 10	10

Recommended actions:

- Adopt a reach code to require new developments to meet the voluntary indoor and outdoor water efficiency standards in the California Green Building Standards Code.
- Encourage developers to install greywater systems in new buildings at time of construction.

Co-benefits:

Conserves resources

Off-Road Equipment (OR)

Shifting to alternative fuel equipment across the community and promotes healthier air for all residents due to the reduction in gasoline or diesel fumes. This is especially important for sensitive populations such as children, the elderly, and individuals with chronic respiratory disease.

OR 1: Clean fuel lawn and garden equipment

Most lawn and garden equipment, such as lawn mowers, leaf blowers, chippers, etc., are fueled by gasoline or diesel. Many manufacturers produce hybrid and electric models, which use less fuel compared to a conventional model (or none at all). These models produce less pollution and may also be quieter to operate than gasoline or diesel equipment.

	2020	2030	2050
GHG reduction ($MTCO_2e$)	0	200	1,140

Recommended actions:

- Buy hybrid and alternative fuel models when purchasing new City-owned landscaping equipment, as feasible.
- Conduct education campaigns and outreach events to property owners and landscaping companies about the availability of hybrid and alternative fuel landscaping equipment, including electric equipment, and available incentives such as the BAAQMD Lawn Mower Exchange.

Co-benefits:

Conserves resources

Improves public health

Summary of Total GHG Emissions

Collectively, the measures in this chapter achieve substantial GHG reductions for the years 2020, 2030, and 2050. **Tables 17** and **18** show the reductions achieved by topic, and **Figures 8** and **9** show these reductions relative to San Mateo's community-wide emissions.

Table 17: Absolute GHG Emissions Reductions by Measure Topic, 2020-2050 ($MTCO_2e$)

	2020	2030	2050
Building electrification	-1,500	-18,590	-94,380
Renewable energy	-450	-1,300	-
Energy efficiency	-1,250	-15,960	-34,900
Municipal energy efficiency and electrification	-0	-130	-280
Clean fuels	-3,680	-49,980	-95,690
Sustainable transportation	-1,480	-13,580	-41,140
Solid waste	-2,180	-19,920	-28,890
Water and wastewater	-20	-100	-240
Off-road equipment	-0	-200	-1,140
Total	**-10,560**	**-119,760**	**-295,660**

Note: Due to rounding, totals may not equal the sum of the component parts.

Table 18: Per-Capita GHG Emissions Reductions by Measure Topic, 2020-2050 ($MTCO_2e$ Per-Capita)

	2020	2030	2050
Building electrification	-0.01	-0.15	-0.65
Renewable energy	-<0.01	0.01	-0
Energy efficiency	-0.01	-0.13	-0.24
Municipal energy efficiency and electrification	-0	-<0.01	-<0.01
Clean fuels	-0.03	-0.41	-0.67
Sustainable transportation	-0.01	-0.11	-0.29
Solid waste	-0.02	-0.16	-0.20
Water and wastewater	-<0.01	-<0.01	-<0.01
Off-road equipment	-<0.01	-<0.01	-0.01
Total	**-0.10**	**-0.97**	**-2.06**

Note: Due to rounding, totals may not equal the sum of the component parts.

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Figure 8: San Mateo Absolute GHG Emissions with Reduction Measures, 2020-2050 ($MTCO_2e$)

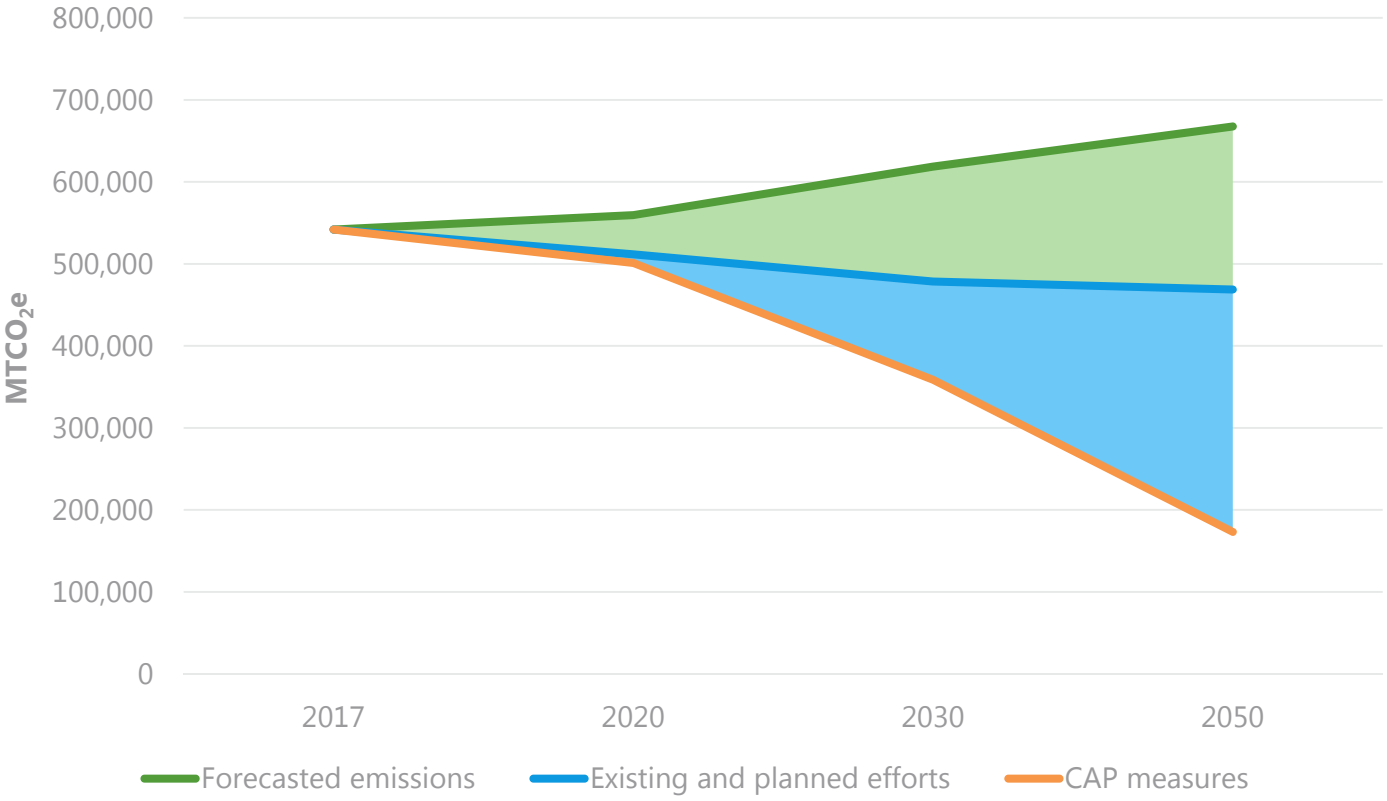
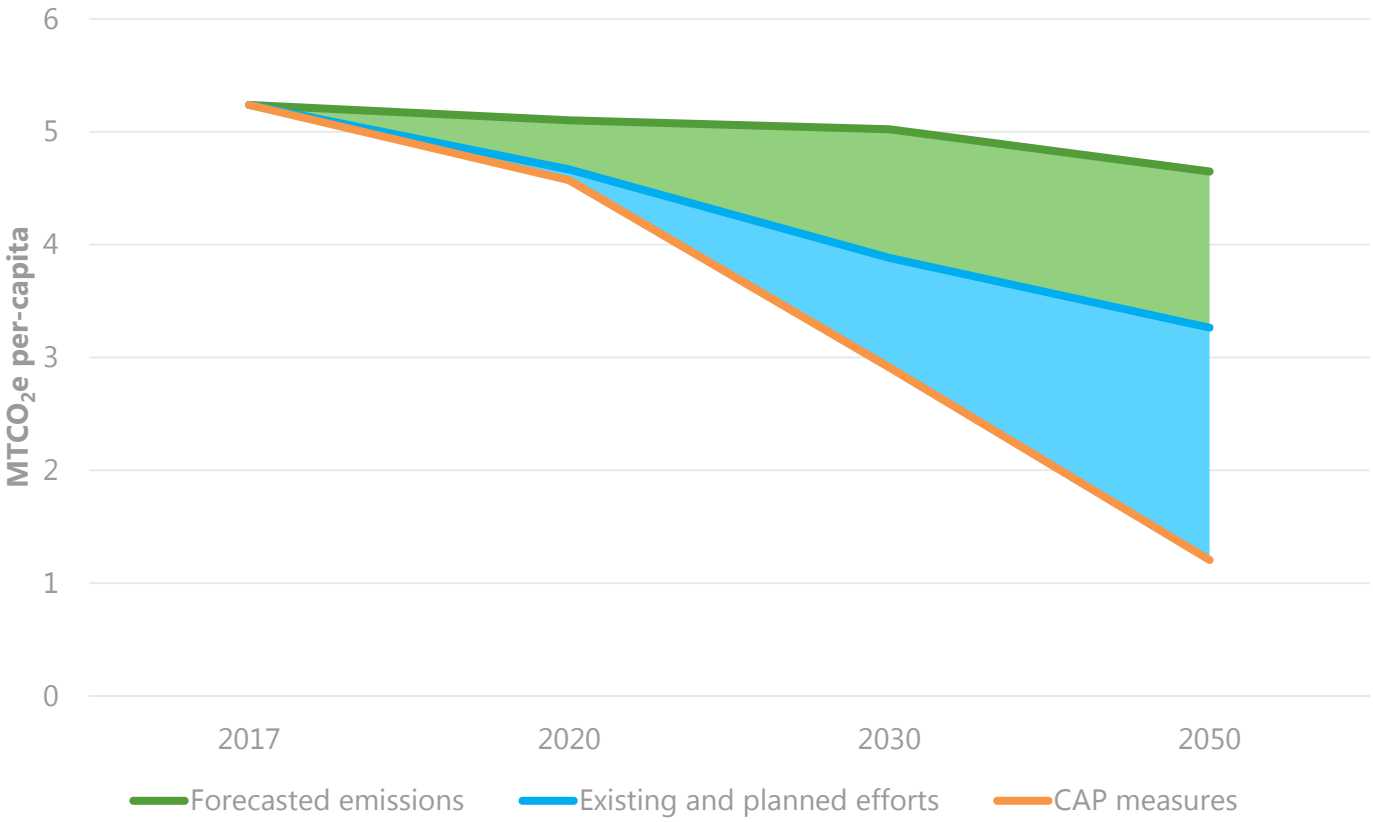


Figure 9: San Mateo Per-Capita GHG Emissions with Reduction Measures, 2020-2050 ($MTCO_2e$ Per-Capita)



In total, this CAP is projected to reduce San Mateo's GHG emissions to 501,110 $MTCO_2e$ (4.6 $MTCO_2e$ per-capita) by 2020, 358,610 $MTCO_2e$ (2.9 $MTCO_2e$ per-capita) by 2030, and 173,080 $MTCO_2e$ (1.2 $MTCO_2e$ per-capita) by 2050. These reductions allow San Mateo to meet its GHG reduction targets of 15% below 2005 levels (561,510 $MTCO_2e$) by 2020, 4.3 $MTCO_2e$ per-capita by 2030, and 1.2 $MTCO_2e$ per-capita by 2050.

It is likely that there will be new policies and regulations, technologies, personal and economic behaviors and preferences, and other factors that emerge in coming years. These factors cannot be accurately forecasted in this CAP, but they will likely be able to reduce GHG emissions beyond the level identified here. Future updates to the CAP will be able to better assess the GHG emission reductions from these factors and include them as part of San Mateo's GHG reduction strategy as appropriate. Future revisions to the CAP may include more stringent GHG reduction targets as they are feasible and appropriate.

CHAPTER 3

Technologies such as autonomous vehicles have the potential to significantly affect future GHG emissions, but the full effect of this and other emerging technologies cannot be accurately forecasted at this time.

Photo by PlaceWorks

Chapter 4

Implementation

Implementing the Climate Action Plan

To ensure the success of the 2020 CAP, the City of San Mateo will integrate the goals and strategies of this plan into other local and regional plans, and implement the programs and activities identified herein. As the City moves forward with updating other planning documents such as the General Plan, the San Mateo Municipal Code, or specific plans, staff will ensure that these documents support and are consistent with the CAP.

Implementing the CAP will require City leadership to execute these measures and report progress. This plan identifies a work plan that includes responsible departments, time frames, and relative costs associated with each measure. Staff will monitor progress using an implementation and monitoring tool on an annual basis and will provide an annual update to City decision-makers. The measures in this CAP are accompanied by a list of recommended actions, selected by City staff, members of the Sustainability and Infrastructure Commission, and members of the public. The list of recommended actions represents suggested means of achieving the measure, but are not a prescriptive path to implementation. Furthermore, not all of the listed actions may be necessary for the City to achieve its target. Due to ongoing changes in technology and regulations, and the emergence of new best practices and funding opportunities, this approach enables the City to adapt and leverage new opportunities or partnerships without being constrained by a specific implementation pathway. The City's sustainability program manager will serve as an ongoing advisor for CAP implementation. As part of annual progress reports, the sustainability program manager and City staff will evaluate the effectiveness of each measure to ensure that anticipated emissions reductions are occurring. If reductions do not occur as expected, the City can modify and add additional measures to the CAP to ensure the reduction target is achieved.

CHAPTER 4

The following programs are designed to guide San Mateo in successfully implementing the CAP.

IMPLEMENTATION MEASURES

Implementation Measure 1: Monitor and report progress toward Climate Action Plan target achievement on an annual basis.

Actions to support Implementation Measure 1:

- Assign responsibility for facilitating and supporting CAP implementation to the City's sustainability program manager.
- Identify key staff from each department responsible for supporting the sustainability program manager with information and updates for annual reporting and monitoring
- Continue to involve the Sustainability and Infrastructure Commission or other advisory bodies in reviewing and recommending CAP action items.
- Prepare an annual progress report on implementation of the recommended GHG reduction measures for review and consideration by the Sustainability and Infrastructure Commission and City Council. When information is available, provide updates on estimated GHG emissions reductions and current GHG emissions levels.
- Use the CAP implementation and monitoring tool to track GHG benefits from CAP implementation and identify progress toward the CAP reduction target.

Implementation Measure 2: Continue collaborative partnerships with agencies and community groups that support Climate Action Plan implementation.

Action to support Implementation Measure 2:

- Continue formal membership and participate in local and regional organizations that provide tools and support for energy efficiency, energy conservation, GHG emissions reductions, adaptation, public information, and implementation of this Plan.
- Participate as a member of the Regionally Integrated Climate Action Planning Suite (RICAPS) climate action planning effort to monitor available resources, programs, and funding to leverage with City CAP efforts.
- At the direction of City Council, commit to formal membership through joint powers authorities or other partnerships to implement high priority measures from the CAP.
- Provide policy input to partner agencies (e.g., League of Cities) on policy barriers that need to be addressed at the state level.

Implementation Measure 3: Secure necessary funding to implement the Climate Action Plan.

Actions to support Implementation Measure 3:

- Identify funding sources and levels for reduction measures as part of annual reporting.
- Include emissions reduction measures in department work plans, the capital improvement program, and other plans as appropriate.
- Pursue local, regional, State, and federal grants to support implementation.
- Explore dedicated funding sources for CAP implementation.
- Explore opportunities to allocate a portion of revenues from revenue-generating measures to CAP allocation.

