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Second Revised Draft Climate Action Plan

Planning, Building, & Environmental Services

May 2019

NAPA COUNTY CALIFORNIA

A Tradition of Stewardship
A Commitment to Service

SECOND REVISED DRAFT

Climate Action Plan

Acknowledgements

Board of Supervisors

Planning Commission

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Acronyms and Abbreviations

ºC	degrees Celsius
ºF	degrees Fahrenheit
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ACSL	American Canyon Sanitary Landfill
APG	California Adaptation Planning Guide
BAAQMD	Bay Area Air Quality Management District
BAU	Business-As-Usual
BayREN	Bay Area Renewable Energy Network
BMP	best management practices
CAL FIRE	California Department of Forestry and Fire Protection
CALGreen	California Green Building Standards Code
CalRecycle	California Department of Resources Recycling and Recovery
CAP	Climate Action Plan
CARB	California Air Resources Board
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbon
CH_4	methane
CNG	compressed natural gas
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
County	County of Napa
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
EV	electric vehicle
FEMA	Federal Emergency Management Agency
F-gases	fluorinated gases

FTE	full-time equivalent
GGRF	Greenhouse Gas Reduction Fund
GHG	greenhouse gas
GWP	global warming potential
HCFC	hydrochlorofluorocarbons
HFC	hydrofluorocarbon
HVAC	heating, ventilation, and air conditioning
ICLEI	International Council for Local Environmental Initiatives
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated Resource Plan
m	meters
MCE	Marin Clean Energy
MPO	Metropolitan Planning Organization
MT	metric ton
MTC	Metropolitan Transportation Commission
$MTCO_2e$	metric tons of carbon dioxide equivalent
N_2O	nitrous oxide
NFPA	National Fire Protection Association
NOP	Notice of Preparation
NVTA	Napa Valley Transportation Authority
NVWT	Napa Valley Wine Train
O_3	ozone
PACE	property assessed clean energy
PFC	perfluorocarbon
PG&E	Pacific Gas and Electric
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
ppm	parts per million
RCD	Resource Conservation District
RMP	Refrigerant Management Program
SB	Senate Bill
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SLCP	short-lived climate pollutant
SMART	Sonoma-Marin Area Rail Transit

TDM	transportation demand management
TIS	Transportation Impact Study
TOD	transit-oriented development
UEF	uniform energy factor
UVA	Upper Valley Waste Management Agency
VMT	vehicle miles traveled
ZNE	zero net energy

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Napa County Climate Action Plan

Executive Summary

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Source: County of Napa

Executive Summary

This Climate Action Plan (CAP) provides a comprehensive roadmap to address the challenges of climate change in unincorporated Napa County. Acting on climate change means reducing greenhouse gas (GHG) emissions from local sources and helping the community to adapt to climate change and improve its resilience over the long term.

The CAP aims to address climate change by reducing GHG emissions from sources within the unincorporated area, and by identifying strategies for adapting to future environmental conditions caused by climate change.

The scientific consensus is that it is "extremely likely" that global climate change is caused by GHG emissions associated with human activities, and that significant reductions in human-caused GHG emissions are needed by the mid-21st century to prevent the most the catastrophic effects of climate change. To this end, in 2006, the California Global Warmings Solutions Act (Assembly Bill [AB] 32) established the State's first target to reduce GHG emissions, which established a goal of lowering emissions to 1990 levels by 2020. California has been making steady progress and is expected to achieve the 2020 target; however, ongoing reductions in GHG emissions are needed as noted above.

As directed by AB 32 and SB 32, the State aims to reduce annual GHG emissions to:

- **1990 levels by 2020,**
- **40 percent below 1990 levels by 2030.**

The State's longer-term goal is to reduce emissions down to 80 percent below 1990 levels by 2050.

In 2016, Senate Bill (SB) 32 was signed into law, which established a new mid-term target of 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 29-nation European Union which adopted the same target in October 2014. The new 2030 target places California on a trajectory towards meeting its longer-term goal, which is to bring emissions down to 80 percent below 1990 levels by 2050.

Over the last decade, the County of Napa (County) has taken several steps to begin addressing climate change and achieving reductions in GHG emissions, in the County's operations as well as the broader community. Since 2007, the County has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies on both a county and larger regional level. The County's General Plan and Environmental Impact Report (EIR) called for development and adoption of a CAP. This CAP builds upon the County's past efforts and fulfills the requirements of the County's General Plan and EIR.

Source: County of Napa

The key components of the climate action planning process represented in this CAP are briefly summarized below:

1. The County prepared a **baseline GHG emissions inventory** for 2014 that is addressed in more detail in Chapter 2 and Appendix A. The key findings from the inventory include:
    - 484,283 metric tons of carbon dioxide equivalent (CO_2e) were emitted by communitywide sources in the unincorporated County in 2014.

The Top 5 Emitting Sectors in 2014:

1. Building Energy Use (31%)
2. On-Road Vehicles (26%)
3. Solid Waste (17%)
4. Agriculture (10%)
5. Off-Road Vehicles (9%).

Source: County of Napa

Local governments play an important role in achieving the State's GHG targets for 2020 and 2030, and in making substantial progress on the pathway to longer-term goals established for 2050. Action and collaboration are needed at all levels to complement and support State level actions.

The CAP contains a total of 50 local GHG reduction measures. While many of the emission reductions of the measures can be quantified, others are more difficult to quantify. However, the combination of all measures contributes towards achieving 2020 and 2030 targets.

- The largest source of emissions was the Building Energy sector (i.e., residential and commercial/industrial buildings and other facilities), which accounted for 31 percent of the inventory; while the Transportation sector accounted for approximately 26 percent of the inventory.

2. The County prepared **GHG emissions forecasts and reduction targets and goals** for 2020, 2030, and 2050, consistent with State targets under AB 32 and SB 32.

   - Without any future actions (i.e., "business-as-usual" conditions), GHG emissions are expected to increase by 2020, 2030, and 2050.
   - GHG emissions reduction targets for the CAP were established for 2020 and 2030, along with a long-term goal for 2050, consistent with the most recent guidance provided by the California Air Resources Board (CARB):
     - 2 percent below 2014 levels by 2020;
     - 40 percent below 2014 levels by 2030; and
     - 77 percent below 2014 levels by 2050.
   - Legislative actions by State or Federal agencies help to reduce emissions in the future, but are not enough to achieve the 2030 targets. Achieving the 2030 target will require local action to help close the gap between legislative-adjusted emissions forecasts and the emissions limits established by the CAP's targets.
   - The CAP is focused on meeting the 2020 and 2030 targets, which are specific planning targets that will put the County on a long-term downward trajectory towards meeting the long-term 2050 goal.

3. **Local GHG emissions reduction strategies and measures** were identified to help the County achieve the 2020 and 2030 targets.

   - GHG reduction strategies in the CAP are aligned with each of the eight GHG inventory sectors and contain a total of 50 specific local reduction measures.
   - The primary GHG reduction measures identified in the CAP will result in measurable, quantifiable reductions in emissions. Supporting measures are qualitative measures that are difficult to quantify, but will still contribute to achieving local GHG reductions, either alone or in combination with legislative actions or other local GHG reduction measures.
   - The top six measures in the CAP that will the achieve the most local GHG emissions reductions by the year 2030 include:

- Measure BE-4: Requiring new or replacement residential water heating systems to be electrically-powered or alternatively-fueled (e.g., solar thermal, ground-source heat pump) will reduce emissions annually by 11,575 metric tons of carbon dioxide equivalent ($MTCO_2e$) by 2030.

- Measure AG-2: Replacing diesel or gasoline-powered agricultural equipment with electric or alternatively-fueled equipment will reduce emissions annually by 11,273 $MTCO_2e$ by 2030.

- Measure BE-3: Increasing participation in Marin Clean Energy's (MCE) Deep Green (100 percent renewable) option and encouraging ongoing participation in MCE will reduce emissions annually by 9,155 $MTCO_2e$.

- Measure MS-1: Supporting efforts to increase the percentage of Napa Green Certified wineries and land will reduce emissions annually by at least 5,742 $MTCO_2e$ by 2030.

- Measure OR-1 and OR-2: Requiring Tier 4 equipment and the use of renewable diesel, other alternative fuels, or zero-emission vehicles for all construction activity and mining operations throughout the County will reduce emissions annually by 5,668 $MTCO_2e$ by 2030.

▪ While the measures included in the CAP are generally geared towards reducing GHG emissions, many will also result in environmental or economic "co-benefits," including climate adaptation co-benefits, that will help to increase community resilience and improve public health.

The total estimated annual GHG emissions reductions from all reduction measures quantified is approximately 66,334 $MTCO_2e$ in 2030.

Co-benefits are the collateral positive side effects that result from strategies and measures identified in the CAP.

4. The County prepared a **climate change vulnerability assessment and climate adaptation measures** to improve community sustainability.

▪ The climate change vulnerability assessment (Appendix C) determined that the County is vulnerable to several adverse impact climate change effects, including:

- Increases in average temperatures and the frequency of heat waves and extreme heat events;

- Changes to precipitation patterns;

- Increased risk of wildfire;

- Increased likelihood of flooding; and

- Increased risk of coastal flooding from sea-level rise.

A vulnerability assessment includes identification of localized climate change exposure and related effects, an assessment of potential areas of vulnerability, a review of the County's current capacity to adapt to climate-related impacts, and consideration of how likely and how quickly impacts will occur. See Appendix C for the full vulnerability assessment.

> The CAP outlines how County staff will implement measures, and how the CAP will be monitored and updated over time to ensure measures and targets are achieved.

- Chapter 4 includes specific adaptation measures to address these effects. Many of the measures require the County and other partnering agencies to address climate-related risks as part of existing planning processes, as well as move towards incremental changes in the way that County services and infrastructure and maintained and operated. Community education and awareness-building are also important components of the adaptation strategies.

5. **Implementation and monitoring mechanisms** are identified that will help the County ensure that the measures and targets are achieved.

   - Implementation of the measures in the CAP will require the County to develop and implement new ordinances, programs and projects, or modify existing ones. This will require careful consideration of the operational and capital resources needed, as well as the timing and phasing of implementation. Chapter 5 outlines these assumptions in detail.

> The County's CAP monitoring and reporting activities will include:
>
> - Evaluating the performance of CAP measures and preparing a progress report to the Board of Supervisors every two years, and
> - Reviewing and updating the GHG emissions inventory every five years.

   - Monitoring is an important aspect of the CAP to ensure that the County is on track to achieve the GHG reduction targets and desired outcomes for increasing resilience in the face of a changing climate. To this end, the County will need to review and update the GHG emissions inventory periodically (every five years), track the community's progress on the implementation status of each measure in the CAP, and report back to the Board of Supervisors and the public at least every two years.

   - The CAP includes a broad range of GHG reduction measures designed to reduce emissions in existing and new development. Some of the GHG reduction measures are specific and enforceable measures that apply to existing or new development, either through the building permitting process or the environmental review process for certain projects pursuant to the California Environmental Quality Act (CEQA). Where the County does not have jurisdiction to enforce specific measures, it supports the efforts of the State or others who retain such jurisdiction by providing incentives or technical assistance.

> Climate change is a global problem, but one that must be addressed on a local level through partnerships and individual actions.

   - The County will use the CAP to streamline the analysis of project-level GHG emissions during environmental review, pursuant to CEQA Guidelines Section 15183.5. Projects that are required to undergo environmental review will be required to comply with the CAP Consistency Checklist in order to be eligible for GHG streamlining (see Appendix D for detailed information about the CAP Checklist and its relationship to the GHG reduction measures in the CAP).

- Local action on climate change cannot be addressed insularly by one agency or community, but requires active and ongoing partnerships between residents, businesses, the County, and other agencies and organizations in the region. On a community-wide level, individuals and businesses can play an important role in combating climate change. By changing habits to consume less energy; produce less waste through recycling, conserve water, and compost; and drive less by choosing to carpool, take transit, or walk and bike more frequently, individuals and businesses can work towards reducing their carbon footprint. The combination of these small efforts can lead to better outcomes for the environment and the County.

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Napa County Climate Action Plan

A Tradition of Stewardship
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Chapter 1

Introduction

1.1 Climate Action Plan Overview

There is strong consensus that global climate change is occurring; seasons are shifting, average temperatures are increasing, precipitation levels are changing, and sea levels are rising. These changes will have adverse effects on human health and safety, economic prosperity, provision of basic services, and the availability of natural resources in Napa County.

The CAP provides the County with a roadmap to address two climate change challenges: to reduce GHG emissions from sources within the County and to improve its response to climate change over the long term.

This Climate Action Plan (CAP) sets a course of action for the County of Napa (County) to address global climate change. The CAP, consistent with and complimentary to statewide legislation and actions, provides a feasible roadmap for the County to both reduce greenhouse gas (GHG) emissions from many sources in the unincorporated County and address the challenges of a changing climate by helping to adapt and respond to climate change over the long term.

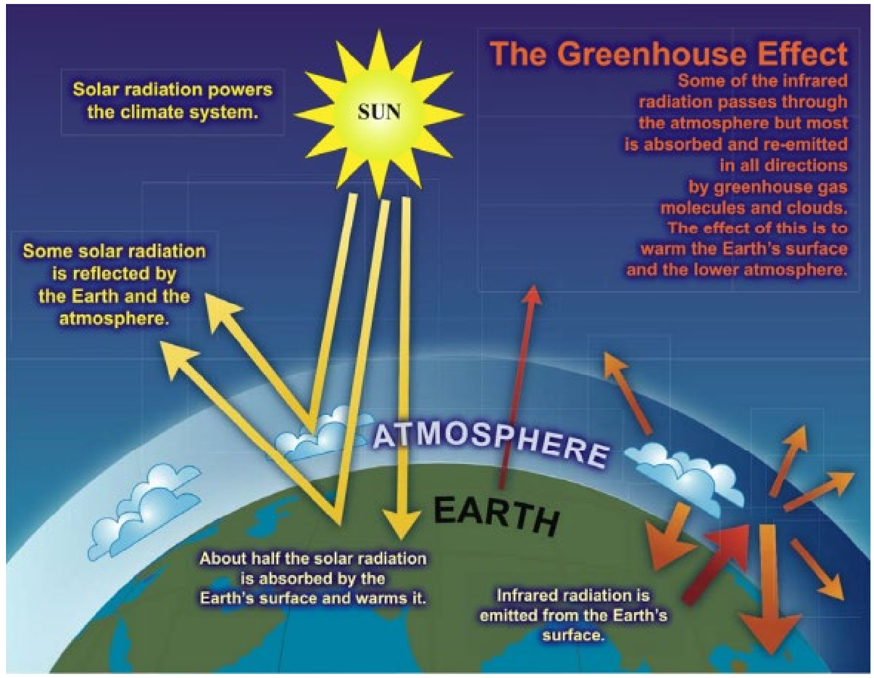
While the CAP uses the best information, research, and techniques available today, technologies and markets are constantly changing. Thus, strategies identified in the CAP may become obsolete considering the development of new technologies that do not yet exist, or as new State and Federal laws are passed. However, the overarching goals of the CAP remain the same: to reduce GHG emissions and prepare for and adapt to climate change.

The County will monitor, review, and update the CAP to ensure continued effectiveness and relevance of the document.

1.2 Introduction to Climate Change Science

The greenhouse effect, as outlined below in Figure 1-1, results from a collection of atmospheric gases called GHGs that insulate the Earth and help regulate its temperature. These naturally occurring gases, mainly water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3), all act as effective global insulators, reflecting Earth's visible light and infrared radiation to keep temperatures on Earth stable. Without the greenhouse effect, Earth would not be able to support life as we know it.

Source: County of Napa



Source: IPCC 2007

Figure 1-1: The Greenhouse Effect

However, human activities (e.g., burning of fossil fuels for transportation and energy, and increasing rates of deforestation and development) have contributed to the elevated concentration of these gases in the atmosphere. Human-caused (i.e., anthropogenic) emissions of GHGs above natural ambient concentrations are responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change, or global warming. There is strong scientific consensus that it is "extremely likely" that most of the changes in the world's climate during the last 50 years are a result of anthropogenic GHG emissions (Intergovernmental Panel on Climate Change [IPCC] 2014:3, 5).

It is "extremely likely" that in the last 50 years, most of the changes in the world's climate are a result of anthropogenic, or human-generated, activities.

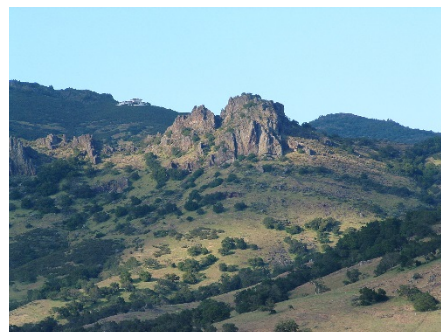
Furthermore, short-lived climate pollutants (SLCPs), which are GHGs that remain in the atmosphere for a much shorter period than long-lived climate pollutants (i.e., CO_2 and N_2O), are powerful climate forcers that have an outsized impact on climate change in the near term. Despite their relatively shorter atmospheric lifespan, their relative potency in terms of how they heat the atmosphere (i.e., global warming potential [GWP]) can be tens, hundreds, or even thousands of times greater than that of CO_2. SLCPs include CH_4; fluorinated gases (F-gases), including hydrofluorocarbons (HFCs), perflurocarbons (PFCs), and sulfur hexafluoride (SF_6); and, black carbon.

Global climate change, is causing changes in precipitation patterns, shrinking polar ice caps, rises in sea level, and other impacts to biological resources and humans. Chapter 2 of the CAP summarizes the County's GHG emissions that are contributing to global warming.

Climate change is a global problem and can lead to significant fluctuations in regional climates. While there is consensus that global climate change is occurring, and is influenced by human activity, there is less certainty as to the timing, severity, and consequences of climate change phenomena, particularly at specific locations. Chapter 4 of the CAP discusses the predicted climate change effects in the County in more detail, while also outlining specific vulnerabilities the County faces because of these effects.

The CAP represents an important step in acknowledging global climate change effects on the County. Chapters 3, 4 and 5 of the CAP includes strategies, specific measures, and implementation programs and monitoring tools to reduce GHG emissions and plan for climate change impacts.

1.3 Regulatory Background



Source: County of Napa

In response to the threat of global climate change, the State and County have already taken several steps to both reduce GHG emissions and adapt to climate change. These efforts, briefly summarized below, provide important policy direction and context for the CAP.

1.3.1 California

In 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, which directed the State of California to reduce GHG emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. A year later, in 2006, the Global Warming Solutions Act (Assembly Bill [AB] 32) was passed, establishing regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions. AB 32 put a cap on GHG emissions, setting a target of reducing GHG emissions to 1990 levels by 2020. As part of its implementation of AB 32 and Executive Order S-3-05, the California Air Resources Board (CARB) developed a Scoping Plan in 2008. The 2008 Scoping Plan, along with the first update in 2014, described the approach California is taking to reduce GHGs to achieve reduction targets and goals for 2020 established under AB 32. According to CARB, California is currently on track to meet or exceed the AB 32 target of reducing GHG emissions to 1990 levels by 2020.

As directed by AB 32, SB 32 and Executive Orders B-30-15 and S-3-05, the State aims to reduce annual GHG emissions to:

- **1990 levels by 2020,**
- **40 percent below 1990 levels by 2030, and**
- **80 percent below 1990 levels by 2050.**

On April 20, 2015 Governor Edmund G. Brown Jr. signed Executive Order B-30-15, establishing a new GHG emissions reduction target 40 percent below 1990 levels by 2030. This target aligns with those of leading international governments such as the 29-nation European Union which adopted the same target in October 2014. Executive Order B-30-15 also directed CARB to update the Scoping Plan to identify pathways to achieving the 2030 target. In September 2016, Governor Brown also signed Senate Bill (SB) 32, which codified into statute the mid-term 2030 target established by Executive Order B-

30-15. The 2017 Scoping Plan, adopted by CARB in December 2017, lays out the framework for achieving the mandate of SB 32 to reduce statewide GHG emissions to 40 percent below 1990 levels by 2030. The new 2030 GHG emissions reduction target places California on a trajectory towards meeting the longer-term goal of reducing statewide emissions to 80 percent below 1990 levels by 2050. In support of these goals, the State has adopted several laws to reduce emissions from various emissions sectors.

SB 350 and SB 100 call for statewide electricity usage to be 60 percent renewable by 2030 and 100 percent renewable by 2045. SB 350 and SB 100 were approved by Governor Brown in October 2015 and September 2018, respectively. These senate bills continue the intent of SB X1-2 that codified a 33 percent renewable portfolio standard to be met by 2020. Specific to SLCPs, SB 605, which was signed in September 2014, required CARB to develop a plan to reduce emissions of SLCPs. SB 1383, signed in September 2016, requires CARB to approve and begin implementing the plan by January 1, 2018. SB 1383 also sets targets for statewide reductions in SLCP emissions of 40 percent below 2013 levels by 2030 for methane and F-gases and 50 percent below 2013 levels for 2030 for anthropogenic black carbon. CARB adopted the SLCP Reduction Strategy in March 2017 pursuant to SB 605 and SB 1383, laying out options to accelerate SLCP emissions reductions in California through enacting regulations, creating incentives, and other market-supporting activities. SB 1383 also establishes statewide targets to reduce statewide disposal of organic waste by 50 percent below 2014 levels by the year 2020, and a 75 percent reduction below 2014 levels by 2025. Pursuant to the authority granted in SB 1383, the California Department of Resources Recycling and Recovery (CalRecycle) will develop and adopt new statewide regulations by 2019 to achieve the organic waste disposal reduction targets.

In addition to legislation setting statewide GHG reduction targets, SB 375, signed by the Governor in 2008, better aligned regional transportation planning efforts, regional GHG emissions reduction targets, and land use and housing allocations. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy, showing prescribed land use allocations in each MPO’s Regional Transportation Plan. CARB, in consultation with the MPOs, provides each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in their respective regions for 2020 and 2035.

To effectively address the challenges that a changing climate will bring, the State also prepared the 2009 California Climate Adaptation Strategy, which highlights climate risks and outlines possible solutions that can be implemented throughout the State. This Strategy was updated in 2014 and is now known as Safeguarding California. In 2015, the State developed the Safeguarding California Implementation Action Plans. The Safeguarding California Plan: 2018 Update was released in January 2018. The plan provides an updated programmatic survey of existing efforts to combat climate change throughout the State.

1.3.2 Napa County

Over the last decade, the County has taken several steps to begin addressing climate change, sustainability, and reductions in GHG emissions. Since 2007, the County has been involved in various efforts to quantify GHG emissions sources and formulate reduction strategies on both a county and larger regional level. This CAP builds upon these past efforts by creating a GHG inventory for 2014 and forecasting emissions for 2020, 2030, and 2050 to comply with new legislation. Other notable County efforts are highlighted below.

Source: County of Napa

- **GHG Reduction Plan for County Municipal Operations:** In 2007, the Napa County Department of Public Works, together with Kenwood Energy, performed a separate inventory and prepared a reduction plan for the GHG emissions associated with the County's municipal operations. The Emissions Reduction Plan identified a suite of actions that would result in reducing emissions from government operations by 15 percent by 2020 compared to 2008 levels (Napa County 2007). In 2016, the County updated the 2008 GHG emissions inventory for County operations (Napa County 2016). A 10 percent reduction has been achieved so far.

- **Napa County General Plan (2008):** The County General Plan provides the foundation upon which all future land use and public investment decisions are based. It is a guide for the development of all planning documents, including this CAP, which must be consistent with General Plan Policies. The General Plan includes policies aimed at reducing local contributions to global climate change and encouraging sustainable building practices, sustainable vineyard practices, and ecological stewardship. The General Plan's Environmental Impact Report (EIR) specifically directed the County to develop a CAP as an implementation action and mitigation measure to reduce GHG emissions in the County and address climate change impacts (Mitigation Measure M-4.8.7a).

The CAP is not a part of the General Plan but must be maintained consistent with the General Plan. This allows the County to update the CAP on an ongoing, as-needed basis, without amending the General Plan. It also ensures that County climate action efforts can be adjusted over time to reflect new legislation and technologies.

1.4 Climate Action Plan Purpose and Objectives

The CAP outlines a course of action for the County to reduce community-wide GHG emissions in the County, as well as to prepare for and adapt to climate change.

AB 32, SB 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets and long-term goals. Because the County's 1990 emissions level were not estimated, proportional targets for the County's CAP were developed for 2014 that are consistent with CARB's 2017 Scoping Plan and the State's 2014 GHG emissions inventory.

The GHG reduction targets for the County in the CAP have been established in accordance with CARB's 2017 Scoping Plan recommendations for developing community-wide, plan-level reduction targets. Consistent with the Scoping Plan targets and the State's 2014 GHG emissions inventory, the CAP aims to achieve the following local community-wide GHG reduction targets for 2020 and 2030, and a longer-term goal for 2050:

- 2 percent below 2014 levels by 2020;
- 40 percent below 2014 levels by 2030; and
- 77 percent below 2014 levels by 2050.

To achieve these objectives, the CAP identifies the following:

- A summary of baseline GHG emissions and the potential growth of these emissions over time;
- The expected climate change effects on the County, including areas of vulnerability;
- GHG emissions reduction targets and goals to reduce the community's contribution to global warming; and
- Identification and evaluation of strategies and specific primary and supporting measures to comply with statewide GHG reduction targets and goals, along with measures to help the community adapt to climate change impacts.

Source: County of Napa

As part of CAP implementation, each strategy and measure must be continually assessed and monitored. Reporting on the status of implementation of strategies, conducting periodic updates to the GHG emissions inventory, and performing other monitoring activities will help to ensure that the CAP is making progress towards established goals. Chapter 5 explains how the measures in the CAP would be administered, implemented, monitored, and updated. The County also developed a CAP Consistency Checklist for new development projects subject to environmental review pursuant to the California Environmental Quality Act (CEQA). This will help to ensure that such projects contribute to the County's GHG reduction goals, while also providing a pathway for streamlining analysis and mitigation of GHG emissions in project-level environmental documents pursuant to the State CEQA Guidelines Section 15183.5. See Chapter 5 for more information.

1.5 Co-Benefits

Co-benefits are the collateral positive side effects that result from strategies and measures identified in the CAP.

While the measures included in the CAP are generally geared towards reducing GHG emissions, many will also result in environmental or economic "co-benefits." Environmental co-benefits include improved air quality, water supplies, biological resources, public health outcomes, and beneficial outcomes for other resources. For example, a significant co-benefit of implementing GHG measures related to reductions in motor vehicle use and associated fuel combustion will result in fewer toxic air contaminants, leading to better air quality and improved health for everyone. Other strategies focus on improving energy and water-use efficiency in new and existing buildings, which often contribute to reducing overall housing and operational costs for residents and businesses. Another key GHG reduction measure focuses on improving the sustainability of wineries in the County, which is a large local economic driver. By incentivizing wineries in the County to participate in the Napa Green Program, wineries could expand their facilities while also reducing the amount of GHGs their facilities emit.

Co-Benefits identified in the CAP:

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Water Supply and Quality
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Improved Quality of Life
- Reduced Fossil Fuel Reliance
- Protection of Structures and Assets
- Increased Public Awareness of Climate Change
- Reduced Energy Demand
- Reduced Building and Operating Costs
- Reduced Energy, Water, and Sewer Bills

Furthermore, several reduction measures encourage transit-oriented development and siting of affordable housing in the County, which allow residents to live closer to jobs, schools, and services, as well as help to reduce housing costs. The CAP also supports the development of increased interregional transit solutions, as well as the construction of more park and ride facilities. Other transportation measures including encouraging the use of active modes of transportation, which can have public health benefits and allow people to drive less, save money, and use their time more constructively.

More detailed discussion of reduction measures, along with their co-benefits, can be found in Chapter 3, Greenhouse Gas Emissions Reduction Strategies and Measures. Further details on the co-benefits analysis can be found in Appendix B. Adaptation co-benefits can be found in Chapter 4, Climate Change Vulnerability and Adaptation.

1.6 Community Action and Public Involvement

1.6.1 Community Action

While global change is happening worldwide, local efforts to reduce human-induced GHG emissions and build resilience in the face of adverse climate change effects can make a difference. Local action on climate change cannot be addressed individually by one agency or community, but requires active and ongoing partnerships between residents, businesses, the County, and other agencies and organizations in the region. By beginning to plan now and engage in more sustainable practices, communities will be better suited to adapt and respond to climate change in the future.

Climate change is a global problem, but one that must be addressed on a local level through partnerships and individual actions.

Effective and long-term climate action and resiliency in the County can only be achieved through efforts that continue to change the way individuals interact with the environment. The CAP serves as a resource and starting point to support long term sustainability efforts.

1.6.2 Summary of Public Involvement

The CAP was prepared with the involvement and engagement of key internal and external stakeholder groups from various public, private, and nonprofit sectors; as well as individual citizens and residents of the County. The County has held several outreach meetings and public hearings at key milestones in the process to engage the community and interested stakeholders.

Source: County of Napa

The first meeting, which occurred in November 2015, introduced the CAP process, provided a history of County actions to date on climate change, and provided an explanation of methods used in GHG emissions inventories. The second meeting took place in February 2016 and presented the results of both the draft GHG emissions inventory and emissions forecasts for the County. There was also time allotted for public comments and questions. The third meeting, occurring in June 2016, presented the draft emissions reductions targets, measures, and gap analysis. At a fourth meeting, held in February 2017, staff presented the Draft CAP to the public and the County Watershed Information and Conservation Council. Public comments on the Draft CAP were accepted from January 26, 2017 through March 10, 2017.

The Planning Commission held a public hearing on the Final CAP on July 5, 2017. The Planning Commission received public comments at this hearing and provided comments and questions to staff, but the Commission did not take action in forwarding a recommendation for adoption to the Board of Supervisors.

In response to public comments received in 2017, the County prepared a Revised Draft CAP that was available for public review from July 24, 2018 to August 22, 2018. The Planning Commission also held a public hearing on the Revised Draft CAP on August 15, 2018. This Second Revised Draft CAP was prepared in response to public comments received on the Revised Draft CAP in July and August 2018.

The County is also preparing an EIR for the CAP pursuant to CEQA, for which a Notice of Preparation (NOP) was released concurrently with the Revised Draft CAP on July 24, 2018 for a 30-day comment period. The EIR, along with the Second Revised Draft CAP, will be released concurrently for a 45-day public review and comment period from May 10 to June 24, 2019

Following the close of the 45-day comment period, County staff will respond to public comments and prepare the Final Revised CAP and Final EIR. Both documents will be brought forth to the Planning Commission for a public hearing and they will be requested to forward a recommendation to the Board of Supervisors to adopt the Plan and certify the EIR. The Final Revised CAP and Final EIR proposed for adoption and certification will be considered by the County Board of Supervisors at a public hearing in late-2019.

Napa County Climate Action Plan

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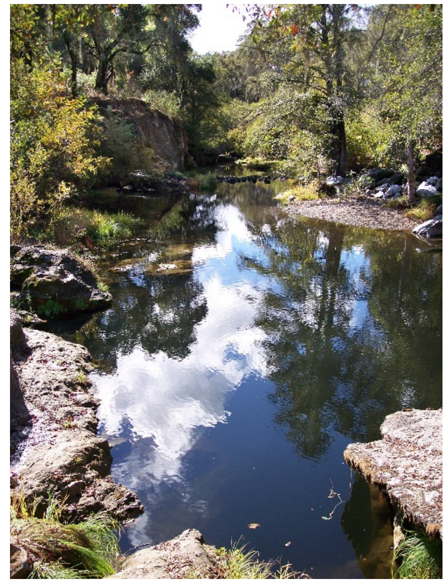
Chapter 2

Greenhouse Gas Emissions Inventory, Forecasts, and Reduction Targets

2.1 Introduction

This chapter summarizes the community's contribution to global warming by offering a detailed accounting of greenhouse gas (GHG) emissions within the unincorporated areas of Napa County. It includes a discussion of the primary sources and annual levels of GHG emissions for 2014 (i.e., inventory); describes likely trends if emissions are not reduced for 2020, 2030, and 2050 (i.e., forecasts); and sets a path forward to reduce emissions for specific target years (i.e., 2020, 2030), in view of a longer-term reduction goal for 2050. Emissions from communitywide activities are discussed in Sections 2.2 through 2.4.



Source: County of Napa

2.1.1 Why Prepare a Greenhouse Gas Emissions Inventory?

Recent increases in global temperatures are highly correlated with elevated GHG emissions resulting from human activities. Per the scientific community, to avoid "dangerous climate change" in the Earth's climate system, GHG emissions will need to be stabilized so that global temperatures do not increase more than 3.6 degrees Fahrenheit (°F) (2 degrees Celsius [°C]) above pre-industrial levels. To achieve this outcome, global carbon dioxide (CO_2) emissions must be stabilized between 300 and 350 parts per million (ppm).

One of the main objectives of this climate action plan (CAP) is to identify and reduce local contributions to global GHG emissions. This chapter is intended to serve as a foundation for the strategies and measures that will implement the commitment of the County of Napa (County) to reducing GHG emissions. Measuring GHG emissions is a critical first step in developing the CAP for several reasons. First, the GHG inventory identifies major sources and quantities of GHG emissions associated with the activities and choices currently made by residents, businesses, and public institutions. Second, the inventory provides the baseline that is used to forecast emissions trends and to develop an accurate near-term reduction target and interim goals consistent with State objectives. Finally, the inventory sets the baseline for the County to develop, evaluate, and implement strategies and measures to achieve its near-term target and interim goals.