Implementation Measure 4: Continue to update the baseline emissions inventory and Climate Action Plan every five years.

Actions to support Implementation Measure 4:

- Prepare a 2020 emissions inventory no later than 2022.
- Update the CAP no later than 2025 to incorporate new technology, practices, and other options to further reduce emissions.

WORK PLAN

The work plan in **Table 19** contains information to support staff and community implementation of the measures to effectively integrate them into budgets, the capital improvement program, and other programs and projects. Information about the sources of data to monitor implementation of each measure is given in **Appendix 2.** The measures of success included in **Table 19** are defined as follows:

Code: The abbreviation that is used to refer to the measure in the CAP and all corresponding workbooks.

Measure: The language used to guide actions needed for reductions.

GHG Reductions ($MTCO_2e$): Amount of GHG emissions reduced by 2020, 2030, and 2050.

City Staff Time: The estimated cost to the City (in staff hours) to complete implementation of the measure, ranked as follows:

- Low (less than 80 hours)
- Medium (80–500 hours)
- High (more than 500 hours)

Time Frame: The year by which a measure should be effective by year's end. The exact status of a measure will vary based on its actions, and many measures will be ongoing through and beyond 2030. An effective measure is one that will be actively on track to achieve its targeted GHG emissions reductions, support adaptation to climate change effects, or achieve long-term resilience. For a measure to be effective, the necessary programs and efforts should be active, and any infrastructure or other capital improvements should be in place. The effective year is not the end year, as many of the measures are programs that are intended to remain in effect for the foreseeable future, and so they do not have end dates. Time frames for effectively setting up the measures are described as follows:

- Immediate (by 2020)
- Near-Term (by 2023)
- Mid-Term (by 2025)
- Long-Term (by 2030)

Lead Department: The lead City department tasked with implementing the measure.

Table 19: CAP Implementation Work Plan

Measure	Measure	2020 GHG Reduction ($MTCO_2e$)	2030 GHG Reduction ($MTCO_2e$)	2050 GHG Reduction ($MTCO_2e$)	City Staff Time	Time Frame	Lead Department(s)
BE 1	All-electric new construction	-880	-4,640	-7,420	Medium	Near-term	City Manager's Office, Community Development
BE 2	All-electric existing buildings	-620	-13,950	-85,960	High	Near-term	City Manager's Office, Community Development
RE 1	Peninsula Clean Energy	-380	-1,060	-0	Low	Immediate	City Manager's Office
RE 2	Renewable energy systems for new and existing residences	-60	-170	-0	Medium	Immediate	City Manager's Office, Community Development
RE 3	Renewable energy systems for new and existing nonresidential buildings	-10	-70	-0	Medium	Immediate	City Manager's Office, Community Development
EE 1	Residential energy efficiency retrofits	--410	-6,030	-17,860	High	Near-term	City Manager's Office, Community Development
EE 2	Nonresidential energy efficiency retrofits	-840	-9,930	--17,040	High	Near-term	City Manager's Office, Community Development
EE 3	Residential tree planting	Less than -10	Less than -10	Less than -10	Low	Mid-term	City Manager's Office, Parks and Recreation

Measure	Measure	2020 GHG Reduction ($MTCO_2e$)	2030 GHG Reduction ($MTCO_2e$)	2050 GHG Reduction ($MTCO_2e$)	City Staff Time	Time Frame	Lead Department(s)
ME 1	Energy efficiency for new municipal buildings	Supportive	Supportive	Supportive	Medium	Mid-term	City Manager's Office, Public Works
ME 2	Energy efficiency at existing municipal buildings	-0	-20	-70	Medium	Near-term	City Manager's Office, Public Works
ME 3	All-electric municipal buildings	-0	-110	-210	Medium	Long-term	City Manager's Office, Public Works
CF 1	Electric vehicle charging infrastructure	-2,650	-29,630	-71,150	High	Immediate	City Manager's Office, Community Development, Public Works
CF 2	Electric vehicle education and outreach	-980	-17,050	-17,120	High	Immediate	City Manager's Office, Community Development
CF 3	Clean City fleet	-30	-170	-420	Low	Near-term	Public Works
CF 4	Clean fuel	-20	-3,130	-7,000	Medium	Long-term	City Manager's Office, Community Development, Public Works
ST 1	Bicycle mode share	-40	-240	-670	Medium	Mid-term	Community Development, Public Works

Measure	Measure	2020 GHG Reduction ($MTCO_2e$)	2030 GHG Reduction ($MTCO_2e$)	2050 GHG Reduction ($MTCO_2e$)	City Staff Time	Time Frame	Lead Department(s)
ST 2	Pedestrian mode share	-390	-760	-1,110	Low	Near-term	Community Development, Public Works
ST 3	Micromobility and shared mobility	Supportive	Supportive	Supportive	Low	Near-term	City Manager's Office, Public Works
ST 4	Public transit service	-830	-9,130	-25,110	Medium	Near-term	City Manager's Office, Public Works
ST 5	Commuter programs	-0	-130	-3,420	High	Mid-term	City Manager's Office, Community Development, Public Works
ST 6	Transportation Demand Management	-60	-2,330	-8,460	Medium	Immediate	Community Development, Public Works
ST 7	Transit-oriented development	-160	-990	-2,370	Low	Near-term	Community Development
SW 1	Composting program	-950	-12,650	-14,850	High	Immediate	Public Works
SW 2	Expanded recycling service	-810	-5,360	-8,530	High	Near-term	Public Works

Measure	Measure	2020 GHG Reduction ($MTCO_2e$)	2030 GHG Reduction ($MTCO_2e$)	2050 GHG Reduction ($MTCO_2e$)	City Staff Time	Time Frame	Lead Department(s)
SW 3	Waste awareness and source reduction	-420	-1,910	-5,510	Medium	Near-term	City Manager's Office, Public Works
WW 1	Water efficiency retrofits for existing buildings	-20	-100	-230	Medium	Mid-term	Public Works
WW 2	Water-efficient landscaping	Less than -10	Less than -10	Less than -10	Low	Near-term	Public Works
WW 3	Water efficiency in new construction	-0	Less than -10	-10	Medium	Mid-term	Community Development
OR 1	Alternative fuel lawn and garden equipment	-0	-200	-1,140	Medium	Mid-term	City Manager's Office, Parks and Recreation

Glossary

Activity: Any action that directly or indirectly results in GHG emissions. Examples include electricity use, vehicle use, and solid waste disposal. Activity data are a discrete measure of how much of an activity occurred in San Mateo in a certain year (e.g., how much electricity was used in 2015). The measurement unit of activity data varies depending on the activity.

Assembly Bill (AB) 32, California Global Warming Solutions Act of 2006: Establishes a comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective reductions of greenhouse gases (GHG) for the State of California. AB 32 designates the California Air Resources Board as the responsible agency for monitoring and reducing statewide GHG emissions to reduce emissions to 1990 levels by 2020.

Association of Bay Area Governments (ABAG): The regional planning agency for the nine counties and 101 incorporated cities in the San Francisco Bay Area.

Baseline year: The year against which future changes are measured. Many communities in California use a baseline year of 2005 through 2008 for consistency with AB 32; the San Mateo inventory uses a baseline year of 2005.

Building electrification: Replacing some or all of a building's natural gas-powered appliances or machinery with models that run on electricity. Since electricity releases much fewer GHGs (and in some cases no GHGs at all), there is a significant GHG reduction benefit. Building electrification is also called "fuel switching".

California Air Resources Board (CARB): A division of the California Environmental Protection Agency charged with protecting public health, welfare, and ecological resources through the reduction of air pollutants.

GLOSSARY

California Environmental Quality Act (CEQA): A State law requiring State and local agencies to regulate activities with consideration for environmental protection. If a proposed activity has the potential for a significant adverse environmental impact, an environmental impact report (EIR) must be prepared and certified as to its adequacy before action can be taken on the proposed project. General plans require the preparation of a program EIR.

California Green Building Standards Code (CALGreen, Title 24 Part 11): The California Green Building Standards Code, commonly referred to as the CALGreen Code, is a statewide mandatory construction code that was developed and adopted by the California Building Standards Commission and the Department of Housing and Community Development. The CALGreen standards require new residential and commercial buildings to comply with mandatory measures under the topics of planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CALGreen also provides voluntary tiers and measures that local governments may adopt that encourage or require additional measures in the five green building topics.

Carbon dioxide (CO_2): A colorless, odorless gas that occurs naturally in the earth's atmosphere. Significant quantities are also emitted into the air by fossil fuel combustion.

Carbon dioxide equivalent (CO_2e): A metric measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP.

Clean Car Fuel Standards (AB 1493, Pavley): Signed into law in 2002 and commonly referred to as Pavley standards. Requires carmakers to reduce greenhouse gas (GHG) emissions from new passenger cars and light trucks beginning in 2011. More recent standards, called the Advanced Clean Car Standards, took effect in 2016 and will require further GHG reductions from new vehicles.

Climate Action Plan (CAP): Strategic plans that establish policies and programs for reducing (or mitigating) a community's greenhouse gas emissions.

Climate change: The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another.

Co-benefit: An additional benefit occurring from the implementation of a greenhouse gas (GHG) reduction measure that is not directly related to reducing GHG emissions.

GLOSSARY

Complete streets: Complete streets policies ensure that transportation planners and engineers consistently design and operate the entire roadway with all potential users in mind. This includes private vehicles, bicyclists, public transportation vehicles and riders, and pedestrians of all ages and abilities.

Emissions factor: A number that describes the amount of greenhouse gases (GHG) released per unit of a certain activity (e.g., GHGs per unit of natural gas used). Factors are provided by utility companies, State agencies, and guidance documents.

Energy conservation: Reducing energy waste, such as turning off lights, heating, and motors when not needed.

Energy efficiency: Doing the same or more work with less energy, such as replacing incandescent light bulbs with compact fluorescent light bulbs or buying an Energy Star appliance to use less energy for the same or greater output.

Energy efficiency standards (Title 24 Part 6): California's energy efficiency standards, also called the California Energy Code (Part 6 of Title 24, the California Building Standards Code), were first adopted in 1978 and established minimum energy efficiency standards for residential and nonresidential buildings. These standards are updated every few years by providing more stringent energy budgets for new buildings to reduce California's energy consumption, eventually working toward a zero-net energy standard for new construction.

Energy Star: A joint program of the US Environmental Protection Agency and the US Department of Energy to provide consumers with information and incentives to purchase the most energy efficient products available.

Environmental Impact Report (EIR): A report required by the California Environmental Quality Act that assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a proposed action or project. See California Environmental Quality Act.

Global warming potential (GWP): An index used to translate the level of emissions of various gases into a common measure in order to compare the relative potency of different gases without directly calculating the changes in atmospheric concentrations. Greenhouse gases are expressed in terms of carbon dioxide equivalent. Global warming potentials are expressed in terms relative to carbon dioxide, which has a global warming potential of 1.

Green building: Sustainable or "green" building is a holistic approach to design, construction, and demolition that minimizes the building's impact on the environment, the occupants, and the community. See the California Green Building Standards Code (CALGreen) for green building regulations in California.

GLOSSARY

Greenhouse gas/gases (GHG): Gases that cause heat to be trapped in the atmosphere, warming the earth. GHGs are necessary to keep the earth warm but increasing concentrations of these gases are implicated in global climate change. GHGs include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride. The majority of GHGs come from natural sources, although human activity is also a major contributor.

Greenhouse gas (GHG) inventory: Provides estimates of the amount of GHGs emitted to and removed from the atmosphere by human activities. A city or county that conducts an inventory looks at both community emissions sources and emissions from government operations. A base year is chosen and used to gather all data from that year. Inventories include data collection from such things as vehicle miles traveled, energy usage from electricity and gas, and waste.

Greywater: Wastewater collected from showers, bathtubs, dishwashers, bathroom sinks, and clothes washing machines that is reused on-site for irrigation and other non-potable (i.e. non-drinkable) purposes.

Low Carbon Fuel Standard (LCFS): An executive order from former Governor Schwarzenegger, the LCFS established the goal of reducing the carbon intensity of fuels used for transportation and off-road vehicles in California by 10% by 2020.

Metropolitan Planning Organization (MPO): A federally funded transportation planning organization comprising representatives from local government agencies and transportation authorities.

Metropolitan Transportation Commission (MTC): The MPO for the nine-county San Francisco Bay Area. It is responsible for securing and distributing funding for transportation planning and construction projects, working with local and regional public transit providers to improve the effectiveness of service, and encouraging development within existing urbanized areas to minimize the loss of agriculture and open space. It also operates the region's seven state-owned toll bridges and the Clipper transit fare card.

Micromobility: A mode of transportation that uses lightweight, usually powered, devices, such as electric scooters, electric-assist bicycles, and electric skateboards.

Mixed-fuel building: A building that uses multiple sources of energy to operate applies and devices. In most of California, including San Mateo, this refers to buildings that use both electricity and natural gas.

Peninsula Clean Energy (PCE): A community choice aggregation program run by the local governments of San Mateo County to provide electricity to San Mateo County community members. PCE purchases electricity on behalf of its customers and distributes it through existing power lines owned by PG&E. It is the default electricity supplier for San Mateo County.

Quantification: The process of determining the amount of greenhouse gas emissions reduced by each measure.

Recycled water: Wastewater from tubs, toilets, and sinks inside homes and offices that is cleaned through a treatment process, producing non-potable water that is safe for landscapes, raw vegetable crops, and agricultural crops.

Reduction measure: A goal, strategy, program, or set of actions that target and reduce a specific source of greenhouse gas emissions.

Regional Transportation Plan (RTP): A long-term blueprint of the region's transportation systems. The RTP is a federally mandated comprehensive long-range regional planning document that identifies the region's transportation needs, sets forth an action plan of projects, determines actions and programs to address the needs and issues, and documents the financial resources needed to implement the RTP. Plan Bay Area, the combined RTP and SCS for the nine-county San Francisco Bay Area, was last adopted in 2017.

Renewable energy: Energy from sources that regenerate and are less damaging to the environment, such as solar, wind, biomass, and small-scale hydroelectric power.

Renewables Portfolio Standard (RPS): A regulation requiring utility companies in California to increase the production of renewable energy from solar, wind, or biomass, or geothermal sources.

Sector: A category of activities responsible for greenhouse gas (GHG) emissions, such as transportation, water use, or energy use. Sectors may comprise multiple GHG sources and activities.

Senate Bill (SB) 97: Requires lead agencies to analyze greenhouse gas emissions and climate change impacts under the California Environmental Quality Act.

Senate Bill (SB) 375: Directs the metropolitan planning organizations in California to create a sustainable communities strategy (SCS) as part of the regional transportation plan. The SCS will demonstrate how the region will achieve the 2020 and 2035 greenhouse gas emissions reduction targets for the region set by the California Air Resources Board.

Shared mobility: A means of transportation using shared devices, such as bicycles and scooters, that users rent for short periods of time.

Sustainability: Community use of natural resources in a way that does not jeopardize the ability of future generations to live and prosper.

GLOSSARY

Sustainable Communities Strategy (SCS): The land use element of each metropolitan planning organization's regional transportation plan as required by Senate Bill 375. The SCS will demonstrate how the region will achieve the 2020 and 2035 vehicle miles traveled and greenhouse gas emissions reduction targets for the region set by the California Air Resources Board. Plan Bay Area, the combined RTP and SCS for the nine-county San Francisco Bay Area, was last adopted in 2017.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Transit-oriented development (TOD): A mixed-use residential or commercial area designed to maximize access to transit options.

Transportation demand management (TDM): A voluntary or mandatory program developed by local agencies, large employers, or high traffic commercial services to limit the amount of congestion and pollution related to transportation demand. TDM plans may include incentives, regulations, and education about transportation alternatives.

Transportation network company (TNC): A company whose service allows users to request an on-demand ride from drivers using their own personal vehicles to transport users. Lyft and Uber are the most prominent examples.

Vehicle miles traveled (VMT): A key measure of overall street and highway use. Reducing VMT is often a major objective in efforts to reduce vehicular congestion and achieve regional air quality goals.

Water conservation: Reducing water use, such as by turning off taps, shortening shower times, and reducing outdoor irrigation demand.

Water-efficient landscape: Native or low-water-using landscapes. Water-efficient landscapes are required by law in all cities and counties in California to conserve water.

Water use efficiency: Replacing older technologies and practices in order to accomplish the same results with less water, for example, by replacing toilets with new high efficiency models and by installing "smart controllers" in irrigated areas.

Zero net energy: Generating as much energy as is used, over the course of a year. For example, a zero net energy building will generate as much energy on-site as it uses annually.

Works Cited

This list is a general list of sources used to broadly inform preparation of the 2020 CAP. **Appendix A** lists the sources used to specifically quantify individual GHG reduction measures.

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures*. http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

California Air Resources Board. 2011. "Local Government Operations Protocol for Greenhouse Gas Assessments". https://ww3.arb.ca.gov/cc/protocols/localgov/localgov.htm.

———. 2018. "AB 32 Scoping Plan". https://ww3.arb.ca.gov/cc/scopingplan/scopingplan.htm.

California Energy Commission. "Cal-Adapt". https://cal-adapt.org/.

California Governor's Office of Emergency Services, California Energy Commission, and California Natural Resources Agency. "California's Fourth Climate Change Assessment". http://www.climateassessment.ca.gov/.

City of San Mateo. 2015. *San Mateo 2015 Climate Action Plan*. https://www.cityofsanmateo.org/DocumentCenter/View/65426/San-Mateo-CAP---Adopted?bidId=.

———. 2019. "CAP Progress Updates". https://www.cityofsanmateo.org/3962/CAP-Progress-Updates.

County of San Mateo. 2019. "RICAPS Program". https://performance.smcgov.org/stories/s/RICAPS/xzkp-fn3v/.

ICLEI Local Governments for Sustainability USA. 2012. US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. http://www.icleiusa.org/tools/ghgprotocol/community-protocol.

Intergovernmental Panel on Climate Change. 2013. IPCC Fifth Assessment Report: Climate Change 2013: The Physical Science Basis. http://www.ipcc.ch/report/ar5/wg1/.

Works Cited

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City of San Mateo
Climate Action Plan

Appendix 1:

Technical Appendix: Methods and Assumptions

GHG Reduction Measure Quantification

This appendix summarizes data sources, assumptions, and performance metrics used to calculate greenhouse gas emissions reductions for the City of San Mateo Climate Action Plan. The sources and metrics are organized by measure and rely on four primary types of data and research: (1) San Mateo's GHG emissions inventory and forecast, (2) government agency tools and reports, (3) case studies in similar jurisdictions, and (4) scholarly research.

Further, the quantification approaches are consistent with guidance provided by the Bay Area Air Quality Management District (BAAQMD) for development of a Qualified GHG Reduction Strategy. The baseline GHG inventory and forecast serve as the foundation for the quantification of the City's GHG reduction measures. Activity data from the inventory form the basis of measure quantification, including vehicle miles traveled (VMT), kilowatt-hours (kWh) of electricity or therms of natural gas consumed, and tons of waste disposed. Activity data were combined with the performance targets and indicators identified by the City and consultants. The activity data and performance targets and indicators were used throughout the quantification process to calculate the emissions reduction benefit of each measure. This approach ensures that San Mateo's GHG emissions reductions are tied to the baseline and to future activities occurring within the City.

APPENDIX 1

Emissions Factors

Table 1-1 lists the emissions factors used to quantify emissions reductions in the CAP. These emission factors reflect the GHG reductions from existing and planned accomplishments, as well as PCE, to the extent feasible. They do not reflect the average emission factors with full implementation of this CAP.

Table 1-1: Emissions Coefficients for CAP Measures

Source	2005	2017	2020	2030	2050	Source
$MTCO_2e$ per mile driven (with Pavley)	0.000464	0.000380	0.000354	0.000274	0.000244	EMFAC 2017
$MTCO_2e$ per Caltrain passenger mile	0.004370	0.002778	0.002778	0.002778	0.002778	Caltrain, US Community Protocol
$MTCO_2e$ per kWh (PCE)	-	0.000064	0.000022	0.000000	0.000000	PCE, US EPA
$MTCO_2e$ per kWh (PG&E)	0.000223	0.000183	0.000183	0.000133	0.000000	PG&E, US EPA
$MTCO_2e$ per kWh (direct access)	0.000362	0.000191	0.000184	0.000132	0.000000	CEC, US EPA
$MTCO_2e$ per kWh (weighted community average)	0.000224	0.000097	0.000037	0.000012	0.000000	PCE, PG&E, CEC, US EPA
$MTCO_2e$ per therm	0.005312	0.005312	0.005312	0.005312	0.005312	US Community Protocol
$MTCO_2e$ per ton of waste	0.192803	0.210421	0.210421	0.210421	0.210421	CARB Landfill Emissions Tool v1.3

These emissions coefficients were calculated as follows, using data from the GHG inventory and forecast:

- **$MTCO_2e$ per mile driven:** Divide the emissions from on-road transportation by the number of on-road vehicle miles traveled.
- **$MTCO_2e$ per passenger mile**: For Caltrain, divide the emissions from Caltrain activities related to San Mateo by the number of passenger miles attributed to San Mateo.
- **$MTCO_2e$ per kWh:** Divide the sum of the emissions for residential and commercial electricity use by the sum of the kWh for these two sources, for each electricity provider.

- **$MTCO_2e$ per therm:** Divide the sum of the emissions from residential and commercial natural gas by the sum of the therms used by these two sources.
- **$MTCO_2e$ per ton of waste:** Divide the sum of the emissions from landfilled waste and waste in place by the sum of the tons of waste in these sources.

TECHNICAL DATA FOR EXISTING AND PLANNED LOCAL AND REGIONAL ACTIVITIES

Data sources, methods, and assumptions for the quantification of the existing and planned local and regional activities are provided below. Note that some existing and planned local activities may not have assumptions and/or performance metrics. The GHG reductions shown for existing and planned local and regional activities is only in addition to any reductions achieved by existing or planned State efforts.

Peninsula Clean Energy

GHG Reduction

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	19,840	28,730	0

Performance Indicators

	2020	2030	2050
Electricity supplied by PCE (kWh)	470,663,200	495,509,370	496,143,950
PCE electricity supplied to ECO 100 customers (kWh)	10,550,640	10,550,640	10,550,640

GHG Method

For overall electricity supplied by PCE, the project team identified the current fraction of community electricity supplied by PCE and applied this ratio to future projections of electricity use. The team subtracted the amount of PCE-supplied electricity in 2018 from this future projection to obtain the increase in PCE electricity supplies, then multiplied this value by an emissions factor that reflects PCE's future energy procurement plans. For ECO 100, the project team identified how much electricity is served to ECO 100 and applied an emissions factor that reflects the community's weighted average of electricity sources to determine the overall amount of averted emissions.

APPENDIX 1

GHG Sources

California Energy Commission. 2018. *2017 Power Content Label: Peninsula Clean Energy*. https://ww2.energy.ca.gov/pcl/labels/2017_labels/PCE_2017_PCL.pdf.

Peninsula Clean Energy. 2018. *Board Correspondence, December 10, 2018: Update on PCE's Marketing and Outreach Activities*. https://www.peninsulacleanenergy.com/wp-content/uploads/2018/12/2018-12-20-PCE-BOD-Agenda-Packet-FINAL.pdf.

Totah, M, A. 2018. Peninsula Clean Energy. Personal communication to A. Chow, City of San Mateo. November 19.

Energy efficiency retrofits

Activity and GHG Reductions

	2020	2030	2050
Electricity savings (kWh)	716,330	716,330	716,330
Natural gas savings (therms)	-860	-860	-860
Emissions reduction ($MTCO_2e$)	50	30	30

GHG Method

The project team collected data on the savings from energy efficiency retrofits, as reported by the San Mateo County Energy Watch and BayREN. The team then multiplied these values by the appropriate emissions factor in order to calculate GHG reductions.

GHG Sources

Londer, R. 2018. County of San Mateo. Personal communication to E. Krispi, PlaceWorks. December 3.

Londer, R. 2018. County of San Mateo. Personal communication to E. Krispi, PlaceWorks. December 5.

APPENDIX 1

Solar energy installation

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	3,592,650	3,592,650	3,592,650
Emissions reduction ($MTCO_2e$)	100	10	0

GHG Method

The project team obtained data on the number and generation potential of new solar energy installations in San Mateo. The team then used a National Renewables Energy Laboratory tool to determine how much electricity can be produced in San Mateo, on average, per kilowatt of generation potential, and calculated the total electricity generated annually from these installations. The project team applied a weighted average community electricity emissions factor to this total to determine GHG reductions.

GHG Sources

Chow, A. 2018. City of San Mateo. Personal communication to E. Krispi, PlaceWorks. December 28.

National Renewable Energy Laboratory. n.d. "PVWatts Calculator". https://pvwatts.nrel.gov/.

Kleinbaum, Kathy. n.d. City of San Mateo. Personal correspondence to Tammy Seale, PlaceWorks.

Technical Appendix: Methods and Assumptions

Caltrain shuttles

Activity and GHG Reduction

	2020	2030	2050
VMT savings	47,740	47,740	47,740
Emissions reduction ($MTCO_2e$)	20	10	10

Performance Indicators

	2020	2030	2050
Annual ridership increase	3,910	3,910	3,910
Average trip length (miles)	13.9	13.9	13.9

GHG Method

The project team reviewed reports showing the increase in shuttle ridership from 2017 to 2018 and the average length of each trip. The team used this information to calculate the total annual VMT reduction associated with the Caltrain shuttles and applied the VMT emissions factor to determine the GHG reductions associated with this existing accomplishment.

GHG Sources

San Mateo County Economic Development Association. 2012. *Labor Supply and Commute Patterns in San Mateo County*. http://www.bayareaeconomy.org/files/pdf/BACEI_Labor_Mobility_110612.pdf.

Ford, J. 2019. Peninsula Traffic Congestion Relief Alliance (commute.org). Personal communication to A. Chow, City of San Mateo. January 10.

APPENDIX 1

Electric vehicle adoption

GHG Assumptions

	2020	2030	2050
Projected EV adoption rate by State	1.63%	3.92%	5.31%

GHG Reduction

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	3,420	0	0

Performance Indicators

	2020	2030	2050
Projected EV adoption rate (at current levels)	2.02%	2.02%	2.02%
Net increase in EV VMT	9,873,684	0	0
Net increase in electricity use (kWh)	-3,357,050	0	0

GHG Method

The project team reviewed current data for EV adoption in San Mateo and compared it to projections of EV adoption prepared by the State. For years where the current EV adoption rate exceeded the State projections, the team used inventory and forecast data to identify the additional VMT that would be driven by EVs. The team then looked at the amount of electricity needed to power these additional EVs. Next, the project team applied the appropriate emissions factor to the VMT projections and increased electricity use and took the net difference as the overall GHG savings.

GHG Sources

California Air Resources Board. 2017. "EMFAC2017 Web Database". https://www.arb.ca.gov/emfac/2017/.

California Department of Motor Vehicles. 2018. *Fuel Type by City as of 1/1/2018*. https://www.dmv.ca.gov/portal/wcm/connect/c24637c9-5faf-4fe2-9375-9b5221a2ef4a/MotorVehicleFuelTypes_City.pdf?MOD=AJPERES&CVID=.

US Environmental Protection Agency. n.d. "Interactive Version of the Electric Vehicle Label". https://www.epa.gov/fueleconomy/interactive-version-electric-vehicle-label.

Public-access EV chargers

GHG Reduction

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	10	10	10

Performance Indicators

	2020	2030	
Net increase in EV VMT	28,200	28,200	28,200
Net increase in electricity use (kWh)	9,600	9,600	9,600

GHG Method

The project team collected information on the number of public EV chargers in San Mateo and used factors about the average charging use of public EV chargers to estimate how many VMT of EV use the public chargers in the community support annually. The project team then estimated the electricity use from these EV chargers. Next, the team applied the appropriate emissions factors to the VMT and electricity use figures and took the difference between the two as the net reduction in GHG emissions.

GHG Sources

ICLEI – Local Governments for Sustainability. n.d. Climate and Air Pollution Planning Assistant v 1.5.

US Environmental Protection Agency. n.d. "Interactive Version of the Electric Vehicle Label". https://www.epa.gov/fueleconomy/interactive-version-electric-vehicle-label.

APPENDIX 1

Transportation Demand Management

Activity and GHG Reduction

	2020	2030	2050
Transportation savings (VMT)	752,750	753,390	733,700
Emissions reduction ($MTCO_2e$)	270	210	180

GHG Method

The project team obtained information from the San Mateo Rail Corridor Area Transportation Management Agency to identify the mandatory reductions in trip generation as a result of existing and under-construction developments subject to TDM provisions, and combined this information with results from the inventory and forecast to estimate the decrease in VMT resulting from TDM. The project team applied the community-wide VMT emissions coefficient to this figure to determine the GHG reductions.

GHG Sources

Lim, L. 2019. City of San Mateo. Personal communication to A. Chow, City of San Mateo. January 3.

Composting

Activity and GHG Reduction

	2020	2030	2050
Waste savings (tons)	4,090	4,090	4,090
Emissions reduction ($MTCO_2e$)	1,800	1,800	1,800

GHG Method

The project team looked at the number of participating residences and nonresidential organizations participating in the community's composting program. The team used results of a statewide waste characterization study to estimate the total amount of organic waste generated by the participants and combined this information with technical factors for waste decomposition by materials to identify the total reduction in GHG emissions.

GHG Sources

California Air Resources Board. 2010. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories version 1.1*. https://ww3.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf

California Air Resources Board. 2011. Landfill Emissions Tool version 1.3. https://ww3.arb.ca.gov/cc/landfills/landfills.htm

California Department of Resources Recycling and Recovery. 2015. *2014 Disposal-Facility-Based Characterization of Solid Waste in California*. https://www2.calrecycle.ca.gov/Publications/Details/1546.

Murray, R. 2018. City of San Mateo. Personal communication to A. Chow, City of San Mateo. November 15.

APPENDIX 1

Caltrain electrification

Activity and GHG Reduction

	2020	2030	2050
Electricity use increase (kWh)	0	10,921,680	10,921,680
Emissions reduction ($MTCO_2e$)	0	3,450	3,880

GHG Method

The project team reviewed information from the Caltrain electrification project EIR to estimate decreases in diesel use and increases in electricity use from electrification. The team combined these data with information from the inventory to scale these changes in activity data specifically to San Mateo. The team applied the Caltrain emissions factors from the inventory to determine net GHG reductions from electrification.