The inventory baseline is used to:

- **forecast emissions,**
- **develop reduction targets, and**
- **develop, evaluate, and implement strategies to achieve the targets.**

The GHG emissions inventory also plays a role in ensuring that the County stays on course to meet the GHG reduction targets. After the CAP is adopted, the County will prepare regular GHG emissions inventories that will be compared to the baseline inventory and be used to track progress in reducing emissions as the CAP is implemented.

Assembly Bill (AB) 32, Senate Bill (SB) 32, and Executive Orders B-30-15 and S-3-05 use 1990 levels as a benchmark to identify statewide reduction targets. Because the County's 1990 emissions level was not estimated, proportional targets for the County's CAP were developed for 2014 that are consistent with guidance provided by CARB in the 2017 Scoping Plan and the State's 2014 GHG emissions inventory.

The inventory establishes 2014 as the baseline year from which the County determines GHG reduction targets.

2.1.2 Overview of GHG Emissions Inventory Characteristics

The emissions inventory is limited to gases that are generated locally in the County or within the region from a defined set of sources (e.g., transportation, electricity use, waste) that can be readily monitored and reduced through County actions.

A local community GHG emissions inventory is an estimate of a defined set of gases emitted to the atmosphere from local or regional sources that contribute to climate change. The six primary GHG emissions typically included in a community GHG emissions inventory are carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); and, three types of fluorinated gases (F-gases), including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

The community emissions inventory prepared for this CAP is limited to production- and activity-based emissions that are generated from local and regional activities within the unincorporated County or the surrounding region (i.e., San Francisco Bay Area), from a defined set of sources (e.g., transportation, electricity use, waste). The County's inventory was prepared in accordance with the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (International Council for Local Environmental Initiatives [ICLEI] 2013).

Source: County of Napa

According to this Protocol, local governments retain discretion regarding the scope of emissions to be included in a local community emissions inventory. Furthermore, as part of the scoping process for preparing a community emissions inventory, local governments need to consider what GHG accounting reporting framework is appropriate for preparation of their local CAP. Like many other local governments in California, the County prepared an emissions inventory using a framework consistent with the Protocol that accounts for emissions sources over which the County would have "significant influence" and where data sources are accurate, complete, measurable at a reasonable cost, and can be consistently tracked.

Based on these factors, the selected emissions sources primarily include community-wide activities that generate emissions within the boundaries of the unincorporated County; however, in the case of transportation, emissions associated with on-road vehicle trip origins and destinations may be located within the County (as a whole) or the broader region (i.e., the San Francisco Bay Area).

Two common terms used when discussing GHG emissions and climate change are "carbon footprint" and "GHG emission inventories." While related, these concepts are not synonymous.

The emissions inventory does not comprehensively address everyone's "carbon footprint" or attempt to quantify life-cycle or consumption-based emissions on a global scale that could be generated from all economic activities associated with the County (e.g., purchasing imported goods, global goods exports, or air travel to and from the County). Unlike a GHG emissions inventory, a carbon footprint is not limited to a defined geography or to a set of activities and sources over which the County has significant influence. A carbon footprint is based on a life-cycle analysis of GHG emissions that result from numerous activities of residences, businesses or organizations, such as the energy required to grow and ship food; the energy required for various forms of travel or goods movement far beyond the County's borders (e.g., trains, planes, ships); or the embodied energy to manufacture, market, and dispose of the products we use.

On a community-wide level, individuals and businesses can play an important role in combating climate change. By changing habits, residents and businesses can work towards reducing their carbon footprint

Local community GHG emissions inventories are focused on emissions that occur within the physical boundaries of the local community or its surrounding region and over which local agencies have significant influence. This is an appropriate reporting framework for climate action planning and is consistent with the Community Protocol. Attempting to account for the global, life-cycle carbon footprint of the community in the context of a GHG emissions inventory for a local CAP could result in double counting emissions that are within the inventories of other jurisdictions in California or elsewhere. Furthermore, the State of California's GHG emissions inventories are not based on global, life-cycle emissions analysis; and, the GHG reduction targets established under Assembly Bill (AB 32) and Senate Bill (SB 32) do not assume that achievement of those targets applies to the State's global carbon footprint. Thus, considering the scoping guidance provided in the U.S. Community Protocol and consistent with the State's emissions inventories and efforts to reduce statewide GHG emissions, the preparation of the 2014 GHG emissions inventory for the County's CAP does not include the calculation of the community's global carbon footprint.

This CAP includes strategies and measures that will help achieve the County's objectives to reduce GHG emissions as documented in the GHG emissions inventory. Many of the measures could also help residents, businesses, and organizations reduce their carbon footprint; however, achieving the targets in the context of the community's broader carbon footprint is beyond the scope of this CAP.

The County's 2014 GHG Emissions Inventory has Nine Sectors:

1. **Building Energy Use**
2. **On-Road Vehicles**
3. **Solid Waste**
4. **Agriculture**
5. **Off-Road Vehicles**
6. **High GWP Gases**
7. **Wastewater**
8. **Land Use Change**
9. **Imported Water Conveyance**

It should be noted that residents, businesses, and organizations make choices daily that produce GHG emissions that may be beyond the influence of the County and the CAP. This does not mean that individual residents or business in the County should feel limited to only those measures identified in this CAP, which are focused primarily on the County's inventoried emissions. Rather, members of the community can still make climate-friendly choices, such as buying locally-grown foods and locally-manufactured products that reduce electricity and energy use, to further reduce the local carbon footprint and further contribute to helping reverse global warming trends on a global scale.

Further details on the County's GHG emissions inventory characteristics, methods, and assumptions are included in Appendix A.

2.2 Inventory

The first step in the County's climate action planning process is to understand the sources and amounts of GHG emissions generated from activities within the County.

The County's 2014 inventory of GHG emissions is broken down into the following nine sectors, shown in decreasing order by level of contribution:

- **Building Energy Use:** Building Energy sector emissions include CO_2, CH_4, and N_2O emissions generated as the result of electricity and natural gas consumption in residential, commercial, and industrial buildings and stationary equipment, including water pumps for private wells.

Black carbon emissions associated with diesel exhaust will continue to be reduced through State actions.

- **On-Road Vehicles:** On-road transportation emissions include CO_2, CH_4, and N_2O emissions associated with gasoline, diesel and other fossil fuel consumption from motor vehicles on local and regional roadways.

- **Solid Waste:** Solid Waste sector emissions include waste-in-place CH_4 emissions generated from the decomposition of previously-landfilled waste in existing landfills operating in the County, as well as CH_4 emissions from the decomposition of waste generated by residences and businesses in the County in at landfills in various locations.

- **Agriculture:** Agriculture sector emissions include CO_2, CH_4 and N_2O generated during fuel combustion in farm equipment operations; CH_4 and N_2O emissions from livestock; and, N_2O from fertilizer use.

Source: County of Napa

- **Off-Road Vehicles:** Off-road vehicles and equipment generate CO_2, CH_4, and N_2O emissions associated with combustion of gasoline, diesel and other fossil fuels.

- **High global warming potential (GWP) gases**: High GWP gas emissions are generated as the result of the use or leakage of refrigerants, electrical insulators in transmission lines, fumigants, and other materials. Emissions in this sector include F-gases such as HFCs, PFCs, and SF_6.

- **Wastewater:** Wastewater treatment results in CO_2 emissions associated with the electricity consumed during treatment, as well as fugitive CH_4 emissions resulting from the treatment process for domestic sewage and industrial wastewater. Fugitive CH_4 accounts for most of the emissions in this sector.

- **Land Use Change:** Lost carbon sequestration and storage potential from conversion of natural lands such as oak woodlands, forests, and shrublands to developed uses, such as agriculture or urban development.

- **Imported Water Conveyance:** Water-related emissions include CO_2 associated with energy and fuel used to convey imported water into the unincorporated County for domestic, irrigation, and industrial purposes.

An important aspect of GHGs is the unit of measurement used to inventory and estimate emissions. CO_2 is the most prevalent and recognized GHG; however, there are five other primary GHGs that must be addressed to meet State-mandated reduction targets, including: CH_4, N_2O, SF_6, HFCs, and PFCs. To simplify discussion and comparison of these emissions collectively, climate action plans use a measurement known as carbon dioxide equivalent (CO_2e).

CO_2e measurement translates each GHG to an equivalent volume of CO_2 by weighting it by its relative global warming potential (GWP). For example, per the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment, CH_4 and N_2O are approximately 25 and 298 times more potent, respectively, than CO_2 in their ability to trap heat in the atmosphere (IPCC 2007). The County's 2014 GHG emissions inventory uses the IPCC's Fourth Assessment Report values to maintain consistency with the latest statewide inventory prepared by the California Air Resources Board (CARB) in 2018 (CARB 2018). Converting all six classes of GHG emissions into "carbon dioxide equivalents (CO_2e)" using GWP values allows us to consider all the gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to global warming using a standard unit of measurement. A metric ton of CO_2e ($MTCO_2e$) is the standard unit of measurement of the amount of GHG emissions produced and released into the atmosphere.

See Section 1.3 Regulatory Background for a more detailed summary of the legislation pertinent to short-lived climate pollutants (SLCPs).

Some GHG emissions can also be referred to as "short-lived climate pollutants" (SLCPs) because they remain in the atmosphere for a much shorter period than long-lived climate pollutants and have much higher GWP values than longer-lived climate pollutants. SLCPs include CH_4, F-gases, and black carbon.

The GHG emissions inventory prepared for this CAP includes the most common and prevalent SLCPs (i.e., CH_4 and F-gases); however, black carbon emissions are not quantified in the inventory. Pursuant to SB 605 and 1383, CARB adopted the SLCP Reduction Strategy in March 2017, which outlines how the State will reduce emissions of SLCPs. CARB notes in the SLCP Reduction Strategy that there are considerable difficulties in developing accurate black carbon estimates at the statewide level because they depend on a variety of factors with high rates of variability and uncertainty (CARB 2017b). Thus, because of this uncertainty and known difficulties in developing

On a local level, certain measures related to on-road transportation and wildfire, will have a co-benefit of reducing black carbon emissions.

reliable methods for black carbon inventories, black carbon emissions are not included in the 2014 emissions inventory. Nevertheless, the State is leading the way in reducing black carbon emissions. The SLCP Strategy states that while mobile sources (primarily from diesel exhaust) and wildfire are the primary statewide sources of black carbon, black carbon emissions from mobile sources have been reduced by 90 percent since the 1960s and the State's air quality policies will virtually eliminate black carbon emissions from on-road diesel engines within 10 years. Additionally, wildfires are now the largest statewide source of black carbon, and the State will continue to explore the actions needed to decrease emissions (CARB 2017b).

The Top Five Emitting Sectors in 2014:

1. **Building Energy Use (31%)**
2. **On-Road Vehicle (26%)**
3. **Solid Waste (17%)**
4. **Agriculture (10%)**
5. **Off-Road Vehicles (9%).**

Transportation sector GHG reduction measures contained in this CAP are aimed at reducing fossil fuel combustion, increasing the use of alternative fuel and zero-emissions vehicles, and reducing vehicle miles traveled (VMT). These measures will help to further reduce fine particulate matter ($PM_{2.5}$) from diesel fuel combustion and other sources, which will complement the State's efforts under the SLCP strategy and result in co-benefits of reducing black carbon emissions in the County. Less black carbon would also be emitted into the atmosphere in the County through wildfire-related climate adaptation measures contained in this plan. For a complete list of measures related to on-road transportation and wildfire, see Chapters 3 and 4.

Further details on the methodology for the inventory can be found in Appendix A.

2.2.1 Napa County's 2014 GHG Emissions

In 2014, communitywide activities in the County accounted for 484,283 $MTCO_2e$. Most emissions were due to building energy use and on-road vehicle activity. Thirty-one percent of these emissions were due to energy used in buildings for heating, cooling, and powering devices, equipment, and other energy loads. Emissions from gasoline and diesel consumption related to vehicles and trucks on local and regional roads accounted for another 26 percent of the County's emissions in 2014.

The County's 2014 emissions are equal to the emissions of a car driving 1.4 billion miles, or driving to the moon and back 2,851 times.

To put the County's emissions into perspective, 484,283 $MTCO_2e$ is equivalent to combusting 54.5 billion gallons of gasoline, combusting 258,388 tons of coal, or a year's worth of carbon sequestration from 458,424 acres of U.S. forests. Assuming an average car gets about 25 miles to the gallon, the County's 2014 emissions is same as a single car driving 1.4 billion miles, or driving to the moon and back 2,851 times (U.S. Environmental Protection Agency [EPA] 2016).

Additional detail related to the specific emission sectors, data sources, assumptions, and methodology can be found in Appendix A. Figure 2-1 and Table 2-1 below show the breakdown of Napa County's GHG emissions 2014.

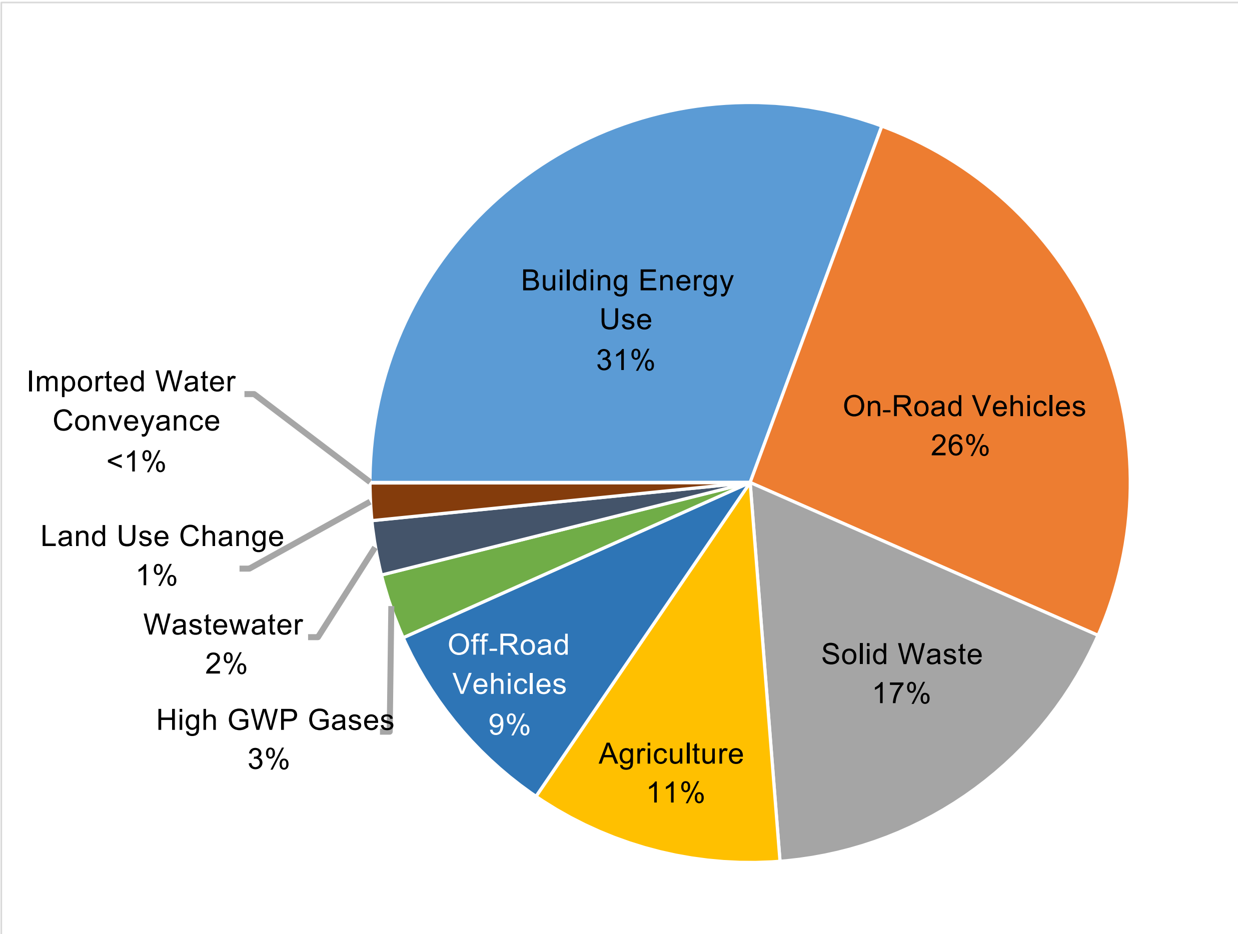


Figure 2-1: Napa County 2014 GHG Emissions

Table 2-1 2014 Unincorporated Napa County Greenhouse Gas Inventory

Emissions Sector	$MTCO_2e$	Percent
Building Energy Use	148,338	31
On-Road Vehicles	125,711	26
Solid Waste	83,086	17
Agriculture	52,198	11
Off-Road Vehicles	42,508	9
High-GWP Gases	13,481	3
Wastewater	11,189	2
Land Use Change	7,684	1
Imported Water Conveyance	88	<1
Total	**484,283**	**100**

Source: Data compiled by Ascent Environmental 2016

2.3 Forecasts

GHG emissions forecasts provide an estimate of future emission levels based on a continuation of current trends in activity while also accounting for known regulatory actions by State or Federal agencies (i.e., "legislative" actions) that could reduce emissions in the future. Forecasts provide insights into the scale of local reductions needed to achieve the GHG emissions reduction targets, in addition to legislative actions.

The BAU GHG emissions forecasts in the CAP assume a continued increase in population, housing units, employment and vehicle activity. Projections are based on Metropolitan Transportation Commission (MTC) and the Napa County General Plan.

The first step in preparing GHG emissions forecasts is the preparation of a "business-as-usual" (BAU) forecast, which assumes that no additional efforts or legislative actions beyond what have already been adopted will be made to reduce GHG emissions in the future. The BAU forecast also assumes that population, housing, employment, and transportation activity will grow over time, consistent with County projections. Finally, the BAU forecast does not account for GHG emissions reductions associated with implementation of the CAP or legislative actions.

Details on how the forecasts were developed and the indicators used to estimate each sector can be found in Appendix A.

2.3.1 Demographic Trends

GHG emission forecasts were estimated for 2020, 2030, and 2050 using County-specific demographic and vehicle activity projections through 2040 from the Metropolitan Transportation Commission (MTC). Based on MTC's projections, the County's unincorporated population is expected to increase by 7 percent by 2020, 19 percent by 2030, and 44 percent by 2050 from 2014 levels. Growth in employment is expected at a lower rate than population, with jobs growing by 3 percent by 2020, 8 percent by 2030, and 17 percent by 2050. This is likely because of the continued agricultural character and associated employment characteristics in the unincorporated area.

From 2014 levels, population in the County is expected to increase by:

- **7 percent by 2020,**
- **19 percent by 2030, and**
- **44 percent by 2050.**

The number of households in the unincorporated area is also anticipated to grow by 5 percent by 2020, 12 percent by 2030, and 28 percent by 2050 from 2014, a significantly lower rate than population. Housing growth is anticipated to be concentrated in the cities and towns to accommodate future population increases, highlighting planning efforts to reduce sprawl and achieve denser development.

The forecasts also consider anticipated changes in land use based on Napa County's General Plan. These land use change forecasts not only affect housing and population, but they also indicate losses in natural vegetation, such as oak woodlands and forests, that sequester CO_2 from the atmosphere.

2.3.2 Legislative Reductions

Source: County of Napa

The County's GHG forecasts account for a variety of legislative actions that will reduce future emissions from the County, without any additional local government action called for in this CAP. The applied legislative reductions include:

- improved vehicle fuel efficiency standards;
- a legislative ban on certain high-GWP gases;
- adopted improvements to the State's Building Energy Efficiency Standards;
- adopted statewide targets to reach 33 percent renewable mix in statewide electricity generation by 2020 and 50 percent by 2050;
- a statewide target to double energy efficiency in existing buildings by 2030 (i.e., SB 350);
- a 75 percent statewide waste diversion goal by 2020;
- planned landfill gas capture projects pursuant to State regulations; and
- participation in Marin Clean Energy (MCE).

The legislative reductions described above do not assume that the stringency of GHG emissions reductions will increase beyond 2030. A detailed description and analysis of how specific legislative reductions are included in the County's BAU GHG emissions forecast can be found in Appendix A. Table 2-2 and Figure 2-2 below show the breakdown of the County's forecasted BAU GHG emissions, including a comparison to total annual emissions that will occur without any legislative reductions.

The County's GHG forecast was completed prior to the reversal of EPA's proposed ruling in 2015 to phase out the use of hydrofluorocarbons (HFCs) following a federal appeals court decision in August 2017 (*Mexichem Fluor, Inc. v. EPA* (2017) 15-1328. D.C. Cir.). The County's GHG forecast in this CAP accounts for limiting emissions of HFCs with global warming potentials of over 2,500 as proposed in 40 CFR Part 82 (See Appendix A). However, since the *Mexichem Fluor, Inc. v. EPA* decision, California has adopted several State laws regulating high-GWP gases in the state, including SB 1383 (Super Pollutant Reduction Act) and SB 1013 (California Cooling Act). The legislative reductions that would occur under these State senate bills are included in the reductions shown in Measure HG-1, discussed in Chapter 3.

Table 2-2 Unincorporated Napa County BAU GHG Emissions Forecasts: With and Without Legislative Reductions ($MTCO_2e$/yr)

Sector and Subsector	2014	2020	2030	2050
Building Energy	148,338	131,643	59,150	67,184
Transportation	125,711	112,854	84,846	85,735
Solid Waste	83,086	62,345	56,711	48,854
Agriculture	52,198	52,521	53,589	57,446
Off-Road Vehicles and Equipment	42,508	45,164	49,592	58,474
High-GWP Gases	13,481	11,828	13,169	15,867
Water and Wastewater	11,277	11,858	12,959	14,335
Land Use Change	7,684	35,608	18,239	21,669
Total BAU with Legislative Reductions	**484,283**	**463,821**	**348,253**	**369,563**
Percent change from 2014 (%)	*0%*	-4%	-28%	-24%
Total BAU without Legislative Reductions	484,283	523,645	522,248	557,379
Percent change from 2014 (%)	*0%*	*8%*	*8%*	*15%*
Reductions due to Current Legislative Actions	0	59,824	173,995	187,816

Notes: Columns may not add to totals due to rounding.
BAU = business as usual
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2016

2.3.3 BAU GHG Forecasts with Legislative Reductions

The legislative actions listed above will help to lower GHG emissions in the unincorporated County, as shown in Table 2-2. Despite a 44 percent increase in population between 2014 and 2050, and without the strategies and measures included in this CAP (see Chapter 3), it is estimated that GHG emissions will decrease by 4 percent from 2014 levels to 463,821 $MTCO_2e$/year by 2020. By 2030 and 2050, emissions will decrease by 28 and 24 percent below 2014 levels, respectively. The overall decrease in emissions is primarily because of substantial increases in renewable electricity generation, improved energy efficiency in existing buildings, and more efficient vehicles. As shown in the legislative-adjusted forecasts in Table 2-2, transportation will replace building energy as the largest emissions sector in the future, accounting for 23 percent of emissions through 2050. On the other hand, emissions from building energy accounted for 31 percent of the County's emissions in 2014, but will account for less than 18 percent of emissions by 2050 in the legislative-adjusted forecasts.

Taking legislative reductions into account, emissions are projected to decrease in the BAU forecast. However, these reductions in emissions are not, in and of themselves, enough to meet State mandates.

2.4 Reduction Targets

Source: County of Napa

This CAP primarily focuses on reducing emissions by 2020 and 2030, consistent with State mandates. While setting goals beyond 2030 is important to provide long-term objectives, it is difficult to establish targets beyond a 15-year time frame for which defensible reduction assumptions can be made. This is primarily because of uncertainty around future technological advances and future changes in State and Federal law beyond 2030.

As directed in AB 32 and SB 32, the State's specific targets include reducing GHG emissions to the following levels:

- 1990 levels by 2020; and
- 40 percent below 1990 levels by 2030.

Previous State governors established longer-term emission reduction policy goal over the last 15 years, including Executive Orders B-30-15 (Brown) and S-3-05 (Scharzenegger), which call for a long-term statewide reduction of 80 percent below 1990 levels by 2050.

To meet its 2020 and 2030 reduction targets and long-term 2050 goal, the County will need to reduce emissions to:

- **474,598 $MTCO_2e$/year in 2020,**
- **290,570 $MTCO_2e$/year in 2030, and**
- **111,385 $MTCO_2e$/year in 2050**

CARB developed the *First Update to the Climate Change Scoping Plan (Scoping Plan Update)* pursuant to AB 32. It indicated that, over the long term, reducing the State's emissions to 80 percent below 1990 levels by 2050 would be consistent with the IPCC's analysis of the global emissions trajectory needed to stabilize atmospheric concentrations at 350 ppm or less, to reduce the likelihood of catastrophic global climate change (CARB 2014). However, the Scoping Plan has not yet been updated to identify a specific pathway that achieves the 2050 goal. The 2017 Scoping Plan identifies a pathway to achieving the 2030 target identified in SB 32, but it does not demonstrate how the 2050 goal would be achieved.

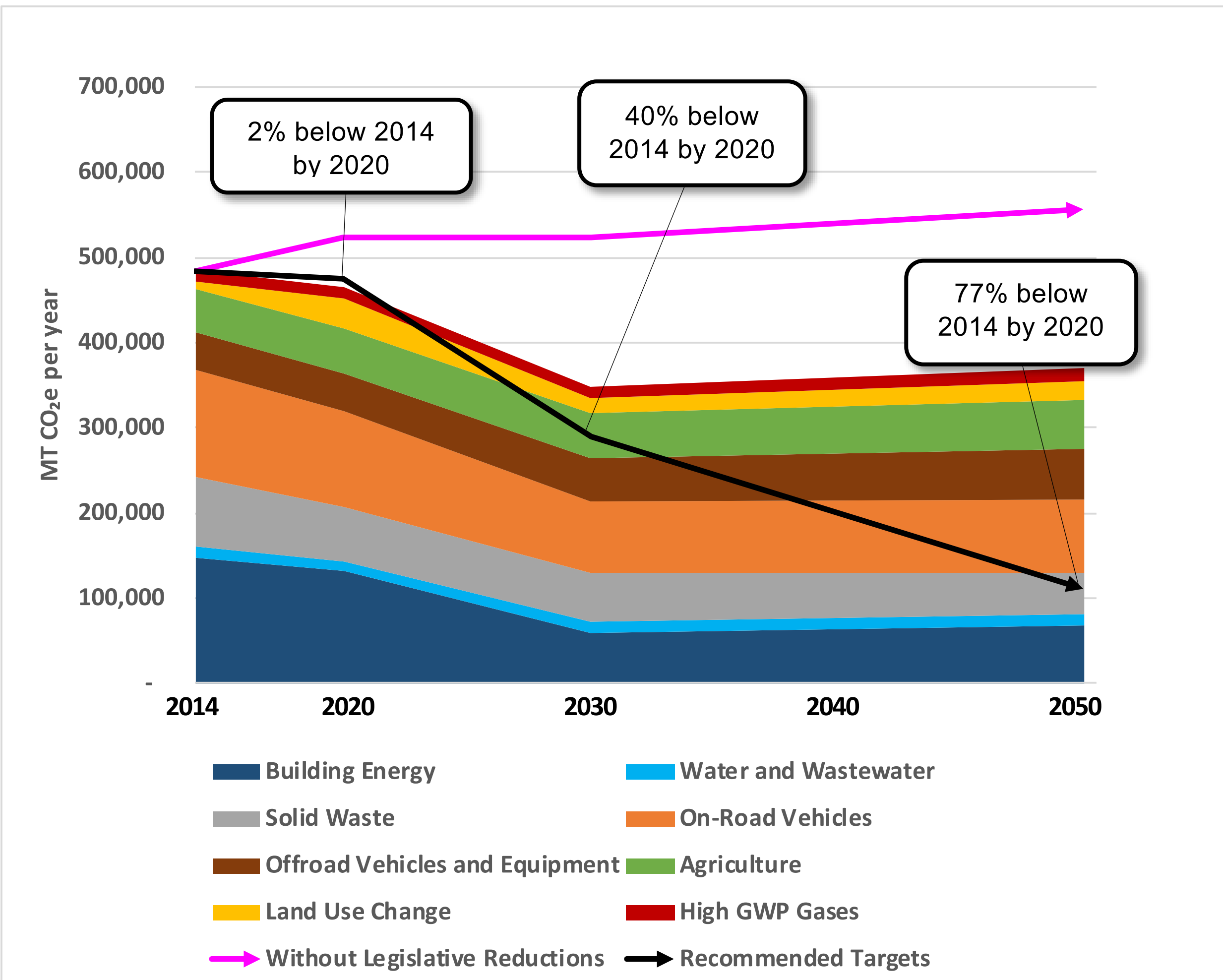
The County's reduction targets are consistent with CARB's 2017 Scoping Plan recommendations for developing community-wide targets and long-term goals, as well as the State's 2014 GHG emissions inventory.

To determine an equivalent reduction target at the local level, CARB's 2017 Scoping Plan Update recommends community-wide GHG reduction goals for local climate action plans that will help the State achieve its 2030 target and make substantial progress on the trajectory towards achieving a longer-term 2050 goal (CARB 2017a). The State's goals consist of reducing emissions to 6 $MTCO_2e$ per capita and 2 $MTCO_2e$ per capita by 2030 and 2050, respectively. Considering the overall statewide emissions in 2014 and the estimated statewide population for 2014 through 2050, CARB's recommended per-capita goals are equivalent to reducing 2014 emissions by 40 percent by 2030 and 77 percent by 2050 (CARB 2016, Department of Finance 2014). Thus, consistent with CARB's recommended community-wide targets and recent updates to the State's 2014 GHG emissions inventory, the following adjusted reduction targets should be achieved in the County:

- 2 percent below 2014 levels by 2020;
- 40 percent below 2014 levels by 2030; and
- 77 percent below 2014 levels by 2050.

Attaining a 2 percent reduction in GHG emissions will require that annual emissions be reduced to approximately 474,598 $MTCO_2e$/year in 2020, which is about 9,686 $MTCO_2e$/year lower than 2014 levels. Forecasts in Table 2-2 show that the County will meet and exceed this reduction target by over 10,000 $MTCO_2e$ through existing legislative reductions.

To achieve long-term GHG reductions, the County will need to reduce emissions to 290,570 $MTCO_2e$/year by 2030, or about 193,713 $MTCO_2e$ (40 percent) below 2014 GHG emissions levels. To achieve a 77 percent reduction in GHG emissions from 2014 levels by 2050, the County will need to reduce its emissions to about 111,385 $MTCO_2e$ per year in 2050, which is about 372,898 $MTCO_2e$ lower than 2014 levels. A detailed technical analysis of the County's emissions reduction target and goals can be found in Appendix B. Figure 2-2 below shows the GHG reduction targets alongside the breakdown of the County's emissions over time discounting any actions and measures proposed in this CAP.



Source: Ascent Environmental 2016

Figure 2-2: Napa County BAU GHG Emissions Forecasts, 2020 and 2030 Targets, and 2050 Goal without CAP Measures

Napa County Climate Action Plan

Chapter 3

Greenhouse Gas Reduction Strategies and Measures

A Tradition of Stewardship
A Commitment to Service

Source: County of Napa

3.1 Introduction

This chapter outlines strategies and specific measures to be implemented by the County of Napa (County) that will achieve its greenhouse gas (GHG) reduction targets for 2020 and 2030, and contribute substantial reductions on the pathway to achieving a longer-term 2050 goal over the coming decades. The strategies and measures focus on locally-based actions to reduce GHG emissions in various sectors as a complement to legislative actions taken by the State or Federal government.

The strategies mainly focus on community-scale strategies, but also include municipal operations strategies – to address both public and private responsibility for climate change. Through partnerships with and among residents, businesses, and other organizations, these measures will provide net benefits for everyone, such as an improved environment, long-term cost savings, conserved resources, a strengthened economy, and greater quality of life, while also making a difference in the world.

Co-benefits are the additional beneficial effects that will result from implementation of strategies and measures identified in the CAP, above and beyond the direct benefits of reducing GHG emissions. Co-benefits include improved air quality, water quality, biological resources, and public health outcomes, and beneficial outcomes for other resources.

In addition to defining new measures, the Climate Action Plan (CAP) accounts for existing plans, programs, and activities that the County has already undertaken to reduce GHG emissions. The CAP acknowledges these efforts and, in some cases, builds or expands on them.

Many of the strategies and measures to reduce GHG emissions will also have important co-benefits, such as improved air quality, improved water quality, improved conditions for biological resources, and beneficial public health outcomes, which are discussed in this chapter. Further details on the analysis of co-benefits can be found in Appendix B. Climate change adaptation and building community resilience are important co-benefits of many GHG reduction measures, and this is discussed in further detail in Chapter 4, Climate Change Vulnerability and Adaptation.

3.2 Summary of Greenhouse Gas Reduction Strategies

As described in Chapter 2, the County has established a 2020 GHG emissions reduction target (two percent below 2014 levels), a 2030 target (40 percent below 2014 levels), and a long-term emissions reduction goal for 2050 (77 percent below 2014 levels) to reduce annual emissions levels, consistent with State laws and guidelines. If communitywide emissions in the county were to continue growing under business-as-usual (BAU) practices and activities, the County's GHG emissions will meet and exceed the 2020 reduction target by just over 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$), but would fall short of the 2030 target by 57,683 $MTCO_2e$. With the

The County aims to reduce annual GHG emissions to:

- **two percent below 2014 levels by 2020,**
- **40 percent below 2014 levels by 2030, and**
- **77 percent below 2014 levels by 2050.**

measures included in the CAP and anticipated legislative reductions, the County's GHG emissions will exceed 2020 and 2030 targets by 48,359 and 8,651 $MTCO_2e$ per year, respectively, but would still need to reduce emissions by 163,678 $MTCO_2e$ per year to meet the longer-term 2050 goal consistent with the State's long-term goal.