GHG Sources

Peninsula Corridor Joint Powers Board. 2014. *Peninsula Corridor Electrification Project Draft Environmental Impact Report.* http://www.caltrain.com/projectsplans/CaltrainModernization/Modernization/PeninsulaCorridorElectrificationProject/PCEP_DEIR_2014.html.

Sustainable Solutions Turnkey program

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	0	1,708,530	1,708,530
Natural gas savings (therms)	0	10,910	10,910
Emissions reduction ($MTCO_2e$)	0	60	60

GHG Method

The project team reviewed the results of the energy efficiency analysis provided by PG&E, which identifies anticipated electricity and natural gas savings from implementing the SST retrofits. The team applied the appropriate electricity and natural gas emissions factor to determine the overall GHG reduction.

GHG Sources

Chow, A. 2019. City of San Mateo. Personal communication to E. Krispi, PlaceWorks. November 6

San Mateo SST – On-Bill Financing Loan and Energy Savings Summary [data table].

APPENDIX 1

TECHNICAL DATA FOR QUANTIFIED MEASURES

Data sources, methods, and assumptions for the quantification of CAP measures are provided below.

BE 1 All-electric new construction

Assumptions

	2020	2030	2050
Cumulative % of residential construction influenced by energy efficiency reach code:	35%	35%	40%
Cumulative % of office commercial construction influenced by energy efficiency reach code:	35%	35%	35%
Cumulative % of non-office commercial construction influenced by energy efficiency reach code:	0%	20%	35%
Cumulative % new non-residential buildings that are office space:	40%	40%	40%

Activity and GHG reductions

	2020	2030	2050
Electricity savings (kWh)	-441,650	-2,386,810	-3,903,360
Natural gas savings (therms)	167,970	874,230	1,395,480
Emissions reduction ($MTCO_2e$)	880	4,640	7,420

Performance indicators

	2020	2030	2050
Number of all-electric new construction residential housing units	480 new construction residential housing units built all-electric.	2,730 new construction residential housing units built all-electric.	5,520 new construction residential housing units built all-electric.
Square feet of all-electric new construction non-residential buildings	24,560 square feet of new construction non-residential buildings built all-electric.	548,730 square feet of new construction non-residential buildings built all-electric.	2,508,810 square feet of new construction non-residential buildings built all-electric.

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

GHG Method

The project team obtained data from the 2030 General Plan Land Use Element on projected buildout of nonresidential buildings in San Mateo and data from Association of Bay Area Governments (ABAG) Plan Bay Area on projected buildout of households in San Mateo out to 2050, and used these data to estimate the number of new buildings that would be impacted by an all-electric new construction reach code. The team identified the average amount of natural gas used per household are per nonresidential square foot and data on the equivalent amount of electricity that would be required in an all-electric version of similar buildings, and applied this information to the projected number of new buildings built in order to estimate the projected reduction in natural gas consumption and the projected increase in electricity consumption resulting from the policy. The team then applied the emission factor for avoided natural gas consumption to estimate the emissions reduction associated with reduced natural gas consumption, and the emission factor for electricity use to estimate the emissions increase associated with increased electricity consumption. The net resulting emissions is the estimated emissions avoided from the policy.

GHG Sources

California Energy Commission. 2006. "California Commercial End-Use Survey". https://ww2.energy.ca.gov/ceus/2006_enduse.html

California Energy Commission. 2009. "2009 California Residential Appliance Saturation Study". https://ww2.energy.ca.gov/appliances/rass/previous_rass.html

APPENDIX 1

BE 2 All-electric existing buildings

Assumptions

	2020	2030	2050
Cumulative percent of commercial buildings that are office space	40%	40%	40%
Cumulative percent of residential gas equipment reaching end of life replaced with electric due to panel incentive	5%	10%	20%
Cumulative percent of residential electrical panel upgrades resulting in EV purchase	15%	20%	25%
Cumulative percent of office gas equipment reaching end of life replaced with electric due to panel incentive	5%	10%	20%
Cumulative percent of office electrical panel upgrades resulting in EV charging installation	10%	10%	15%
Cumulative percent of EV purchases replacing gasoline vehicle	99%	98%	96%
Cumulative percent of EV purchases replacing diesel vehicle	1%	2%	4%

Activity and GHG reductions

	2020	2030	2050
Electricity savings (kWh)	-444,130	-9,897,890	-61,334,800
Natural gas savings (therms)	63,350	1,393,740	7,855,640
Emissions reduction ($MTCO_2e$)	620	13,950	85,960

Performance indicators

	2020	2030	2050
Existing residential gas to electric HVAC conversions	130 existing residential gas HVAC systems replaced with electric HVAC systems.	2,860 existing residential gas HVAC systems replaced with electric HVAC systems.	16,100 existing residential gas HVAC systems replaced with electric HVAC systems.
Existing residential gas to electric water heating conversions	190 existing residential gas water heaters replaced with electric HVAC systems.	4,280 existing residential gas water heaters replaced with electric HVAC systems.	24,150 existing residential gas water heaters replaced with electric HVAC systems.
Existing residential gas to electric clothes drying conversions	190 existing residential gas clothes dryers replaced with electric clothes dryers.	4,280 existing residential gas clothes dryers replaced with electric clothes dryers.	24,150 existing residential gas clothes dryers replaced with electric clothes dryers.
Existing residential gas to electric cooking conversions	160 existing residential gas ranges and ovens replaced with electric ranges and ovens.	3,430 existing residential gas ranges and ovens replaced with electric ranges and ovens.	19,320 existing residential gas ranges and ovens replaced with electric ranges and ovens.
Existing residential electrical panel upgrades	340 existing residential electrical panels upgraded.	7,430 existing residential electrical panels upgraded.	41,860 existing residential electrical panels upgraded.
Square feet of existing offices receiving gas to electric HVAC conversions	32,560 square feet of existing office buildings replace existing gas HVAC systems with electric HVAC systems.	716,370 square feet of existing office buildings replace existing gas HVAC systems with electric HVAC systems.	4,037,710 square feet of existing office buildings replace existing gas HVAC systems with electric HVAC systems.
Square feet of existing offices receiving gas to electric water heating conversions	48,840 square feet of existing office buildings replace existing gas water heaters with electric water heaters.	1,074,550 square feet of existing office buildings replace existing gas water heaters with electric water heaters.	6,056,560 square feet of existing office buildings replace existing gas water heaters with electric water heaters.

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	2020	2030	2050
Square feet of existing offices receiving gas to electric cooking conversions	39,070 square feet of existing office buildings replace existing gas ranges and ovens with electric ranges and ovens.	859,640 square feet of existing office buildings replace existing gas ranges and ovens with electric ranges and ovens.	4,845,250 square feet of existing office buildings replace existing gas ranges and ovens with electric ranges and ovens.
Square feet of existing offices receiving electrical panel upgrades	60,240 square feet of existing office buildings electrical panels upgraded.	1,325,280 square feet of existing office buildings electrical panels upgraded.	7,469,760 square feet of existing office buildings electrical panels upgraded.
Number of electric vehicles purchased/leased to replace internal combustion engine (ICE) vehicles	60 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	1,720 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	12,450 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.
Existing office parking spaces with EV charging:	10 EV charging ports installed at existing office buildings.	270 EV charging ports installed at existing office buildings.	2,240 EV charging ports installed at existing office buildings.
Existing residential parking spaces with EV charging:	50 EV charging ports installed at existing residential buildings.	1,490 EV charging ports installed at existing residential buildings.	10,460 EV charging ports installed at existing residential buildings.

GHG Method

The project team used data from the 2030 General Plan Land Use Element on projected buildout of nonresidential buildings in San Mateo and data from Association of Bay Area Governments (ABAG) Plan Bay Area on projected buildout of households in San Mateo out to 2050 to estimate the number of existing buildings that would be impacted by a policy aimed at providing incentives to encourage residents and businesses to upgrade electric panels and adopt all-electric technologies. The team identified the percent of natural gas equipment (e.g. water heaters) that would be replaced at end of life if this policy existed, using the average life of natural gas equipment to estimate the number of each type of equipment type that would be replaced per year. Next, the project team consulted reports on the average amount of natural gas consumed by each type of equipment to estimate the natural gas consumption avoided through electrification of natural gas equipment. The team used data on energy factors by equipment type to estimate the resulting increase in electricity use resulting from the replacement of natural gas equipment with electric equipment. The team also identified performance indicators for the percent of EV chargers that would be installed as a result of this policy

and the resulting number of EVs that would be purchased due to accessibility of charging. The team used data on the average VMT by a passenger vehicle, average efficiency of gasoline vehicles, average efficiency of diesel vehicles, and average efficiency of electric vehicles to estimate the resulting gasoline and diesel consumption avoided and increase in electricity use resulting from the replacement of gasoline and diesel vehicles with electric vehicles. Last, the team applied the appropriate emission factors for natural gas consumption, electricity use, gasoline consumption, and diesel consumption to estimate the emissions reduction associated with a reduction in natural gas consumption, gasoline consumption, and diesel consumption and the increase in emissions associated with an increase in electricity consumption. The net resulting emissions is the estimated emissions avoided from the policy.

GHG Sources

California Energy Commission. 2006. "California Commercial End-Use Survey". https://ww2.energy.ca.gov/ceus/2006_enduse.html

California Energy Commission. 2009. "2009 California Residential Appliance Saturation Study". https://ww2.energy.ca.gov/appliances/rass/previous_rass.html

RSMeans. 2019 RSMeans Online, 2019 [software package].

ASHRAE, 2017. "ASHRAE Technical FAQ". https://www.ashrae.org/technical-resources/technical-faqs

US Department of Energy. 2019. www.fueleconomy.gov. https://www.fueleconomy.gov/.

California Air Resources Board. 2017. "EMFAC2017 Web Database". https://www.arb.ca.gov/emfac/2017/.

National Renewable Energy Laboratory. 2018. "CEC EV Infrastructure Projection Tool (EVI-Pro)". https://afdc.energy.gov/evi-pro-lite.

APPENDIX 1

RE I Peninsula Clean Energy

GHG Assumptions

	2020	2030	2050
Percent of residents enrolling in PCE	98%	99%	99.5%
Percent of businesses enrolling in PCE	98%	99%	99.5%
Percent of direct access customers switching to PCE	0%	2%	5%

GHG Reductions

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	380	1,060	0

Performance Indicators

	2020	2030	2050
PCE opt-out rate	2.0%	1.0%	0.5%
kWh supplied by ECO 100	15,009,960	28,976,980	53,073,310

GHG Method

The project team identified the amount of electricity from San Mateo customers projected to switch from PG&E to PCE service, and PCE customers upgrading to ECO 100. The team next applied the difference in PG&E and PCE emissions factors for both regular and ECO 100 service to identify the decrease in GHG emissions.

GHG Sources

California Energy Commission. 2018. *2017 Power Content Label: Peninsula Clean Energy*. https://ww2.energy.ca.gov/pcl/labels/2017_labels/PCE_2017_PCL.pdf.

Peninsula Clean Energy. 2018. *Board Correspondence, December 10, 2018: Update on PCE's Marketing and Outreach Activities*. https://www.peninsulacleanenergy.com/wp-content/uploads/2018/12/2018-12-20-PCE-BOD-Agenda-Packet-FINAL.pdf.

RE 2 Renewable energy systems for new and existing residences

GHG Assumptions

	2020	2030	2050
Percent of existing homes installing solar energy systems	4%	15%	30%
Percent of existing homes with solar energy systems installing battery storage systems	1%	20%	50%
Percent of new homes installing battery storage systems	2%	25%	60%

GHG Reduction

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	60	170	0

Performance Indicators

	2020	2030	2050
Number of homes built before 2018 with solar panels	420	4,700	10,540
Number of total homes (existing and new) with battery energy systems	40	3,480	14,650

GHG Method

For solar energy systems, the project team identified the number of existing homes in San Mateo that could be projected to have a solar energy system. Using data from the National Renewable Energy Laboratory, the team identified how much electricity these solar energy systems could generate annually and applied the community-wide electricity factor to identify electricity savings. For battery systems, the team identified the number of new and existing homes installing solar energy systems and determined the number of these homes that could install a battery energy system. Assuming that battery systems fully charge and discharge once a day, the team identified how much additional renewable energy storage capacity would be enabled by the batteries. The project team then again applied the community-wide electricity factor to identify electricity savings.

GHG Sources

National Renewable Energy Laboratory. n.d. "PVWatts Calculator". https://pvwatts.nrel.gov/.

Regional Climate Action Planning Suite. 2019. RICAPS Menu of Measures version 4.1 [data table].

APPENDIX 1

RE 3 Renewable energy systems for new and existing nonresidential buildings

GHG Assumptions

	2020	2030	2050
Percent of existing businesses installing solar energy systems	1.50%	6%	15%
Percent of existing businesses with solar energy systems installing battery storage systems	1%	15%	40%

GHG reductions

	2020	2030	2050
Emissions reduction ($MTCO_2e$)	10	70	0

Performance indicators

	2020	2030	2050
Number of businesses built before 2018 with solar panels	10	200	580
Number of existing businesses with battery energy systems	0	40	250

GHG Method

The project team identified the number of existing businesses in San Mateo that could be projected to have a solar energy system. Using data from the National Renewable Energy Laboratory, the team identified how much electricity these solar energy systems could generate annually and applied the community-wide electricity factor to identify electricity savings. Next, the team identified the number of existing businesses installing solar energy systems and determined the number of these businesses that could install a battery energy system. Assuming that battery systems fully charge and discharge once a day, the team identified how much additional renewable energy storage capacity would be enabled by the batteries. The project team then again applied the community-wide electricity factor to identify electricity savings.

GHG Sources

National Renewable Energy Laboratory. n.d. "PVWatts Calculator". https://pvwatts.nrel.gov/.

Regional Climate Action Planning Suite. 2019. RICAPS Menu of Measures version 4.1 [data table].

EE 1 Residential energy efficiency retrofits

Assumptions

	2020	2030	2050
Percent of existing homes conducting standard retrofits (not including fuel-switched homes)	2%	25%	60%
Percent of existing homes retrofitting to current Title 24 standards (not including fuel-switched homes)	0%	5%	20%

Activity and GHG reductions

	2020	2030	2050
Electricity savings (kWh)	935,040	22,303,130	63,551,960
Natural gas savings (therms)	73,040	1,120,590	3,358,020
Emissions reduction ($MTCO_2e$)	410	6,030	17,860

Performance indicators

	2020	2030	2050
Number of homes retrofitted	400 single-family homes and 340 multi-family homes undergoing standard retrofits, and 0 single-family homes and 0 multi-family homes being upgraded to current Title 24 standards	4,720 single-family homes and 4,040 multi-family homes undergoing standard retrofits, and 940 single-family homes and 810 multi-family homes being upgraded to current Title 24 standards	10,060 single-family homes and 8,620 multi-family homes undergoing standard retrofits, and 3,350 single-family homes and 2,870 multi-family homes being upgraded to current Title 24 standards

GHG Method

The project team looked at reports from retrofit programs throughout California to identify the typical electricity and natural gas savings from single-family and multi-family home retrofits and applied these savings to the energy use patterns of residences in San Mateo. The team next reviewed current and projected future Title 24 standards against the current energy performance of San Mateo homes and projections of future San Mateo Title 24 retrofits to determine the typical electricity and natural gas savings. The team then applied the appropriate emissions factors to the energy savings estimates to determine GHG reductions.