The quantifiable measures in the CAP currently fall short of meeting the County's long-term 2050 reduction goal; however, demonstration of achievement of the 2050 goal in a local government CAP is considerably challenging due to the extended time horizon and the County's limited jurisdiction over numerous sources of emissions. The State's 2017 Scoping Plan does not currently demonstrate a feasible pathway for the State to achieve its 2050 goal, and while it is possible to calculate the scale of emissions reductions at a local level to achieve a similar goal, it is not possible to demonstrate how a local government can achieve a 2050 target based on local actions alone.

Over time, the County will also monitor, review, and update the CAP with new reduction measures to ensure continued effectiveness and progress towards meeting the long-term 2050 emissions reduction goal.

In the coming decades, new innovations and technologies will likely become available that will enable further GHG reductions beyond 2030 on the path to achieving the long-term 2050 goal. New or more reliable methods may also become available to quantify measures that are currently unquantifiable. Finally, new State and Federal laws may further reduce emissions in sectors currently outside of the jurisdiction of the County (e.g., new vehicle emissions standards that would apply to new or replacement vehicles decades into the future), or emissions in sectors addressed primarily by local County measures. As climate change science and policy continue to advance, the County will be able to apply new reductions toward meeting the long-term 2050 goal in future CAP updates.

The County is committed to monitoring and updating the CAP regularly to modify or update the specific GHG measures in each sector, and account for potential future legislative targets and legislative actions, to ensure that a feasible and quantifiable pathway to achieving the 2050 goal is ultimately identified (see Chapter 5, "Implementation and Monitoring," for a description of the County's specific commitments to CAP monitoring, progress reporting, and future updates).

Table 3-1 below shows the annual GHG reductions attributable to the measures included in this Plan. Table 3-2 shows how the anticipated reductions will help the County meet its GHG reduction targets and goals. See Appendix B for detailed calculations and an explanation of how the measures in the CAP work towards achieving the 2020 and 2030 targets.

Table 3-1 Annual GHG Reductions by Sector due to Proposed Reduction Strategies and Measures ($MTCO_2e$/year)

Strategy	2020	2030	2050
Building Energy	36,875	23,620	32,773
On-Road Transportation	0	4,312	4,508
Solid Waste	707	2,363	2,847

Table 3-1 Annual GHG Reductions by Sector due to Proposed Reduction Strategies and Measures ($MTCO_2e$/year)

Strategy	2020	2030	2050
Off-Road Vehicles and Equipment	0	5,668	6,169
Agriculture	0	11,922	16,218
Land Use Change	0	7,580	18,487
Wastewater[1]	0	5,743	5,737
High GWP	0	5,127	7,762
Total Reductions	37,583	66,334	94,500

Notes: Columns may not add to totals due to rounding.
[1] Reduction attributed only to Action MS-2, a multi-sector strategy.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
GWP = global warming potential
Source: Ascent Environmental 2018

As shown in Table 3-1, the GHG reductions anticipated by 2020 under this CAP are minimal due to the time needed to implement the measures pending the County's CAP adoption in mid-2019. As shown in Table 3-2, some of the proposed measures are already being implemented or are currently in the process of being implemented, relative to the 2014 baseline. Thus, annual GHG reductions are shown in the year 2020. Most of the GHG reductions achieved through the GHG measures will not be implemented until 2020 or thereafter, and thus total annual reductions are shown in the year 2030. The timing of implementation of all GHG measures is discussed in further detail in Chapter 5, "Implementation and Monitoring."

Table 3-2 Effect of Plan Measures on County Emissions, 2020 and 2030 Targets, and 2050 Goal ($MTCO_2e$/year)

Emissions Source	2020	2030	2050
Legislative-Adjusted BAU Napa County Emissions	463,821	348,253	369,563
Reductions from CAP Measures	37,583	66,334	94,500
Napa County Emissions with CAP	462,186	289,690	288,646
Napa County GHG Reduction Targets (Percent below 2014)	-2%	-40%	-77%
Percent Reduction below 2014 with Measures	-12%	-42%	-43%
Maximum Emissions allowed with Targets / Goal	474,598	290,570	111,385
Additional GHG Reductions Needed to meet Targets / Goal	-48,359[a]	-8,651[a]	163,678

Notes: Columns may not add to totals due to rounding.
[a] Negative values represent that the reductions meet and exceed the targets.
BAU = Business-As-Usual
CAP = Climate Action Plan
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2018

3.3 Strategies and Measures to Reduce Greenhouse Gases

The CAP includes 50 GHG reduction measures, organized under eight sector-based strategies and one multi-sector strategy.
Measures are also further organized into two categories: primary measures and supporting measures.

To help close the gap between the County's future BAU emissions and the State's target for 2030, the CAP includes 50 GHG-reducing measures which are organized under eight GHG emissions sector-based strategies and one multi-sector strategy.

The measures were developed based on a combination of factors, including:

- the feasibility of the measure to be implemented by the County;
- the need for greater reductions in the sectors with the most emissions, especially in building energy and transportation (See Figure 2-1 in Chapter 2);
- existing policies, actions, or programs that can be expanded or proposed policies yet to be adopted;
- feedback from community and other stakeholders; and
- technological innovations.

Under each sector, measures have been further categorized as either **primary measures** or **supporting measures**.

Under the provisions of CEQA Guidelines Section 15183.5, if a project can show consistency with applicable GHG reduction measures in a CAP, the level of analysis for the project required under CEQA with respect to GHG emissions can be streamlined and reduced considerably. See Chapter 5 for more information on how new development projects can show consistency with the CAP.

Primary measures are specific programs, policies, and actions that the County will carry out to achieve its climate action strategies. These measures include those for which GHG reductions have been quantified and are the primary measures that the County will rely upon to meet the GHG reduction targets for 2020 and 2030. Many of the primary measures include specific and enforceable components that could be applied to future projects seeking to tier and streamline from the CAP in the future; however, not all primary measures are regulatory in nature. Some of the primary measures that will result in quantifiable GHG reductions do not rely on County regulation or are the responsibility of other local agencies or organizations, either solely or in partnership with the County. All primary GHG reduction measures were quantified wherever substantial evidence and reasonable assumptions were available to support calculations.

Supporting measures are qualitative measures that are not identified as part of the primary set of quantifiable GHG reduction measures needed to meet CAP targets. Some supporting measures were not quantified to avoid double-counting of GHG reductions achieved by other primary measures that are similar in nature, while others were not quantified because of a lack of available data and/or lack of methods to quantify emissions reductions. However, over time, implementation of supporting measures may still result in GHG reductions and could be quantified in future CAP updates if data or quantification methods become available. Additionally, supporting measures included in the CAP are still considered important complementary actions to State or other County measures. Finally, supporting measures are also important to include in the CAP because they will achieve other important co-benefits.

As part of the CAP implementation process, all GHG reduction measures will be tracked and monitored for effectiveness. If future data and/or quantitation methods become available, supporting measures could be quantified in future updates. See Chapter 5 for more information on implementing and monitoring primary and supporting measures in the CAP.

Each sector-based strategy is described in detail in this chapter, including a summary of primary measures and associated GHG emissions reductions, and supporting measures under each strategy. Additional technical details for all measures, including detailed assumptions and supporting calculations for primary measures and the results of the GHG measures analysis (including co-benefits), can be found in Appendix B.

Chapter 5 also describes how both primary and supporting measures will be implemented under each strategy. Many primary measures that apply to new development will be implemented and enforced through new or amended regulations in the County Code, or by requiring projects that undergo environmental review to demonstrate consistency with the CAP via the CAP Consistency Checklist (see Chapter 5 and Appendix D).

3.3.1 Building Energy

The energy used in buildings is a significant contributor to GHG emissions in the County, accounting for 31 percent of total emissions (10 percent from residential and 21 percent commercial/industrial) in 2014. Although legislative reductions related to State actions will help to reduce building energy emissions by 60 percent from 2014 levels by 2030, and 55 percent by 2050, additional reductions can help the County meet State GHG reduction targets.

Source: County of Napa

The Building Energy strategy offers the greatest opportunity to achieve emissions reductions across the eight strategies. Measures under the Building Energy strategy will reduce building energy emissions by an additional 16 percent, resulting in a 76 percent reduction from 2014 levels by 2030, and a 77 percent reduction by 2050 when combined with legislative reductions. The building energy measures included in the CAP aim to further reduce emissions by improving energy efficiency earlier than or beyond State requirements, streamlining access to renewable energy, and increasing the supply of renewable energy for homes and businesses within the county. The success of these measures relies on coordination with local utilities and organizations, participation from the community, and administration of new or revised local policies and programs. Major co-benefits of building energy measures include improved air quality, reduced reliance on fossil fuels, and monetary savings. Furthermore, California Green Building Standards Code (CALGreen) Tier 1 standards include stipulations regarding low-VOC materials and building ventilation, leading to improved indoor air

Legislative reductions contribute greatly to emission reductions in the Building Energy sector. Beyond legislative reductions, measures under the Building Energy strategy will reduce emissions by an additional:

- **16 percent in 2030, and**
- **22 percent in 2050.**

quality and health outcomes. These benefits are discussed in greater detail in Appendix B.

All Building Energy measures also serve as adaptation measures by reducing overall energy demand and increasing the ability of the community and local economy to weather future change. For a complete list of adaptation measures, see Chapter 4.

The Building Energy strategy includes 11 measures, seven of which are primary measures and four of which are supporting measures. The primary measures include a new water heater replacement program and formal adoption of new construction standards to help achieve the State's zero net energy (ZNE) goals. Combined, these two measures will reduce emissions by 13,612 $MTCO_2e$ per year by 2030. Recent plans by Marin Clean Energy (MCE) to achieve a 100 percent GHG-free electricity portfolio by 2022 will reduce emissions in the County by another 9,155 $MTCO_2e$ by 2030. The seven primary measures together are expected to reduce emissions by 23,620 $MTCO_2e$ by 2030.

Table 3-3 summarizes building energy primary and supporting measures. Each measure is described in further detail below.

Table 3-3	Summary of Building Energy Measures			
Measure Number	Measure Description	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	0	73	80
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030.	0	2,037	10,730
	Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.	35,948	9,155	8,633
BE-4	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	0	11,575	12,550
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	545	605	571
BE-6	Select MCE's Deep Green Option for all County Facilities[1]	382	170	205
BE-7	Support Waste-to-Energy Programs at Unincorporated Landfills	0	5	5
Supporting Measures				
BE-8	Work with PG&E, BayREN, MCE, PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	NA	NA	NA
BE-9	Require energy audits for major additions to or alterations of existing buildings	NA	NA	NA
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	NA	NA	NA
BE-11	Encourage Solar Panel Installations on Warehouse Roof Space	NA	NA	NA
TOTAL		36,875	23,620	32,773

Notes: Columns may not add to totals due to rounding.
AB = Assembly Bill
BayREN = Bay Area Regional Energy Network
CALGreen = California Green Building Standards Code
GHG = greenhouse gas emissions
MCE = Marin Clean Energy
$MTCO_2e$ = metric tons of carbon dioxide equivalent
NA = Not Available
PACE = property assessed clean energy
PG&E = Pacific Gas and Electric
ZNE = zero net energy
[1] Reductions decrease over time because the legislative-adjusted forecasts already anticipate lower electricity emission factors in the future.
Source: Ascent Environmental 2018

Primary Building Energy Measures

Measure BE-1 Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings.

The County will amend County Code to require compliance with CALGreen Tier 1 standards (Title 24, Part 11), as well as Tier 1 building energy efficiency standards (Title 24, Part 6), for alterations and additions over 1,000 square feet, in addition to requiring energy audits (see Measure BE-9). The County may also consider incentivizing compliance with CALGreen Tier 2 standards for eligible buildings, such as through expedited permitting or reduced permit fees (see Measures BE-5 and BE-8 below). CALGreen Tier 1 also requires all appliances to be EnergyStar rated.

Co-Benefits (BE-1 and BE-2)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**
- **Reduced Building and Operating Costs**

Measure BE-2 Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction beginning with residential in 2020 and non-residential by 2030.

The County will amend the County Code to require compliance with CALGreen Tier 1 green building standards (Title 24, Part 11), as well as Tier 1 building energy efficiency standards (Title 24, Part 6), for all new construction. These “reach code” standards include green building measures that can reduce GHG emissions beyond mandatory CALGreen requirements in several categories, including Energy Efficiency, Planning and Design, Water Efficiency and Conservation, Materials Conservation and Resource Efficiency, and Indoor Air Quality. Compliance with these green building measures can lead to increased use of green and recycled materials, turf area limits, reduction of construction waste through recycling, and other important features that achieve important sustainability and public health co-benefits.

Source: County of Napa

Under Tier 1 standards, new construction will be required to exceed minimum building energy efficiency standards by 15 percent or more. The County may also consider additional incentives for new construction projects meeting or exceeding Tier 2 standards which will have energy efficiencies of 30 percent above current standards (see Measures BE-5 and BE-8 below).

The State is considering, but has not formally adopted, a mandatory ZNE[1] standard for all new residential construction starting in 2020 and new commercial construction starting in 2030. Under this measure, the County will also revise the County’s building code to phase in and formally adopt the State’s proposed ZNE standard in 2020. The State has demonstrated that ZNE can be achieved through a combination of high-performance energy efficient design and maximizing on-site renewable energy production (e.g., solar and storage).

[1] A ZNE building is one that produces as much renewable energy on-site as it consumes in one year.

To phase in the ZNE requirements, the County will amend the local building code to require compliance with ZNE standards for all residential and commercial construction starting in 2020 and 2030, respectively.

Under this measure, CALGreen Tier 1 measures for green building categories other than energy efficiency (Planning and Design, Water Efficiency, Material Conservation and Resource Efficiency, and Indoor Air Quality) will continue to be required after ZNE requirements have been phased in.

Also, with respect to Water Efficiency and Conservation standards under CALGreen Tier 1, the County will develop a program to provide incentives through the permitting process, including:

- incentivize installation of commercial and residential rainwater capture systems,
- incentivize installation of commercial and residential graywater capture and reuse systems for discharge to irrigation applications, and
- require ultra-low flow fixtures and toilets in new construction.

This measure will be enforced during the building permitting process following the adoption of the CALGreen Tier 1 reach code into County Code, and by requiring all new development projects subject to environmental review under CEQA to comply with this measure via the CAP Consistency Checklist (see Chapter 5 and Appendix D).

Measure BE-3 Increase participation in MCE's Deep Green (100 percent renewable) option and encourage ongoing participation in MCE.

The County will develop and provide incentives for residents and businesses to adopt MCE's Deep Green Option, which provides 100 percent renewable electricity. The County will commit to subsidizing the extra cost of opting into Deep Green (e.g., $0.01 per kilowatt hour) for low-income households, and will develop incentives for wineries, hotels, and other businesses that opt into Deep Green. The County will also work with MCE to promote awareness of the Deep Green Option.

Co-Benefits (BE-3 and BE-4)

- **Improved Air Quality**
- **Reduced Fossil Fuel Reliance**

Drawing on the experiences of other MCE municipalities, the County is already "leading by example" in its adoption of Deep Green for County municipal accounts (see Measure BE-6), and the County similarly encourages Deep Green adoption by residents and businesses. In 2017, the County of Marin adopted Deep Green for all its municipal facilities. In the same year, residential and commercial Deep Green enrollments increased by 62 percent within 10 months to four percent of total accounts – all without county-level subsidies (MCE 2017a). With subsidies, the County estimates that 15 percent of energy use in the unincorporated county will be associated with Deep Green enrollment by 2030.

The County will still plan to approve all subsidy applications until 15 percent of the anticipated energy usage in 2030 is associated with Deep Green enrollment (approximately 26 GWh/year, accounting for reduced electricity demand from other measures). This method allows for any additional participation beyond the 15 percent target to occur without additional subsidies needed from the County. Based on MCE's $0.01 premium, the County's subsidies would total about $263,000 per year by 2030. To ensure that the 15 percent target will be met, the County will work with MCE to launch an aggressive marketing and enrollment campaign that informs the public about available County subsidies and make the Deep Green option enrollment process as easy and as streamlined as possible. The County will also monitor the progress of Deep Green enrollments with MCE quarterly.

The County will also continue to support participation in MCE by residents and businesses. The unincorporated County's enrollment in MCE began in 2015 and currently has a 14 percent opt-out rate. The County will encourage unincorporated County MCE costumers to continue to participate in MCE and encourage those who have opted out to switch back to MCE. Continued participation in MCE will help the County reduce its GHG emissions especially in light of MCE's recently approved 2019 Integrated Resource Plan (IRP). In the 2019 IRP, MCE plans to achieve a minimum of a 94 percent and 100 percent GHG-free portfolio for all customers by 2020 and 2022, respectively (MCE 2018:Table 8). "GHG-free" energy sources differ from "renewable" sources in that some GHG-free sources are not considered "renewable" due to the environmental impacts they may cause (e.g., large-scale hydroelectric). Despite these differences in terminology, MCE's commitment to work towards 100 percent GHG-free generation sources will still help to achieve the County's GHG reduction goals. As such, MCE's GHG-free plans are quantified in this measure, while also accounting for the unincorporated County's current opt-out rate (MCE 2018).

Measure BE-4 Require new or replacement residential and commercial water heating systems to be electrically powered and/or alternatively fueled (e.g., solar water heating).

The County will amend the County Code to require all new or replacement residential water heaters to be electrically-powered (e.g., heat pumps) or alternatively-fueled systems such as solar thermal or geothermal heat pump systems. Replacement of natural gas-fueled water heaters with electric or alternatively fueled heating allows for more opportunities to reduce emissions by displacing on-site fossil fuel combustion with electricity that is at least 50 percent renewable under MCE, on-site renewable energy, or a combination thereof.

This measure will be enforced through the County's current permitting process for new or replacement water heaters in existing buildings and will initially apply to residential properties first. New residential development projects that are not exempt from CEQA will also be required to comply with this measure via compliance with the CAP

Consistency Checklist (see Chapter 5 and Appendix D). New or replacement residential natural gas water heaters would typically no longer be permitted under this ordinance unless they are high-efficiency units that meet stringent uniform energy factor (UEF) ratings of 0.95 or higher. Examples of eligible replacement types could include solar thermal water heaters, tankless on-demand and storage-type electric water heaters, geothermal heat pumps, and electric heat pump systems. Electric water heaters could be paired with a solar water heating system to provide backup hot water. Heat pump systems could also include air or ground-source heat pump systems. The County will later phase in requirements for new or replacement commercial water heaters to develop an effective program that can accommodate the variations in size, cost, and capacity of commercial-grade water heaters.

As part of this measure, the County will also work with MCE, PG&E, BayREN, and other partners to secure funding sources and develop a program that offers financial incentives if the conversion to electric or other alternatively-fueled water heating systems would require substantial work beyond the unit replacement cost. Financial incentives would also help to offset the incremental cost of electric or alternatively-fueled systems compared to natural gas water heaters for eligible homeowners. The County will also expedite or reduce permitting fees associated with electric or solar water heating installations; however, no incentives would be provided for natural gas systems. This could be achieved in coordination with implementation of Measures BE-5 and BE-8.

Measure BE-5 Expand current renewable energy and green energy incentives and update local ordinances

Co-Benefits (BE-5)

- **Improved Air Quality**
- **Reduced Fossil Fuel Reliance**

The County will continue to provide expedited permitting incentives for installing solar panels, electric vehicle charging stations, and wind turbines. The County will also consider expanding permitting incentives and develop new incentives for other green technologies (e.g., solar water heating systems, geothermal ground-source heat pumps, micro-turbines, and battery storage).

The County will also amend the County Code to ensure that all codes and ordinances are consistent with ongoing State legislation updates that encourage or require the use of renewable energy in existing or new development. This includes identifying any ordinances and policy language that may inhibit reasonable development or usage of renewable energy in the county. Notably, the statewide Title 24 Part 6 Energy Code update for 2019, which is scheduled to become effective on January 1, 2020, will require the installation of solar PV systems on all new single-family and low-rise residential buildings.

Based on a historical trend in solar permit approvals in the County since 2014, along with the pending 2019 Title 24 Energy Code update, the County will set a goal of approving 6,700 kW worth of solar permits by 2030. To achieve this goal, the County will then periodically review progress of permit applications and adjust incentives and outreach efforts accordingly, along with any required adjustments to County Code considering ongoing triennial code updates mandated by the State.

The County will also update all other ordinances affecting renewable energy use by the end of 2020. This would include ensuring that ground-based solar systems would not count against residential acreage limits on agricultural land uses. The County will also amend the County Code to be consistent with AB 1236 by spring 2019. Approved by Governor Brown in October 2015, AB 1236 requires all local jurisdictions to adopt an ordinance with an expedited, streamlined permitting process for the installation of electric vehicle charging stations (see also Measure TR-12 for additional actions to increase EV charging).

Co-Benefits (BE-6)

- **Improved Air Quality**
- **Reduced Fossil Fuel Reliance**

Measure BE-6 Select MCE's Deep Green option for all County facilities

In 2017, the County selected MCE's Deep Green option for all County-owned facilities within the County's operational control, fulfilling the intent of this measure (MCE 2017b). The County will continue to opt into the Deep Green option into the future.

Co-Benefits (BE-7)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

Measure BE-7 Support waste-to-energy programs at unincorporated landfills

The County will encourage landfills located in the county to pursue waste-to-energy programs that convert waste-based fuel to usable energy that can offset a facility's non-renewable energy usage. Currently, the only landfills located in the county are the American Canyon Sanitary Landfill (ACSL) and the Clover Flat Landfill. According to the "Climate Action Management Plan to 2020 for Clover Flat Landfill and Upper Valley Recycling," Clover Flat Landfill anticipates to offset all of its electricity demand with electricity generated by on-site conversion of waste-generated methane to electricity by 2020 (Upper Valley Disposal and Recycling 2016).

ACSL, which stopped accepting waste in 1993, has already ended its waste-to-energy program that ran from 1983 until 2013. Representatives from ACSL have indicated that a waste-to-energy program is not cost-effective going forward because the declining quantity of methane generated by the landfill (Luthy, pers. comm., 2016).

Supporting Building Energy Measures

Measure BE-8 Work with PG&E, BayREN, MCE, PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings

The County will provide information on County-, State-, utility-based, and other local or regional energy efficiency programs and funding opportunities (e.g., Pacific Gas and Electric's [PG&E's] Energy Watch Program, Bay Area Renewable Energy Network [BayREN], MCE, Sustainable Napa County, and various property assessed clean energy [PACE] financing programs). This will be achieved by providing informational brochures at County offices, updating the County website, and other methods that the County will determine based on collaborative efforts with the above-referenced organizations and agencies. This measure is meant to support the efforts pursued under Measures BE-1, BE-2, and BE-4.

Measure BE-9 Require energy audits for major additions to or alterations of existing buildings

Co-Benefits (BE-8 and BE-9)

- **Improved Air Quality**
- **Reduced Fossil Fuel Reliance**

The County will amend the County Code to require energy audits when a building permit application is submitted for a substantial addition to or alteration to an existing building. Audits could be triggered by an alteration or addition greater than or equal to 50 percent of a lot's total building square footage. Permit applicants would be required to incorporate all cost-effective improvements into the project to increase energy efficiency per the recommendations of the audit.

According to permit records, the County issued or finalized an average of 300 permits per year for additions, alterations, and replacements for inhabited residential and commercial land uses between 2010 and 2015.

The County will work with Napa Green's existing energy audit program under Napa Green's Integrated Resource Assessment program to avoid duplicating efforts and implementing this measure efficiently.

This measure could be combined with BE-8 to inform permit applicants of available incentives and financing available to cover efficiency upgrades pursuant to audit recommendations.

For projects subject to environmental review, this measure will also be enforced through the CAP Consistency Checklist (see Chapter 5 and Appendix D).

Measure BE-10 Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings

Co-Benefits (BE-10)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

The County will establish a program that allows new development to offset construction or operational GHG emissions by setting up a funding mechanism into which developments pay and, indirectly, finance residential energy efficiency retrofits in local existing income-qualified homes or buildings. The County will need to determine how the offset funds will be used to fund retrofits. Emissions benefits may be quantifiable once program details are established. The County could consider pairing funds from the retrofit program with other funding sources or financing mechanisms to allow for even greater energy efficiency improvements in existing buildings (see Measure BE-8).

Co-Benefits (BE-11)
- **Reduced Fossil Fuel Reliance**
- **Reduced Energy Demand**
- **Reduced Energy, Water, and Sewer bills**

Measure BE-11 Encourage solar panel installations on commercial roof spaces

The County will work with MCE and commercial & industrial building owners to encourage solar panel installations on roof spaces, including warehouses. The County would develop a program to incentivize these installations by expediting permitting or reducing permit fees associated with installations on existing facilities (see Measure BE-5). The County could also work with interested stakeholders in developing a program to encourage solar panel installations for Feed-in-Tariff arrangements.

3.3.2 On-Road Transportation

Legislative reductions contribute greatly to emission reductions in the On-Road Transportation sector. When combined with legislative reductions, on-road transportation measures will reduce annual GHG emissions by:
- **36 percent by 2030, and**
- **35 percent by 2050.**

Like building energy, on-road transportation is also a significant contributor to the County's GHG emissions. Emissions from on-road transportation sources accounted for 26 percent of the County's total emissions in 2014. Legislative reductions outside of the County's jurisdiction will reduce 2014 transportation emissions by 33 percent by 2030 and 32 percent by 2050 despite population growth, mainly due to improvements in State and Federal vehicle fuel efficiency standards. These legislative reductions apply to the fuel efficiency of vehicle operations, while measures that affect the frequency or distance of vehicle travel are within local or regional control and can be addressed in a local CAP.

The Plan's on-road transportation measures together with legislative reductions will reduce 2014 emissions from this sector by 36 percent by 2030 and a 35 percent by 2050. The transportation-related measures proposed under this strategy aim to further reduce emissions by reducing vehicle trips through consolidation of vehicle trips and non-motorized solutions, encouraging the use of electric and alternative fuel vehicles, and reducing vehicle miles traveled (VMT) through smarter land use planning. Emissions reductions from these measures rely on successful coordination with and participation from local and regional transportation and planning agencies, incorporated cities in the county, residents, and businesses. These measures will also help to reduce criteria pollutants such as fine particulate matter ($PM_{2.5}$) from diesel fuel combustion and other sources, which will result in the additional co-benefits of reducing black carbon emissions, improved air quality, and improved public health outcomes. These benefits are discussed in greater detail in Appendix B.


Source: County of Napa

This strategy includes 15 measures, five of which are primary measures and 10 of which are supporting measures. One major measure included in this strategy is an update to the County's transportation system management ordinance that will establish a policy mechanism that reduces commute trips and VMT. Measures under this strategy will also encourage and support the development of active transportation projects in the County.

In early 2019, the County adopted an update to the General Plan Circulation Element that establishes several new or updated policies that reinforce the County's commitment to reduce GHG emissions from on-road sources. Several key General Plan policies or programs are cross-referenced in several of the on-road transportation measures in this section.

Table 3-4 summarizes the on-road transportation primary and supporting measures. Each measure is described in further detail below.

Table 3-4 Summary of On-Road Transportation Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
TR-1	Update Transportation System Management Ordinance (for employers)	0	3,582	3,547
TR-2	Adopt parking reduction ordinance revisions	0	58	57
TR-3	Increase affordable housing, especially workforce housing, in Napa County	0	23	23
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-way	0	403	711
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use CNG	0	247	169
Supporting Measures				
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information	NA	NA	NA
TR-7	Support alternatives to private vehicle travel for visitors	NA	NA	NA
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	NA	NA	NA
TR-9	Support interregional transit solutions	NA	NA	NA
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park-and-ride facilities near residential centers	NA	NA	NA
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county	NA	NA	NA
TR-12	Increase the supply of electric vehicle charging stations	NA	NA	NA
TR-13	Promote telecommuting at office-based businesses	NA	NA	NA
TR-14	Develop and implement active transportation projects	NA	NA	NA
TR-15	Require new development projects to evaluate and reduce VMT	NA	NA	NA
TR-16	Convert at least 50 percent of County fleet vehicles to alternative fuels by 2030	NA	NA	NA
TOTAL		0	4,312	4,508

Notes: Columns may not add to totals due to rounding.
CNG = compressed natural gas
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NVTA = Napa Valley Transportation Authority
PG&E = Pacific Gas and Electric
NA = Not Available
Source: Ascent Environmental 2018

Primary On-Road Transportation Measures

Co-Benefits (TR-1)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure TR-1 Update Transportation System Management Ordinance (for employers)

The County will revise, adopt, and enforce the existing Transportation System Management ordinance (Chapter 10.28 of the County Code), consistent with General Plan Policy CIR-23, Policy CIR-24, and Actions Items CIR-24.1 and 24.2 in the updated Circulation Element. The updated ordinance will include measures to reduce commute trips to workplaces within the county as well as a program to oversee implementation of these measures at businesses. The County will develop a point-based system that allows employers with more than 20 employees to choose the best trip reduction measures that work for them. The County will develop a list of trip reduction or transportation demand management (TDM) measures, such as preferential parking for carpools/vanpools or providing shuttle service. The ordinance will also establish a measurable target (e.g., percent increase in vanpool participation and number of transit pass sales) as a guide for eligible workplaces. The ordinance will also require projects to demonstrate that at least one or more of a list of best management practices (e.g., telework programs, parking management plans, secure bike parking) will be implemented as part of the project. See example trip reduction ordinances from the U.S. Environmental Protection Agency and Code 17.94.060 (Transportation Control Measure) for the City of Rocklin (U.S. Environmental Protection Agency 2011). The ordinance will be integrated with current Bay Area Air Quality Management District (BAAQMD) and Metropolitan Transportation Commission (MTC) programs and regulations.

For new development projects subject to environmental review, applicants would also be required, through the CAP Consistency Checklist, to demonstrate compliance with the TSM ordinance.

Co-Benefits (TR-2, T-3, and TR-4)

- Improved Air Quality
- Reduction in Black Carbon Emissions
- Improved Public Health
- Reduced Fossil Fuel Reliance

Measure TR-2 Adopt parking reduction ordinance revisions

The County will develop, adopt, and enforce reductions in visitor and employee parking requirements that are consistent with General Plan Policy CIR-8 in the updated Circulation Element, and require minimum carpool/vanpool/tour bus or shuttle parking spaces, consistent with CALGreen Tier 1 measures (see CALGreen Tier 1 requirements for applicable projects in Measures BE-1 and BE-2 above).

The County will also consider allowing dedicated electric vehicle (EV)-only and other low or zero-emission vehicle-only parking in lieu of parking reductions. Reductions in standard parking requirements will be made to the standards in Napa County Code 18.66.280.

Parking requirements under this measure will be enforced through the adoption of the parking reduction ordinance and the CAP Consistency Checklist.

Measure TR-3 Increase affordable housing, especially workforce housing, in Napa County

The County will increase affordable multi-unit housing (including workforce housing) through implementation of policies and programs in the County's Housing Element and General Plan Policy CIR-8 in the updated Circulation Element Update, and by promoting and encouraging the development of affordable housing and transit-oriented development (TOD) in priority development areas in the County as allowable under the County's jurisdiction. Also, the County will encourage the development of housing closer to jobs and services. The Napa Valley Transportation Authority's (NVTA) Countywide Transportation Plan (Vision 2040) predicts growth in low-wage employment throughout the County. Given the many low-wage jobs already located in the county, VMT from commuting will increase without sufficient affordable housing in the County.

Measure TR-4 Support efforts to allow commuter service to operate on railroad rights-of-way

Source: County of Napa

The County will support efforts to allow commuter rail service to operate on railroad rights-of-way in the County, so long as it does not worsen traffic congestion and associated vehicular emissions. The NVTA has already explored the possibility of having such a service, but no action has yet been taken to implement such a service. Enhancing connection services, such as shuttles, between stations and nearby employment destinations, in both incorporated and unincorporated areas, will improve the effectiveness of this measure. The County will further support these efforts by establishing a public-private task force to advocate for commuter rail service in Napa County. This task force would examine and recommend revision of any County ordinances that may hinder the success of commuter rail service in the county.

According to the 2014 Napa County Travel Behavior Study Survey, 66 percent of workers in the County live in Napa County cities and could be serviced by the commuter rail service on the Napa Valley Wine Train line (NCTPA 2014:109). Twelve percent of workers in the County work in the unincorporated area. This measure will reduce more trips associated with VMT to and from incorporated cities and the unincorporated county.

Measure TR-5 Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use compressed natural gas

Co-Benefits (TR-5)

- **Improved Air Quality**
- **Reduction in Black Carbon Emissions**

The County will support and encourage solid waste services to convert diesel and gasoline solid waste collection vehicles to compressed natural gas (CNG) or other alternative fuels, thereby reducing fleet-wide emissions. Other alternative fuels may include renewable CNG from biogas generated by solid waste facilities and electric hybrid technology in solid waste collection vehicles.

UVDS and Clover Flat Landfill already have plans to convert their fleet from diesel to CNG according to their Climate Action Management Plan (Upper Valley Disposal and Recycling 2016). Although the County does not have direct control over privately-owned waste management businesses serving the county, the County supports UVDS's fleet organics conversion efforts.

Supporting On-Road Transportation Measures

Measure TR-6 Support efforts of transit agencies to increase availability and accessibility of transit information

The County will support efforts to improve overall availability and accessibility of transit information. NVTA is currently working with Google to provide up-to-date transit information online.

Measure TR-7 Support alternatives to private vehicle travel for visitors

Co-Benefits (TR-6, TR-7, and TR-8)

- **Improved Air Quality**
- **Reduction in Black Carbon Emissions**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

The County will work with NVTA to improve access to available travel alternatives for visitors. The ways the County will support travel alternatives include:

- subsidizing shuttles for visitors;
- offering winery travel trip route plans that reduce trips and VMT;
- providing information of public and private multi-modal options, including active transportation (e.g., bicycle routes/tours, van tours, motorcycle tours);
- participating in an industry-wide transportation demand management program (such as a “hop-on hop-off” shuttle programs);
- exploring driverless technology solutions, as they become available;
- requiring dedicated parking space for eligible car-sharing vehicles at major destinations;
- providing cost comparisons to tourists to show monetary and safety benefits of driving vs. using a shuttle service; and
- offering additional subsidies for commercial fleets that are more than 50 percent alternatively fueled.

NVTA is the countywide transportation planning organization that operates the county’s transit system and serves as the countywide active transportation coordinator. NVTA has planned for both pedestrian and bicycle mode uses in the county as part of the Countywide Pedestrian Plan and Countywide Bicycle Plan.

Measure TR-8 Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region

The County will work with the City of Napa and other incorporated cities in exploring the possibility of making the recently-built Soscol Gateway Transit Center, other planned transit hubs, and surrounding areas more visitor-friendly and not just serve commuters. Transit facilities can be marketed as attractions in and of themselves. The County will also support and encourage development of restaurants, hotels, and other attractions within walking distance of the transit center throughout the County, as its jurisdiction allows. One example of such a development is a "grand station" district concept with easy and walkable access to major downtown destinations (e.g., downtown Napa, Riverfront green). This will encourage transit and other non-automobile ridership for visitors traveling to and from the county. This measure should be enacted in tandem with vanpool, shuttle, and increasing transit service in the county (e.g., stops along Vine's Route 10). In addition to funding, the County could install wayfinding signage to promote uses of these developments.

Measure TR-9 Support interregional transit solutions

The County will support and work with NVTA, Association of Bay Area Governments (ABAG), MTC, and Bay Area tourism bureaus to develop transit solutions for interregional passenger travel between San Francisco/East Bay and Napa County, including the unincorporated areas. In addition to expanding connections with ferries, Bay Area Rapid Transit, and Amtrak, the County will consider supporting improvements to existing transit/rail connections to Sonoma County via the Sonoma-Marin Area Rail Transit (SMART) system, and with Solano County, to increase ridership. This could help offset employee commuter trips to and from the county. The County will also work with NVTA to implement or support applicable measures for interregional travel already included in NVTA's Short Range Transit Plan and Vision 2040.

Co-Benefits (TR-9, TR-10, TR-11 and TR-12)

- **Improved Air Quality**
- **Reduction in Black Carbon Emissions**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

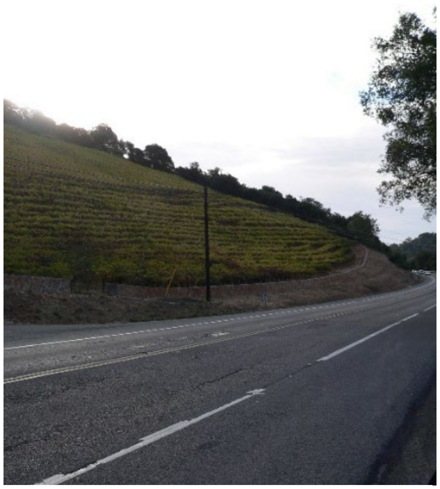
Measure TR-10 Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park-and-ride facilities near residential centers

The County will work with the incorporated cities, neighboring jurisdictions, and NVTA to install additional park-and-ride facilities near major unincorporated residential centers, where feasible. The County will work with stakeholders to identify appropriate locations of the proposed park-and-ride facilities, such that the facilities are located and designed in such a way to maximize facility usage and vehicle occupancy rates, and to identify opportunities to connect these facilities to bicycle and pedestrian infrastructure. Currently, there are only a handful of park-and-ride facilities in the County, all of which are located in three incorporated cities: Yountville, the City of Napa, and American Canyon. The additional park-and-ride facilities will help consolidate and reduce vehicle trips through carpooling, vanpooling, and transit.

Successful implementation of this measure will depend on the coordination with and participation of local jurisdictions and NVTA.

Measure TR-11 Promote existing ride-matching services for people living and working in the unincorporated county

The County will support NVTA and the Solano Transportation Authority to promote awareness of the ride-matching services provided through the Solano Napa Commuter Information website and other organizations. The County will work with local businesses, especially winery, vineyards, and hospitality, to provide information to employers and their employees on ridesharing or shuttle options to transport seasonal workers to and from home. The County will consider offering monetary and non-monetary incentives.



Source: County of Napa

Measure TR-12 Increase the supply of electric vehicle charging stations

The County will increase the supply of electric vehicle (EV) charging stations by (1) adopting new minimum standards for the installation of EV charging stations in new residential and non-residential development and (2) promoting or incentivizing installation of EV charging stations at existing facilities such as wineries, industrial centers, hotels, major visitor attractions, and multifamily complexes.

Incentives

The County's incentives and promotions of EV charging stations will include streamlined permitting (see Measure BE-7) and prioritization of incentives for existing building owners or property owners for siting EV charging stations in locations where most vehicles would be charging during daytime hours (e.g., workplaces, wineries). The California Energy Commission anticipates that daytime EV charging can help balance overall electricity demand from the future electricity grid, which will be increasingly based on renewable generation, such as solar (CEC 2018). Renewable energy is more abundant and less expensive during daytime hours than at night.

The County will also ensure consistency with plans already made under Vision 2040. These plans include expanding the EV charging network, ensuring that EV charging stations are available at key locations, and preparing for new charging technology, such as electric charging roads.

New Minimum Standards for EV Charging Stations

As noted in Measures BE-1 and BE-2, new construction projects or major additions or alterations to existing buildings will be required to implement CALGreen Tier 1 measures. Specific measures under the Planning and Design section of the CALGreen Tier 1 code require a minimum number of on-site, dedicated EV parking spaces and pre-wiring dedicated spaces for EV charging stations.

As a complement to adopting CALGreen Tier 1 measures, the County will also develop and adopt an ordinance that establishes minimum requirements for the installation of EV charging stations in all new residential and non-residential development. For example, the County could require that at least 50 percent or more of the dedicated pre-wired parking spaces required per CALGreen Tier 1 also have EV charging stations installed in multi-family residential or commercial developments prior to receiving a certificate of occupancy. Such actions would further contribute to increasing the supply of EV charging in the near term, while also allowing for phased growth in the future supply of EV charging commensurate with the pace of growing consumer adoption of EVs.

The County will also require EV charging stations at all new park-and-ride facilities. New facilities with EV charging stations should have clear and obvious signage, require some form of payment to allow for availability, be located near amenities, be easily accessible, and be monitored and enforced.

These requirements will also apply to new development projects subject to environmental review and are included in the CAP Consistency Checklist (see Chapter 5 and Appendix D).

Measure TR-13 Promote telecommuting at office-based businesses

To reduce commute vehicle miles traveled, the County will work with local office-based businesses to encourage telecommuting. Telecommuting should not impede on normal business practices and, thus, may not be suitable for businesses that require physical employee attendance, such as at retail storefronts and warehouses.

Co-Benefits (TR-13)

- **Improved Air Quality**
- **Reduction in Black Carbon Emissions**

Measure TR-14 Develop and implement active transportation projects

The County will develop and implement active transportation projects in the unincorporated County, such as roadway modifications to install bike lanes, sidewalks (in small lot residential areas), or other infrastructure that encourages and facilitates walking and bicycling. The County will work with NVTA to implement the current countywide Pedestrian and Bicycle Master Plans and will prioritize improvements in areas where residential uses are within reasonable walking or biking distance to retail, parks, employment, or other key destinations. The County will also support existing efforts to develop multi-use trail systems (e.g., the Napa Valley Vine Trail). This measure is also further supported by various policies and programs in the County's updated General Plan Circualtion Element, adopted in 2019, that call for complete streets, multi-model access, and increasing pedestrian and bicycle facilities.

Co-Benefits (TR-14)

- **Improved Air Quality**
- **Reduction in Black Carbon Emissions**

Measure TR-15 Require new development projects to evaluate and reduce VMT

Policy CIR-7 in the County's updated Circulation Element (adopted in 2019) requires all new development projects to evaluate and reduce unmitigated VMT associated with the project by at least 15 percent. Accompanying this policy is Action Item CIR-7.1, in which staff will update the County's Local Procedures for Implementation of CEQA to develop screening criteria for projects that would not be considered to have significant impacts to VMT.

Policy CIR-9 also requires the County to update its Transportation Impact Study (TIS) Guidelines to specify a methodology for evaluating a project's VMT and a list of potential mitigation measures for achieving VMT reductions from a project. This policy also requires the County to periodically monitor vehicle trips at built projects to assess the effectiveness of specified VMT reduction measures and shall periodically modify the list in the TIS Guidelines to reflect ongoing best practices in VMT reduction.

This measure will also be enforced through the CAP Consistency Checklist and would apply to projects subject to enviromental review pursuant to CEQA.

Measure TR-16 Convert at least 50 percent of County fleet vehicles to alternative fuels by 2030.

The County will convert at least 50 percent of the County fleet be powered by alternative fuels or zero-emission technology, such as electricity, hyrdogen, CNG, and bioethanol, by 2030. These may also include electric hybrid vehicles. In 2014, 50 of 225 vehicles, or 22 percent, of the County's fleet consisted of hybrid or flex fuel vehicles that used 85 percent bioethanol (E85). The final selection of vehicles and fuel types will depend on vehicle availability and County fiscal constraints.

3.3.3 Solid Waste

The solid waste sector accounted for 17 percent of the County's emissions in 2014. Solid waste is one of the primary sources of methane (CH_4) emissions, which are classified as short-lived climate pollutants (SLCPs). Legislative reductions outside of the County's jurisdiction will reduce 2014 solid waste emissions by approximately 32 percent by 2030 and 41 percent by 2050 despite population growth, mainly due to the State's 75 percent waste diversion goal and a planned landfill gas collection project at Potrero Hills landfill, which accepted 98 percent of the county's waste in 2014.

Recent changes in State law and new regulations require various levels of organics recycling, or composting, from both residential and commercial sources. Assembly Bill (AB) 1826, signed in 2016, requires businesses, including multi-family units, to divert organic waste from landfills. AB 1826 allows rural jurisdictions, which includes unincorporated Napa County as defined in the resolution, to adopt a resolution to be exempt from the requirements of AB 1826. Despite this allowance, the County has already adopted California Department of Resources Recycling and Recovery's (CalRecycle) implementation schedule for businesses to separate organic waste (Napa County 2018a).

Senate Bill (SB) 1383, also signed in 2016, targets a 50 percent reduction in the level of statewide organics disposal from 2014 levels by 2020 and 75 percent reduction by 2025 in both residential and commercial waste sectors. The California Department of Resources

Recycling and Recovery (CalRecycle) began the formal rulemaking process in 2018 to develop regulations that reduce statewide organic waste disposal by at least 50 percent below 2014 levels by 2020 and 75 percent by 2025 (CalRecycle 2018).

When combined with legislative reductions, solid-waste measures will reduce annual GHG emissions by:
- **35 percent by 2030, and**
- **45 percent by 2050.**

AB 1826 and SB 1383 were signed after the completion of the County's GHG emissions inventory and forecast. Thus, the targeted reductions under these regulations are incorporated into the reductions under the CAP's solid waste measures.

The CAP's solid waste measures, in combination with legislative reductions, will reduce 2014 emissions in this sector by 35 percent by 2030 and 45 percent by 2050. The two primary solid waste measures aim to further reduce emissions by encouraging expansion of current composting programs in the County and exceeding the State's waste diversion target. Landfills located within the County already have landfill gas capture operations in place. Major co-benefits of solid waste measures include improved water quality and preservation of biological resources. Waste diversion and composting would reduce the need for landfill expansion, protecting natural ecosystems and habitat.

Solid waste emissions reductions depend on participation from landfills; expansion of County waste reduction, recycling, and composting programs; and participation from county residents and businesses to reduce waste and increase recycling.

Table 3-5 summarizes the solid waste primary measures, with more detailed descriptions of the measures following.

Table 3-5 Summary of Solid Waste Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
SW-1	Encourage expansion of composting program for both residential and commercial land uses	372	1,106	1,332
SW-2	Meet an 80 percent Waste Diversion Goal by 2020 and a 90 percent Waste Diversion Goal by 2030	335	1,257	1,514
	TOTAL	707	2,363	2,847

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
PG&E = Pacific Gas and Electric
Source: Ascent Environmental 2018

Primary Solid Waste Measures

Measure SW-1 Encourage expansion of composting programs for both residential and commercial land uses

Co-Benefits (SW-1)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**

The County will encourage expansion of current composting programs that serve the county to exceed requirements under AB 1826. Under AB 1826, no more than 50 percent of the amount of commercial organic waste landfilled in 2014 can be landfilled starting in 2020. Under this measure, the County will target a composting rate of 85 percent of all food waste and 100 percent of yard waste generated by the County by 2030.

Expansion of local composting programs described under this measure could complement or be included in potential compliance mechanisms for future SB 1383 regulations, which are scheduled for adoption in 2019. Expansion of current composting programs are already in process. Under AB 1826, UVDS's Climate Action Management Plan anticipates a greater amount of organic material that will be separated from the waste stream and diverted to UVDS facilities serving the county. In 2016, Clover Flat Landfill submitted a Use Permit Modification to accommodate additional organic waste. County staff will meet and coordinate with UVDS and other waste management agencies in the county to determine how the County can assist in facilitating the composting program expansions.

Measure SW-2 Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Waste Diversion Goal by 2030

Co-Benefits (SW-2)

- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

The County will establish a target to meet an 80 percent waste diversion goal by 2020 and a 90 percent waste diversion goal by 2030. This will exceed the State's 2020 75 percent waste diversion target by five percent. Key steps include:

- completing an annual or biannual waste characterization study to analyze the distribution of waste types in the County's generated waste and identify major waste reduction opportunities (the last waste characterization profile available for the county was available for 1999 from CalRecycle);
- supporting and expanding existing composting and recycling programs and incentives for residences and businesses;
- supporting and incentivizing private waste collection providers and landfills in reducing landfilled waste; and,
- working with private waste collection providers and landfills to leverage CalRecycle's GHG Reduction Grant and Loan Program, which provides grants and loans for capital investments in infrastructure for aerobic composting, anaerobic digestion, and recycling facilities.

According to Napa Recycling, recycling rates are already at 70 percent in the City of Napa and the southern county. These actions apply to waste management areas under the County's control. Waste in Zone 3 (most areas north of Yountville) is managed by a Joint Powers Authority, the Upper Valley Waste Management Agency (UVA). The County can encourage UVA to adopt these goals but cannot itself mandate them.

3.3.4 Agriculture

As a leading center for viticulture, the County greatly values the contribution of the agricultural sector to the County's economy and livelihood. Accordingly, the high level of agricultural activity also presents a significant emissions reduction opportunity. Emissions from the agriculture sector, including emissions from livestock, fertilizer use, and equipment, accounted for 11 percent of the County's total emissions in 2014. No applicable legislative actions were assumed to reduce GHG emissions from agriculture; thus, agricultural emissions are anticipated to increase by about three percent by 2030 and 10 percent by 2050 from 2014 levels, proportional to the forecasted growth in agricultural acres.

Source: County of Napa

The CAP's measures that address agricultural emissions would prevent emissions increases from this sector and reduce 2014 emissions from this sector by about 20 percent by 2030 and 21 percent by 2050. The agriculture-related measures proposed under this strategy aim to reduce emissions from agricultural equipment, fertilizer use, and residue burning and to promote carbon sequestration through carbon farming and other sustainable agricultural practices. Emissions from agricultural equipment accounted for over 60 percent of agricultural emissions in 2014. Actions to reduce emissions from other agricultural operations were not included due to limitation in the County's jurisdiction over activities such as CH_4 generated from cattle (enteric fermentation) and fertilizer use necessary for cultivation. The agriculture-related measures cover the whole spectrum of co-benefits. Reduced application of inorganic nitrogen fertilizer would lead to less pollutant runoff from agricultural fields and protection of local ecosystems. Several measures would reduce the use of fossil fuels, leading to improved air quality, health benefits, and decreased reliance on non-renewable resources. These benefits are discussed in greater detail in Appendix B.

Agriculture-related measures will reduce annual GHG emissions by:
- **20 percent by 2030, and**
- **21 percent by 2050**

This strategy includes four primary measures and two supporting measures. The primary measure with the most future reductions under this strategy supports the usage of electric or alternatively-fueled equipment in lieu of gasoline- or diesel- powered equipment.

Table 3-6 summarizes the measures under the agriculture sector. Each measure is described below Table 3-6.

Table 3-6	Summary of Agriculture Measures			
Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuels	0	591	995
AG-2	Support use of electric or alternatively- fueled agricultural equipment	0	11,273	15,166
AG-3	Support the use of Tier 4 final diesel equipment for off-road agricultural equipment	0	57	58
Supporting Measures				
AG-4	Support reduced application of inorganic nitrogen fertilizer	NA	NA	NA
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	NA	NA	NA
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	NA	NA	NA
TOTAL		0	11,922	16,218

Notes: Columns may not add to totals due to rounding.
BAAQMD = Bay Area Air Quality Management District
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
RCD = Resource Conservation District
Source: Ascent Environmental 2018

Primary Agriculture Measures

Measure AG-1 Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternatively- fueled pumps

The County will work with the California Air Resources Board, (CARB), BAAQMD, PG&E, MCE, and other public agencies to provide incentives and technical assistance to pump operators to convert stationary diesel or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar; or, switch to alternative fuels such as renewable diesel in either existing or upgraded pumps. Electric pumps are up to 2.5 times more efficient than diesel pumps. This measure will apply to all crop types and assumes that electric, solar, and renewable diesel alternatives to traditional diesel and gasoline irrigation pumps are viable. This measure assumes that 50 percent of pumps in the County will be converted to electric or alternative fuels, instead of petroleum-based diesel and gasoline, by 2030. The measure effectively targets replacement of up to 14 irrigation pumps by 2030 and 24 pumps by 2050.

The County will implement this measure by providing technical assistance to pump operators that would include determining which types of alternative irrigation pump technologies are available and appropriate for irrigation practices used in the county, vendors or locations where operators could purchase such alternative pumps and potential costs, and sources of incentives or financing to fund pump replacement projects. There are several existing funding sources on which both the County and operators can capitalize, including the Funding Agricultural Replacement Measures for Emission Reductions (FARMER) program or other State Greenhouse Gas Reduction Fund (GGRF) programs administered by CARB, and the Carl Moyer Program administered by BAAQMD.

For existing diesel pumps, renewable diesel is a cost-effective alternative fuel option. Renewable diesel can be used in existing diesel equipment and is priced competitively with conventional diesel (AFDC 2018). This reduces the need for equipment modifications or replacements. Although the supply of renewable diesel is currently smaller than the supply of conventional diesel, the State is already making efforts to increase the supply of renewable diesel throughout California in the short and long-term through the Low Emission Diesel regulation and the Low Carbon Fuel Standard.

For certain agricultural projects subject to environmental review (i.e., new vineyards on slopes greater than 5 percent), this measure would also be required and enforced through the CAP Consistency Checklist (see Appendix D).

Measure AG-2 Support use of electric or alternatively-fueled agricultural equipment

Farm equipment other than irrigation pumps accounted for 60 percent of agricultural emissions in 2014 and is anticipated to increase through 2050. Under this measure, the County will support the use of electric or alternatively-fueled equipment in place of gasoline or diesel equipment. This measure targets a 50 percent alternatively-fueled agricultural equipment fleet in the county by 2030. Similar to AG-1, the County will provide technical assistance in identifying available alternative fuels and technology for agricultural equipment include CNG, biodiesel, and renewable diesel and electric equipment. The County will also work with BAAQMD or CARB to promote or provide financial or regulatory incentives to encourage the switch to electric or alternatively-fueled equipment. CARB funding sources include the FARMER program, the State's GHG Reduction Fund, and the Carl Moyer Program.

Currently-available electric equipment includes vineyard tractors, mulchers, and chainsaws; however, the range and types of such equipment will likely increase as low- or zero-emission technology advances in the future.

For existing diesel equipment, renewable diesel is a cost-effective alternative fuel option. Renewable diesel can be used in existing diesel equipment and is priced competitively with conventional diesel (AFDC 2018). This reduces the need for equipment modifications or replacements. Although the supply of renewable diesel is currently overshadowed by that of conventional diesel, the State is already making efforts to increase the supply of renewable diesel throughout California in the short and long-term through the Low Emission Diesel regulation and the Low Carbon Fuels Standard.

Co-Benefits (AG-1, AG-2, and AG-3)

- **Improved Air Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

For certain agricultural projects subject to environmental review, this measure would also be required and enforced through the CAP Consistency Checklist (see Appendix D).

Measure AG-3 Support the use of Tier 4 final diesel equipment for off-road agricultural equipment

The County will work with Napa Green and other entities to encourage vintners and other growers to use Tier 4 final diesel equipment[2]. Equipment manufacturers claim that Tier 4 final equipment may increase fuel efficiency by up to five percent from Tier 4 interim and Tier 3 level equipment (Caterpillar 2016, Empire Renewable Energy 2011). Measure AG-6 below will also contribute to achieving these reductions. The County will work with Napa Green to encourage the use of Tier 4 Final equipment as a requirement for certification.

Supporting Agriculture Measures

Measure AG-4 Support reduced application of inorganic nitrogen fertilizer

Co-Benefits (AG-4)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

In 2014, nitrogen fertilizer application accounted for five percent of total agricultural remissions, based on annual fertilizer tonnage reports for applied nitrogen in Napa County from the California Department of Food and Agriculture (CDFA) (CDFA 2014). Although grape crops generally require less nitrogen per acre than most other crop types according to UC Davis crop cost studies (UC Davis 2017), even a small reduction in nitrogen application per acre can result in large reduction in nitrogen application in the county as a whole due to the extensive grape crop area. Also, the crops grown in the county are not limited to grapes.

The County will work with farmers to either reduce or replace the use of nitrogen-based fertilizers. Reductions can be achieved through better fertilizer management, and examples of recommended replacements include compost produced from local waste management or manure from local ranches and dairies. To track the progress of this measure, the County will work with the farming cooperatives or industry associations, such as the Napa Valley Grape growers or Napa Valley Vintners, to determine the amount of inorganic and organic nitrogen fertilizers applied per year and identify ways to further reduce nitrogen fertilizer use. The County will also review the annual fertilizer tonnage reports from CDFA to assess whether reductions in the county's nitrogen application rates are being achieved.

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[2] In 1994, EPA established tiered rulings for diesel equipment to meet certain emission standards to be phased in over a period of time. The most recent ruling was for Tier 4 equipment, signed in 2004, which would reduce emissions of particulate matter and nitrogen oxides by over 90 percent from Tier 1 equipment.

Measure AG-5 Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris

The County will support BAAQMD in encouraging farmers and County public services to find alternatives to open burning of agricultural, forest, and other removed biomass. The County does not have regulatory jurisdiction over open burning. Potential alternatives could include converting agricultural and forest waste to compost, mulch, smokeless burning, or pyrolysis into biochar for reapplication on cropland (see Measure AG-6 below); or, converting to biomass to energy at waste-to-energy facilities. The County may also be willing to contribute funds to support a wood waste to energy plant, should a viable project be proposed by another party. There may be instances where open burning is still the most effective tool to prevent the spread of pests and disease, and for this reason the County will support ongoing use of open burning where appropriate and in compliance with BAAQMD regulations.

Co-Benefits (AG-5)

- **Improved Air Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

Measure AG-6 Encourage and support the use of carbon farming and other sustainable agricultural practices in the County

The County will work with the Napa County Resource Conservation District (RCD), farmers, and other stakeholders to encourage and support the use of carbon farming and other sustainable agricultural practices in the County. Some examples of sustainable agricultural practices include cover-cropping, composting, limited or no-tilling, and livestock methane capture. The County can encourage and promote, through partnerships and education and outreach, the use of best management practices (BMPs) in farming operations to reduce emissions and sequester carbon. These BMPs include, but are not limited to, low carbon farming, low impact farming including minimizing tractor passes, low- or no-till farming, cover cropping strategies, low nitrogen usage, low water usage, composting, and use of fuel-efficient equipment.

Co-Benefits (AG-6)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Increased Public Awareness of Climate Change**

The County will set a goal to engage 10 percent of Napa County’s working lands in carbon farming by 2030. To support the increased use of carbon farming practices, the County could use Napa County RCD’s Huichica Creek Sustainable Demonstration Vineyard Carbon Farm Plan and its implementation as a pilot project for potential replication. Additionally, the County could also work with Napa County RCD and farmers to identify regional, state, and federal incentive programs, along with other funding sources and financing.

Sustainable farming practices are also supported and encouraged under Multi-Sector Strategy measures outlined later in this chapter.

3.3.5 Off-Road Vehicles and Equipment

Source: County of Napa

Off-road measures will reduce annual GHG emissions by:
- **two percent by 2030, and**
- **17 percent by 2050.**

Emissions from the off-road sector accounted for nine percent of the County's total emissions in 2014, and off-road emissions are anticipated to increase by about 17 percent by 2030 and 38 percent to 2050 from 2014 levels, proportional to the forecasted growth in population and jobs.

The CAP includes two primary measures that will reduce 2014 emissions from this sector by about three percent by 2030 and 23 percent by 2050. The proposed measures under this strategy are focused on improving equipment efficiency and the use of alternative fuels in marine vessels. Co-benefits include improved air quality and public health, reduced reliance on fossil fuels, and protection of natural ecosystems and habitats. These benefits are discussed in greater detail in Appendix B.

Table 3-7 summarizes the reductions from this strategy. Descriptions of the off-road primary measures follow Table 3-7.

Table 3-7 Summary of Off-Road Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030	0	5,668	6,169
OR-2	Require use of renewable diesel or other alternative fuel for all construction activity and mining operations as a condition for approval by 2030			
TOTAL		0	5,668	6,169

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2018

Primary Off-Road Measures

Measure OR-1 Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030

The County will amend the County Code to require the use of Tier 4 final equipment as a condition of approval for all construction projects occurring in the county by 2030. Equipment manufacturers claim that Tier 4 final equipment may increase fuel efficiency by up to five percent from Tier 4 interim equipment. Because higher Tier equipment have more stringent standards, efficiency gains compared to lower Tier equipment may be greater.

Co-Benefits (OR-1)
- **Improved Air Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

For projects subject to CEQA review, this measure would be also be required and enforced through the CAP Consistency Checklist.

Measure OR-2 Require use of renewable diesel or other alternative fuel for all construction activity as a condition for approval by 2030

The County will amend the County Code to require the use of renewable diesel or other alternative fuels, such as CNG, electricity, or biodiesel, as a condition of approval for all construction projects occurring in the county by 2030.

Co-Benefits (OR-2)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

For existing diesel equipment, renewable diesel is a cost-effective alternative fuel option. Renewable diesel can be used in existing diesel equipment and is priced competitively with conventional diesel (AFDC 2018). This reduces the need for equipment modifications or replacements. Although the supply of renewable diesel is currently smaller than the supply of conventional diesel, the State is already making efforts to increase the supply of renewable diesel throughout California in the short and long-term through the Low Emission Diesel regulation and the Low Carbon Fuels Standard.

For projects subject to environmental review, this measure would also be required and enforced through the CAP Consistency Checklist.

3.3.6 Water and Wastewater

Although water and wastewater-related GHG emissions only accounted for two percent of the County's emissions in 2014, water conservation is needed to address serious periodic drought issues affecting Napa County and the State, in general. As discussed further in Chapter 4, drought conditions could increase in frequency and severity because of climate change over the long term.

Water and wastewater-related measures included in this Plan will reduce both the strain on water supplies and GHG emissions from pumping and treatment activities. Although electricity emission factors will decrease over time due to current legislative actions, water and wastewater-related GHG emissions would still increase by 15 percent by 2030 and 27 percent by 2050 from 2014 levels. This is due primarily to the anticipated population growth in the county overshadowing the reductions due to greater renewable energy production. The State's water conservation plans, despite addressing the on-going drought, do not address reductions in non-urban water use by 2020 or future years.

Water and wastewater-related GHG emissions will increase over time because projected population growth overshadows anticipated reductions in emissions from renewable energy production.

The supporting measures proposed under this strategy will reduce emissions primarily through water conservation in new and existing facilities. Most measures involve revising the County's current ordinances that relate to water conservation. Emissions reductions from these measures rely on successful coordination with and participation from Napa County residents and businesses. The major co-benefits of

All water and wastewater measures also serve as adaptation measures by preserving water quality and encouraging water conservation. For a complete list of adaptation measures related to water, see Chapter 4.

water and wastewater measures is improved water supply and quality. These benefits are discussed in greater detail in Appendix B.

This strategy includes four supporting measures, all of which are qualitatively addressed. These could not be quantified due to the uncertainty related to participation rates and the types of new facilities that will be constructed. Table 3-8 summarizes the supporting measures included in this strategy. Each measure is described in further detail below.

Measure MS-2 under the Multi-Sector Strategy described later in this chapter also addresses reductions of wastewater emissions from wineries. Note that Measure MS-2, under the multi-sector strategy, includes and quantifies emissions reductions in wastewater treatment activity at wineries. However, emissions reductions from that measure are not specifically attributed to the measures under the water and wastewater strategy. Nevertheless, emission reductions from MS-2 will reduce water and wastewater-related emissions by 36 percent in 2030 and 24 percent in 2050 from 2014 levels.

Table 3-8 Summary of Water and Wastewater Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Supporting Measures				
WA-1	Amend or revise water conservation regulations for landscape design	NA	NA	NA
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	NA	NA	NA
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	NA	NA	NA
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	NA	NA	NA
TOTAL		NA	NA	NA

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
Source: Ascent Environmental 2018

Supporting Water and Wastewater Measures

Measure WA-1 Amend or revise water conservation regulations for landscape design

The County will consider expanding its existing water conservation ordinance (Chapter 18.118) to include homeowner-provided landscaping projects. Section 18.118.020 exempts home-owner provided landscaping on a residential property. This measure will limit documentation requirements for homeowners. Other potential amendments can include minimum drought tolerant plant species and cash-for-grass turf rebates.

Measure WA-2 Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering

The County will adopt a new water conservation ordinance for commercial and residential land uses that focuses on limiting on-site outdoor and indoor water use. Requirements include:

- limiting outdoor watering to two days per week and having written violations for the first offense and increasing fines for each offence thereafter, waiving a second offense fee after an offender attends a two-hour water conservation seminar;
- staggering allowable watering days on an address-number basis (e.g., even address numbers can only water on Tuesday and Saturday);
- banning most lawn and landscape watering on consecutive days and irrigation within 48 hours of measurable rainfall, similar to the City of Napa's water conservation ordinance;
- banning outdoor car washing on certain days of the week; and
- providing educational material for residents and businesses on water conservation tips.

Note that commercial watering limits do not apply to irrigation on agricultrual lands.

Co-Benefits (WA-1 and WA-2)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Reduced Fossil Fuel Reliance**

Measure WA-3 Expedite and/or reduce permit fees associated with water conservation installations in existing facilities

The County will expedite, reduce, or exempt permits and permit fees associated with water conservation installations in existing facilities. These installations can include graywater plumbing and large rainwater catchment systems.

Co-Benefits (WA-3)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Reduced Fossil Fuel Reliance**

Measure WA-4 Require water audits for large new commercial or industrial projects and significant expansions of existing facilities

The County will require water audits for large new commercial or industrial projects and significant expansions of existing facilities to identify opportunities for water conservation. Water audits are already required as part of the Napa Green certification program and Napa Green's Integrated Resource Assessments program. The County will establish a program to follow up with the water audits for eligible facilities and explore water conservation that are appropriate to each facility. Funding for water audits are currently available from Napa Valley Vintners with work being done by Sustainable Napa County. The County will designate staff to work with Napa Green, Napa Valley

Co-Benefits (WA-4)

- **Improved Water Supply and Quality**

Vintners, and Sustainable Napa County to streamline implementation of this measure and reduce duplicative efforts.

3.3.7 Land Use Change

Changes in land use can result in the reduction or loss of stored carbon and carbon sequestration potential. This occurs when trees and other vegetation on natural undeveloped lands (e.g., riparian woodland, grassland, coniferous forest, oak woodland, shrubland) are converted to agriculture (e.g., vineyards) or urban development. The net losses in carbon storage and sequestration are considered GHG emissions in the CAP, and emissions from this sector accounted for two percent of the County's total emissions in 2014.

Source: County of Napa

The County anticipates that conversion of natural lands would increase in the future due to conversion of undeveloped lands to new or expanded vineyards or other crops, as well as increased residential and commercial development. The County's General Plan projected that over 8,000 acres of riparian woodland, oak woodland, coniferous forests, and other natural lands would be converted to vineyards between 2005 and 2030 (Hade, pers. comm., 2015). Due to these development forecasts, land use change-related emissions would increase by nearly 137 percent by 2030 and 182 percent by 2050 compared to the baseline annual losses in 2014. These emissions are based on the projected annual carbon sequestration lost from the cumulative reduction in natural lands since 2014 and the projected annual losses in stored carbon from year-to-year reductions in natural lands. Apart from the County's land use forecasts under its general plan, no State or Federal legislative actions are currently assumed to address future changes in land use or emissions related to land use change. However, the County Board of Supervisors adopted Ordinance No. 1438 on April 9, 2019, which resulted in modifications to the County's Conservation Regulations in Chapter 18 of the County Code. Enforcement of the revised Conservation Regulations will contribute towards achieving the GHG reduction measures identified in this section.