APPENDIX 1

GHG Sources

California Energy Commission. 2014. Impact Evaluation of the California Comprehensive Residential Retrofit Programs.

EE 2 Nonresidential energy efficiency retrofits

Assumptions

	2020	2030	2050
Percent of existing businesses conducting standard retrofits (not including fuel-switched businesses)	3%	40%	75%
Percent of existing businesses retrofitting to current Title 24 standards (not including fuel-switched businesses)	0%	5%	20%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	3,488,130	46,736,170	119,125,610
Natural gas savings (therms)	121,600	1,629,220	3,203,760
Emissions reduction ($MTCO_2e$)	840	9,930	17,040

Performance Indicators

	2020	2030	2050
Number of businesses retrofitted	120 businesses undergoing standard retrofits, and 0 businesses upgraded to current Title 24 standards.	1,600 businesses undergoing standard retrofits, and 200 businesses upgraded to current Title 24 standards.	2,870 businesses undergoing standard retrofits, and 770 businesses upgraded to current Title 24 standards.

GHG Method

The project team looked at reports of the energy savings from different types of nonresidential energy efficiency retrofits to identify the typical electricity and natural gas savings from these activities and applied these savings to the energy use patterns of San Mateo businesses. The team next reviewed current and projected future Title 24 standards against the current energy performance of San Mateo businesses and projections of future San Mateo Title 24 retrofits to determine the typical electricity and natural gas savings. The team then applied the appropriate emissions factors to the energy savings estimates to determine GHG reductions.

APPENDIX 1

GHG Sources

Pacific Northwest National Laboratory. 2011. Advanced Energy Retrofit Guides: Office Buildings. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20761.pdf.

Pacific Northwest National Laboratory. 2011. Advanced Energy Retrofit Guides: Retail Buildings. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20814.pdf.

EE 3 Residential tree planting

Assumptions

	2020	2030	2050
Percent of households with shade trees	2%	10%	35%

Activity and GHG reduction

	2020	2030	2050
Electricity savings (kWh)	174,760	874,610	3,064,110
Emissions reduction ($MTCO_2e$)	Less than 10	Less than 10	Less than 10

Performance Indicators

	2020	2030	2050
Number of households with shade trees	860	4,820	18,770

GHG Method

The GHG inventory and reports from PG&E were used to identify per business energy use in San Mateo, while data from the Pacific Northwest National Laboratory, the California Energy Commission, and academic studies were used to determine reductions per home. These results were combined with participation rates to calculate total reductions in energy use from this measure. The outcome was then combined with emissions factors from the inventory to determine GHG reductions.

GHG Sources

The project team reviewed studies about the typical electricity savings from reduced air conditioning demand associated with tree planting. The team then applied this information to projections of future participation and the energy use patterns in San Mateo to identify total electricity reduction. Next, the team converted this to GHG emission savings using the appropriate emissions factors.

APPENDIX 1

ME 1 Energy efficiency for new municipal buildings

GHG Assumptions, Reductions, and Performance Indicators

This measure is supportive due to the lack of information about future municipal construction. There are no assumptions, activity or GHG reductions, or performance indicators for supportive measures.

GHG Method

Supportive measures do not produce direct, measurable GHG reductions, so no calculations were made.

GHG Sources

Supportive measures do not produce direct, measurable GHG reductions. There are no sources for GHG reduction calculations for supportive measures.

ME 2 Energy efficiency at existing municipal buildings

Assumptions

	2020	2030	2050
Percent of existing municipal square footage retrofitted	0%	10%	35%

Note that these retrofits go beyond those included as part of the Sustainable Solutions Turnkey program, as those are already accounted for as a planned action.

Activity and GHG Reductions

	2020	2030	2050
Electricity savings (kWh)	21,240	106,200	371,700
Natural gas savings (therms)	740	3,700	12,960
Emissions reduction ($MTCO_2e$)	Less than 10	20	70

Performance Indicators

	2020	2030	2050
Square footage of retrofitted municipal buildings	3,970	19,830	69,390

GHG Method

The project team looked at the typical energy efficiency savings that can be achieved with retrofits to office buildings and applied this reduction to the projected amount of retrofitted City square footage to calculate the total electricity and natural gas savings. The team then used the appropriate emission factors to identify the GHG reductions from these retrofits.

GHG Sources

City of San Mateo. 2007. *City of San Mateo Greenhouse Gas Emissions Inventory Report*. https://www.cityofsanmateo.org/DocumentCenter/View/5262/APPENDIX-S-October24-2007?bidId=

Pacific Northwest National Laboratory. 2011. Advanced Energy Retrofit Guides: Office Buildings. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20761.pdf.

APPENDIX 1

ME 3 All-electric municipal buildings

Assumptions

	2020	2030	2050
Cumulative building area of existing municipal building/s electrified (square feet):	0	40,000	80,000
Cumulative number of police stations & fire stations electrified:	0	0	1
Cumulative building area of new municipal building/s electrified (square feet):	0	40,000	80,000

Activity and GHG Reductions

	2020	2030	2050
Electricity savings (kWh)	0	-157,380	-314,760
Natural gas savings (therms)	0	19,760	39,520
Emissions reduction ($MTCO_2e$)	0	110	210

Performance Indicators

	2020	2030	2050
Square feet of existing municipal building/s electrified:	0 square feet of existing municipal buildings retrofitted to all-electric.	40,000 square feet of existing municipal buildings retrofitted to all-electric.	80,000 square feet of existing municipal buildings retrofitted to all-electric.
Number of police stations & fire stations electrified:	0 existing police stations or fire stations retrofitted to all-electric.	0 existing police stations or fire stations retrofitted to all-electric.	1 existing police stations or fire stations retrofitted to all-electric.
Square feet of new municipal building/s electrified:	0 square feet of new municipal buildings built all-electric.	40,000 square feet of new municipal buildings built all-electric.	80,000 square feet of new municipal buildings built all-electric.

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

GHG Method

The project team to inputs from City staff to project the total square footage of new municipal construction that is built all-electric and existing municipal construction that is retrofitted to be all-electric. The team estimated annual gas use associated with the existing municipal buildings to be retrofitted and the newly constructed municipal buildings (assuming they were built with natural gas equipment), based on energy use intensity information from the California Energy Commission Commercial End-Use Survey. The team used this estimate on "business as usual" natural gas consumption for these buildings to calculate the natural gas consumption avoided from retrofitting to all-electric or building to all-electric. The team looked at data on the average amount of natural gas consumed by each type of equipment to estimate the natural gas consumption avoided through electrification of natural gas equipment and used data on energy factors by equipment type was used to estimate the resulting increase in electricity use resulting from the replacement of natural gas equipment with electric equipment. The team applied emission factors for natural gas consumption and electricity use to estimate the emissions reduction associated with a reduction in natural gas consumption and the increase in emissions associated with an increase in electricity use, and took the net resulting emissions as the estimated emissions avoided from the policy.

GHG Sources

California Energy Commission. 2009. "2009 California Residential Appliance Saturation Study". https://ww2.energy.ca.gov/appliances/rass/previous_rass.html

APPENDIX 1

CF 1 Electric vehicle charging infrastructure

Assumptions

	2020	2030	2050
Cumulative average square feet of new commercial building space per parking spot	300	300	300
Cumulative target percent of new workplace parking to have EV charger installed	10%	13%	17%
Cumulative target percent of new multi-unit dwelling residents with EV charger access	8%	16%	22%
Cumulative target percent of new single-family homes to have EV charger outlet installed	0%	50%	70%
Cumulative percent commercial buildings that are office space with parking	40%	40%	40%
Cumulative average square feet of existing commercial building space per parking spot	600	600	600
Cumulative target percent of existing workplace parking to have EV charger installed	1%	10%	15%
Cumulative target percent of existing multi-unit dwelling residents with access to EV charging	1%	10%	15%
Cumulative target additional public parking spaces with EV charging	2	30	60
Cumulative percent of EV purchases that replace a gasoline vehicle	99%	98%	96%
Cumulative percent of EV purchases that replace a diesel vehicle	1%	2%	4%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	-2,557,760	-27,826,150	-64,649,830
Emissions reduction ($MTCO_2e$)	2,650	29,630	71,150

Performance Indicators

	2020	2030	2050
New non-residential parking spaces with EV charging	150 EV charging ports installed at new non-residential buildings.	2,700 EV charging ports installed at new non-residential buildings.	10,810 EV charging ports installed at new non-residential buildings.
New multi-unit dwelling residential parking spaces with EV charging	80 EV charging ports installed at new multi-family residential buildings.	1,060 EV charging ports installed at new multi-family residential buildings.	2,320 EV charging ports installed at new multi-family residential buildings.
New single-family residential parking spaces with EV charger outlet	0 EV charging outlets installed at new single-family residential buildings.	1,310 EV charging outlets installed at new single-family residential buildings.	2,910 EV charging outlets installed at new single-family residential buildings.
Existing non-residential parking spaces with EV charging	170 EV charging ports installed at existing non-residential buildings.	2,040 EV charging ports installed at existing non-residential buildings.	4,350 EV charging ports installed at existing non-residential buildings.
Existing multi-unit dwelling residential parking spaces with EV charging	210 EV charging ports installed at existing multi-family residential buildings.	2,380 EV charging ports installed at existing multi-family residential buildings.	3,980 EV charging ports installed at existing multi-family residential buildings.
Existing additional public parking spaces with EV charging	2 EV charging ports installed at existing public locations.	30 EV charging ports installed at existing public locations.	60 EV charging ports installed at existing public locations.
Number of electric vehicles purchased/ leased to replace ICE vehicles	570 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	7,800 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	20,040 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.

APPENDIX 1

GHG Method

The project team relied on data from the 2030 General Plan Land Use Element for the projected buildout of nonresidential buildings in San Mateo, along with data from Association of Bay Area Governments (ABAG) Plan Bay Area on projected buildout of households in San Mateo out to 2050, to estimate the number of new buildings that would be impacted by an electric vehicle charging infrastructure new construction reach code. The team used permit data from the U.S. Department of Housing and Urban Development to estimate the percent of new residential units that will be single family or duplex vs. 3+ unit multi-family. Using assumptions regarding the building square footage per new development parking space, the team identified the total number of parking spaces associated with multi-family residential and commercial development, assuming an increasing percentage of new development parking spaces will be required to be built electric vehicle (EV) capable to accommodate electric vehicle supply equipment (EVSE). The team looked at how the deployment of EVSE in new development is projected to increase the rate at which residents and employees will replace gasoline vehicles with EVs, and estimated how the increased adoption of EVs is likely to decrease the VMT (and associated gasoline and diesel consumption) from gasoline and diesel vehicles and increase the VMT (and associated electricity use) from EVs. The team then applied emission factors for avoided gasoline and diesel consumption, and increased electricity use, and took the difference as the net reduction in GHG emissions.

GHG Sources

California Air Resources Board. 2018. "EMFAC2017 Web Database".

NREL, 2018. "CEC EV Infrastructure Projection Tool (EVI-Pro)".

U.S. Census Bureau. 2017. "American Community Survey".

U.S. Department of Energy. 2019. "www.fueleconomy.gov".

U.S. Department of Housing and Urban Development. 2019. "State of the Cities Data Systems".

U.S. Department of Transportation Federal Highway Administration. 2016. "Average miles driven per year by state".

CF 2 Electric vehicle education and outreach

Assumptions

	2020	2030	2050
Target percent of total community Transportation Network Company (TNC) VMT from electric vehicles	2%	60%	90%
Target percent total community VMT from electric vehicles	4.5%	30%	74%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	-885,200	-16,127,620	-16,697,140
Emissions reduction ($MTCO_2e$)	980	17,050	17,120

Performance Indicators

	2020	2030	2050
Annual additional VMT travelled by EV TNCs	0 vehicle miles travelled by internal combustion engine transportation network companies vehicles replaced with electric vehicles.	44,448,380 vehicle miles travelled by internal combustion engine transportation network companies vehicles replaced with electric vehicles.	74,729,990 vehicle miles travelled by internal combustion engine transportation network companies vehicles replaced with electric vehicles.
Number of electric vehicles purchased/leased to replace ICE vehicles due to education/outreach/incentives	200 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	1,440 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	0 electric vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.

APPENDIX 1

GHG Method

The projected team relied on forecasted total community VMT from passenger vehicles and estimates from the City of San Francisco on the percent of total community VMT from Transportation Network Companies (TNCs) to estimate the total annual VMT from TNCs in City of San Mateo. The team assumed that the policy or program aimed at regulating or incentivizing TNCs to increase adoption of EVs will results in a specific percent of TNCs being EVs by a given target year, and then estimated how the increased adoption of TNC EVs will decrease the VMT (and associated gasoline consumption) associated with gasoline vehicles and increase the VMT (and associated electricity consumption) associated with EVs. The team applied the emission factor for avoided gasoline consumption, and an emissions factor for increased electricity use. The difference between the two results is the net GHG reduction from this measure.

GHG Sources

California Air Resources Board, 2018. "EMFAC2017 Web Database".

San Francisco County Transportation Authority. 2017. "TNCs Today: A Profile of San Francisco Transportation Network Company Activity".

US Department of Energy. 2019. www.fueleconomy.gov.

CF 3 Clean City fleet

GHG Assumptions

	2020	2030	2050
Percent of City vehicles replaced with EVs	3%	25%	60%
Percent of City vehicles fueled by biomethane	7%	15%	25%

Activity and GHG Reductions

	2020	2030	2050
Electricity savings (kWh)	-11,640	-135,510	-353,720
Emissions reduction ($MTCO_2e$)	30	170	420

Performance Indicators

	2020	2030	2050
Fleet EV VMT	69,210	643,920	1,715,120
Fleet biomethane VMT	161,480	386,350	714,630

GHG Method

The projected team looked at State projections for regional increases in electric and natural gas (including biomethane) vehicles and applied these proportions to the City municipal fleet. The team then took the local projections for increases in electric and natural gas vehicles in the municipal fleet and identified the increase in electric and natural gas VMT resulting from local policies. The team then adjusted the natural gas VMT to account for the different energy density of natural gas and gasoline/diesel and calculated the increase in electricity resulting from greater municipal EV adoption. Lastly, the team applied emission factors, taking the net difference between decreased VMT emissions from electric and natural gas vehicle adoption and increased electricity use as the overall GHG benefit.

APPENDIX 1

GHG Sources

City of San Mateo. 2007. *City of San Mateo Greenhouse Gas Emissions Inventory Report*. https://www.cityofsanmateo.org/DocumentCenter/View/5262/APPENDIX-S-October24-2007?bidId=

ICLEI Local Governments for Sustainability USA. 2012. *US Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*. http://www.icleiusa.org/tools/ghgprotocol/community-protocol.

Gable, C., and Gable, S. 2019. "Gasoline Gallon Equivalents (GGE)". https://www.thoughtco.com/fuel-energy-comparisons-85636.