Land use change will result in net GHG emissions over time due to the loss of stored carbon and sequestration potential. However, land use measures will help to reduce this net increase in annual GHG emissions by:

- **39 percent in 2030, and**
- **59 percent in 2050.**

The measures included under this strategy will reduce GHG emissions associated with land use change by promoting conservation of existing natural lands, tree replanting efforts, and preserving stored carbon through repurposing removed wood. These measures will not show substantial reductions in the near term due to the slow growth rates of trees over time and the larger effect in emissions from sudden loss of natural land cover. However, the CAP measures will reduce the increase in emissions from this sector from 137 to 39 percent in 2030 from 2014 levels and reduce 2014 emissions by 59 percent by 2050. Emissions reductions from these measures rely on successful administration of new programs, enforcement of County ordinances, and coordination with and participation from land use development in the County. Major co-benefits of land use change measures include improved air and water quality, and the protection of natural ecosystems and habitat. These co-benefits are discussed in greater detail in Appendix B.

This strategy includes three primary measures. The first measure, LU-1, prioritizes preservation of existing trees on lands that will be converted to urban development or agricultural use. In addition, the measure targets planting 2,500 trees per year. Such efforts will have a compounding effect on the amount of carbon dioxide (CO_2) removed from the atmosphere resulting in a reduction of nearly 13,000 $MTCO_2e$ per year by 2050 from replanting alone.

Measure LU-2 also serves as an adaptation measure by conserving natural habitats to prevent future flooding (see Chapter 4).

Table 3-9 summarizes primary measures affecting the land use change sector. Each measure is described below Table 3-9.

Table 3-9 Summary of Land Use Change Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	0	3,525	12,956
LU-2	Refine protection guidelines for existing riparian lands	0	602	799
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	0	3,453	4,731
TOTAL		0	7,580	18,487

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
Source: Ascent Environmental 2018

Primary Land Use Measures

Measure LU-1 Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting

The County will establish a mitigation program that prioritizes preservation of existing on-site trees for land use development projects, including vineyard conversions. Trees that cannot be preserved will be required to be replaced at a 2:1 ratio, consistent with General Plan Policy CON-24. This program will primarily focus on, but will not be limited to, oak and coniferous trees. The program will target a minimum preservation rate of 30 percent of existing on-site trees, weighted by tree size in diameter at breast height. For any tree replacements, the County will encourage project applicants to prioritize replanting on the project site followed by offering off-site planting opportunities.

Co-Benefits (LU-1)
- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

Considering County resources, staffing, and physical space limitations on available lands, it is assumed that an average of 2,500 replacement trees will be planted per year beginning in 2020 after the adoption of the CAP in spring 2019. This target could be achieved by a combination of existing or enhanced volunteer replanting efforts (e.g., 5,000 Oaks

Initiative) and compliance with the County's 2:1 tree replacement policy (Napa County Resource Conservation District 2015).

The County will work with arborists and local conservation organizations (e.g., Napa Land Trust) to design and implement this mitigation program, along with other policies and programs that will protect or enhance the health of existing oak woodlands. Key coordination activities include determining ecologically-sound locations for tree plantings, or expanding the use of conservation easements or other efforts to protect existing oak woodlands.

Note that, in 2014, the county had approximately 160,000 acres of oak woodland with a total of approximately 24 million trees (see Appendix A). The 2017 and 2018 wildfires burned over 33,000 acres of oak woodland and additional acres of conifers. In response to this loss, the County is already budgeting additional funds to help replant the lost trees, particularly oaks. (Eberling 2018, Napa County 2018b, California Department of Forestry and Fire Protection 2019).

In April 2019, the County Board of Supervisors adopted Ordinance No. 1438, which amended the County's Conservation Regulations in Chapter 18 of the County Code. The amended regulations will serve as the County's implementation mechanism to achieve a substantial portion of tree preservation and mandatory replanting targets associated with development projects or other regulated activities that are assumed under this measure. Further details with respect to implementation and monitoring of this measure, including both the County's enforcement of the revised regulations as well as other non-regulatory activities assumed under this measure, are further described in Chapter 5 ("Implementation and Monitoring").

Measure LU-2 Refine protection guidelines for existing riparian lands

Co-Benefits (LU-2)

- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

The County will continue to enforce the County's Conservation Regulations (County Code, section 18.108.010 B.4) that protect riparian lands and prevents conversion of riparian lands to urban development, agricultural land use, or other land use types. If appropriate, the County will develop guidelines or refine existing regulations to ensure that no net losses of riparian lands will occur.

The County already restricts development activity in riparian zones through several ordinances. Section 16.04.750 limits number of the types and sizes of trees and vegetation that can be removed from riparian areas, including limitations on removal of native trees. The County will ensure that any revisions to riparian policies do not prevent removal of non-native disease hosts. Also, any development activities in riparian zones are required to be permitted. Such limits are also in place to prevent erosion under Section 18.108.100.

On April 9, 2019, the County Board of Supervisors adopted Ordinance No. 1438, which amended the County's Conservation Regulations in Chapter 18 of the County Code. The amended regulations will serve as the County's implementation mechanism to achieve a substantial portion of riparian protections associated with development projects or other regulated activities that are assumed under this measure. Further details with respect to implementation and monitoring of this measure, including both the County's enforcement of the revised regulations as well as other non-regulatory activities assumed under this measure, are further described in Chapter 5 ("Implementation and Monitoring").

The County will also collaborate with arborist and stakeholder organizations, (e.g., Napa River Rutherford Reach Restoration Project, U.S. Army Corp of Engineers, California Department of Fish and Wildlife, and State Water Resources Control Board) to develop and implement coordinated policies or programs that enhance existing riparian lands, especially those deemed unhealthy or at risk.

Measure LU-3 Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests

The County will develop a program to require repurposing of usable timber from trees removed due to land use conversion and burying or chipping of non-usable timber. Repurposed wood may be used in construction or sold to local woodworking businesses or collectives with proceeds funding the administration of this measure and, if additional funds are available, LU-1. A minimum of 80 percent of the total removed weight of trees shall be repurposed, buried, chipped, or otherwise prevented from burning. This measure excludes timber in commercial forests. The County will consider collaborating with one or more program partners to implement the program in order to avoid duplicative efforts.

Co-Benefits (LU-3)
- **Improved Air Quality**
- **Improved Public Health**

Land use forecasts and associated GHG emissions forecasts from vegetation losses conservatively assume that all vegetation removed due to land conversions will be burned, releasing all stored carbon as CO_2 into the atmosphere. The goal of this program is to prevent burning of removed biomass, thus avoiding future CO_2 emissions.

3.3.8 High-GWP Gases

High-GWP gases accounted for 13,481 $MTCO_2e$, or approximately three percent of total emissions in 2014. High-GWP gas emissions are generated as the result of the use or leakage of refrigerants, electrical insulators in transmission lines, fumigants, and other materials. Emissions in this sector includes various types of F-gas emissions such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6), which are also classified as SLCPs.

State and Federal regulations are reducing high-GWP gases as the result of regulations. For example, SB 1383 requires CARB to implement the SLCP Strategy and reduce HFCs by 40 percent below 2013 baseline levels by 2030 statewide. The County will act to complement legislative actions already in place, including the SLCP

High-GWP measures will reduce annual GHG emissions by:
- **40 percent by 2030, and**
- **40 percent by 2050.**

Strategy and forthcoming CARB and BAAQMD regulations that implement the SLCP Strategy.

At the time the inventory and forecast were being developed, SB 1383 had not yet been adopted. Thus, the potential legislative reductions from SB 1383 were not included in the County's GHG forecast but are accounted for in Measure HG-1.

The high-GWP strategy includes one primary measure and one supporting measure that both aim to reduce the use of high-GWP refrigerant systems commensurate with applicable policies. These measures will reduce high-GWP emissions by 40 percent below 2014 levels by 2030 and by 2050.

Table 3-10 summarizes supporting measures from this strategy, with descriptions following the table.

Table 3-10 Summary of High-GWP Gases Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Supporting Measures				
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	0	5,127	7,762
HG-2	Incentivize the use of low-GWP refrigerants	NA	NA	NA
TOTAL		0	5,127	7,762

Notes:
CARB = California Air Resources Board
GWP = global warming potential
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
RMP = Refrigerant Management Program
Source: Ascent Environmental 2018d

Primary High GWP Gases Measures

Measure HG-1 Encourage registration of facilities in CARB's Refrigerant Management Program and support local compliance efforts with State regulations.

CARB's Refrigerant Management Program (RMP) requires facilities with refrigeration systems using over 50 pounds of high GWP refrigerant to register with the program. To reduce emissions of these refrigerants, facilities registered in the program are required to enact several BMPs including conducting periodic leak checks and detecting leaks in a timely manner. The County will encourage registration into the program and explore ways to financially incentivize the future installation of low-GWP refrigerant systems (see Measure HG-2 below for specific County actions on incentives).

Co-Benefits (HG-1)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

After the passing of SB 1383 (Super Pollutant Reduction Act), CARB approved the SLCP strategy that includes a range of measures to reduce SLCPs, including HFCs, in California. These measures include proposed regulations that would ban HFCs with a GWP factor of 750 or more in new stationary source air conditioning systems by 2023, limiting the use of high GWP refrigerants in stationary systems, increase recovery of HFCs from spent containers, and developing a certification system for small containers of automotive refrigerants. SB 1383 set a standard for the state to reduce HFC emissions by 40 percent below 2013 levels by 2030. CARB's RMP is poised to implement SB 1383 and track compliance. Local air districts, such as BAAQMD, would be responsible for developing regulations to require low-GWP replacements for HFCs. In September 2018, Governor Brown signed SB 1013, the California Cooling Act, strengthening the intent of SB 1383 with respect to refrigerant chemicals, specifically.

The County will assist in the statewide and regional efforts to reduce HFC emissions by first evaluating and changing the use of refrigerants in County facilities and fleet to decrease the amount of refrigerant used or switch to refrigerants with lower GWP factors, as recommended by CARB and BAAQMD. The County will also take an active role in working with BAAQMD to implement locally-specific programs, such as the replacement of refrigerants in refrigerated warehouses and grocery stores.

For projects subject to environmental review, this measure will also be required and enforced through the CAP Consistency Checklist.

Supporting High GWP Gases Measures

Measure HG-2 Incentivize the use of low-GWP refrigerants

The County will consider incentivizing the use of low-GWP refrigerants in refrigeration systems or heating, ventilation, and air conditioning (HVAC) systems by expediting the permitting process or reducing permitting for new or replacement projects. The County could also pair funds with other funding sources and financing mechanisms to increase installation rates.

Co-Benefits (HG-2)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**

Because of adoption and enforcement of CALGreen Tier 1 standards under Measures BE-1 and BE-2, eligible HVAC and refrigeration equipment would not be permitted to contain hydrochlorofluorocarbons (HCFCs). Installation of HVAC systems could comply with either of the following: install HVAC and refrigeration that do not contain hydrofluorocarbons (HFCs) or do not contain HFCs with a GWP greater than 150; or install HVAC and refrigeration equipment that limit the use of HFC refrigerant by using a secondary heat transfer fluid with a GWP no greater than one.

3.3.9 Multi-Sector Strategy

Source: County of Napa.

In addition to identifying reduction opportunities associated with individual measures in the affected sectors, a multi-sector GHG reduction strategy looks at implementing program and policies that will reduce GHG emissions across sectors. This strategy includes four measures, one of which is primary and three of which are supporting. These measures address the overall function of activity in the County and establish a carbon offset program. The primary measure targets Napa Green certification of 100 percent of eligible wineries, vineyards, and eligible businesses in the county by 2030. This measure will reduce approximately 5,743 $MTCO_2e$ per year by 2030 and 5,737 $MTCO_2e$ per year by 2050. In addition to the environmental co-benefits of the multi-sector measures, multi-sector measures could have economic benefits for the County and its businesses.

Table 3-11 summarizes the primary and supporting measures that affect all sectors. Each measure is described below Table 3-11.

Table 3-11 Summary of Multi-Sector Measures

Measure Number	Measure Name	Annual GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Primary Measures				
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030.	0	5,743	5,737
Supporting Measures				
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	NA	NA	NA
MS-3	Promote the sale of locally-grown foods and/or products	NA	NA	NA
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	NA	NA	NA
	TOTAL	0	5,743	5,737

Notes: Columns may not add to totals due to rounding.
GHG = greenhouse gas emissions
$MTCO_2e$ = metric tons of carbon dioxide equivalents
NA = Not Available
Source: Ascent Environmental 2016

Primary Multi-Sector Measures

Measure MS-1 Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030

Co-Benefits (MS-1)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

Napa Green offers two environmental certification programs, Napa Green Winery and Napa Green Land, for winery and land owners, respectively. Although Napa Green Land typically applies to vineyards, it also applies to land management of whole parcels, including any combination of farmland, natural land, and road and water ways. Green land management practices include using electrified or alternatively-fueled agricultural equipment, converting diesel-powered irrigation pumps to electric, night-shift harvesting, and using biochar as soil amendments. Together, the Napa Green Winery and Land certification programs aim to reduce solid waste generation, water use, and wastewater generation, promoting sustainable agricultural practices.

The County will support efforts to increase the number of Napa Green Certified wineries and properties in the County by including designated facilities as a favorable factor in its locational criteria when considering applications for new or expanded facilities. The County will also work with Napa Green to incentivize the replacement of CH_4-emitting open air wastewater treatment ponds in certified wineries and vineyards with low-emissions treatment systems. These actions depend on the ongoing support of the Napa Valley Vintners and increased staffing in the County to support the certification program.

The County will also consider highlighting Napa Green Certified wineries on appropriate websites (e.g., visitnapavalley.com). As of Fall 2018, approximately 72 wineries in Napa are Napa Green Certified, representing at least 40 percent of current annual wine production by volume in the County. Also, more than 50 percent of vineyard land in the County is currently Napa Green Land certified. This measure targets a participation rate of 60 percent by 2020 and 100 percent by 2030, as a function of eligible acreage or annual production by volume.

These actions depend on the ongoing support of program stakeholders and increased resources from the County to support the certification program.

Supporting Multi-Sector Measures

Measure MS-2 Work with other local jurisdictions within the County to develop a unified Climate Action Plan

Co-Benefits (MS-2)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

Reducing GHG emissions in the entire County will require the efforts of all local jurisdictions in the County. The measures in the CAP are primarily focused on the unincorporated county. Under this measure, the County will coordinate with the incorporated cities in the County to pursue development of a unified, countywide climate action policy framework. This could result in a countywide CAP that applies to both the County and incorporated cities, or similar efforts to encourage incorporated communities to adopt their own CAPs consistent with the County's CAP.

A comprehensive, unified CAP will improve the effectiveness of intraregional GHG reduction efforts, such as providing affordable housing in city centers and offering regional transit or rideshare solutions to wineries, vineyards, and other employment centers throughout the county.

Co-Benefits (MS-3)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Improved Public Health**

Measure MS-3 Promote the sale and consumption of locally-grown foods and/or products

Developing and supporting a market for locally-grown foods or other consumer products helps to decrease transportation emissions from delivery, promotes local sustainable growing practices, and contributes to a stronger local economy. Under this measure, the County will promote the sale and use of locally grown food and/or products in the County. The County will work with local grocery stores, farmer's markets, and restaurants to identify opportunities to reduce the supply of imported foods and to encourage local farmers to grow foods that are typically imported. Imported crops are typically off-season crops or tropical fruits for which there is little or no domestic production. The County will encourage farmers to use greenhouses or other methods to supply off-season crops during the winter.

While primarily focused on food, this measure could also be expanded to other products. For example, locally-sourced wood products developed because of Measure LU-3 implementation will help to reduce demand for wood products from more distant locations.

Co-Benefits (MS-4)

- **Improved Air Quality**
- **Improved Water Supply and Quality**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Public Health**
- **Reduced Fossil Fuel Reliance**

Measure MS-4 Establish a local carbon offset program in partnership with Sustainable Napa County

In coordination with Sustainable Napa County, the County will establish a local carbon offset program that allows events, persons, businesses, or institutions in Napa County to purchase credits to offset GHG emissions they generate. The funds from the sale of carbon offsets will be used to construct, develop, or operate projects that provide short or long term GHG reductions, depending on the emissions being offset. This program could be used to help implement other measures in this CAP, such as auditing and retrofitting existing buildings under applicable Building Energy sector measures; or, converting agricultural equipment to alternative fuels under measures AG-2 or AG-3.

A Tradition of Stewardship
A Commitment to Service

Chapter 4

Climate Change Vulnerability and Adaptation

4.1 Introduction

Climate change is a global phenomenon that over the long term will have a wide variety of impacts on human health and safety, economic continuity, water supply, ecosystem function, and the provision of basic services (California Natural Resources Agency [CNRA] 2012:3). Locally, climate change is already affecting and will continue to affect the physical environment throughout California, the Bay Area, and Napa County. For example, the 2017 California wildfire season, fueled by persistent drought in prior years followed by heavy rains and vegetation growth, and record-setting high summer temperatures, resulted in one of the most destructive wildfire seasons on record (California Department of Forestry and Fire Protection [CAL FIRE] 2017, 2018a, b, c). Because impacts of climate change vary by location and other social and economic characteristics, it is important to identify the projected severity these impacts could have in Napa County.

The California Adaptation Planning Guide (APG) provides climate adaptation planning guidance to cities, counties, and local governments. The APG, developed by the California Office of Emergency Services and CNRA, introduces the basis for climate change adaptation planning, including a nine-step process that details ways communities can reduce climate-related risks and impacts and prepare for climate change.

The nine steps in the adaptation planning process are outlined below in Figure 4-1. The first five steps of the process represent the vulnerability assessment phase, which is a method for determining the potential impacts of climate change on community assets and populations. The severity of these impacts and the community's ability to respond determine how these impacts affect a community's health, economy, ecosystems, and socio-cultural stability. Section 4.2 of this chapter summarizes the results of the vulnerability assessment prepared for the County of Napa (County). The entire vulnerability assessment can be found in Appendix C.

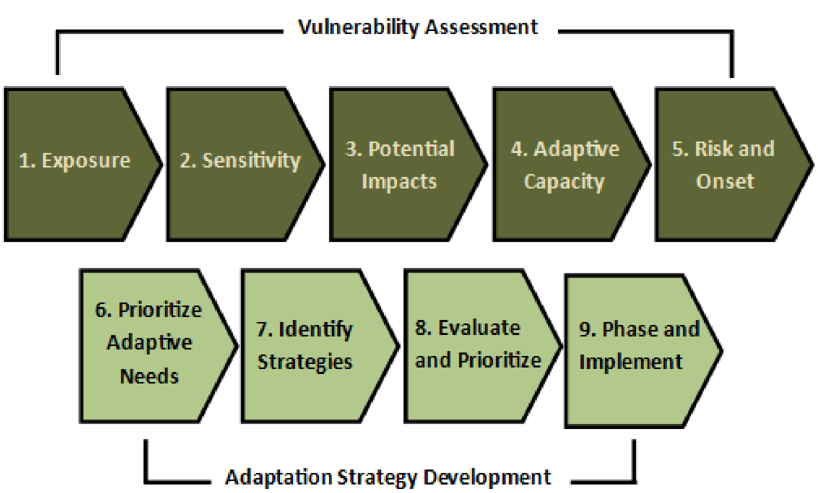


Figure 4-1: The Nine Steps in the Adaptation Planning Process

The second phase of the process is adaptation strategy development, in which effective climate adaptation strategies and measures are identified and prioritized that apply to County assets, systems or populations that may be vulnerable to climate change. These strategies and measures will help increase the County's ability to prepare for, respond to, and adapt to climate change. Climate adaptation strategies and measures for the County are included in Section 4.3 of this chapter.

4.2 Summary of Climate Change Effects and Vulnerability Assessment

This section summarizes the results of the vulnerability assessment prepared for the County, which includes identification of localized climate change exposure and related effects, an assessment of areas of vulnerability, a review of the County's current capacity to adapt to climate-related impacts, and consideration of how likely and how quickly impacts will occur. The completed vulnerability assessment, which follows the first five steps of APG's adaptation planning development, can be found in Appendix C.

4.2.1 Climate Change Effects

Where possible, climate change effects in the County are characterized for two periods of time: midcentury (around 2050) and the end of the century (around 2100). Historical data is used to identify the degree of change by these two future periods in time.

The first step in assessing vulnerability is to identify what climate change effects the County will experience in the future. To begin assessing climate change impacts over time, Cal-Adapt, a climate change scenario planning tool was used. Cal-Adapt downscales global climate simulation model data to local and regional resolution under both high and low global greenhouse gas (GHG) emissions scenarios. Results from both emissions scenarios are considered in this summary and distinguished where possible.

The direct, or primary, changes analyzed for the County include average temperature, annual precipitation, and sea-level rise. Secondary impacts, which can occur because of individual or a combination of these changes, are also assessed and include extreme heat and its frequency, wildfire risk, and changes in precipitation and hydrology (CNRA 2012:16-17).

Increased Temperatures

Annual average temperatures are projected to increase between 3.3 ° F and 5.7 ° F by the end of the century.

Annual temperatures in the County are projected to climb steadily. The County's historical average temperature, based on data from 1960-1990, is 58.3 degrees Fahrenheit (˚F). Under the low-emissions scenario, annual average temperature is projected to increase to 61.6 ˚F by 2090, an increase of 3.3 ˚F. The annual average temperature under the high-emissions scenario is projected to increase 5.7 ˚F to 64.0 ˚F by the end of the century.

The County's average annual low temperature, based on historical data from 1960-1990, is 44.4˚F. Under the low-emissions scenario, annual low temperature is projected to increase to 48.6˚F by 2090, an increase of approximately 4.2˚F. The annual average low temperature under the high-emissions scenario is projected to increase to 50.7˚F in 2090 (i.e., an increase of approximately 6.3˚F). Historically, annual high temperatures average 70.5˚F. Annual average high temperatures are projected to increase under the low-emissions scenario by approximately 2.9˚F to 73.4˚F. Under the high-emissions scenario, annual average high temperature is projected to increase to 76.4˚F, an increase of approximately 5.9˚F.

Source: County of Napa

Increased Frequency of Extreme Heat Events and Heat Waves

In Napa County, an "extreme heat day" is defined as a day with a high temperature of at least 92˚F (California Energy Commission [CEC] 2016). Historically, the County has experienced an average of four extreme heat days a year. Because of climate change, the number of extreme heat days is projected to increase substantially by 2099. The projected annual average number of extreme heat days is expected to increase approximately 23-26 days per year in 2050, and 54-64 days per year towards the end of the 21st century.

Heat waves have been historically infrequent in the County. However, with climate change, a significant rise in the frequency in heat waves is projected to occur.

Heat waves, which can be defined as five or more consecutive extreme heat days, have been historically infrequent in the County, with no more than two heat waves occurring in a year. However, with climate change, a significant rise in the frequency in heat waves is projected under both emissions scenarios. Under the low emissions scenario, projections show an increase of heat wave events with around three per year at the middle of the century and up to seven per year in 2090. The high emissions scenario also shows an increase in annual heat wave events, with up to five heat wave events occurring annual by midcentury and as high as 16 heat wave events occurring annually by the end of the century. Along with an increased frequency of heat events, heat waves are also projected to occur both earlier and later in the season, which historically started in late May/early June and ended in mid-September.

Changes to Precipitation Patterns

Reduced precipitation could lead to higher risks of drought, while increased precipitation could cause flooding and soil erosion (CNRA 2014: 25).

While projections generally show little change in total annual precipitation in California and trends are not consistent, even modest changes could have a significant effect on California ecosystems that are conditioned to historical precipitation levels (CEC 2016).

While the County is not located in an area where snow typically accumulates, major water districts and utilities in the County receive a significant amount of water from the State Water Project, which depends on spring and early-summer snowmelt in the Sierra Nevada for water supply. Additionally, agricultural water users in the unincorporated areas of the County are the primary user of groundwater (Napa County 2005:2). Increased average temperatures and changes in the timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies, and thus the County could face increasing challenges of providing adequate water supplies because of increased uncertainty in the amount and timing of water availability to meet future demand. If demand exceeds supply, water users could face shortages in normal or dry years.

Increased Wildfire Risk

Recent mitigation efforts, including adoption of the 2010 Uniform Fire Code, the Firewise Program, and the Chipping Program, have helped reduce Napa County's wildfire risk, but it is still quite vulnerable and at high-risk for wildfires (Napa County 2013: 77).

According to Napa County's Operational Area Hazard Mitigation Plan, the County has a history of wildfires. Before the 2017 wildfires, more than 200,000 acres of the County's 482,000 acres burned in the last thirty years, most of which occurred in the unincorporated areas (Napa County 2013: 12). The 2017 California wildfire season was one of the most destructive seasons on record, occurring in a year of record-setting heat and persistent drought (2018a, b, c, d). In October 2017, a series of wildfires broke out across Napa, Lake, Sonoma, Mendocino, Butte, and Solano Counties, burning over 245,000 acres. In 2018, the most destructive fire in California's history, the Camp Fire, burned over 150,000 acres and nearly 19,000 structures in Butte County. 2018 also saw the Snell Fire burn an additional 2,500 acres between Napa and Solano Counties. According to CAL FIRE and various news outlets, the fires across both years resulted in at least 130 casualties and the destruction of an estimated 28,000 structures (CAL FIRE 2018a, d). Napa County was greatly impacted by the fires in 2017 alone, with over 70,000 acres burned, and 1,200 structures damaged or destroyed, including more than 700 residences (Napa County 2018). Currently, the major wildland fire hazard risks for residential development are in the County's hilly areas characterized by steep slopes, poor fire suppression delivery access, inadequate water supply and highly-flammable vegetation (Napa County 2013: 75).

Increased temperatures and changes in precipitation patterns associated with climate change are expected to increase the risk of wildfire in the County. The 2017 California wildfire season was exacerbated by periods of persistent drought, intense winter rains, and the hottest summer in more than 100 years of record keeping. Heavy winter rainfall resulted in an abundance of vegetation, which dried out in the summer, creating hazardous fuel conditions. Under the low-emissions scenario, wildfires are 11 percent more likely to occur in 2020, compared with a baseline year of 2010, 15 percent more likely to occur in 2050, and 12 percent more likely to occur in 2085. Under the high-emissions scenario, wildfires are 14 percent more likely to occur in 2020, compared to the 2010 baseline year, 13 percent more likely in 2050, and 22 percent more likely to occur in 2085. Given that the County is currently at risk for wildfire, these increases of between 10 and 20 percent under both emissions scenarios is significant and could result in additional threats and increased vulnerability.

Increased Likelihood of Flooding

Climate change is likely to lead to changes in the frequency, intensity, and duration of extreme events, such as sustained periods of heavy precipitation and increased rainfall intensity during precipitation events. These projected changes could lead to increased flood magnitude and frequency (Intergovernmental Panel on Climate Change [IPCC] 2001:14).

According to Napa County's Operational Area Hazard Mitigation Plan, the County is already considerably vulnerable to flooding. Flooding has caused the most disaster declarations and the most damage and loss of life historically in the County, with floods usually occurring during the season of highest precipitation or during heavy rainfall after prolonged dry periods (Napa County 2013:11). Almost all of the land adjacent to the Napa River is subject to flooding that has a one percent probability of occurring in any given year, or a 100-year flood event (Napa County 2013:58). While it is uncertain exactly how and to what extent climate change will affect flooding events in the County, it is reasonable to assume that any increase in flooding could have serious ramifications as the area is already considerably vulnerable. Additional information on increased risk of flooding, which could be exacerbated by sea-level rise in the southern portion of the County, is included below.

The County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months (Napa County 2013:11).

Sea-Level Rise

Another outcome of global climate change is sea-level rise. The southwestern portion of the County includes the mouth of the Napa River, which forms a tidal estuary that drains into San Pablo Bay. Less than one percent of the County's population is considered at risk and vulnerable to sea-level rise (CEC 2012:14 and U.S. Census 2014). Some critical infrastructure (i.e., roads, hospitals, schools, emergency facilities, and properties) are at increased risk of coastal flooding in the County. For example, the American Canyon Power Plant and the Napa Sanitation District Water Treatment Plant could become vulnerable to a 100-year flood event with 1.4 meters (m) of sea-level rise (CEC 2012:23).

Currently 140,000 people, or 2 percent of the Bay Area's population, live in areas currently at risk of being inundated in a 100-year flood event. A 1.4 m rise in sea level will put an additional 130,000 people at risk, increasing the total number of people at risk to 270,000 (CEC 2012).

Because several physical structures (i.e., levees) are currently in place to protect against a 100-year flood event, approximately 36 acres in the County are currently at risk for flooding. Taking a 1.5 m rise in sea level into account, along with other storm factors, it is projected that an additional 13,000 acres could be inundated by a 100-year flood event. The majority of area that is at risk is currently undeveloped or used for agricultural purposes. Specific areas along the Napa River that could become vulnerable include Buchli, Cuttings Wharf, Thompson, and Imola, along with areas further north along the Napa River, including some industrial uses, wineries, and parts of Downtown Napa (i.e., up to 3rd Street and portions east of State-Route 29). The Milton Road/Edgerly Island area could be lost in its entirety if the privately-owned levy system were to fail. Additional portions of Thompson, Middleton, and American Canyon also have some flood-prone low-lying areas that would become more vulnerable to flooding because of sea-level rise. While the Napa County Airport itself is not at immediate risk for inundation from coastal flooding due to 1.5 m of sea-level rise, adjacent areas to the west are at increased risk of flooding due to sea-level rise.

4.2.2 Vulnerability

This section summarizes the main areas of vulnerability, in terms of structures, functions, and population to climate change exposures and impacts in the County. Vulnerability to climate change also considers the County's adaptive capacity, or the ability to currently address climate change exposures, along with how likely and how quickly impacts will occur. More detailed discussion of climate-related vulnerabilities, as they relate to the climate change exposures, can be found in Appendix C.

The County's wine industry accounts for $10.1 billion of $51.8 billion in economic impact from winemaking and related industries in California (Mayton 2015a).

Agriculture and Wine Industries

Climate change could significantly impact the agricultural and wine industries, which are large drivers of the County's economy. Specifically, the wine industry in Napa, which produces an average of four percent of California's wine grape harvest, has 475 wineries, producing more than 49.7 million cases of wines totaling over $4.5 billion dollars in sales, as of 2017 (Napa Valley Vintners 2017 and Napa County 2013:28).

Increases in temperature and changes in precipitation and soil moisture could impact the growing of wine grapes by causing late or irregular blooming and affecting yields (Lee et al. 2013:1).

Source: County of Napa

The increased likelihood of extreme floods could also lead to the destruction of crops, erosion of topsoil, and deposits of debris and sediment on crop lands. Conversely, as average temperatures increase with climate change, agricultural demand for water could intensify under extreme heat conditions, under which water evaporates faster and plants need more water to move through their circulatory systems to stay cool (CNRA 2014:21). More specifically, attempts to maintain wine grape productivity and quality in the face of warming may be associated with increased water use for irrigation, a change to different varietals of grapes, and to cool grapes through misting or sprinkling (Lee et al. 2013). As noted earlier, increased average temperatures and changes in timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies in the future, which could in turn affect water supplies for agricultural uses.

The wine industry and thousands of acres of vines could also be affected by wildfire. Most wineries in Napa County were left intact after the October 2017 fires. Roughly 3,500 acres of vineyards were located within the fire areas; however, only 126 of those acres burned. Several wineries were damaged or destroyed (Napa County 2018). In addition to direct impacts such as loss of vineyards and property, several indirect impacts could occur. The October 2017 fires took place during the peak of the winemaking season, resulting in a temporary downturn in tourism. For vineyards that are near fire-prone areas, smoke from wildfire could potentially cause problems, particularly for red grapes, where the grape skin is still used in the winemaking process. Studies have shown that wildfire smoke can potentially infuse with the grape skin and create abnormal flavors (Mayton 2015a). Furthermore, wildfires could threaten vineyards, particularly at the start of harvest season. Oftentimes when wildfires occur, evacuation orders are established by CAL FIRE, which could leave certain vineyards inaccessible for a period. Without access, grapes could remain on the vine too long and over ripen, leaving them unsuitable for winemaking (Mayton 2015b).

Sensitive Populations

With approximately 17 percent of the County's population over the age of 65 and 33 percent of Hispanic or Latino origin, projected climate change exposures have the potential to leave sensitive populations in the County especially vulnerable to increased risk (Census 2014).

Higher frequency of extreme heat conditions can cause serious public health impacts, increasing the risk of conditions directly related to heat such as heat stroke and dehydration (CNRA 2012: 3). Older adults, particularly seniors, are more likely to experience respiratory and/or cardiovascular health complications than younger individuals. Approximately 24,000 of the County's population are elderly, which are more likely to live alone with limited mobility, all of which can exacerbate health risks associated with extreme heat (Census 2014).

The County has a large Hispanic population, many of which are low-income agricultural workers that speak primarily Spanish. The majority of the County's large agricultural job base is of Hispanic origin. Heat stress can seriously affect those working outside, by reducing overall productivity and in extreme exposures could lead to illness, disability, or death (CNRA 2014:24). Wildfire could also negatively impact those who pick the grapes, because of the potential degradation of transportation infrastructure. Because a large number of agricultural workers cannot afford to live in the County (due to high housing costs and the lack of affordable housing), their access and mobility could be impaired.

The Hispanic population has increased from 23.7 percent in 2000 to 33.7 percent in 2014 (Census 2014).

As sea levels rise, the area and the number of people at risk because of flooding will also rise. Factors that increase vulnerability to the adverse impacts of flood events associated with sea-level rise include access to preparedness information, transportation, healthcare, and insurance. Key demographics associated with these vulnerabilities include income, race, linguistic isolation (i.e., non-English speaking), and residential tenure (CEC 2012:8). Language ability is an important factor in assessing vulnerability as emergency response crews may be unable to communicate with non-English speakers (CEC 2012: 9). The portion of the County's Hispanic population that is low-income and that speak primarily Spanish are especially vulnerable and would be impacted by a flood event associated with sea-level rise.

Renters are also more vulnerable, as they are less likely to reinforce buildings and buy insurance because the decision to make major home improvements typically lies with the property owner. Additionally, disaster recovery services have often targeted homeowners, to the disadvantage of renters (CEC 2012:9).


Source: County of Napa

Wildfire Threat is Likely to Increase

The County is already considered to be an area that is at high-risk for wildfires, which is only expected to increase by the end of the century (Napa County 2013:77). This increase could cause additional threats to the County and has the potential to affect emergency services, roads, water supplies to residents, housing access, and quality of life. For example, the County lost six percent of its housing stock in the October 2017 fires, in an already challenging housing market (Napa County 2018).

A changing climate is expected to subject forests to increased stress due to drought, disease, invasive species, and insect pests. These stressors are likely to make forests more vulnerable to catastrophic fire (Westerling 2007:231). While periodic fires are natural processes and carry out an important ecological function, catastrophic fire events that cannot be contained or managed can cause serious threats to homes and infrastructure, especially for properties located at the wildland-urban interface (i.e., where residential development mingles with wildland areas) (CAL FIRE 2009). Ecological functions are further impacted as the risk of fire increases. When it does rain in burned areas, more soil washes off the hills and into roads, ditches, and streams.


Source: County of Napa

Flooding and Sea-Level Rise Could Make New Areas in the County Vulnerable

The County is not extremely vulnerable to sea-level rise, with less than one percent of the County's total population considered at risk (CEC 2012:14 and Census 2014). Considering a 100-year flood event, a 1.5 m rise in sea-level and other hydrodynamical factors, most of the land at increased risk for flooding is undeveloped. A small portion of critical infrastructure, such as roads, railways, hospitals, emergency facilities, and properties in the southwestern portion of the County and in areas along the Napa River, including parts of Downtown Napa, could become vulnerable. American Canyon Power

Plant and the Napa Sanitation District Water Treatment Plant could also become vulnerable (CEC 2012:23).

Current Actions and Adaptive Capacity

The County has already begun to address many of the challenges associated with climate change through existing local policies, plans, programs, resources, and institutions.

On a planning level, the County addresses current and future impacts related to existing natural hazards, as evidenced by the creation of the County's Operational Area Hazard Mitigation Plan in 2013, which identifies current hazard risks and mitigation strategies for flooding, earthquakes, and fires. Furthermore, the County's 2008 General Plan includes policies aimed at reducing local contributions to global climate change and encourages sustainable building practices, efficient use of resources (i.e., water, land, and energy), sustainable vineyard practices, and ecological stewardship. It also covers vulnerable populations, including policies aimed at achieving more equitable outcomes for the growing low-income populations in the County, as well as its aging population that require better access to public services and housing. In Fall 2018, the County will commence a 5-year update of the Operational Area Hazard Mitigation Plan. Concurrent with the plan update, the Safety Element of the County's general plan will be updated, including any necessary updates to climate adaptation and resilience policies.

The County is already addressing climate change through existing policies, plans, and programs. Based on current efforts, the CAP assesses the County's adaptive capacity, or its ability to adapt and respond to projected changes.

In addition to planning efforts, the County has embarked on a number of climate adaptation-related efforts, which are summarized below. The County's adaptive capacity, or the ability to adapt and reduce vulnerability to climate change, is also assessed. Adaptive capacity can be rated high, medium, or low. High adaptive capacity indicates that sufficient measures are already in place to address projected changes, while a low rating indicates a community is unprepared (CNRA 2012:26).

Efforts Related to Increased Temperature and Extreme Heat Frequency

The Napa County Health and Human Services Agency, Public Health Division, maintains an Excessive Heat Emergency Response Plan, which is designed to address current and projected changes in increased temperature, including extreme heat events and heat waves (Napa County 2009). The plan clearly outlines procedures and steps the County can take, including which other agencies to enlist for support, to effectively help the community in the event of excessive heat emergencies. While the plan can account for projected increases in temperature, it is reactive in nature and does not include potential solutions that could be put in place before extreme heat events occur. Therefore, the adaptive capacity ranking for increased temperature is considered medium.

Source: County of Napa

Efforts Related to Water Supply and Precipitation Patterns

The County has several water conservation programs, including rebates for appliances and free-water saving devices for residents, that are helping to combat drought and other water supply issues, but the County is still currently vulnerable to water supply issues because of drought and other factors. The County will face challenges in providing sufficient water supplies in the future due to climate change effects, coupled with an increasing population (i.e., mostly in the incorporated areas) and increasing water demand. While the County has already taken steps towards achieving long-term groundwater sustainability, there is still a possibility that water supply availability may change in the future and will need to be further addressed. Therefore, the adaptive capacity ranking for changes to precipitation patterns and water supply is medium.

The County has water conservation regulations for landscape design, with the intent to conserve water through promotion of the most efficient use of water in landscape design, while respecting the economic, environmental, aesthetic, and lifestyle choices of individuals and property owners (Napa County Municipal Code Title 18, Chapter 18.118).

Efforts Related to Flooding

While levees and structures have been built to protect the County from a 100-year flood event, and the Napa River Flood Control Project will provide a higher level of flood protection, the County is currently not prepared to address effects associated with future sea-level rise and other hydrodynamic factors that would increase the risk of flooding. Climate change is projected to expose 13,000 additional acres to 100-year flood risk. While most of these areas are undeveloped, some developed areas are at risk and should be accounted for in future plans. Therefore, the adaptive capacity for risks associated with flooding is considered medium.

The Napa River Flood Control Project will restore more than 900 acres of high-value tidal wetlands of the San Francisco Bay Estuary while protecting 2,700 homes, 350 businesses, and over 50 public properties from 100-year flood levels, a savings of $26 million annually in flood damage costs (Napa County 2016a).

Efforts Related to Wildfire Prevention

The County is an area that is currently at high-risk for wildfires. Currently, the County has several programs to help prevent wildfires. The County participates in the National Fire Protection Association's (NFPA) Firewise Communities Program and has several Fire Safe Councils that are active in minimizing the potential for wildfire damage. The County is also only one of four Counties to have road standards that meet the Board of Forestry's stringent requirements. While programs and policies in place show a current capacity to address risks, the County is still vulnerable, as evidenced by the October 2017 fires. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent and the County will need to continue to adapt to this projected increase. Therefore, the adaptive capacity for risks associated with wildfire is considered medium.

The County has provisions to help prevent the accumulation of combustible vegetation or rubbish that can be found to create fire hazards and potentially impact health, safety, and general welfare of the public (Napa County Municipal Code Title 8, Chapter 8.36).

Other Climate-Adaptation Related Efforts

The County has practices and organizations in place that help address future issues of sustainability and climate adaptation. With organizations, such as Sustainable Napa County, that educate the public and foster collaboration for longer term environmental

The County enforces the Green Building Standards Code to establish and encourage sustainable building construction practices having a positive environmental impact (Napa County Municipal Code Title 15, Chapter 15.14).

sustainability, the County through partnerships is finding ways to change behaviors and practices now. The County also supports the Napa Green Certification program, which aims to reduce solid waste generation, water use, and wastewater generation, promoting sustainable agricultural practices. Furthermore, by adopting the Green Building Standards Code, the County is setting a precedent for reduced energy use, building with more sustainable materials, and employing better water conservation tactics. The County also recently joined Marin Clean Energy (MCE), which allows users to purchase more renewable energy options. These efforts, however, would need to be expanded and applied on a much larger scale throughout the County to address future changes attributed to climate change. Therefore, the adaptive capacity for other climate-adaptation related efforts is medium.

Risk and Onset

The County is committed to continuing efforts to address and reduce existing climate-related risks and future impacts on a program level. With several ordinances and programs that cover a range of climate exposures and related impacts, the County is well equipped to handle current issues of extreme heat events and water supply issues, but could still likely face increasing challenges as projected changes occur.

The timeframe in which the impact is most likely to occur are defined as follows:

- **Near-term: 2020-2040,**
- **Mid-term: 2040-2070, and**
- **Long-term: 2070-2100.**

In terms of how likely and quickly impacts will occur, temperature related impacts are the most likely near-term climate change exposure facing the County and should be addressed and prioritized in future adaptation planning efforts. While sea-level rise has a high certainty rating and is already occurring, its onset is not expected to occur until closer to the end of the century in terms of changes in areas already vulnerable to flooding or causing permanent inundation in tidally-influenced areas of the County. Addressing increases in flooding and wildfire risk have mid-term onsets and should be prioritized accordingly.

4.3 Adaptation Strategies and Measures

This section defines the strategies and measures that the County will pursue to further its climate adaptation efforts. These strategies build upon current efforts to be more sustainable, adaptive, and progressive. The County's 2008 General Plan contains several policies aimed at achieving sustainable development, reducing vehicle emissions, using resources more efficiently, and improving vineyard practices. The strategies and measures within this section define the specific steps necessary to prepare for the future effects of a changing climate. Other County plans, programs, efforts, and policies support this vision and contribute to addressing climate change issues.

See Section 4.2 Current Actions and Next Steps for more details regarding current County efforts to address climate change.

Strategies identify the primary ways to adapt to climate change impacts. Measures identify specific steps that the County will take to implement strategies.

Adaptation measures are grouped into five strategies. These strategies address the climate change impacts and vulnerabilities identified in the vulnerability assessment (i.e., temperature, wildfire, precipitation, flooding, and sea-level rise). Within each strategy are a series of measures that define the programs, policies and regulations the County will implement to remain responsive to the challenges created by climate change. Consideration for how likely and how soon impacts are expected to occur are included, with specific attention given to those exposures that pose the most serious and near-term threats to the County. This includes identifying responsible County departments and an implementation timeframe for each measure. More detailed discussion on implementation and monitoring of the CAP can be found in Chapter 5.

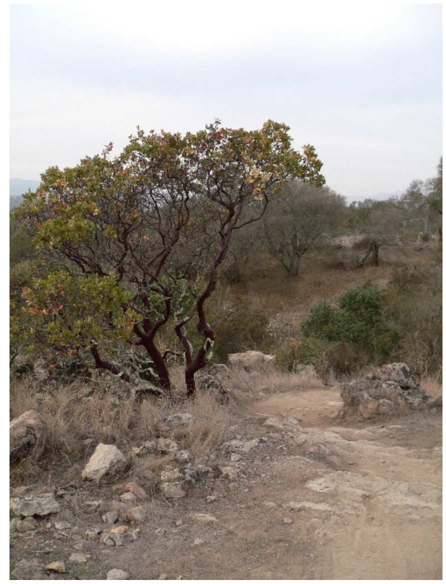
Adaptation strategies also have the potential to provide other important benefits to the community, or co-benefits, such as improved air quality, water supplies, biological resources, public health outcomes, and beneficial outcomes for non-renewable energy resources. For example, several adaptation measures would help to curb the urban heat island effect while also strengthening education and awareness about extreme heat and health, thus reducing the incidence of heat-related illness. Flood protection measures would increase resilience to flood-events while also restoring and protecting riparian habitats, resulting in ecological co-benefits. Often, those who are most vulnerable to the impacts of climate change are the ones who have the fewest resources to deal with these issues. Adaptation strategies that focus on identifying and targeting vulnerable populations would also provide health equity co-benefits. Co-benefits are identified within each strategy, where applicable. And finally, GHG reduction measures previously identified in Chapter 3 that also contribute to adaptation are discussed, where appropriate.

Below are the five strategies included in this section:

The five adaptation strategies address the climate change impacts and vulnerabilities identified in Section 4.2:
- **temperature,**
- **wildfire,**
- **precipitation,**
- **flooding, and**
- **sea-level rise.**

- Prepare for Increases in Average Temperatures and Extreme Heat Events,
- Prepare for Increased Risk of Wildfire,
- Prepare for Variable Water Supplies and Preserve Water Quality,
- Prepare for Increased Likelihood of Flooding, and
- Prepare for Sea-Level Rise.

4.3.1 Prepare for Increases in Average Temperatures and Extreme Heat Events



Source: County of Napa

Temperature-related impacts because of climate change are likely to affect the County in several ways. Increased average temperatures, along with more frequent extreme heat events, are likely to exacerbate already high temperatures, in what are known in developed areas as urban heat islands. Built-up areas, which tend to have a prominence of asphalt and less vegetation, create, intensify and retain heat. To help curb the effects of urban heat islands in developed areas, the County will incorporate "green" infrastructure into new development and developing areas. Examples of green infrastructure include planting trees, climate-appropriate landscaping, rain gardens, and rooftop gardens. The County will also incorporate cool pavement and rooftop technology in new and existing developments, while also including more shade trees in parking lots.

With increased average temperatures and more frequent extreme heat events, energy demand is likely to increase. A number of GHG-reduction measures (see Chapter 3) also serve as climate adaptation measures. For example, improving energy efficiency and reducing energy demand in buildings today will help to mitigate future increases in energy demand as average temperatures rise and more extreme heat events occur. GHG reduction measures include working on increasing energy efficiency in new and existing buildings, by requiring compliance with CALGreen Tier 1 Standards (GHG Measures BE-1 and BE-2), increasing participation in MCE's Deep Green option for renewable energy (GHG Measures BE-3 and BE-6), and incentivizing energy efficiency improvements (GHG Measures BE-5 and BE-8).

All GHG Building Energy measures serve as adaptation measures by reducing overall energy demand. For a complete list of measures related to building energy, see Chapter 3.

Understanding that health-related risks increase along with average temperatures, the County will continue to work with the Health and Human Services Agency, along with other departments to ensure that the proper outreach programs and plans are in place to deal with heat-related illnesses and that the agricultural sector is equipped to withstand a changing climate.

Measures related to temperature are described below and summarized in Table 4-1 below.

Measure Temp-1 Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to extreme heat events.

Co-Benefits:

- Reduced Energy Demand
- Reduced Energy Bills
- Reduced Building and Operating Costs
- Reduced Fossil Fuel Reliance
- Improved Air Quality
- Improved Public Health
- Improved Quality of Life
- Increased Public Awareness of Climate Change

Measure Temp-2 Develop Outreach Programs for Outdoor Workers

Work with labor organizations, the agriculture and wine community, and County and State health and safety agencies to publicize programs and standards for preventing heat-related illness in employees who work outdoors.

Measure Temp-3 Educate Residents on Heat-Related Illness Prevention

Develop education outreach materials to publicize methods for preventing heat-related illness during heat waves.

Measure Temp-4 Encourage the installation of Cool Roof Technologies and Rooftop Gardens

Encourage and explore ways to incentivize the installation of cool roof technologies and, where appropriate, rooftop gardens in residences and commercial buildings.

Measure Temp-5 Incorporate Cool Pavement Technology

Explore options to incorporate cool pavement technology into both the regular maintenance of existing and construction of new roads, sidewalks, parking areas, and bike lanes.

Measure Temp-6 Improve Parking Lot Shading and Landscaping

Explore options to improve parking lot shading requirements in new construction and to promote planting of additional trees and landscaping in existing parking lots.

Measure Temp-7 Update the County's Excessive Heat Emergency Response Plan

Coordinate with the Napa County Health and Human Services Agency, Public Health Division, to maintain and update the County's Excessive Heat Emergency Response Plan to better prepare for increased extreme heat days and more frequent and intense heat waves.

Measure Temp-8 Support and Monitor Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries

Support and monitor ongoing research on the potential effects of a warmer climate on the agriculture and wine industry by existing organizations and groups, including but not limited to, Napa Valley Vintners and the California Climate and Agriculture Network.

Measure Temp-9 Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures

Work with grape growers and grape grower associations (e.g., Napa Valley Vintners) to understand the tolerance of current wine grape crop mixes to withstand increased temperatures and explore options to shift the types of grape varietals to suit changing environments.

Measure Temp-10 Develop Outreach Programs for Winemakers

Develop outreach programs to inform and assist winemakers in changing practices to adapt to the effects of climate change (e.g., increasing average temperatures, variation in water supplies). Techniques could include, but are not limited to, providing artificial shade and limiting light exposure on grapevines during extreme heat events.

Measure Temp-11 Develop and Implement Strategies to Increase Energy Resiliency

Work with MCE and PG&E to develop and implement strategies to increase energy resiliency in the face of extreme events (e.g., extreme heat events, damages due to wildfire, flooding, and sea-level rise). Strategies could include, but are not limited to, battery storage and back-up systems, creating grid flexibility through increased renewable energy development, and identifying design weaknesses in energy infrastructure.

Creating a more resilient energy system will increase reliability and help ensure uninterrupted access to critical resources like power and water. GHG Building Energy measures also help to increase energy resilience by reducing the County's overall energy demand and diversifying regional sources of renewable power generation.

Table 4-1 Summary of Temperature Related Measures

Measure	Title	Responsibility	Timeframe
Temp-1	Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events	Planning and Public Works	Near-Term
Temp-2	Develop Outreach Programs for Outdoor Workers	Planning & Public Health Division	Near-Term
Temp-3	Educate Residents on Heat-Related Illness Prevention	Planning & Public Health Division	Near-Term
Temp-4	Encourage the installation of Cool Roof Technologies and Rooftop Gardens	Planning	Near-Term
Temp-5	Incorporate Cool Pavement Technology	Planning	Mid-Term
Temp-6	Improve Parking Lot Shading and Landscaping	Planning	Near-Term
Temp-7	Update the County's Excessive Heat Emergency Response Plan	Planning & Public Health Division	Mid-Term
Temp-8	Support Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries	Planning & the Agriculture Commissioner's Office	Near-Term
Temp-9	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures	Planning & the Agriculture Commissioner's Office	Mid-Term
Temp-10	Develop Outreach Programs for Winemakers	Planning & the Agriculture Commissioner's Office	Mid-Term
Temp-11	Develop and Implement Strategies to Increase Energy Resiliency	Planning and Public Works	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2018

4.3.2 Prepare for Increased Risk of Wildfire

With the County already at high risk for wildfire, it is imperative that the County prepare for increased wildfire risk as a result of climate change. The Napa County Fire Department currently has mutual aid agreements with American Canyon, the City of Napa, St. Helena, and Calistoga, forming the Napa County Firefighters Association (Association). The County will continue to collaborate with the Association and other pertinent agencies to coordinate strategies to ensure a cohesive County-wide approach to wildfire risk management.

GHG Measure AG-5 will help to reduce the risk of fire spreading (see Chapter 3).

Additionally, GHG Measure AG-5, which supports BAAQMD efforts to reduce open burning of removed agricultural biomass and flood debris, will help to reduce the risk of fire to spread and become hazardous threats. Wildfire is also the largest source of black carbon in California, harmfully impacting both public health and the climate (CARB 2017). An added co-benefit of reducing fire hazard risks and building resiliency through wildfire-related adaptation measures, is that less black carbon will be emitted into the atmosphere.

All wildfire-related measures are described below. Summaries of the measures are included in Table 4-2 below.

Co-Benefits:

- Protection of Structures and Assets
- Improved Air Quality
- Reduction in Black Carbon Emissions
- Protection of Natural Ecosystems and Habitats
- Improved Public Health
- Improved Quality of Life
- Increased Public Awareness of Climate Change

Measure Fire-1 Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards

Work with CAL FIRE and the Napa County Fire Department to map and identify locations in the County that are newly at risk, or at higher risk, for fire hazards because of climate change and its impacts.

Measure Fire-2 Map Critical Infrastructure Locations Vulnerable to Wildfires

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to wildfires.

Measure Fire-3 Collaborate with the Napa County Firefighters Association in the Dissemination of Information

Collaborate with the Napa County Firefighters Association to disseminate information regarding the nexus between climate change and increased wildfire risk to identify opportunities for County-wide coordination efforts.

The Napa County Firefighters Association is a joint agency comprised of fire departments in Napa County, American Canyon, City of Napa, St. Helena, and Calistoga (Napa County 2016b).

Measure Fire-4 Coordinate Emergency Preparedness Systems

Coordinate with the Napa County Firefighters Association and the Office of Emergency Services to identify strategies to ensure capacity and resilience of escape routes compromised by wildfire, including emergency evacuation and supply transportation routes.

Measure Fire-5 Collaborate on Programs to Reduce Fire Hazards

Collaborate with the Napa County Fire Department to continue to reduce fire hazards, including but not limited to, enforcing defensible space guidelines, restoring fire-resilient conditions by thinning, removing live or dead vegetation, and retaining healthy native trees.

Table 4-2 Summary of Wildfire Risk Measures

Measure	Title	Responsibility	Timeframe
Fire-1	Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards	Planning, Napa Couny Fire Department, & CAL FIRE	Near-Term
Fire-2	Map Critical Infrastructure Locations Vulnerable to Wildfires	Planning, Public Works, & Caltrans	Mid-Term
Fire-3	Collaborate with the Napa County Firefighters Association in the Dissemination of Information	Planning & Napa County Firefighters Association	Mid-Term
Fire-4	Coordinate Emergency Preparedness Systems	Planning, Napa County Firefighters Association, & Office of Emergency Services	Mid-Term
Fire-5	Collaborate on Programs to Reduce Fire Hazards	Planning & Napa County Fire Department	Near-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2018

4.3.3 Prepare for Variable Water Supplies and Preserve Water Quality

Climate change effects will result in variable water supplies and an increased need to preserve water quality in Napa County. To prepare for these conditions, the County will continue to evaluate the vulnerabilities of its water supply systems and networks, while also identifying innovative options to meet future water demand.

Several GHG reductions measures also serve as adaptation strategies. GHG Measure LU-2, refines protection guidelines for existing riparian lands, further preserving areas and water quality. Additional water related GHG measures cover a range of water conservation tactics, including regulations for landscape design (GHG Measure WA-1), adopting ordinances that limit outdoor watering for commercial and residential land uses (GHG Measure WA-2), and requiring audits for new large-scaled projects and existing facilities (GHG Measure WA-4). GHG Measure WA-3, expedites and reduces permit fees associated with water conservation installations, including rainwater catchment systems, which are also encouraged in Adaptation Measure Water-3 below.

All GHG Water measures serve as adaptation measures by preserving water quality and encouraging water conservation. For a complete list of measures related to water, see Chapter 3.

Additionally, the County will pursue future grant opportunities to continue efforts related to provide enough water supplies in the future, and support local efforts from Napa Green Land to increase water efficiency in agricultural lands in the County.

All measures related to water supply and quality are described below and summarized in Table 4-3 below.

Co-Benefits:

- Reduced Water and Sewer Bills
- Improved Water Supply and Quality
- Increased Public Awareness of Climate Change

Measure Water-1 Evaluate Vulnerabilities of Water Supply Systems and Networks

Evaluate the vulnerability of the water supply systems and networks to climate change related impacts and develop strategies to increase the resilience of these systems.

Measure Water-2 Consider Innovative Options to Meet Future Demand

Consider innovative options to meet future water demand (e.g., on-site graywater systems; institute water conservation strategies; and use of recycled water).

Measure Water-3 Promote Use of Rainwater Catchment and Storage Systems

Promote the use of catchment systems, such as rain barrels, rain gardens, cisterns, and other mechanisms to capture and store rainwater.

Source: County of Napa

Measure Water-4 Support Napa Green Land Certification Efforts

Support efforts of the Napa Green Land certification program for agriculture and farm land to prevent soil erosion, reduce harmful inputs and runoff, restore wildlife habitats, and support healthy rivers, streams, and riparian vegetation to maintain water quality and conserve water resources. See also GHG reduction measure MS-1 in Chapter 3, which establishes a goal for 100 percent certification for all eligible properties in the Napa Green certification programs.

Measure Water-5 Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources

Collaborate with the Napa County Flood Control and Water Conservation District and Public Works, to identify water supply options for the future. Explore opportunities to expand the use of on-site graywater systems, recycled water systems, or other alternative supply sources to meet non-potable water demands, and where possible, to offset groundwater and/or potable use.

Measure Water-6 Pursue Grant Funding Opportunities for Water Resource Planning Projects

Pursue grant funding opportunities related to on-site graywater reuse systems, water recycling projects, and/or other water resource planning projects.

Table 4-3	Summary of Water Supply and Quality Measures		
Measure	Title	Responsibility	Timeframe
Water-1	Evaluate Vulnerabilities of Water Supply Systems and Networks	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Near-Term
Water-2	Consider Innovative Options to Meet Future Demand	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term
Water-3	Promote Use of Rainwater Catchment Systems	Planning & Public Works	Mid-Term
Water-4	Support Napa Green Land Certification Efforts	Planning	Near-Term
Water-5	Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term
Water-6	Pursue Grant Funding Opportunities for Water Resource Planning Projects	Planning & Public Works	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
Source: Ascent Environmental 2018

4.3.4 Prepare for Increased Likelihood of Flooding

Through a variety of measures, the County will prepare for the increased likelihood of flooding. The County will work with local agencies and organizations to reduce the effects of flooding by improving and mapping critical infrastructure. On a larger County-wide level, the County is committed to partner with incorporated cities to address flooding collectively, paying attention to areas at increased flooding risk along the Napa River.

The County will also use several measures to restore the natural environment to combat flooding. Identifying streamside areas that could be restored will not only buffer buildings, roads, and crops from floods, but will also improve natural landscapes and air quality.

Additionally, GHG reduction Measure LU-2 which refines protections guidelines for existing riparian lands, also serves as an adaptation strategy.

GHG Measure LU-2 will help conserve natural habitats to prevent future flooding (see Chapter 3).

Measures related to flooding are described below and summarized in Table 4-4 below.

Measure Flood-1 Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change

Ensure that future updates to the County's Operational Area Hazard Mitigation Plan incorporate strategies to address the increased likelihood of flooding because of climate change.

Measure Flood-2 Partner with Incorporated Towns and Cities and Local Organizations to Address Flooding

Partner with incorporated cities in the County and local organizations, such as the North Bay Climate Adaptation Initiative, to ensure coordinated efforts are taken to reduce threats to structures, populations, and functions because of flooding, particularly along the Napa River.

Measure Flood-3 Identify Potential Streamside Restoration Areas

Co-Benefits:

- **Protection of Structures and Assets**
- **Protection of Natural Ecosystems and Habitats**
- **Improved Air Quality**
- **Improved Public Health**
- **Improved Quality of Life**

Identify potential streamside areas in the County that could be restored by stabilizing stream banks and planting appropriate vegetation to buffer buildings, roads, and crops from floods.

Measure Flood-4 Encourage Replanting Bare or Disturbed Areas

Encourage the replanting of bare or disturbed areas to reduce runoff, improve water uptake, and reduce erosion and sedimentation in streams.

Measure Flood-5 Coordinate Emergency Evacuation and Supply Transportation Routes

Coordinate emergency evacuation and supply transportation routes with the County's Office of Emergency Services to ensure capacity and resilience of escape routes compromised by flooding.

Measure Flood-6 Improve Sewage and Solid-Waste Management Infrastructure

Improve sewage and solid-waste management infrastructure, to the extent such infrastructure is within the jurisdiction of the County, to reduce vulnerabilities to climate change (i.e., storm surge, flooding, and inundation).

Measure Flood-7 Improve Capacity of Storm Water Infrastructure

Evaluate and improve capacity of storm water infrastructure for high intensity rainfall events.

Source: County of Napa

Measure Flood-8 Increase Use of Pervious Pavements and Landscaping in Developed Areas

Increase the use of pervious pavements and landscaped areas to allow for better infiltration and reduced stormwater overflow in developed areas.

Measure Flood-9 Map Critical Infrastructure Locations Vulnerable to Flooding

Map locations of communication, energy, service, and transportation infrastructure that are vulnerable to floods and storm surges.

Measure Flood-10 Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding

Work with the agriculture sector to understand the tolerance of current wine grape varieties to withstand increased flooding, and explore options to shift the types of grape varietals to suit changing conditions.

Measure Flood-11 Design Programs to Address Vector- and Waterborne Diseases

Design programs to monitor and prepare for the appearance of vector- and waterborne diseases following floods and storms.

Table 4-4 Summary of Flood Risk Measures

Measure	Title	Responsibility	Timeframe
Flood-1	Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change	Planning & Office of Emergency Services	Near-Term
Flood-2	Partner with Incorporated Towns and Cities and Local Organizations to Address Flooding	Planning & Incorporated Cities[1]	Mid-Term
Flood-3	Identify Potential Streamside Restoration Areas	Planning & Public Works	Near-Term
Flood-4	Encourage Replanting Bare or Disturbed Areas	Planning	Mid-Term
Flood-5	Coordinate Emergency Evacuation and Supply Transportation Routes	Planning & Office of Emergency Services	Mid-Term
Flood-6	Improve Sewage and Solid-Waste Management Infrastructure	Planning & Public Works	Mid-Term
Flood-7	Improve Capacity of Storm Water Infrastructure	Planning & Public Works	Mid-Term
Flood-8	Increase Use of Pervious Surfaces and Landscaping in Developed Areas	Planning	Mid-Term
Flood-9	Map Critical Infrastructure Locations Vulnerable to Flooding	Planning	Near-Term
Flood-10	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding	Planning & the Agriculture Commissioner's Office	Mid-Term
Flood-11	Design Programs to Address Vector- and Waterborne Diseases	Planning and Public Health Division	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
[1] Includes American Canyon, Calistoga, City of Napa, St. Helena, and Yountville.
Source: Ascent Environmental 2018

4.3.5 Prepare for Sea-Level Rise

The County will coordinate with several agencies, including the Federal Emergency Management Agency (FEMA) Region IX, DWR, Napa County Public Works, and Napa County's Office of Emergency Services to prepare for the projected effects of sea-level rise. Measures include identifying specific areas in the County that will be affected by sea-level rise and establishing measures to protect functions, structures and populations. In addition to supporting ongoing research and analysis of sea-level rise and its effects on the County, the County will incorporate sea-level rise effects into its future planning efforts. The County will also through an outreach strategy, educate and inform residents of potentially affected areas of the need to plan for sea-level rise.

Source: County of Napa

Measures related to sea-level rise are described below and summarized in Table 4-5 below.

Measure SLR-1 Identify Areas Affected by Sea-Level Rise

Conduct a detailed sea-level rise assessment to identify and inventory areas that will be affected by sea-level rise and establish measures to protect functions, structures, and populations.

Measure SLR-2 Update the County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise

Ensure that future updates to the County's Operational Area Hazard Mitigation Plan incorporate sea-level rise assessment and risk management processes.

Measure SLR-3 Floodplain Mapping Coordination

Coordinate with FEMA and DWR to ensure that floodplain mapping for potentially affected areas are regularly updated to reflect changes in Base Flood Elevations that account for sea-level rise.

Co-Benefits:

- **Protection of Structures and Assets**
- **Improved Public Health**
- **Improved Quality of Life**
- **Increased Public Awareness of Climate Change**

Measure SLR-4 Support and Monitor Ongoing Analysis of Sea-Level Rise Data

Support and monitor ongoing collection and analysis of sea-level rise, storm surge, and tidal data by existing institutions, including, but not limited to FEMA, the Bay Conservation Development Commission, the Bay Area Regional Collaborative, and the National Oceanic and Atmospheric Administration.

Measure SLR-5 Create a Comprehensive Outreach Strategy

Create a comprehensive outreach strategy that informs residents in potentially affected areas of County efforts to protect and increase community resiliency to sea-level rise.

Measure SLR-6 Incorporate Sea-Level Rise Effects into Capital Improvement Plans

Update capital improvement plans for critical infrastructure to address the effects of future sea-level rise and associated hazards in potentially affected areas.

Measure SLR-7 Assess Sea-Level Rise Impacts on Agriculture

Conduct a more detailed assessment of the impacts sea-level rise, severe storms, and increased risk of coastal flooding on the County's agriculture sector.

Table 4-5 Summary of Sea-Level Rise Measures

Measure	Title	Responsibility	Timeframe
SLR-1	Identify Areas Affected by Sea-Level Rise	Planning	Mid-Term
SLR-2	Update Napa County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise	Planning & Office of Emergency Services	Near-Term
SLR-3	Floodplain Mapping Coordination	Planning, FEMA & DWR	Near-Term
SLR-4	Support Ongoing Analysis of Sea-Level Rise Data	Planning	Near-Term
SLR-5	Create a Comprehensive Outreach Strategy	Planning	Mid-Term
SLR-6	Incorporate Sea-Level Rise Effects into Capital Improvement Plans	Planning & Public Works	Mid-Term
SLR-7	Assess Sea-Level Rise Impacts on Agriculture	Planning	Mid-Term

Note: Near-Term: 1-3 Years, Mid-Term: 4-8 Years, Long-Term: 8+ Years
FEMA = Federal Emergency Management Agency
DWR = Department of Water Resources
Source: Ascent Environmental 2018

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Napa County Climate Action Plan

Chapter 5

Implementation and Monitoring

A Tradition of Stewardship
A Commitment to Service

Source: County of Napa

5.1 Introduction

This chapter outlines in detail how the County of Napa (County) will implement, monitor, and update the Climate Action Plan (CAP) strategies and measures over time to reduce greenhouse gas (GHG) emissions and adapt to climate change. To achieve the GHG emissions reductions and adaptation strategies described in Chapters 3 and 4, measures must also be continuously assessed and monitored to ensure that: (1) the measures are effective; (2) the CAP is on track to achieve the GHG reduction targets; and (3) desired community outcomes are attained.