CF 4 Clean fuel

GHG Assumptions

	2020	2030	2050
Target % total community VMT from hydrogen vehicles	0.01%	1.5%	3.5%

Activity and GHG Reductions

	2020	2030	2050
Electricity savings (kWh)	-53,540	-6,526,280	-14,423,210
Emissions reduction ($MTCO_2e$)	20	3,130	7,000

Performance Indicators

	2020	2030	2050
Number of hydrogen vehicles purchased/ leased to replace ICE vehicles due to education, outreach, or incentives	5 hydrogen fuel cell vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	800 hydrogen fuel cell vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.	1,960 hydrogen fuel cell vehicles purchased or leased by residents or commuters to replace internal combustion engine vehicles.

GHG Method

The project team estimated how the deployment of hydrogen fueling stations will increase the rate at which residents and employees will replace gasoline vehicles with hydrogen fuel cell vehicles (FCVs). The team analyzed how the increased adoption of FCVs is likely to decrease the VMT (and associated gasoline consumption) associated with gasoline vehicles and increase the VMT (and associated hydrogen consumption) associated with FCVs. The team used data from the U.S. Department of Energy on the efficiency of the electrolysis process to estimate the amount of electricity required to produce hydrogen. The team then applied an emission factor for avoided gasoline consumption to estimate the emissions reduction associated with reduced gasoline consumption, and an emission factor for electricity consumption to estimate the emissions increase associated with increased electricity use. The net resulting emissions is the estimated emissions avoided from the policy.

APPENDIX 1

GHG Sources

California Air Resources Board, 2018. "EMFAC2017 Web Database".

US Department of Energy, 2019. www.fueleconomy.gov.

U.S. Department of Energy, 2019. "DOE Technical Targets for Hydrogen Production from Electrolysis".

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

ST 1 Bicycle mode share

GHG Assumptions

	2020	2030	2050
Additional miles of bike lanes	1.3	10	30

Activity and GHG Reduction

	2020	2030	2050
Travel savings (VMT)	106,930	874,290	2,742,520
Emissions reduction ($MTCO_2e$)	40	240	670

Performance Indicators

	2020	2030	2050
Total miles of bike lanes	58	67	87

GHG Method

The project team identified projected increase in bike lanes from implementation of the Bicycle Master Plan. Based on the density of bike lanes per square mile in San Mateo, the team followed the recommendations of the California Air Pollution Control Officer's Association to estimate the projected decrease in VMT as a result. The team then applied the appropriate emissions factors to calculate the GHG reduction.

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures".

City of San Mateo. 2019. *City of San Mateo Bicycle Master Plan*. https://www.cityofsanmateo.org/3944/Bicycle-Master-Plan-Update.

APPENDIX 1

ST 2 Pedestrian mode share

GHG Assumptions

It is assumed that all new development occurs in infill areas (areas with existing development)

Activity and GHG Reduction

	2020	2030	2050
Travel savings (VMT)	1,159,460	2,853,720	4,650,540
Emissions reduction ($MTCO_2e$)	390	760	1,110

Performance Indicators

There are no performance indicators associated with this measure.

GHG Method

The project team identified the number of new people and jobs from new developments that are projected to be in areas with good pedestrian connections. The team applied a method recommended by the California Air Pollution Control Officers Association to determine the VMT reduction, and then applied the appropriate emissions factor to calculate GHG reductions.

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures".

ST 3 Micromobility and shared mobility

GHG assumptions, activity and GHG reductions, and performance indicators.

This is a supportive measure, due to the lack of sufficient data or a feasible method of quantification that would avoid double-counting reductions with other measures. As a result, there are no assumptions, activity or GHG reductions, and performance indicators associated with this measure.

GHG Method

Supportive measures do not produce direct, measurable GHG reductions, so no calculations were made.

GHG Sources

Supportive measures do not produce direct, measurable GHG reductions. There are no sources for GHG reduction calculations for supportive measures.

APPENDIX 1

ST 4 Public transit service

GHG Assumptions

	2020	2030	2050
Bus commute share	3%	5%	10%
Percent increase in Caltrain ridership	6%	87%	263%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	-668,490	-9,447,930	-28,739,580
Travel savings (VMT)	2,395,930	33,318,340	102,835,750
Emissions reduction ($MTCO_2e$)	830	9,130	25,110

Performance Indicators

	2020	2030	2050
Bus commute share	3%	5%	10%
Average Caltrain daily ridership in San Mateo	4,230	7,440	14,490

GHG Method

For increases in bus travel, the project team looked at San Mateo's current bus commute share and targets for future bus commute share and calculated the net increase. Using methods from the California Air Pollution Control District, the project team determined the VMT reduction that would occur, and then applied the appropriate GHG emissions factor. For increase in Caltrain, the project team reviewed Caltrain's existing business plan and projected increases in ridership under the "Moderate Growth" scenario, then applied this increase to San Mateo. Using factors from the inventory and existing/planned activity calculations, the team determined the VMT reduction from increased Caltrain growth as well as the increase in electricity use due to Caltrain becoming a mostly electric system. The team applied the appropriate emissions factors and took the difference between the two as the net reduction from Caltrain ridership growth.

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."

Caltrain. 2017. *Caltrain 2017 Annual Passenger Count, Key Findings*. http://www.caltrain.com/Assets/_Marketing/caltrain/pdf/2016/2017+Annual+Count+Key+Findings+Report.pdf.

Caltrain. 2019. *Caltrain Business Plan: Developing a Long-Range Vision for Caltrain*. https://caltrain2040.org/wp-content/uploads/CBP_CIA_R2_Booklet_SanMateo-2.pdf.

U.S. Census Bureau. 2018. 2013 – 2017 American Community Survey 5-Year Estimates, B08006: Sex of Workers by Means of Transportation to Work [data table].

APPENDIX 1

ST 5 Commuter programs

GHG Assumptions

	2020	2030	2050
Percent of existing employers (pre-2006) participating in TDM	0%	5%	30%
Average trip reduction from voluntary TDM participation, beyond other CAP measures	0%	8%	40%

Activity and GHG Reduction

	2020	2030	2050
Travel savings (VMT)	0	466,240	13,987,130
Emissions reduction ($MTCO_2e$)	0	130	3,420

Performance Indicators

	2020	2030	2050
Existing (pre-2006) businesses participating in TDM efforts	0	210	1,250

GHG Method

The project team identified the amount of commute-related VMT from personal vehicles associated with existing businesses and applied the projected metrics from voluntary participation in Transportation Demand Management (TDM) programs to determine the total VMT reduction from implementation of this measure. The team then used the appropriate emissions factors to calculate GHG reductions. It is assumed that these TDM standards would go beyond trip reductions associated with other measures in the CAP, as the goal of TDM efforts is to reduce trip generation below the level that would otherwise occur if the TDM requirement was not in place.

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."

ST 6 Transportation Demand Management

GHG Assumptions

	2020	2030	2050
Percent of new developments subject to TDM rules	90%	95%	95%
Average trip reduction from new development subject to TDM rules, beyond other CAP measures	6.25%	10%	40%

Activity and GHG Reduction

	2020	2030	2050
Travel savings (VMT)	167,920	8,500,890	34,636,730
Emissions reduction ($MTCO_2e$)	60	2,330	8,460

Performance Indicators

	2020	2030	2050
Service population in new development (2018 and later) subject to the TDM ordinance	2,910	20,410	43,870

GHG Method

The project team determined the number of new people and jobs in developments that would be subject to TDM rules, excluding those already identified through the existing and planned activities assessment. Using projections of future TDM standards, the project team determined the amount of VMT that would be reduced by future TDM requirements, then converted this reduction to a decrease in GHG emissions. It is assumed that these TDM standards would go beyond trip reductions associated with other measures in the CAP, as the goal of TDM efforts is to reduce trip generation below the level that would otherwise occur if the TDM requirement was not in place.

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."

APPENDIX 1

ST 7 Transit-oriented development

GHG Assumptions

	2020	2030	2050
Percent of new units in areas supporting transit-oriented development	90%	95%	95%
Percent of new nonresidential square footage in areas supporting transit-oriented development	85%	90%	90%

Activity and GHG Reduction

	2020	2030	2050
Travel savings (VMT)	464,110	3,605,900	9,695,490
Emissions reduction ($MTCO_2e$)	160	990	2,370

Performance Indicators

	2020	2030	2050
New development in TOD zones	3,680 households and 0 employees	8,770 households and 2,980 employees	13,940 households and 5,710 employees

GHG Method

The project team identified the anticipated development in areas that support transit-oriented development and used geospatial analysis to obtain a reasonable estimate of the new growth potential in these areas. The team then used resources from the California Air Pollution Control Officers Association to determine the VMT reduction associated with transit-oriented development in these areas, then applied the appropriate emissions factors to calculate GHG reductions.

GHG Sources

California Air Pollution Control Officers Association. 2010. "Quantifying Greenhouse Gas Mitigation Measures."

City of San Mateo. 2018. Area plans [GIS file].

City of San Mateo. 2018. SMRoadCenterline [GIS file].

Metropolitan Transportation Commission. 2017. Major_Transit_Stops_2017 [GIS file].

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

SW 1 Composting program

GHG Assumptions

	2020	2030	2050
Residential composting participation rate	55%	90%	95%
Nonresidential composting participation rate	10%	80%	90%

Activity and GHG Reduction

	2020	2030	2050
Waste savings (tons)	2,190	28,910	33,910
Emissions reduction ($MTCO_2e$)	950	12,650	14,850

Performance Indicators

	2020	2030	2050
Composting participation levels	23,670 households and 410 businesses	43,360 households and 3,510 businesses	50,940 households and 4,120 businesses

GHG Method

The project team reviewed the number of future projected residences and nonresidential buildings participating in the community's composting program, removing the currently participating customers to only focus on growth in the composting program. The team used results of a statewide waste characterization study to estimate the total amount of organic waste generated by the participants and combined this information with technical factors for waste decomposition by materials to identify the total reduction in GHG emissions.

GHG Sources

California Air Resources Board. 2010. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories version 1.1*. https://ww3.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf

California Air Resources Board. 2011. Landfill Emissions Tool version 1.3. https://ww3.arb.ca.gov/cc/landfills/landfills.htm

California Department of Resources Recycling and Recovery. 2015. *2014 Disposal-Facility-Based Characterization of Solid Waste in California*. https://www2.calrecycle.ca.gov/Publications/Details/1546.

APPENDIX 1

SW 2 Expanded recycling service

GHG Assumptions

	2020	2030	2050
Target diversion rate	75%	85%	90%

Activity and GHG Reduction

	2020	2030	2050
Waste savings (tons)	1,320	8,710	13,860
Emissions reduction ($MTCO_2e$)	810	5,360	8,530

Performance Indicators

	2020	2030	2050
Total tons of recyclables recovered (curbside bins only)	49,430	61,700	73,400

GHG Method

The project team looked at projections of how San Mateo's diversion rate from curbside recycling may increase in future years and used statewide waste characterization studies to identify the amounts of various material types that could be recovered from this increase. The team then applied the results of technical studies about waste decomposition to determine the total GHG reductions that would result from increased waste collection.

GHG Sources

California Air Resources Board. 2010. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories version 1.1*. https://ww3.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf

California Air Resources Board. 2011. Landfill Emissions Tool version 1.3. https://ww3.arb.ca.gov/cc/landfills/landfills.htm

California Department of Resources Recycling and Recovery. 2015. *2014 Disposal-Facility-Based Characterization of Solid Waste in California*. https://www2.calrecycle.ca.gov/Publications/Details/1546.

Murray, R. 2018. City of San Mateo. Personal communication to A. Chow, City of San Mateo. November 15.

SW 3 Waste awareness and source reduction

GHG Assumptions

	2020	2030	2050
Decrease in non-organic and non-recyclable waste tonnage	5%	20%	50%

Activity and GHG Reduction

	2020	2030	2050
Waste savings (tons)	2,250	10,200	29,510
Emissions reduction ($MTCO_2e$)	420	1,910	5,510

Performance Indicators

	2020	2030	2050
Decrease in non-organic and non-recyclable waste tonnage sent to landfills	2,250	10,200	29,510

GHG Method

The project team looked at statewide waste characterization studies to determine the amount of materials being produced in San Mateo that could not be recycled or composted (including construction and demolition wastes) and used technical studies about waste characterization to determine the GHG emissions associated with a ton of this waste material. The project team then examined projections about waste awareness potential to identify how much of this waste could be reduced in future years and combined these two outcomes to determine the total GHG savings.

GHG Sources

California Air Resources Board. 2010. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories version 1.1*. https://ww3.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf

California Air Resources Board. 2011. Landfill Emissions Tool version 1.3. https://ww3.arb.ca.gov/cc/landfills/landfills.htm

California Department of Resources Recycling and Recovery. 2015. *2014 Disposal-Facility-Based Characterization of Solid Waste in California*. https://www2.calrecycle.ca.gov/Publications/Details/1546.

APPENDIX 1

WW 1 Water efficiency retrofits for existing buildings

GHG Assumptions

	2020	2030	2050
Percent of existing homes retrofitting water fixtures	10%	50%	95%
Percent of existing businesses retrofitting water fixtures	5%	40%	95%
Percent of existing homes with greywater systems	0%	5%	20%
Percent of existing businesses with greywater systems	0%	3%	15%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	38,960	345,160	877,710
Water savings (millions of gallons)	20	130	300
Emissions reduction ($MTCO_2e$)	20	100	230

Performance Indicators

	2020	2030	2050
Number of water efficiency retrofits	3,890 existing homes and 210 existing businesses with water efficiency retrofits.	19,470 existing homes and 1,670 existing businesses with water efficiency retrofits.	37,000 existing homes and 3,960 existing businesses with water efficiency retrofits.
Number of greywater system installations as part of retrofit activities	0 homes and 0 businesses with greywater systems installed.	1,950 homes and 120 businesses with greywater systems installed.	7,790 homes and 620 businesses with greywater systems installed.

TECHNICAL APPENDIX: METHODS AND ASSUMPTIONS

GHG Method

Working on the assumption that half of greywater systems are laundry-to-landscaping, and that the other half uses greywater from additional sources such as wash basins and showers, the project team identified the water savings resulting from greywater systems for an individual home or business. The project team then used the water savings to determine the decrease in electricity use and direct process emissions associated with this effort per building, and then applied the projections of greywater installations at existing San Mateo buildings as part of retrofit activities to identify the total water, electricity, and direct process emissions. The team applied the appropriate electricity emissions coefficients to identify the additional GHG savings.

GHG Sources

Alliance for Water Efficiency. 2009. *Making Every Drop Work: Increasing Water Efficiency in California's Commercial, Industrial, and Institutional (CII) Sector*. https://www.allianceforwaterefficiency.org/resources/publications/making-every-drop-work-increasing-water-efficiency-california%E2%80%99s-commercial.

California Department of Water Resources. 2013. *California Water Plan 2013 Update, Volume 3, Chapter 3: Water Use Efficiency*. http://toolbox.calwep.org/wiki/California_Water_Plan_2013_Update_(selections)#tab=Vol__3_Ch__3_-_Water_Use_Efficiency.

California Department of Water Resources. 2017. *Making Water Conservation a California Way of Life: Implementing Executive Order B-37-16*. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/County-Drought-Planning/Files/Making-Water-Conservation-a-CA-Way-of-Life-EO-B-37-16.pdf.