Source: County of Napa

5.2 Implementation Strategy

This chapter describes how County staff will implement the CAP, and how the CAP will be monitored and updated over time to ensure continued effectiveness and relevance of the document.

Achieving the 2020 and 2030 GHG reduction targets, along with ongoing and increasingly-effective progress such that the longer-term 2050 goal is eventually achieved, will require ongoing implementation and frequent monitoring of the strategies and measures identified in the CAP. Ensuring that the measures translate to on-the-ground results and reductions in GHG emissions is critical to success. It requires careful consideration of the operational and capital resources needed to implement the CAP, as well as the overall timing, phasing, and monitoring of implementation.

The monitoring strategy outlined below serves as initial guidance for County staff in monitoring progress towards established goals. Monitoring and assessment of the CAP implementation process will provide key insights into which strategies and measures have been most successful in terms of implementation and GHG reductions and will inform policy and strategy development for future CAP updates.

The County will implement strategies and measures of the CAP through several types of programs and activities that can be grouped into the following categories:

- **Code Updates.** Several of the measures in the CAP will be implemented through new or amended regulations as part of County Code updates. The County, for example, will need to incorporate the California Green Building Standards Code (CALGreen) Tier 1 “reach code” into the County’s local building code, along with requiring that new or replacement residential water heating systems be electrically-powered and/or alternatively-fueled systems.

- **Financing and Incentives.** Identifying mechanisms for funding and allocating resources, such as expanding current green energy incentives, will help ensure that the CAP is successfully implemented.

Source: County of Napa

- **Program Research and Development.** Several measures are programmatic in nature and will require additional research and development for proper implementation to occur (i.e., developing programs to address vector- and waterborne diseases). These programs may require future partnerships and financing mechanisms to be in place down the road, but most immediately, County staff will need to integrate program research and development into the context of existing workloads and programs whenever possible.

- **Partnerships.** Inter-agency coordination and partnerships with other organizations is critical to ensuring implementation of certain measures (i.e., developing a region-wide CAP, increasing Napa Green-Certified wineries, or supporting efforts to allow commuter service to operate on the Napa Wine Train right-of-way). This is especially important in cases where the County does not have sole authority or legal jurisdiction over activities or actions that are within the purview of other agencies or organizations and; thus, County partnership and collaboration with others is essential.

Low cost measures are those that have low County administrative costs, can be subsidized, or compared to other measures have lower start-up costs. High cost measures are those that consume a substantial portion of local government budget or would require extensive infrastructure to implement.

- **Education and Outreach**. Education efforts about the objectives of the CAP will create support for the CAP, and the County will involve the community in its implementation.

Table 5-1 summarizes the implementation strategy for the CAP. More specifically, for each GHG reduction and adaptation measure, the table identifies the following information:

- **Responsibility**. Identifies County departments that will be responsible for implementing assigned actions upon adoption of the CAP. Because some measures will require interdepartmental or inter-agency cooperation, appropriate partnerships have been initially identified.

- **Timeframe**. The estimated timeframe for implementing each measure. Measures are categorized as Near-Term (will occur within 1-3 years), Mid-Term (will occur within 4-7 years), by 2030, or Ongoing (already occurring).

- **General County Implementation Costs**. Relative County costs required to implement each measure are represented by an order of magnitude category (i.e., Low, Medium, High). These categories are based on the anticipated level of resources, staffing, and time required to implement each measure. The general cost category is not intended to represent the relative costs of compliance, but rather focused on the County's costs to facilitate program development and implementation. For a more specific discussion of the relative costs and benefits of compliance with individual measures, see Appendix B.

- **Estimated County Staff Time**. Staffing requirements for the County are presented in terms of the estimated number of full-time equivalent (FTE) employees needed to implement and coordinate CAP measures over one fiscal year. In some cases, the FTE estimates could be absorbed into existing work programs, while in other cases new work programs and associated staff positions could be required. More detailed estimates of staffing and program costs will be developed during implementation of specific measures.

Full-time equivalent (FTE) in this context represents the proportion of time that one employee working on a full-time basis (i.e., 40 hours a week) would devote to implementing the CAP over the course of one fiscal year.

- **Category**. Identifies the general implementation category (i.e., method of implementation) for each measure (i.e., Code Updates, Financing and Incentives, Program Research and Development, Partnerships, and Education and Outreach). For some measures, more than one implementation category may apply.

- **Applies to Projects Seeking CEQA GHG Streamlining**. Distinguishes which GHG reduction measures would be required for development projects that are not exempt and must undergo environmental review pursuant to the California Environmental Quality Act (CEQA), in order to qualify for project-level GHG analysis tiering and streamlining from the CAP. See Section 5.2.1 below and Appendix D for additional details.

- **Implementing Actions and Other Considerations**. Summarizes the key actions County staff will take, partnership or collaboration needs, generalized costs and benefits of compliance, and other considerations for measure implementation and monitoring.

The County will develop more detailed implementation schedules for each measure, based on staff requirements and funding opportunities available for implementing the measures outlined in the CAP. Implementation of the CAP will require inter-departmental collaboration and key staff in each department will facilitate and oversee action implementation. Priority will be given to programs based on cost effectiveness, GHG reduction potential, available funding, and the ease and length of time for implementation.

Proper implementation and tracking of the CAP allows County staff, the Board of Supervisors, and the public to monitor the effectiveness of each measure, as well as monitor the overall progress in achieving the targets and goals established in the CAP.

The County will incur costs to implement some of the measures outlined in the CAP. These include initial start-up, ongoing administration, and enforcement costs. While some measures will only require funding from public entities, others will result in increased costs for businesses, new construction, and residents. However, most measures provide substantial cost-savings in the long term, such as through reduced energy and fuel usage. The County will be diligent in seeking cost-effective implementation, strategic funding opportunities, and the use of partnerships to share costs.

5.2.1 Role of New Development

The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

Implementation of the CAP will require that all new development projects attain higher levels of energy efficiency and incorporate more sustainable design standards. Several of the GHG reduction measures applicable to new development in the CAP will be implemented through various County Code amendments to development and building standards that all projects will be required to meet. Such standards would be enforced in the course of planning and development review and would apply to all projects.

However, for new developments that are not exempt from CEQA and must undergo environmental review, and which are found to consistent with applicable GHG reduction measures in the CAP, are eligible for CEQA streamlining, per the provisions of CEQA Guidelines Section 15183.5. Under these provisions, such projects must show consistency with applicable GHG reduction measures and associated performance standards in the CAP, regardless of whether the GHG reduction measures are adopted in County Code. Thus, if the project is fully consistent with the CAP, including incorporation of all applicable GHG reduction measures into the project designs or as mitigation measures, the level of analysis for the project required under CEQA with respect to GHG emissions can be reduced considerably (i.e., detailed analysis of project-level GHG emissions and potential climate change impacts is not needed). Furthermore, a project's incremental contribution to cumulative GHG emissions may be determined not to be cumulatively considerable. This CAP meets the criteria identified in Section 15183.5 and is therefore considered a "qualified" CAP that provides a pathway for tiering and streamlining project-level GHG analysis in project-specific environmental documents.

To help new development applicants plan and design projects consistent with the CAP, and to assist County staff in determining the consistency of proposed projects with the CAP during environmental review, the County has prepared a CAP Consistency Checklist (See Appendix D). The Checklist incorporates the GHG reduction measures that could be feasibly applied to future projects subject to environmental review under CEQA and are noted in Table 5-1 below.

The Checklist may also be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or Federal law. By incorporating applicable GHG reduction measures in the Checklist into project designs or mitigation measures, the County will ensure that new development is consistent with applicable GHG reduction measures in the CAP and thus will contribute its "fair share" in achieving the identified GHG reduction targets.

Source: County of Napa

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
GHG Reduction Measures								
Agriculture - Primary Measures								
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel.	Planning,CARB and BAAQMD	Near-Term	Low	Less than 0.01 FTE	Yes[2]	Financing & Incentives	Requires County staff time for development review, funding sources for new incentives, and collaboration with CARB and BAAQMD. New or replacement equipment costs and potential electrification costs for property owners, with potential for long-term cost savings.
AG-2	Support use of electric or alternatively-fueled agricultural equipment	Planning, CARB and BAAQMD	Near-Term	Low	Less than 0.01 FTE	Yes[2]	Partnerships	Requires County staff time for development review and collaboration with CARB, BAAQMD, and agricultral sector. New or replacement equipment costs for property owners, with potential for long-term cost savings.
AG-3	Support the use of Tier 4 final diesel equipment for off-road agricultural equipment	Planning & Agricultural Community	Mid-Term	Low	Less than 0.01 FTE	Yes[2]	Partnerships	Requires County staff time for development review and collaboration with agriculture sector. New or replacement equipment costs for property owners, with potential for long-term cost savings.
Agriculture - Supporting Measures								
AG-4	Support reduced application of inorganic nitrogen fertilizer	Planning & Agricultural Community	Near-Term	Low	0.02 FTE	No	Partnerships, Education & Outreach	Requires County staff collaboration with agriculture sector. Potential cost savings for farmers from reduced fertilizer use.
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	Planning & BAAQMD	Near-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time for collabration with BAAQMD.
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	Planning, Napa County RCD, & Agricultural Community	Mid-Term	Low	Less than 0.01 FTE	Yes[2]	Partnerships, Program Research & Development, Education & Outreach	Requires County staff time for collaboration. New funding sources could be required to provide incentives or expand existing programs operated by RCD or other organizations.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Building Energy- Primary Measures								
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	Building & Public Works	Near-Term	Medium	0.08 FTE	Yes	Code Updates, Financing & Incentives	Requires County staff time to update and enforce new CALGreen Tier 1 building code requirements, and develop incentives to help offset permit and construction costs. Upgraded green building and sustainable site design measures could increase development costs, but also would reduce operating costs for future residents and businesses.
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	Building & Public Works	Near-Term	Medium	0.08 FTE	Yes	Code Updates, Financing & Incentives	Requires County staff time to update and enforce new CALGreen Tier 1 and ZNE code requirements and develop incentives to help offset permit and construction costs. Upgraded green building and sustainable site design measures could increase development costs, but also would reduce operating costs for future residents and businesses.
BE-3	Increase participation in MCE's Deep Green (100 percent renewable) option and encourage ongoing participation in MCE	Planning, Public Works, MCE, & Potential Funding Sources	Near-Term	Medium	Less than 0.01 FTE	No	Financing & Incentives	Requires County staff time to develop incentive program for Deep Green, along with a potential new funding source to provide subsidy to income-qualified residents to offset cost of MCE Deep Green premium. Requires County staff time to work with MCE to promote MCE participation throughout the county, such as through advertisements, events, and outreach to customers who have opted out.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
BE-4	Require new or replacement residential and commercial water heating systems to be electrically powered and/or alternatively fueled (e.g., solar water heating) for all residential land uses	Building	Near-Term	Medium	0.08 FTE	Yes	Code Updates, Financing & Incentives	Requires County staff time to update and enforce new regulations in County building code, and develop incentives to help offset permit and construction costs. New or replacment could reduce operating costs for residents due to increased efficiency.
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	Planning, Google, and National Renewable Energy Laboratory	Mid-Term	Medium	0.08 FTE	No	Code Updates, Financing & Incentives, Partnerships	Requires County staff time to update local ordinances and expand incentive programs. Annual costs to County for permitting or other incentives. Potential costs savings to consumers would help to offest costs of installation along with County incentives.
BE-6	Select MCE's Deep Green option for all County facilities	Public Works	Near-Term	Low	0.000 FTE	No	Financing & Incentives	Annual County operating cost increases for MCE Deep Green premium.
BE-7	Support waste-to-energy programs at unincorporated landfills	Planning, Public Works, & Landfills	Mid-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to collaborate with other agencies and organizations. New infrasuturctre costs, and operating costs and benefits, need to be determined based on specific programs or projects.
Building Energy- Supporting Measures								
BE-8	Work with PG&E, BayREN, MCE, and PACE financing programs, and other partners to incentivize energy efficiency improvements in existing buildings	Planning, Public Works, BayREN, MCE, & PG&E	Ongoing, Near-Term	Medium	0.02 FTE	No	Partnerships, Financing & Incentives	Requires County staff time to maintain and provide information to the public regarding existing incentive and financing programs, and collaborate with existing organizations and partnerships.
BE-9	Require energy audits for major additions to or alterations of existing buildings	Building	Near-Term	Medium	0.08 FTE	Yes	Code Updates	Requires County staff time to update and enforce new regulations in County building code. Upgraded homes or existing buildings would help to reduce operating costs for residents and businesses.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	Planning	Mid-Term	Medium	0.12 FTE	No	Program Research & Development	Requires County staff time to research, develop, and adopt a new GHG offset program.
BE-11	Encourage solar panel installations on commercial roof spaces	Planning & MCE	Near-Term	Medium	Less than 0.01 FTE	No	Partnerships, Financing & Incentives	Requires County staff time to collaborate with MCE and develop incentive programs.
Land Use – Primary Measures								
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	Planning, Project Applicants, & Volunteers	Near-Term	Medium	0.15 FTE	Yes	Code Updates, Partnerships, Financing & Incentives	Requires County staff time to update and enforce new code provisions, develop mitigation program, and collaborate with other agnecies or organizations to identify funding and appropriate replanting sites. On April 9, 2019, the County Board of Supervisors adopted Ordinance No. 1438, which amended the County's Conservation Regulations in Chapter 18 of the County Code. The amended regulations will serve as the County's implementation mechanism to achieve a substantial portion of tree preservation and mandatory replanting targets associated with development projects or other regulated activities that are assumed under this measure.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
LU-2	Refine protection guidelines for existing riparian lands	Planning	Near-Term	Medium	0.15 FTE	Yes	Code Updates, Partnerships	Requires County staff time to update County Code & guidelines, and work with arborists and local organizations. On April 9, 2019, the County Board of Supervisors adopted Ordinance No. 1438, which amended the County's Conservation Regulations in Chapter 18 of the County Code. The amended regulations will serve as the County's implementation mechanism to achieve a substantial portion of riparian protections associated with development projects or other regulated activities that are assumed under this measure.
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	Planning & Eligible Businesses/ Organizations	Near-Term	Medium	0.02 FTE	Yes	Program Research & Development, Partnerships	Requires County staff time to develop and implement a new program and establish partnerships with local businesses. Potential cost increases associated with harvesting of removed timber or woody biomass could be offset by the sale of wood products.
Multi-Sector – Primary Measures								
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	Planning, Public Works, Napa Green, & Businesses	Near-Term	Medium	0.12 FTE	No	Program Research & Development, Partnerships	Requires County staff time to work collaboratively with the Napa Green program.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Multi-Sector – Supporting Measures								
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	Planning & Other Cities	Mid-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to collaborate with local jurisdictions
MS-3	Promote the sale and consumption of locally-grown foods and/or products	Planning & the Agriculture Commissioner's Office	Mid-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with local buisnesses and organizations.
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	Planning & Sustainable Napa County	Mid-Term	High	0.23 FTE	No	Program Research & Development, Partnerships	Requires County staff time to work collaboratively with local organizations to develop and implement a new program.
Off-Road Vehicles and Equipment – Primary Measures								
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030	Planning & Project Applicants	Mid-Term	Medium	0.08 FTE	No	Code Updates	Requires staff time to develop, adopt and enforce County code amendments. Potential cost increases associated with new or modified equipment could potentially be offset by increased efficiency.
OR-2	Require the use of renewable diesel or other alternative fuels for all construction activity and mining operations as a condition for approval by 2030	Planning & Project Applicants	Mid-Term	Medium	0.08 FTE	No	Code Updates	Requires staff time to develop, adopt and enforce County code amendments.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Solid Waste – Primary Measures								
SW-1	Encourage expansion of composting program for both residential and commercial land uses	Planning & Waste Management Companies	Near-Term	Medium	0.12 FTE	Yes	Program Research & Development, Partnerships	Requires County staff time to work collaboratively with waste haulers and waste management agencies on program expansion.
SW-2	Meet an 80 percent Waste Diversion Goal by 2020 and a 90 percent Waste Diversion Goal by 2030	Planning & Waste Management Companies	Near-Term	Medium	0.12 FTE	No	Program Research & Development, Partnerships	Requires County staff time to work collaboratively with waste haulers and waste management agencies to adopt and implement new waste diversion goals.
On-Road Transportation – Primary Measures								
TR-1	Update Transportation System Management Ordinance (for employers)	Planning, BAAQMD, & MTC	Near-Term	Medium	0.23 FTE	Yes	Code Updates	Requires County staff time to develop, update, and enforce an existing ordinance, collaborate with regional and local agencies, and secure new funding.
TR-2	Adopt parking reduction ordinance revisions	Planning	Near-Term	Medium	0.23 FTE	Yes	Code Updates	Requires County staff time to research, develop and update parking standards in the County code.
TR-3	Increase affordable housing, especially workforce housing, in Napa County	Planning, Cities, Napa County Housing Authority	Mid-Term	Medium	0.12 FTE	No	Program Research & Development, Partnerships	Requires County staff time to develop or implement affordable housing programs, and collaborate with regional partners on regional affordable housing efforts.
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-way	Planning, NVTA, & Napa Wine Train	Mid-Term	High	Less than 0.01 FTE	No	Program Research & Development, Partnerships	Requires County staff time to research and develop potential new services, in collaboration with local and regional agencies such as NVTA. New funding sources could be required for capital and operations & maintenance.
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to use compressed natural gas	Planning & Solid Waste Collection Services	By 2030	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with waste haulers and waste management agencies on program expansion.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
On-Road Transportation – Supporting Measures								
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information	Planning, NVTA, & Regional Transit Agencies	Near-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with NVTA and transit agencies
TR-7	Support alternatives to private vehicle travel for visitors	Planning, NVTA, & Visit Napa Valley	Mid-Term	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with NVTA and Visit Napa Valley
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	Planning & Cities	Mid-Term	Medium	0.12 FTE	No	Program Research & Development	Requires County staff time to work collaboratively with local incorporated communities
TR-9	Support interregional transit solutions	Planning, Cities, NVTA, MTC, & Regional Transit Agencies	By 2030	Low	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with local incorporated communities, NVTA, and regional transit agencies
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	Planning, Cities, & NVTA	By 2030	Medium	Less than 0.01 FTE	No	Partnerships	Requires County staff time to work collaboratively with local incorporated communities, NVTA
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county	Planning, NVTA, Solano TransportationAuthority	By 2030	Low	0.02 FTE	No	Partnerships, Education & Outreach	Requires County staff time to work collaboratively with NVTA and Solano Transportation Authority

Table 5-1	Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
TR-12	Increase the supply of electric vehicle charging stations	Planning, Public Works, Cities and Town & Local Businesses	By 2030	Low	0.02 FTE	Yes	Financing & Incentives	Requires County staff time to promote programs, identify funding for capital costs and maintenance, and review development projects
TR-13	Promote telecommuting at office-based businesses	Planning	By 2030	Low	0.02 FTE	No	Partnerships, Education & Outreach	Requires County staff time to work collaboratively with local businesses and organizations
TR-14	Develop and implement active transportation projects	Planning, Public Health, Napa Valley Vine Trail Coalition, NVTA, & Caltrans	Mid-Term	Medium	Less than 0.01 FTE	No	Partnerships, Financing & Incentives	Requires County staff collaboration with NVTA and other organizations, and agencies to develop and implement projects. Existing statewide funding sources are available, however additional funding sources could also be needed.
TR-15	Require new development projects to evaluate and reduce VMT	Planning	Near-Term	Medium	0.12 FTE	Yes	Program Research & Development	Requires County staff time to further develop VMT analysis thresholds and guidance per the Circulation Element Update, and review development projects for consistency.
TR-16	Convert at least 50 percent of County fleet vehicles to alternative fuels by 2030	Public Works	Mid-Term	Medium	Less than 0.01 FTE	No	Financing & Incentives	Potential County capital cost increases for purchase of alternatively fueled vehicles. Cost reductions from reduced fuel consumption.
Water and Wastewater – Supporting Measures								
WA-1	Amend or revise water conservation regulations for landscape design	Planning	Near-Term	Low	0.08 FTE	Yes	Code Updates	Requires County staff time to review, update and enforce water conservation regualtions in the County Code.
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	Planning	Near-Term	Low	0.08 FTE	No	Code Updates	Requires County staff time to review, update and enforce water conservation regulations in the County Code.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	Planning	Near-Term	Low	0.02 FTE	No	Financing & Incentives	Requires County staff time to develop and implement a permitting streamlining or incentive program
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	Planning	Mid-Term	Medium	0.02 FTE	Yes	Program Research & Development	Requires County staff time to review, update and enforce new water audit requirements in the County Code.
High GWP Gases – Primary Measures								
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	Planning & Building	Mid-Term	Medium	0.02 FTE	No	Partnerships, Education & Outreach, Program Research & Development	Requires County staff time to promote existing State programs and explore new incentive programs.
High GWP Gases – Supporting Measures								
HG-2	Incentivize the use of low-GWP refrigerants	Planning & Building	Mid-Term	Medium	0.02 FTE	Yes	Partnerships, Education & Outreach, Research & Development	Requires County staff time to review development projects and explore new incentive programs.
Adaptation Measures								
Temperature								
Temp-1	Map Critical Infrastructure Locations Vulnerable to Extreme Heat Events	Planning & Public Works	Near-Term	Medium	0.06 FTE	N/A	Program Research & Development	Requires County staff time to develop a process for mapping infrastructure that is vulnerable and to work collaboratively across County departments. Potential funding may be needed to implement the work.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Temp-2	Develop Outreach Programs for Outdoor Workers	Planning & Public Health Division	Near-Term	Medium	0.02 FTE	N/A	Education & Outreach	Requires County staff time to research, develop, and create outreach programs, and to collaborate with labor organizations, the agriculture and wine community, and County and State health and safety agencies.
Temp-3	Educate Residents on Heat-Related Illness Prevention	Planning & Public Health Division	Near-Term	Low	0.02 FTE	N/A	Education & Outreach	Requires County staff time to develop and publicize methods for preventing heat-related illness during heatwaves.
Temp-4	Encourage the installation of Cool Roof Technologies and Rooftop Gardens	Planning	Near-Term	Medium	0.08 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to develop an incentive program for cool roof and rooftop gardens. Annual costs to County for permitting or other incentives, but potential cost savings to consumers.
Temp-5	Incorporate Cool Pavement Technology	Planning & Public Works	Mid-Term	Medium	0.08 FTE	N/A	Program Research & Development	Requires County staff time to research and develop methods for incorporating cool pavement technology into maintenance and construction of new roads, sidewalks, parking areas, and bike lanes, and to secure new sources of funding.
Temp-6	Improve Parking Lot Shading and Landscaping	Planning	Near-Term	Low	0.02 FTE	N/A	Program Research & Development, Code Updates, Education & Outreach	Requires County staff time to develop policies to improve parking lot shading requirements in new construction, and to develop outreach program for promoting planting of additional trees/landscaping in existing parking lots.
Temp-7	Update the County's Excessive Heat Emergency Response Plan	Planning & Public Health Division	Near-Term	Medium	0.12 FTE	N/A	Financing & Incentives	Requires County staff time to prepare an updated plan and to work collaboratively across County departments. Funding sources may be needed to support the update of this plan.
Temp-8	Support Research on the Effects of a Warmer Climate on the Agriculture and Wine Industries	Planning & the Agriculture Commissioner's Office	Near-Term	Low	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to collaborate with existing organizations and groups, including the Napa Valley Vintners and the California Climate and Agriculture Network.

Table 5-1	Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Temp-9	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Temperatures	Planning & the Agriculture Commissioner's Office	Mid-Term	Low	0.03 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to collaborate with grape growers and to research and explore options to shift the types of grape varietals to suit changing environment. Funding sources may be needed to begin research.
Temp-10	Develop Outreach Programs for Winemakers	Planning & the Agriculture Commissioner's Office	Mid-Term	Low	0.03 FTE	N/A	Education & Outreach	Requires County staff time to develop and prepare outreach programs to inform and assist winemakers, and work collaboratively with the Agriculture Commissioner's Office.
Temp-11	Develop Strategies to Increase Energy Resiliency	Planning, Public Works, MCE, & PG&E	Mid-Term	Medium	Less than 0.01 FTE	N/A	Program Research & Development, Partnerships	Requires County staff time to develop and implement strategies, and work collaboratively with MCE and PG&E to increase energy resiliency in extreme events.
Wildfire Risk								
Fire-1	Map and Identify Locations That Are Newly at Risk, or at Higher Risk for Fire Hazards	Planning, Napa Couny Fire Department, & CAL FIRE	Near-Term	Medium	0.06 FTE	N/A	Program Research & Development, Partnerships	Requires County staff time to work collaboratively with CAL FIRE and the Napa County Fire Department to identify locations newly or at higher risk for fire hazards.
Fire-2	Map Critical Infrastructure Locations Vulnerable to Wildfires	Planning, Public Works, & Caltrans	Near-Term	Medium	0.06 FTE	N/A	Program Research & Development	Requires County staff time to develop a process for mapping infrastructure that is vulnerable and to work collaboratively across County departments. Potential funding may be needed to implement the work.
Fire-3	Collaborate with the Napa County Firefighters Association in the Dissemination of Information	Planning & Napa County Firefighters Association	Mid-Term	Low	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to work collaboratively with the Napa County Firefighters Association.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Fire-4	Coordinate Emergency Preparedness Systems	Planning, Public Health, Napa County Firefighters Association, & Office of Emergency Services	Mid-Term	Low	0.01 FTE	N/A	Partnerships	Requires County staff time to work collaboratively with the Napa County Firefighters Association and the Office of Emergency Services.
Fire-5	Collaborate on Programs to Reduce Fire Hazards	Planning & Napa County Fire Department	Near-Term	Low	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to collaborate with the Napa County Fire Department to reduce fire hazards through continued programming.
Water Supply and Quality								
Water-1	Evaluate Vulnerabilities of Water Supply Systems and Networks	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Near-Term	Medium	0.12 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to research and develop methodologies for evaluating the water supply system and network vulnerablilites. Potential funding may be needed to begin research.
Water-2	Consider Innovative Options to Meet Future Demand	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term	Medium	0.12 FTE	N/A	Program Research & Development	Requires County staff time to research, secure funding, and develop programs, and to work collaboratively with the Napa County Flood Control and Water Conservation District and across County departments.
Water-3	Promote Use of Rainwater Catchment Systems	Planning & Public Works	Mid-Term	Low	Less than 0.01 FTE	N/A	Partnerships, Outreach & Education	Requires County staff time to work collaboratively across County departments.
Water-4	Support Napa Green Land and Green Winery Efforts	Planning & Public Works	Near-Term	Low	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to collaborate and support Napa Green Land and Green Winery programs.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Water-5	Collaborate with Agencies to Identify Future Water Supplies and Explore Alternative Supply Sources	Planning, Napa County Flood Control & Water Conservation District, & Public Works	Mid-Term	Medium	0.12 FTE	N/A	Partnerships, Program Research & Development	Requires County staff time to collaborate with Napa County Flood Control and Water Conservation District and Public Works, and time to develop and research opportunities to explore alternative water supply sources. Funding may be needed to begin research.
Water-6	Pursue Grant Funding Opportunities for Water Resource Planning Projects	Planning & Public Works	Mid-Term	Low	0.12 FTE	N/A	Financing & Incentives	Requires County staff time to identify and pursue grant funding opportunities for water resource planning projects.
Flood Risk (Adaptation)								
Flood-1	Update the County's Operational Area Hazard Mitigation Plan to Address Flooding and Climate Change	Planning, Public Health, & Office of Emergency Services	Near-Term	Medium	0.15 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to prepare an updated plan and to work collaboratively across County departments. Funding sources may be needed to support the update of this plan.
Flood-2	Partner with Incorporated Towns and Cities and Local Organizations to Address Flooding	Planning, Napa County Flood Control and Water Conservation District, & Incorporated Cities[1]	Mid-Term	Medium	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to coordinate efforts and work collaboratively with incorporated cities in the County and local organizations to address flooding.
Flood-3	Identify Potential Streamside Restoration Areas	Planning & Public Works	Near-Term	Low	0.02 FTE	N/A	Program Research & Development	Requires County staff time to research and identify streamside area locations that could be restored.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Flood-4	Encourage the Replanting of Bare or Disturbed Areas	Planning, Public Works, Napa County Flood Control and Water Conservation District	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development	Requires County staff time to develop, secure funding, and implement a program to replant bare or disturbed areas.
Flood-5	Coordinate Emergency Evacuation and Supply Transportation Routes	Planning & Office of Emergency Services	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development, Partnerships	Requires County staff time to coordinate with the Office of Emergency Services on emergency evacuation and supply transportation routes to ensure capacity and resilience.
Flood-6	Improve Sewage and Solid-Waste Management Infrastructure	Planning & Public Works	Mid-Term	High	0.04 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to research, develop, and implement programs to improve sewage and solid-waste management infrastructure, and to work collaboratively across County departments. Funding sources may be needed to support implementation.
Flood-7	Improve Capacity of Storm Water Infrastructure	Planning & Public Works	Mid-Term	High	0.04 FTE	N/A	Program Research & Development	Requires County staff time to research, evaluate, and implement programs to improve the capcity of storm water infrastructure for high intensity rainfall events. Funding sources may be needed to support implementation.
Flood-8	Increase Use of Pervious Surfaces and Landscaping in Developed Areas	Planning & Public Works	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development, Education & Outreach	Requires County staff time to develop, secure funding, implement, and promote programs to increase the use of pervious surfaces and landscaping.
Flood-9	Map Critical Infrastructure Locations Vulnerable to Flooding	Planning, Napa County Flood Control and Water Conservation District, & NVTA	Near-Term	Medium	0.06 FTE	N/A	Program Research & Development	Requires County staff time to develop a process for mapping infrastructure that is vulnerable and to work collaboratively across County departments, Napa County Flood Control and Water Conservation District, and NVTA. Potential funding may be needed to implement the work.

Table 5-1	Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures							
Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
Flood-10	Understand the Tolerance of Current Wine Grape Varieties to Withstand Increased Flooding	Planning & the Agriculture Commissioner's Office	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to collaborate with the agriculture sector and to research and explore options to shift the types of grape varietals to suit changing environment. Funding sources may be needed to begin research.
Flood-11	Design Programs to Address Vector- and Waterborne Diseases	Planning and Public Health Division	Near-Term	Low	0.04 FTE	N/A	Program Research & Development	Requires County staff time to research, develop, coordinate, and implement programs to monitor and prepare for the appearance of vector- and waterborne diseases following floods and storms.
Sea-Level Rise								
SLR-1	Identify Areas Affected by Sea-Level Rise	Planning	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development	Requires County staff to research, identify, and assess areas that will be affected by sea-level rise, and to establish policies and programs to protect functions, structures, and populations.
SLR-2	Update Napa County's Operational Area Hazard Mitigation Plan to Incorporate Sea-Level Rise	Planning & Office of Emergency Services	Near-Term	Medium	0.15 FTE	N/A	Program Research & Development, Financing & Incentives	Requires County staff time to prepare an updated plan and to work collaboratively across County departments. Funding sources may be needed to support the update of this plan.
SLR-3	Floodplain Mapping Coordination	Planning, Napa County Flood Control and Water Conservation District, FEMA, DWR, & NVTA	Near-Term	Medium	Less than 0.01 FTE	N/A	Program Research & Development	Requires County staff time to coordinate and collaborate with FEMA, DWR, and Napa County Flood Control and Water Conservation on updating floodplain mapping regularly.
SLR-4	Support Ongoing Analysis of Sea-Level Rise Data	Planning	Near-Term	Low	Less than 0.01 FTE	N/A	Partnerships	Requires County staff time to support FEMA, the Bay Conservation Development Commission, the Bay Area Regional Collaborative, and National Oceanic and Atmospheric Administration in ongoing collection and analysis of sea-level rise data.

Table 5-1 Napa County CAP Implementation Assumptions for GHG Reduction and Adaptation Measures

Measure #	Title	Responsibility	Timeframe[1]	General County Implementation Costs	Estimated County Staff Time	Applies to Projects Seeking CEQA GHG Streamlining	Category	Impementing Actions and Other Considerations
SLR-5	Create a Comprehensive Outreach Strategy	Planning	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development, Education & Outreach	Requires County staff time to research, design, implement, educated, and promote a comprehensive outreach strategy to protect and increase community resiliency to sea-level rise.
SLR-6	Incorporate Sea-Level Rise Effects into Capital Improvement Plans	Planning & Public Works	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development	Requires County staff time to prepare and incorporate sea-level rise into Capitol Improvement Plans and to work collaboratively across County departments.
SLR-7	Assess Sea-Level Rise Impacts on Agriculture	Planning	Mid-Term	Medium	0.04 FTE	N/A	Program Research & Development	Requires County staff time to research, identify, and assess the impacts of sea-level rise on the County's agriculture sector. Funding sources may be needed to support research.

Notes:

[1] Near-Term = 1-3 Years, Mid-Term = 4-7 Years

[2] These measures only apply to new vineyards on more than 5% slope. See Appendix D for the Checklist and additional details.