APPENDIX 1

WW 2 Water-efficient landscaping

GHG Assumptions

	2020	2030	2050
Reduction in total outdoor water use	3%	10%	25%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	85,940	315,520	886,220
Water savings (millions of gallons)	60	220	610
Emissions reduction ($MTCO_2e$)	Less than 10	Less than 10	0

GHG Method

The team estimated the total water use that occurs outdoors in San Mateo and determined the amount that would be reduced based on assumed participation levels. The project team then used the water savings to determine the decrease in electricity use associated with this effort and applied the appropriate electricity emissions coefficients to identify the GHG savings.

GHG Sources

There are no sources for this measure beyond the inventory and forecast.

WW 3 Water efficiency in new construction

GHG Assumptions

	2020	2030	2050
Percent of new homes installing greywater systems	0%	8%	25%
Percent of new businesses installing greywater systems	0%	5%	20%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	0	5,990	30,050
Water savings (millions of gallons)	0	Less than 10	20
Emissions reduction ($MTCO_2e$)	0	Less than 10	10

Performance Indicators

	2020	2030	2050
Number of new homes with greywater systems	0	740	3,670
Number of new businesses with greywater systems	0	10	80

GHG Method

Working on the assumption that half of greywater systems are laundry-to-landscaping, and that the other half uses greywater from additional sources such as wash basins and showers, the project team identified the water savings resulting from greywater systems for an individual home or business. The project team then used the water savings to determine the decrease in electricity use and direct process emissions associated with this effort per building, and then applied the projections of greywater installations at new San Mateo buildings to identify the total water, electricity, and direct process emissions. The team applied the appropriate electricity emissions coefficients to identify the additional GHG savings.

APPENDIX 1

GHG Sources

Alliance for Water Efficiency. 2009. *Making Every Drop Work: Increasing Water Efficiency in California's Commercial, Industrial, and Institutional (CII) Sector*. https://www.allianceforwaterefficiency.org/resources/publications/making-every-drop-work-increasing-water-efficiency-california%E2%80%99s-commercial.

California Department of Water Resources. 2013. *California Water Plan 2013 Update, Volume 3, Chapter 3: Water Use Efficiency*. http://toolbox.calwep.org/wiki/California_Water_Plan_2013_Update_(selections)#tab=Vol__3_Ch__3_-_Water_Use_Efficiency.

California Department of Water Resources. 2017. *Making Water Conservation a California Way of Life: Implementing Executive Order B-37-16*. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/County-Drought-Planning/Files/Making-Water-Conservation-a-CA-Way-of-Life-EO-B-37-16.pdf.

OR 1 Alternative fuel lawn and garden equipment

GHG Assumptions

	2020	2030	2050
Percent of landscaping equipment that uses electricity	0%	8%	40%

Activity and GHG Reduction

	2020	2030	2050
Electricity savings (kWh)	0	-892,140	-4,460,680
Emissions reduction ($MTCO_2e$)	0	200	1,140

GHG Method

The team used data from the California Air Resources Board and the inventory to identify the reduction in direct emissions per percent of landscaping equipment converted to electricity traded in. The team then estimated the decrease in gasoline and diesel fuel resulting from this effort and used information about energy density to determine the increase in electricity needs. The team estimated the GHG increase from greater electricity needs and subtracted this from the emission reduction from decreased fuel use to determine the net GHG reduction.

GHG Sources

Alternative Fuels Data Center. 2014. *Alternative Fuels Data Center – Fuel Properties Comparison*. https://afdc.energy.gov/fuels/fuel_comparison_chart.pdf/

California Air Resources Board. 2011. OFFROAD model. http://www.arb.ca.gov/msei/categories.htm.

APPENDIX 1

This page has no content.

Appendix 2:

CAP Measure Key Metrics

This appendix summarizes the items that the City will use to track implementation of the CAP. As part of San Mateo's ongoing CAP monitoring and implementation efforts, the City will track progress on the implementation of individual measures. The City will collect specific pieces of data, known as key metrics, for each measure, including the planned actions. These key metrics will be used to identify the implementation status of each measure. City staff, utility companies, and state and regional agencies collect the key metrics to track CAP implementation. Some data may be collected through the Development Checklist in **Appendix 3**. Specific information about the sources of each key metric is given in the monitoring tool. The key metrics are shown in **Table 1-2**.

APPENDIX 2

Table 1-2: CAP Measure Key Metrics

Measure		Time Frame	Lead Department	Key Metric
BE 1	All-electric new construction	Near-term	City Manager's Office, Community Development	- Number of all-electric new construction residential housing units. - Square feet of all-electric new construction non-residential buildings.
BE 2	All-electric existing buildings	Near-term	City Manager's Office, Community Development	- Number of existing homes with gas to electric HVAC conversions. - Square feet of existing office buildings with gas to electric HVAC conversions. - Number of parking spaces at existing office buildings with EV charging.
RE 1	Peninsula Clean Energy	Immediate	City Manager's Office	- PCE opt-out rate. - kWh supplied by ECO 100
RE 2	Renewable energy systems for new and existing residences	Immediate	City Manager's Office, Community Development	- Number of homes built before 2018 with solar panels. - Number of total homes (existing and new) with battery energy systems.
RE 3	Renewable energy systems for new and existing nonresidential buildings	Immediate	City Manager's Office, Community Development	- Number of businesses built before 2018 with solar panels. - Number of existing businesses with battery energy systems.
EE 1	Residential energy efficiency retrofits	Near-term	City Manager's Office, Community Development	- Number of homes retrofitted.
EE 2	Nonresidential energy efficiency retrofits	Near-term	City Manager's Office, Community Development	- Number of businesses retrofitted.
EE 3	Residential tree plantings	Mid-term	City Manager's Office, Parks and Recreation	- Number of households with shade trees.
ME 1	Energy efficiency for new municipal buildings	Mid-term	City Manager's Office, Public Works	None – supportive measure.

CAP Measure Key Metrics

Measure		Time Frame	Lead Department	Key Metric
ME 2	Energy efficiency at existing municipal buildings	Near-term	City Manager's Office, Public Works	- Square footage of retrofitted municipal buildings.
ME 3	All-electric municipal buildings	Long-term	City Manager's Office, Public Works	- Square feet of existing municipal buildings electrified. - Square feet of new municipal buildings electrified.
CF 1	Electric vehicle charging infrastructure	Immediate	City Manager's Office, Community Development, Public Works	- Number of parking spaces at new nonresidential buildings with EV charging. - Number of parking spaces at existing nonresidential buildings (not including offices) with EV charging. - Number of parking spaces at existing multifamily units with EV charging.
CF 2	Electric vehicle education and outreach	Immediate	City Manager's Office, Community Development	- Estimated number of TNCs operating in San Mateo that are EVs. - Number of residents contacted with EV marketing materials.
CF 3	Clean City fleet	Near-term	Public Works	- Fleet EV VMT. - Fleet biomethane VMT.
CF 4	Clean fuel	Long-term	City Manager's Office, Community Development, Public Works	- Number of hydrogen vehicles registered.
ST 1	Bicycle mode share	Mid-term	Community Development, Public Works	- Total miles of bike lanes.
ST 2	Pedestrian mode share	Near-term	Community Development, Public Works	- Percent of development in infill locations.
ST 3	Micromobility and shared mobility	Near-term	City Manager's Office, Public Works	None – supportive measure.

APPENDIX 2

Measure		Time Frame	Lead Department	Key Metric
ST 4	Public transit services	Near-term	City Manager's Office, Public Works	- Bus commute share. - Average Caltrain daily ridership.
ST 5	Commuter programs	Mid-term	City Manager's Office, Community Development, Public Works	- Pre-2006 businesses participating in TDM efforts.
ST 6	Transportation Demand Management	Immediate	Community Development, Public Works	- Service population in new development subject to the TDM ordinance.
ST 7	Transit-oriented development	Near-term	Community Development	- New development in TOD zones.
SW 1	Composting program	Immediate	Public Works	- Composting participation levels.
SW 2	Expanded recycling service	Near-term	Public Works	- Total tons of recyclables recovered.
SW 3	Waste awareness and source reduction	Near-term	City Manager's Office, Public Works	- Decrease in non-organic and non-recyclable waste tonnage sent to landfills.
WW 1	Water efficiency retrofits for existing buildings	Mid-term	Public Works	- Number of water efficiency retrofits. - Number of greywater system installations in existing buildings.
WW 2	Water-efficient landscaping	Near-term	City Manager's Office, Parks and Recreation	- Estimated outdoor water use
WW 3	Water efficiency in new construction	Mid-term	Community Development	- Number of new homes with greywater systems. - Number of new businesses with greywater systems.
OR 1	Alternative fuel lawn and garden equipment	Mid-term	City Manager's Office, Parks and Recreation	- Estimated percent of landscaping equipment that uses electricity.

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Appendix 3:

CAP Consistency Checklist

The following checklist assists project applicants and City staff to determine whether a proposed project complies with the City of San Mateo CAP. The CAP is an implementation tool of the General Plan, demonstrating the City's strategy to reduce greenhouse gas (GHG) emissions consistent with Section 15183.5 of the California Environmental Quality Act (CEQA) Guidelines. New projects deemed consistent with the CAP are eligible for streamlining the analysis of GHG emissions. Projects inconsistent with the CAP may refer to this checklist for informational purposes but may have to submit a separate GHG analysis for the project. Examples of projects inconsistent with the City's forecast include:

- Stationary source emissions regulated by the Bay Area Air Quality Management District.
- General Plan amendments.
- New specific plans, amendments to specific plans, or new development agreements that would increase the population and nonresidential land use expectations beyond those anticipated in the General Plan buildout scenario.

APPENDIX 3

Development Checklist

Project Description Characteristics

Please identify the applicable land uses included in the proposed project and provide a brief description of the proposed project (or the project description to be used for the associated environmental document).

1) What is the size of the project (in acres)?

2) Identify the applicable land uses:

Residential
Commercial
Industrial
Manufacturing
Other

3) If there is a residential component to the project, how many units are being proposed?

Single-family residences:	:
Multi-family residences:	:

4) Please provide a brief project description, including the square footage of conditioned space by land use:

5) Does the project require any amendments to the General Plan or specific plans?

Yes No

If yes, please explain:

6) Is the project located in a specific plan area?

   Yes No

   If so, which one? _____

7) Please complete the following table to identify project compliance with any applicable CAP measures.

Standards for CAP Consistency – New Development

Reduction Measure and Applicable Standard	Does the Project Comply?	Notes & Comments
BE 1: All new development: The project does not have natural gas connections, and does not have any natural gas appliances or other equipment installed	Yes No N/A	Additional notes:
RE 2. All new developments with residential units: The project includes an on-site renewable energy system that meets or exceeds the minimum requirements of the California State Building Code	Yes No N/A	If yes, what is the kW potential of the renewable energy system? Additional notes:
RE 2. All new developments with residential units: The project includes an on-site energy storage system, such as a battery.	Yes No N/A	If yes, how much electricity does the system store? Additional notes:
RE 3. All new developments with nonresidential space: The project includes an on-site renewable energy system that meets or exceeds the minimum requirements of the California State Building Code	Yes No N/A	If yes, what is the kW potential of the renewable energy system? Additional notes:

APPENDIX 3

Reduction Measure and Applicable Standard	Does the Project Comply?	Notes & Comments
RE 3. All new developments with nonresidential space: The project includes an on-site energy storage system, such as a battery.	Yes No N/A	If yes, how much electricity does the system store? Additional notes:
EE 3. All new developments with residential units: The project includes trees that provide shade to residences.	Yes No N/A	If yes, how many residences are shaded by newly planted trees? Additional notes:
CF 1. All new development with dedicated off-street parking: The project includes parking spaces with installed EV chargers or are pre-wired for EV chargers, consistent with state and any local regulations.	Yes No N/A	If yes, how many spaces include installed EV chargers? If yes, how many spaces are pre-wired for EV chargers? Additional notes:
CF 1. All new development with dedicated off-street parking: The project includes parking spaces with installed EV chargers that are accessible by members of the public beyond those who live and/or work at the project.	Yes No N/A	If yes, how many spaces with installed EV chargers are accessible by members of the public? If yes, how many Level 3 chargers installed as part of this project are publicly accessible? Additional notes:

Reduction Measure and Applicable Standard	Does the Project Comply?	Notes & Comments
ST 6. New developments of at least six multi-family units and/or 10,000 square feet of nonresidential space: Implement TDM strategies to comply with the appropriate trip reduction target identified in applicable area plans and San Mateo Citywide TDM Plan.	Yes No N/A	If yes, what is the trip reduction target for the project? % short-term commute trip reduction % long-term commute trip reduction What strategies will the project use to achieve these trip reduction targets? Additional notes:
ST 6. Projects of at least 20 multi-family units and/or 50,000 square feet of nonresidential space undergoing additions or alterations (as defined in San Mateo Municipal Code Section 23.06.012): Implement TDM strategies consistent with the targets in relevant area plans and the San Mateo Citywide TDM Plan.	Yes No N/A	If yes, what is the trip reduction target for the project? % short-term commute trip reduction % long-term commute trip reduction What strategies will the project use to achieve these trip reduction targets? Additional notes:
ST 7. All new development: Be located along El Camino Real, within one-half mile of any Caltrain station, or in the Rail Corridor Transit Oriented Development or Hillsdale Station Area Plan areas.	Yes No N/A	Additional notes:

APPENDIX 3

Reduction Measure and Applicable Standard	Does the Project Comply?	Notes & Comments
SW 1. All developments with multifamily units or nonresidential space: Provide an area of sufficient space to store and allow access to a compost bin.	Yes No N/A	Does the project participate in any composting programs? Does the project compost on-site? Additional notes:
WW 3. All new development: Include a greywater system.	Yes No N/A	If yes, is the greywater system "laundry-to-landscape" or another type of system? Additional notes:

City of San Mateo
Climate Action Plan

Appendix 4:

Summary of Community Workshop

The City, with support from the PlaceWorks and DNV GL consultant team, hosted a community meeting for the Climate Action Plan (CAP) update on Thursday, June 6, 2019, from 6:00 to 8:00 pm at the San Mateo Public Library.

The purpose of this workshop was to provide community members with an overview of the 2015 CAP and the CAP update process, the results of the new and updated GHG inventory, and the new and revised GHG mitigation measures that will be included in the updated CAP. This workshop offered an opportunity to receive feedback on the measures and suggest additional reduction measures for the 2020 CAP.

City staff and members of the consultant team facilitated the workshop. Approximately 50 community members attended and participated. The workshop included a presentation about the CAP update and a summary of work-to-date, a question and answer period, and an open house that allowed participated to review draft GHG reduction measures, provide input, and engage with staff, consultants, and other community members. Community members reviewed the proposed measures by placing colored dots next to each measure: green for measures they supported, yellow for measures they supported with some reservations or concerns, and red for measures they did not support.

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The following results are organized by poster topic and present the number and type of dots for each measure (green, yellow, or red) and any open comments received on sticky notes and easel pads. No comment cards were submitted during the meeting, although some additional comments were submitted later via email.

BOARD 1: RENEWABLE ENERGY

Measure	Greens	Yellows	Reds
Measure 1: Continue to support Peninsula Clean Energy (PCE) and encourage residents and businesses not already participating in PCE, especially large energy users, to join.	17	1	0
Measure 2: Continue promoting renewable energy systems for new homes and businesses with education and incentives.	12	2	0
Measure 3: Continue to encourage property owners to install renewable energy systems on existing homes and businesses.	12	2	0
Measure 4: Renew San Mateo's requirement for new buildings to include solar panels, going beyond state requirements.	11	2	1
Measure 5: Promote battery storage systems as a part of renewable energy installations.	8	6	0
Measure 6: Set up microgrid demonstration projects.	5	5	1

Renewable Energy Open Comments

Measure 4: We need a way to store power from PV to use at night, check out Sandford's *[sic]* Central Energy Facility's thermal storage/heat recovery.

Measure 4: More infill to reduce VMT.

Measure 6: There are a lot of bigger things we can do.

Measure 5: Batteries – What level of support will this provide? For whom? How rapidly will today's batteries become obsolete if the technology is evolving rapidly?

Will microgrid demonstration have a significant impact?

On/Off grid solar installs - reduce fees if install option to supply power when PCE down to house/buildings.

BOARD 2: ENERGY EFFICIENCY AND CONSERVATION

Measure	Greens	Yellows	Reds
Measure 1: Continue to provide education about energy efficiency retrofits to residents and businesses, including information about financing.	9	2	1
Measure 2: Provide incentives for energy efficiency retrofits.	11	1	0
Measure 3: Establish a program to require home energy assessments at the time of sale.	12	2	0
Measure 4: Provide incentives for all-electric new construction.	7	1	0
Measure 5: Encourage upgrades to existing buildings to support all-electric operations.	9	0	0
Measure 6: New municipal buildings and facilities will be all-electric or will use alternative fuels.	9	1	0
Measure 7: Establish a commercial and multi-family energy conservation benchmarking program and offer low- or no-cost energy audits to rental properties and business.	11	0	0
Measure 8: Continue to conduct energy efficiency retrofits for existing municipal buildings.	7	0	0

Energy Efficiency and Conservation Open Comments

Require Net Zero on existing homes.

Cut energy use everywhere else in the US that is hotter and/or colder than San Mateo: urban infill.

Urge people to wear sweaters etc.

Incentivize cleaner emission leaf blowers (continuing the work sustainability commission started in 2018 then halted).

Make a contest, who can reduce their emissions? Or compare vs. an average.

Require by law, plus shift housing to the public sector.

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Prioritize PCE 100 – how does it compare to home retrofits?

Ban military recruiters so our citizens don't participate in the world's worst institutional emitter: the US military.

Incentivize won't save us. If we want to stop Armageddon, we must require sustainable to its fullest extent, right now!

BOARD 3: ALTERNATIVE TRANSPORTATION

Measure	Greens	Yellows	Reds
Measure 1: Expand the public shuttle system in San Mateo, including using microtransit to provide first-mile and last-mile connections.	23	0	0
Measure 2: Continue to support reduction of commuter-related vehicle trips through the City's Transportation Demand Management program and other employer-focused programs.	11	1	0
Measure 3: Expand carpool options for San Mateo residents and commuters.	3	4	1
Measure 4: Implement the Bicycle Master Plan and continue to support additional shared mobility options.	22	0	1
Measure 5: Continue to make walking a safe and easy way to get around San Mateo.	27	0	0
Measure 6: Increase transit-oriented developments along El Camino Real and near Caltrain stations.	22	3	0
Measure 7: Support new rapid bus transit routes.	14	1	0
Measure 8: Improve the frequency of Caltrain services, particularly to the Hayward Park station.	17	1	0

Alternative Transportation Open Comments

Increase penalty for stealing bicycles.

Encourage mixed-use development to reduce SOV.

SUMMARY OF COMMUNITY WORKSHOP

Close B Street to car traffic and institute shuttle to encourage less driving in City core.

Help change mindset of Peninsula re: BART/Bus Service.

Spend more on GHG Reduction than road maintenance and more truck free roads (weight and potholes) and more car free walking streets.

Eliminate traffic deaths for pedestrians and bicyclists with Vision Zero. New York City is good example.

Sierra Club recommends dividend account parking.

San Mateo needs to be much more bike friendly. 1) more dedicated lanes, 2) lights triggered by bike, 3) Require businesses like Safeway to have bike racks. (1 green)

Citywide mobility targets: Portland does it with target mode share (1 green)

Increase buses and vans use. Incentivize use, increases status of transit use.

More east-west transit opportunities shuttles, scooter, etc.!

Increase bike boulevards and bike infrastructure.

Work from home!!

Need bus-only lanes and transit signal priority. (2 greens)

Bike Streets work North/South (Claremont, Edinburg, Flores).

Create bus routes that allow access to natural public spaces like Laurelwood park and Purisima Creek. This will create love for nature and drive action.

Ridesharing kills public transit, congest streets, and abuses workers. The City must impose a heavy cap on Uber & Lyft vehicles to save our streets.

Light intersections that are triggered by bikes.

Educate residents and visitors on their impacts while driving.

What can the City do to reduce people idling in their cars? (1 green)

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Affordable housing = reduced GHGs (2 greens)

Fewer cars, more public transit! Increased frequency in bus service, other non-car modes.

Affordable housing for workers = fewer trip = lower GHG where is housing in the CAP?

Change the topic/sector name – alternative to what?

BOARD 4: ALTERNATIVE FUELS

Measure	Greens	Yellows	Reds
Measure 1: Require all new buildings to have EV charging infrastructure.	15	5	0
Measure 2: Continue to encourage EV charging infrastructure in existing homes and businesses.	8	0	1
Measure 3: Continue to install EV charging infrastructure in public parking lots and garages.	17	0	1
Measure 4: Transition San Mateo's municipal fleet to electric and other clean-energy vehicles.	15	1	0
Measure 5: Continue to educate community members about the availability of hybrid and clean-fuel landscaping equipment.	13	4	4
Measure 6: Buy hybrid and clean-fuel landscaping equipment for municipal use as options are available.	11	0	0

Alternative Fuels Open Comments

Measure 3: Battery Ready

Measure 5: Very low hanging fruit compared to something as important as diet, which is not even mentioned so far. Topic 4, Measure 5

Measure 5: Start with large properties like churches, help them through issues like extension cord length limits (if they exist).

Measure 5: Go beyond education. Need a competitive "green yard" program for homeowners. Need to incentivize or network commercial properties and churches to transitions them ASAP. The landowners already have equipment for Menlo Park and Atherton!

Measure 5: Ordinance to restrict gas landscape equipment.

EVs are great but often not affordable could there be financial incentives and subsidy?

More community charging stations are needed. Will Measure 1 create charging stations that can be shared by the public? Even by registering them with the building or something?

Measure 2: Provide incentives!!

Measure 5: This will work as well as abstinence-only sex ED

Biodiesel incentives? Can reduce net carbon emissions and use waste oil.

You always mention El. Cars = No!!! Go hydrogen!

Change the topic/sector name – alternative to what?

BOARD 5: SOLID WASTE

Measure	Greens	Yellows	Reds
Measure 1: Continue to expand San Mateo's composting program to businesses and multi-family homes.	25	0	0
Measure 2: Accept new types of materials in recycling bins as economics allow.	8	5	0
Measure 3: Create a materials reuse program and educate community members about ways to make unwanted items available for reuse.	11	2	1
Measure 4: Explore a ban on single-use plastics.	22	6 (Do it! Just do it!)	0
Measure 5: Work with waste haulers to reduce contamination of recyclables.	12	1	0

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Solid Waste Open Comments

Multi-family composting opportunities are a must!! You can also put the collection points in parks and around the community!

If composting in multi-family units is problematic, at least offer compost drop off points through the City!

Recycling info keeps changing. We need way better educations.

Create a mass distribution program for reusable bottle, paid for through business tax hikes.

My condo association will be charged if we get composting so we don't compost.

Solid waste = 3% of the GHG. These programs are good but please do not use a lot of $$.

More guidance is needed about good vs. poor recycling habits. (what plastics are good)

Be able to recycle black plastic or don't allow it to be used. (1 green)

I wish we could get more compost delivered to our houses.

Biweekly recycling and garbage pickup instead of weekly? Other cities have tried this. Since San Francisco/Recology has one of the best recycling/zero waste programs in the USA, why not excel at it here in San Mateo! If pickups were fewer, folks might be motivated (or forced) to decrease their waste. Fewer pickups also means less fuel/energy wasted by the trucks.

Tax consumers for clamshells in packaging – like plastic bags.

Measure 4: reusable bags require more energy to produce… causing more production.

Stop selling chemicals – pass an ordinance.

People are either uneducated or lazy/noncompliant RE putting items in the correct bins. Adding different/more bins won't work because of this. (2 greens)

Work with Trader Joes, Safeway, etc. to reduce clamshell packaging.

New accurate recycle bin labels for everyone.

Offer better rates for very low trash creation. Smaller waste cans? Alternate week collection?

Reduce uses at the source, require take back of packaging (3 greens)

Be able to recycle plastic bags that have the recycle symbol.

Encourage reduce purchases consumption. (1 green)

Encourage stores like Costco to put (business + social) pressure on their venders to use recyclable packaging (not plastics). When venders figure out recyclable packaging, they should let their customers know about the efforts they have made to solve a problem that affects everyone. Mae it a win-win-win situation.

BOARD 6: WATER AND WASTEWATER

Measure	Greens	Yellows	Reds
Measure 1: Continue to work with water providers and regional agencies to encourage water-efficient retrofits of existing buildings.	21	2	0
Measure 2: Require new developments to meet higher water efficiency standards.	19	1	0

Water and Wastewater Open Comments

The current CAP should be renamed "Greenhouse Gas Reduction Plan"

The CAP should include water and waste conservation, recycle, reduction mechanisms. (1 green)

Green lawn/yard competition among homeowners.

We need a water committee to implement best practices.

Is there local support for existing greywater systems?

I wish that there was information to have domestic greywater. (Help in putting it in) (5 greens)

Recycle water from treatment plant. (4 greens)

Can the City investigate rainwater collection for use by City and residents?

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Are there incentives for lawn replacement/xeriscaping/use of native landscaping?

Lawns are a huge source of water use. They should be abolished!

Large lots and sprawl leads to wasted water for irrigation.

Ban green lawns. (1 green, 1 yellow)

Provide realistic incentives for homeowners to get rid of lawns. Too expensive right now. (1 green)

Can the wastewater treatment plant be run on a schedule that helps address duck curve?

Educate people with sprinklers to not water the sidewalks!

Looks like real problem is behavior of individuals free will.

Follow best practices from more arid places (landscaping water, recycle water, flow meters on faucets, fix leaks)

Eliminate garbage disposals in new construction and retrofits.

Incentivize water reuse, especially in new development and public buildings (Use SFPUC model). (1 green).

Adopt better water demand management, including conservation, like SFPUC's programs. Reduce outdoor irrigation by 70%.

Aim for 5% reduced imported water by 2024.

BOARD 7: WHAT'S YOUR BIG IDEA?

Open comments

Plant more trees.

Plant trees and gardens, every $1 in trees returns $2.5 in value to the community. California Billion Tree Initiative. (10 greens)

Build housing here and plant trees elsewhere. (1 green)

Increase the urban tree canopy where possible. (2 greens)

SUMMARY OF COMMUNITY WORKSHOP

Do not allow wood burnings in fireplaces or building FP in new buildings. (1 green)

Explore rainwater collection for use by city and residents.

To reduce traffic and auto emissions on Hillsdale Ave, employ The Boring Company to put a tunnel under Hillsdale Avenue (2 greens, 5 reds)

Local public free telecommuting centers, reduce VMTs from commuters, keep people and money in San Mateo.

Affordable housing reduced worker trips where is that in CAP? (1 green)

More communication/educations on climate change and CO_2 emissions.

Allow for micro units and affordable housing.

Don't let people cut and trim existing trees and shrubs for view.

Require more from residents (instead of "encourage"). (2 greens)

Bring back recycling stations at Safeway.

The US Military is one of the largest institutional GHG emitters worldwide. Ban military recruiters from San Mateo and stop the rolling war machine in our City.

Include a program for carbon sequestration and offsets.

Ban leaf blowers and gas-powered landscape equipment. (3 greens, 1 red)

- Need a way to transition this would hurt all the gardeners.

No Amazon infrastructure in San Mateo.

Annual reporting of GHG: Mountain View does this and allocates $10k/year. Sectors can be adjusted for compliance.

Promote the local "I heart rakes and brooms" campaign.

Send a link to all San Mateo residents that helps them calculate their carbon footprint.

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Encourage competition among homeowners to use electric lawn equipment to "lose your lawn", to practice permaculture/plant native plants/use IPM methods. Create a City competition!

Determine San Mateo's "earth overshoot" day to raise awareness.

Public housing for all! (With solar panels) (1 green)

City government should fund clothing and farming co-ops in our community to reduce reliance on global trade.

Encourage cooperative businesses (worker owned). Expansion isn't profit seeking drive our crisis and must stop.

Please design new housing near transit centers to have at most car space. Maybe happening already.

Count on per capita basis and not a total basis.

To avoid 2 degree C temperature rise, there must be a robust system of carbon capture by 2030! (1 green)

Raise the height limit on buildings. (5 greens)

Take advantage of our volunteer hours needed by master composter participants – 40 hours each.

Urban infill: UC Berkeley rates urban infill in the City of San Mateo #1 among all rated measures visit: coolclimate.berkeley.edu/ca-scenarios/index.html. (2 greens)

When we add jobs but not housing, we should count 100% of those commute emissions.

Make GHG's info public => competitions in neighborhoods to retrofit/reduce fossil energy use? Smart Meters?

Charge new businesses setting up shop in San Mateo a "sustainability" tax to fund all these projects. (1 green)

Pedestrian overpass at Hillsdale/Highway 101. (3 greens)

More density causes miserable traffic. (1 red)

San Mateo to provide water barrels at cost and volunteer installers too much water is lost.

According to many studies, reaching greenhouse reduction goals without the world adapting a plant-based diet is impossible. Many people in San Mateo are not aware that they can contribute greatly to GHG lowering by modifying their diet. San Mateo should encourage diet change. (3 greens, 1 red)

Increased densities in SFH and transit-oriented areas. Infill housing helps to reduce VMTs. (3 greens)

Implement UN Agenda 21.

Please ban leaf blowers!! Exhaust + PM in the air! (1 green)

Encourage infill development instead of greenfield development.

Figure how to encourage plant-based diet education? (w/ groceries, schools, etc.) Taxes on meat? Don't' just say we have no control over that. (2 greens)

Meatless Monday or eating 1x per day instead of twice. Could this be worked into schools or civic buildings?

Composting toilets save water, reduce methane, turn waste into resources. Make legal, they don't stink!

To reduce commutes and traffic, subsidize ADUs in neighborhoods w/ larger lots, houses and parking available. (1 green)

Way more outreach to non-English speakers. (1 green)

Make sure to do outreach to non-English speakers and people not on City email lists.

MISCELLANEOUS COMMENTS

Clarifications on process of accounting GHGs, timeline, state vs local actions.

Solar panels – why need in light of PCE? What about city buildings.

Cement emissions- embedded emissions of development.

Data – on implementation measures for example – cool climate Berkeley .edu – consumption based calcs – concerns on highest impact including embedded emissions (infill as example).

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This page has no content.