BAAQMD = Bay Area Air Quality Management District, BAU = Business-As-Usual, CAL FIRE = California Department of Forestry and Fire Protection, CALGreen = California Green Building Standards Code, CAP = Climate Action Plan, CARB = California Air Resources Board, CEQA = California Environmental Quality Act, DWR = Department of Water Resources, FEMA = Federal Emergency Management Agency, FTE = full-time equivalent, GHG = greenhouse gas emissions, MCE = Marin Clean Energy, MTC = Metropolitan Transportation Commission, $MTCO_2e$ = metric tons of carbon dioxide equivalent, N/A = Not Applicable, NVTA = Napa Valley Transportation Authority, PACE = property assessed clean energy, PG&E = Pacific Gas and Electric, RCD = Resource Conservation District, RMP = Refrigerant Management Program, VMT = vehicle miles traveled, ZNE = zero net energy

Source: Ascent Environmental 2018

5.3 Monitoring and Updates

The CAP lays out a broad-based strategy to substantially reduce GHG emissions and improve the sustainability and resilience of the community. However, the CAP will need to be monitored, updated, and maintained if it is to remain relevant and effective. Thus, County staff will need to evaluate and monitor plan performance over time, publicly report on the results of CAP monitoring efforts, and make recommendations to the Board of Supervisors to alter or amend the plan if it is not achieving the proposed reduction targets.

Accordingly, the County will conduct the following activities:

(1) Updates to the GHG Emission Inventory: The County will conduct periodic GHG emissions inventory updates at least every three years, beginning with the year 2020, to quantify whether overall progress is being made towards achieving emission reduction targets. The inventory updates will also serve as an opportunity to reevaluate the scope, methods, and assumptions in the inventory using the most recent GHG accounting and reporting protocols, which are constantly evolving along with global climate change science and policy.

(2) Monitor Implementation Status and Performance of Measures:

Implementation monitoring: County staff will monitor the implementation status of all GHG and adaptation measures in the plan on a quarterly basis.

Performance Monitoring: County staff will also monitor the overall performance of both primary and supporting GHG reduction measures and climate adaptation measures in meeting specified targets or goals by describing or quantifying GHG reductions achieved on an annual basis. County staff will evaluate and, where feasible, quantify the effectiveness of each primary measure in achieving the GHG reductions or other benefits described in the CAP. Performance of supporting measures will generally be described qualitatively, unless specific quantitative monitoring methods become available. Primary measure performance monitoring requires analyzing the level of community participation, costs, or barriers to implementation; and, quantifying actual reductions in fuel consumption, vehicle miles traveled, energy usage, water usage, landfilled waste, or other activities that result in GHG emissions reductions. By evaluating whether the implementation of a measure is on track to achieve its reduction potential, the County can identify successful measures and determine whether to modify or replace under-performing measures.

(3) Public Reporting on CAP Progress: The County will prepare annual CAP progress reports that summarize the status of implementation and monitoring efforts for the performance of individual GHG measures. The annual reports will also provide the opportunity to include new information about potential new measures or related activities in the region or State that may help the County meet its goals. County staff will make the annual reports available to the public (e.g., posted to the County website) and present a summary of the annual report to the Board of Supervisors.

Additionally, beginning in 2021 and every three years after, County staff will prepare a more detailed CAP progress report to the Board of Supervisors that describes:

- results of the latest three-year update to the inventory;
- estimated annual GHG reductions associated with measure implementation or legislative reductions;
- estimated participation rates (where applicable);
- implementation costs and funding needs;
- community benefits realized;
- remaining barriers to implementation;
- projections of whether the CAP is on track to achieve the 2030 target, along with updates to post-2030 forecasts and estimated reductions considering the longer-term 2050 goal; and,
- recommendations for changes or updates to the CAP required to achieve the 2030 target, as well as making increasingly-effective progress towards achieving the 2050 goal (see also items 4, 5, and 6 below).

Beginning with the year 2020, the County will:

- **evaluate measures and report on the CAP's performance annually,**
- **coordinate inventory updates every three years, and**
- **evaluate CAP progress and potential updates in a detailed report to the Board of Supervisors every three years.**

(4) CAP Updates: Based on the findings of items 1 through 3 above, the County will initiate updates or amendments to the CAP document as needed to ensure that (a) the CAP remains on track to meet the 2030 GHG reduction target; and, (b) the County is making substantial and increasingly-effective progress towards achieving its longer-term goal for 2050.

(5) Specified Regulatory Triggers for CAP Updates: The County is committed to keeping the CAP up to date with both evolving State and Federal statutes, policies, and plans that are designed to reduce GHG emissions beyond 2030 consistent with scientific findings. Thus, the County will take immediate action to initiate a CAP update if any of the following events occur:

(a) Adoption of an update to the Climate Change Scoping Plan by the California Air Resources Board (CARB), pursuant to executive orders or other legislative actions, that identifies specific regulations, programs, or other reasonably-foreseeable State actions that define a specific pathway to achieving the State's longer-term goals. These longer-term goals could include the 2050 GHG reduction goal established in EO S-3-05 and EO B-30-15; other new post-2030 interim targets related to achievement of the GHG reduction goal for 2050 (e.g., a new 2040 legislative target); or, any new or modified target related to the zero-net carbon goal for 2045 as stated in EO B-55-15.

CEQA Guidelines Section 15183.5(b)(1)(E) requires that the County amend the CAP if it finds that the plan is not achieving the adopted GHG reduction targets.

(b) Enactment of new State or Federal legislation that codifies into statute post-2030 GHG emission reduction or zero-net carbon targets or goals; and, that would require CARB, EPA, or other entities to update existing plans (i.e., Scoping Plan) to identify specific regulations, programs, or other reasonably-foreseeable actions that define a specific pathway to achieving post-2030 targets or goals.

(6) Updates Consistent with State Guidance: The County's actions to update the CAP will be consistent with current guidance and best-available methods recommended by CARB, OPR, or other appropriate regulatory agencies that demonstrate how local government efforts to reduce GHG emissions should be aligned with and complement State efforts.

CAP Monitoring and Reporting Schedule

2019	**CAP Adopted** Board of Supervisors adopts the CAP and staff begins to implement CAP strategies and measures.
2020	**Annual CAP Monitoring and Reporting Begins** County staff begins annual monitoring and reporting program. Staff will track implementation status of all measures quarterly, quantify or describe performance of all measures annually, and prepare and publish annual reports each year thereafter (except on years during which there is a three-year progress report scheduled, which will also serve as the annual report – see CAP Progress Reports below).
2021	**Inventory Update (2020)** County staff prepares a 2020 inventory update.
2021	**CAP Progress Report** County staff report to the Board of Supervisors on the 2020 inventory update results, implementation status and performance of all measures to date, key achievements to date, and recommended updates to the CAP, to ensure the CAP is on track to meet its targets and goals.
2024	**Inventory Update (2023)** County staff initiate a 2023 inventory update.
2024	**CAP Progress Report** County staff report to the Board of Supervisors on the 2023 inventory update results, measure performance and implementation status, key achievements to date, and recommended updates to the CAP to ensure the CAP is on track to meet its targets and goals.
2027+	Repeat the annual and triennial processes described above, and develop appropriate actions to ensure CAP is on track meet 2030 target and making substantial and increasingly-effective progress towards meeting post-2030 goals.

Figure 5-1. CAP Monitoring Schedule

5.4 Ongoing Community Engagement and Participation

Source: County of Napa

As the County continues to implement and monitor progress on the CAP, continued engagement with and participation by the community is critical. This includes individual residents and businesses, community organizations (e.g., Napa Valley Vintners, Napa Valley Grapegrowers, Sustainable Napa County), local and regional government agencies, and others. It is important to engage disadvantaged communities, who are the most vulnerable to and least able to adapt to the impacts of climate change. While this CAP focuses on measures in which the County has a role, many of the measures require partnership and collaboration.

The County is also committed to public education about the important role individuals play in combating climate change. Effective and long-term climate action and resiliency in the County can only be achieved through efforts that continue to change the way individuals interact with the environment. Many of the measures in Chapters 3 and 4 are focused on increasing community awareness and participation in existing programs or connecting the community with additional information, tools, funding or resources to act. Thus, this CAP serves as a resource that supports community-based action.

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Napa County Climate Action Plan

Chapter 6

References

A Tradition of Stewardship
A Commitment to Service

Source: County of Napa

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None present.

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Chapter 5, Implementation and Monitoring

None present.

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Appendix A

Technical Memo #1 - Greenhouse Gas Emissions Inventory and Forecasts

Memo

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916.444-7301

Date: February 13, 2019

To: David Morrison and Jason Hade (County of Napa)

From: Honey Walters, Erik de Kok, and Brenda Hom (Ascent Environmental, Inc.)

Subject: Napa County Climate Action Plan
Revised Technical Memorandum #1: 2014 Greenhouse Gas Emissions Inventory and Forecasts

INTRODUCTION

The initial phase in the preparation of Napa County's Climate Action Plan (CAP) includes: (1) updating the unincorporated County's community-wide greenhouse gas (GHG) emissions inventory to 2014, and (2) preparing new GHG emissions forecasts for 2020, 2030, and 2050. This revised technical memorandum provides the results of the 2014 GHG emissions inventory update and future year emissions forecasts, including associated methods, assumptions, emission factors, and data sources. This revision supersedes the previous version dated August 23, 2016, and incorporates changes throughout based on feedback from County staff and public input, as well as technical corrections.

The updated GHG emissions inventory and forecasts provided a foundation for the subsequent phases of work on the CAP including the development of GHG emissions reduction targets, GHG emissions reduction measures, and an action plan to help the County achieve identified targets.

Although it has been nearly four years since the 2014 GHG inventory and forecasts were prepared, the 2014 baseline GHG inventory is still an appropriate year to use for the purposes of the CAP. It is common to have an emissions inventory year that is several years prior to the year in which a CAP is adopted because of the time and cost required to gather data and perform the analysis. Additionally, 2014 is an appropriate year to use for baseline conditions for the CAP because the County's population, employment, and housing levels have not changed significantly between 2014 and 2018. According to the California Department of Finance (DOF), the population of unincorporated Napa County remained mostly constant between 2014 and 2017, increasing by less than 0.2 percent, but decreased by 3 percent between 2017 and 2018 (DOF 2019). This latest shift in population is largely due to the displacement of hundreds of Napa County residents resulting from the major wildfires that occurred in October 2017. This declining population trend stands in contrast to the 7 percent increase that was anticipated between 2014 and 2020 in the GHG forecasts. Although the population may bounce back by 2020, it is unlikely that the 2020 population will increase 7 percent beyond 2014 levels. This means that the GHG forecasts estimated in the previous version of this memorandum would be conservative in that the County's emissions would likely be lower in future years than forecasted. Thus, the GHG inventory and forecasts are still valid for the purposes of climate action planning.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of two main parts:

- Section 1 summarizes the updated 2014 GHG emissions inventory for each sector, including any new sectors not previously included in the 2005 baseline inventory. Key components include:
  - A summary of annual emissions by sector; and
  - Data sources and methods used.
- Section 2 summarizes the forecasted GHG emissions under "business-as-usual" (BAU) and legislative-adjusted BAU scenarios. A BAU scenario is one in which no action is taken by local, State or federal agencies to reduce GHG emissions. A legislative-adjusted scenario is one in which BAU conditions are adjusted to reflect policy or regulatory actions enacted by State or federal agencies, without taking into account any local actions to reduce GHG emissions.

1 2014 GREENHOUSE GAS EMISSIONS INVENTORY UPDATE

1.1 SUMMARY OF RESULTS

Based on the modeling conducted, the unincorporated area of Napa County generated approximately 484,283 metric tons of carbon dioxide equivalents ($MTCO_2e$) in 2014. Major emissions sectors included building energy use, on-road vehicles, off-road vehicles and equipment, wastewater management, solid waste, agriculture, and land use changes. In addition, the 2014 inventory update included several new emissions sources that were not included in the 2005 baseline inventory. These new sectors include emissions from methane generated at landfills (e.g., waste-in-place), electricity use from importing water, fuel use in recreational watercrafts, and the release of high global warming potential (GWP) gases.

Table 1 and Figure 1 present the County's 2014 GHG emissions inventory by sector. A description of each emissions sector, including key sources of emissions, is provided in further detail below.

Table 1 2014 Unincorporated Napa County Greenhouse Gas Inventory

Sectors	2014[1] ($MTCO_2e$/yr)	Percent of Total (%)
Building Energy Use	148,338	31
On-Road Vehicles	125,711	26
Solid Waste	83,086	17
Agriculture	52,198	11
Off-Road Vehicles	42,508	9
High GWP Gases	13,481	3
Wastewater	11,189	2
Land Use Change	7,684	2
Imported Water Conveyance	88	<1
Total with new sectors	**484,283**	**100**
Total without new sectors	**374,793**	**77**

Notes: For a comparison of the 2005 and 2014 inventories, see Table 2. Note that columns may not add to totals due to rounding.

$MTCO_2e$ = metric tons of carbon dioxide equivalent; GWP = global warming potential; IPCC = Intergovernmental Panel on Climate Change; NA = Not applicable

1. Uses GWP Factors from IPCC's Fourth Assessment Report
2. Includes new off-road subsectors

Source: Data compiled by Ascent Environmental in 2016.

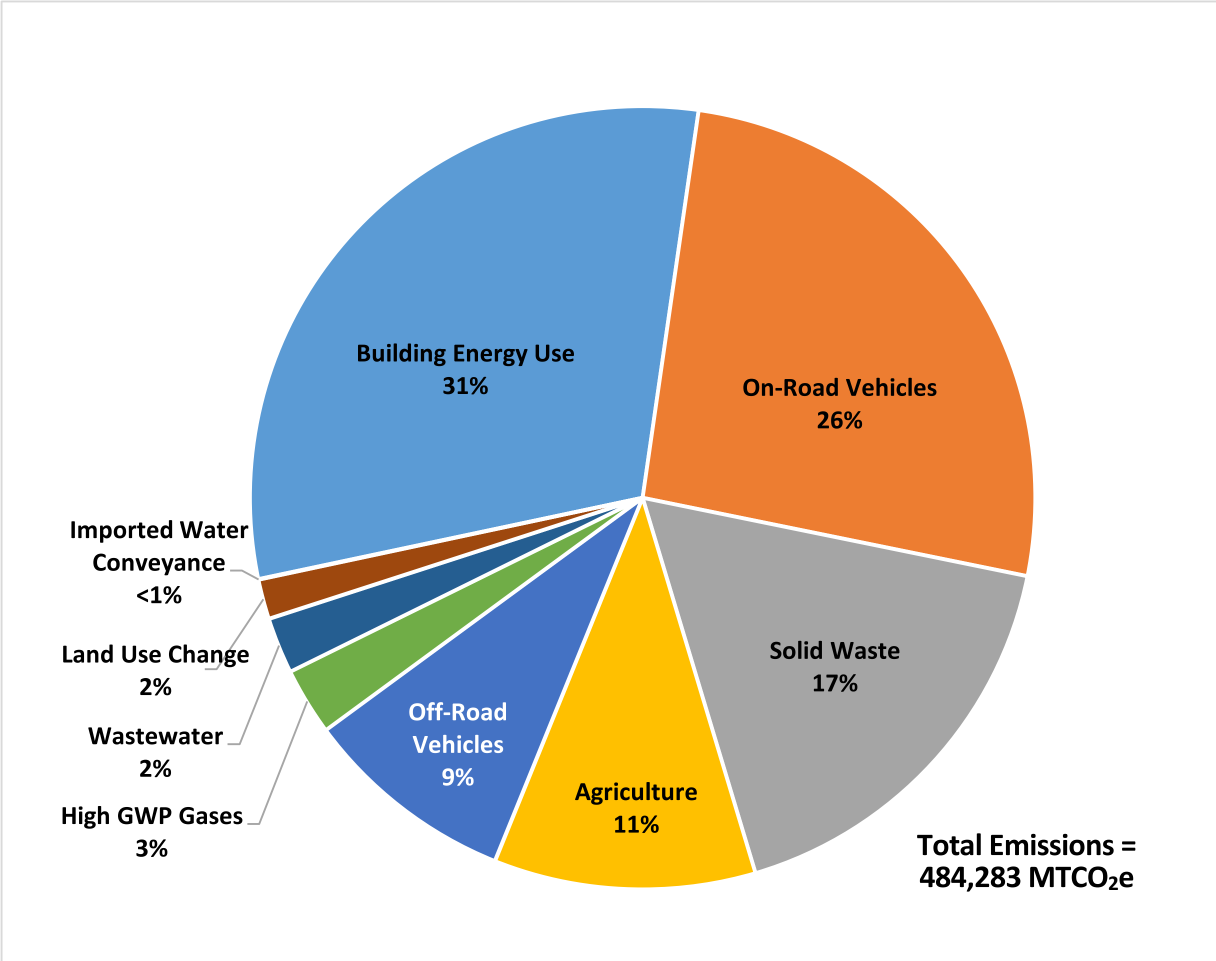

Figure 1: 2014 Unincorporated Napa County Greenhouse Gas Inventory

For comparison purposes only, Table 2 shows the 2005 baseline inventory alongside the 2014 inventory, which has been adjusted to use GWP factors from the IPCC's Second Assessment Report, consistent with the methodology used in the 2005 inventory. This approach was necessary because the 2005 inventory did not make methane (CH_4) and nitrous oxide (N_2O) emissions available for adjustment with newer GWP factors from the IPCC Fourth Assessment Report. In addition, the Table 2 only includes sectors that were present in the 2005 inventory and does not include sectors introduced in the 2014 inventory shown in Table 1. After comparing the two inventories using the same GWP factors and considering only emissions sectors included in the 2005 inventory, County emissions decreased by about 14 percent between 2005 and 2014. This decrease in emissions between 2005 and 2014 is due to a variety of factors including, but not limited to:

- adjustments in calculation methodologies (e.g., equations and emission factors),
- differences in data sources between the two inventories, and
- changes in actual activity levels within the County (e.g., building energy use and vehicle travel).

Table 2 Comparison of Unincorporated Napa County Greenhouse Gas Inventories (2005 and 2014) using GWP factors from IPCC's Second Assessment Report (for comparison only)

Sectors	2005 ($MTCO_2e$/yr)	2014[1] ($MTCO_2e$/yr)	Difference ($MTCO_2e$/yr)	Percent change from 2005 (%)
Residential and Commercial Building Energy Use	143,540	145,994	2,453	2
Wastewater	9,900	9,457	-443	-4
Solid Waste (Waste Generation)	9,240	16,767	7,527	81
On-Road Vehicles	191,270	125,830	-65,440	-34
Off-Road Vehicles (old categories)	16,620	10,740	-5,880	-35
Agriculture	46,800	49,982	3,182	7
Land Use Change	26,300	7,746	-18,554	-71
Total	**443,670**	**365,448**	**-78,222**	**-18**

Notes: This table contains adjusted 2014 inventory numbers and is only to be used for comparing the 2014 inventory with the 2005 inventory. See Table 1 for the official 2014 inventory results.

$MTCO_2e$ = metric tons of carbon dioxide equivalent; GWP = global warming potential; IPCC = Intergovernmental Panel on Climate Change; NA = Not applicable

1. Emissions have been adjusted to use the global warming potentials in IPCC's Second Assessment Report to be consistent with the 2005 baseline GHG inventory assumptions. The 2005 baseline inventory did not make methane and nitrous oxide emissions available for adjustment with newer GWP factors from the IPCC Fourth Assessment Report. This inventory only shows emissions for sectors that were present in the 2005 inventory.
2. Uses unincorporated-only solid waste generation data from CalRecycle. The 2005 inventory used data directly from waste providers.

Source: Napa Country 2012 (2005 inventory data); 2014 inventory prepared by Ascent Environmental in 2016.

1.2 DATA SOURCES AND METHODS

In addition to including new GHG emissions sectors and sources, the 2014 inventory update includes several changes to the data sources and emission factors used, along with changes in methods. These differences were necessary in cases where the original data sources used in the 2005 inventory were no longer available or have been updated. New methods that provide more accurate emissions estimates are available for sectors such as the on-road vehicles and solid waste sectors. The general approach used to estimate the County's 2014 GHG inventory is consistent with the required emissions inventory process in the latest guidance from the *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol) (Versions 1.1) produced by the International Council for Local Environmental Initiatives (ICLEI) (ICLEI 2013). The approach and methods used are also consistent with guidance provided by the Governor's Office of Planning and Research (OPR) and the California Air Resources Board (CARB). The Community Protocol, along with guidance from OPR and CARB, are described further below.

1.2.1 ICLEI Community Protocol

ICLEI protocols provide authoritative guidance for communities to account for carbon pollution accurately and consistently (ICLEI 2019). The protocols are the national standards for local-scale accounting of GHG emissions that contribute to climate change. Developed through extensive stakeholder consultation and in partnership with other leading GHG emissions experts, ICLEI developed four protocols for different emissions areas and needs; the Community Protocol, the Global Protocol for Community-Scale Emissions (GPC), the Local Government Operations Protocol, and the Recycling and Composting Emissions Protocol.

The Community Protocol is designed to guide local governments, specifically in the U.S., to account and report on GHG emissions associated with the communities they represent (ICLEI 2013: 7). According to the protocol, community GHG inventory reports typically focus on selected GHG emissions occurring within the jurisdictional boundary, as well as certain trans-boundary emissions sources associated with community activities. The protocol establishes requirements and recommend best practices for developing community GHG emissions inventories and, where possible, aligns with nationally and internationally-recognized GHG accounting and reporting principles, as well as with emerging reporting processes or registries. It represents a national standard to help U.S. local governments develop effective community GHG emissions inventories, ones that are consistent, comparable, and relevant to allow communities to compare emissions (ICLEI 2013;8). The protocol acknowledges that a community inventory cannot be fully comprehensive (some emissions cannot be estimated due to a lack of valid methods, a lack of emissions data, or for other reasons), and community inventories aim to provide a complete picture of GHG emissions associated with a community, as is feasible (ICLEI 2013, 10).

The Community Protocol was developed concurrently and in parallel with the GPC. The GPC is the global counterpart to Community Protocol and is intended for use by local government authorities internationally to capture GHG emissions (ICLEI 2013; 18). ICLEI acknowledges that the Community Protocol provides more detailed methodology tailored to U.S. communities and was developed to meet the specific needs of U.S. local governments. The GHG accounting methods provided are based on U.S. best practices and available that may not be applicable or in use outside the U.S. For this reason, some of the requirements and optional guidance contained in the Community Protocol differs from that included in the GPC (ICLEI 2013; 18). While ICLEI publishes both the Community Protocol and the GPC, communities in the U.S. should follow the Community Protocol. Furthermore, the GPC does not supersede or provide superior guidance to that included in the Community Protocol.

According to the Community Protocol, "Local governments must include a minimum set of five Basic Emissions Generating Activities in their GHG emission inventories (described in section 2.2 of the Protocol). These five basic activities are focused either within the defined geographic boundaries of the community, or those partially within it (e.g., transportation). Indirect emissions that occur entirely outside of the boundary of the community are not required to be included, although they may be disclosed as part of additional reporting as an option under Lifecycle or Consumption-Based reporting frameworks. Local governments are encouraged to include additional emission sources and activities **as guided by their reporting goals.** [emphasis added]." (ICLEI 2013:20)

The Community Protocol also encourages local governments to select a reporting framework that is best suited to achieving the agency's goals. A common protocol-compliant framework used when preparing local GHG inventories used in CAPs is the "Significant Influence" framework. As noted,

> Local governments will often choose to focus their community GHG emissions inventories, as well as their reduction targets, climate action planning, and mitigation efforts, on emission sources and activities over which they have significant influence. This reporting framework emphasizes policy relevance, highlighting a set of emission sources and activities that the local government has the greatest opportunity to address. Explicitly identifying these emission sources and activities in contrast with others can help to establish expectations within the local government and the community regarding where the local government plans to focus its efforts (ICLEI 2013:22-23).

Highlighted below are key criteria defined in the Community Protocol that can be used to determine where a local government has "significant influence" over a source or activity used to quantify emissions:

- Ownership – Does the local government own the GHG emission source and/or key related infrastructure? *Example: Does the local government own a landfill or municipal utility?*

- Operational Control – Does the local government have operational control over the GHG emission source and/or key related infrastructure? *Example: Does the local government operate the local public transit system?*

- Regulatory Authority – Does the local government have the statutory authority to enact regulatory requirements or incentives that could significantly impact the emission generating activity or source, even if it chooses not to exercise such authority? *Example: Can the local government reduce combustion emissions associated with fuels used by off-road surface vehicles and mobile equipment (e.g., construction equipment, lawn mowers) operating within the community boundary?*

- Enforcement – Is the local government the primary responsible party for enforcing regulations that could significantly impact the emission generating activity or its associated GHG emission source? *Example: Does the local government enforce building codes, dedicated lanes for transit, restrictions on the use of illegal refrigerants, or the maintenance of septic systems?*

- Budgetary – Does the local government exercise budgetary authority over the GHG emission source or have monetary influence over the community activity? *Example: Does the local government have budgetary authority over local public transit services?*

Inclusion of the five Basic Emissions Generating Activities, along with use of the "Significant Influence" reporting framework criteria noted above, is acceptable for use in developing an inventory to be used in a CAP or other related GHG reduction plan used to satisfy CEQA requirements for plan-level mitigation, as well as for project-level GHG analysis tiering and streamlining. The Community Protocol appears to provide deference to local agencies to determine which reporting frameworks or additional activities are included in a community emission inventory.

The Basic Emissions Generating activities that must be included in community GHG inventories include:

- Use of electricity by the community
- Use of fuel in residential and commercial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by the community

The Community Protocol encourages (but does not require) communities to include additional reporting frameworks such as full-consumption-based inventories and life cycle emissions of community businesses. Although these frameworks may result in a more detailed emissions inventory, the Community Protocol recognizes that communities must consider multiple factors when deciding whether to include certain emissions sources or frameworks. These factors include whether the data for those emission sources are relevant, complete, accurate, measurable at a reasonable cost, and can be consistently tracked. These factors were used in the Community Protocol's own development of the requirements and best practices for developing community GHG inventory reports. (ICLEI 2013:17-18)

In the case of the additional recommended frameworks, Ascent found that the full-consumption-based inventory, which includes global emissions associated with the manufacture of products consumed in the community, and accounting for life cycle emissions of community businesses such as global GHG emission from import or export of products, would require data that are not readily available and not measurable at a reasonable cost. Life cycle emissions may include emissions related to vehicle travel beyond the region and downstream energy use related to storage of products manufactured in the County, such as delivery and shopping trips and refrigeration associated with the sale of Napa Valley wines across the country and the world. (ICLEI 2013: 17, Table 4).

As such, emissions from sources included within a life-cycle based frameworks are difficult to measure accurately without substantial costs being incurred, and they are outside of the "significant influence" framework which is appropriate for the purposes of climate action planning. For the same reasons, domestic and international aircraft emissions generated by Napa County, much of which is associated with tourism, are also excluded.

1.2.2 2017 General Plan Guidelines

The 2017 General Plan Guidelines published by OPR includes guidance on the preparation of emissions inventories prepared for GHG reduction plans, either as stand-alone climate action plans or in coordination with general plan updates. OPR states that local governments have "substantial discretion in choice of methodology and may identify appropriate methods to address this important issue" (OPR 2017: 222). The Guidelines also recommend that local governments use the Community Protocol for community-scale GHG emissions inventories and in local government planning efforts (OPR 2017; 226). While the Guidelines document is advisory, page 5 acknowledges that "courts periodically refer to the [Guidelines] to interpret planning law. For this reason, the [Guidelines] closely adheres to statute and current case law. It also relies upon commonly accepted principles of contemporary planning practice."

OPR further states that regardless of whether GHG reductions are addressed as a stand-alone CAP or directly part of the general plan, local governments should inventory and mitigate GHG emissions "within a defined geographical area," which is typically the "city or unincorporated county over which they have land use authority" (OPR 2017:223). Ascent interprets this to mean that the boundaries of the analysis should be focused primarily on physical activities occurring within the geographic boundaries and associated production-based emissions over which a local agency has jurisdiction. This appears to be consistent with the "Significant Influence" framework in the Community Protocol.

Local governments may also coordinate with surrounding jurisdictions in a regional context through metropolitan planning organizations (MPOs) or other similar organizations on regional transportation planning and land use planning to reduce GHG emissions pursuant to SB 375; thus, attributing or apportioning regional emissions that are not entirely within a geographic boundary but may be appropriate for a CAP given this context. We disagree with any interpretation that suggests that "within a defined geographic area" means all global emissions that could be attributed indirectly to local activities that are associated with upstream or downstream activities beyond the local and regional scale, such as more distant regions in California, other states in distant locations within the U.S., or other countries across the globe. This is essentially lifecycle analysis and is not required in a CAP or in the context of GHG analysis in CEQA because it relies on remote and speculative assumptions, and it is not within the required scope of emissions analysis per the Community Protocol.

1.2.3 2017 Scoping Plan Guidance

CARB updates the State's GHG emissions inventory annually. The State's inventory is limited to production-based emissions within the defined geographic area of California and does not include all consumption-based, lifecycle, or global emissions attributable to California's economy. Our understanding is that AB 32 and SB 32 do not require CARB or the Scoping Plan to mitigate emissions that occur outside of California, only those that are within the scope of the statewide emissions inventory. Furthermore, as CARB states in Chapter 5 of the 2017 Scoping Plan:

> Production based inventories and emissions reduction programs are appropriate for local communities wanting to mitigate their emissions pursuant to CEQA Section 15183.5(b). Consumption based inventories are complementary to production-based inventories and are appropriate as a background setting, disclosure, and as an outreach tool to show how personal decisions may change a person's or household's contribution to climate change (CARB 2017: 101).

We interpret "production based" to mean emissions associated with activities "within a defined geographic area," as noted in the General Plan Guidelines and the Community Protocol, and not global emissions. Thus, we believe it is appropriate to limit the scope of the emissions inventory prepared for a CAP or other plan for the reduction of greenhouse gases to those generated within a defined geographic area, per CEQA Section 15183.5(b). While consumption-based inventories or other inventory methods that extend beyond the limits of a defined geographic area may be appropriate for background information, general disclosure, or community outreach purposes regarding personal decision-making, they are not required for detailed emissions accounting and mitigation pursuant to CEQA.

Furthermore, CARB states that local governments should "disclose all emissions within the defined geographical boundary, even those over which the local government has no regulatory authority to control, and then focus the strategies on those emissions that the jurisdiction controls." CARB also states that "for emissions from transportation, the Community Protocol recommends including emissions from trips that extend beyond the community's boundaries." As noted in our comments above regarding the Guidelines, we understand that "emissions that a jurisdiction controls" are best framed as those within the defined geographic boundary of the jurisdiction (per OPR guidance), and in some cases regional emissions where the local agency may have a role in coordination with other local jurisdictions such as an MPO in addressing transportation and land use within a defined region per SB 375. We disagree with any interpretation of CARB's recommendation here that transportation emissions beyond the community's defined geographic boundaries implies that the scope of transportation analysis should be global in nature. The State's regulatory program to achieve AB 32 and SB 32 targets, as outlined in the 2017 Scoping Plan, does not extend to global transportation emissions.

1.3 INVENTORY SECTORS

The following lists the emissions sectors included in the unincorporated County's 2014 GHG emissions inventory and summarizes data sources and methods used in estimating the inventory (see Table 3 for further detail):

- **Building Energy:** Annual electricity and natural gas usage data for the unincorporated areas were obtained from Pacific Gas and Electric's (PG&E's) Green Communities report for Napa County. At the time the inventory was being developed, data were only available for 2013 and; thus, was scaled to 2014 based on the change in the unincorporated population and jobs between 2013 and 2014.

- **Solid Waste:** The solid waste inventory was updated using disposal and landfill data from the California Department of Resources Recycling and Recovery (CalRecycle) and landfill gas data from the U.S. Environmental Protection Agency (EPA), respectively. Domestic wastewater emissions were calculated using population-based equations from the Community Protocol (ICLEI 2013).

- **Water and Wastewater:** Winery wastewater emissions were also estimated using guidance from EPA and county-specific data. Water import numbers were available from each of the specific water suppliers that service the unincorporated areas of Napa County.

- **On-Road and Off-Road Vehicles:** For the on-road vehicle sector, annual vehicle miles traveled (VMT) by speed bin (e.g., zero to five miles per hour, or twenty to twenty-five miles per hour) were obtained from the Metropolitan Transportation Commission (MTC) for the unincorporated area, using the Regional Technical Advisory Committee's (RTAC's) origin-destination method. Vehicle emission factors were available from California Air Resources Board's (CARB's) 2014 EMissions FACtor (EMFAC) model. Off-road vehicle emissions were estimated from CARB's OFFROAD 2007 model and scaled by population, jobs, or location of activity in the unincorporated area. For example, the majority of countywide watercraft emissions occur within the unincorporated County because most navigable waterways, such as Lake Berryessa and Napa River, in the County are located in the unincorporated area. On the other hand, use of lawn and garden equipment would be proportional to the population distribution between the unincorporated and incorporated areas of the County.

- **Agriculture:** Agricultural emissions were based on livestock and crop data from the County's 2014 Crop Report; pesticide use data from the California Department of Pesticide Regulation (DPR); fertilizer use from the California Department of Food and Agriculture (CDFA), ARB's GHG inventory, and University of California Davis Agricultural studies; diesel irrigation pump information from ARB; and open burning permit data from the Bay Area Air Quality Management District (BAAQMD).

- **Land Use Change:** Lost carbon storage and sequestration potential due to land use changes were based on estimated changes in natural lands from the County's assessor parcel data and associated differences in carbon storage and sequestration rates by land cover type.

These sources were selected based on the Community Protocol's Basic Emissions Generating Activities, as well as the inclusion of agriculture and land use change emissions sources consistent with the Significant Influence reporting framework in the Community Protocol. The latter two sources were added because of the County's unique status as California's leading producer of wine grapes and to account for the carbon storage balance between agricultural lands, urban development, and natural landscapes in the County. Although the Community Protocol does not have specific guidance on agriculture and land use change, the Community Protocol recognizes that further development is needed for guidance methodologies on other emissions activities and sources (e.g., agriculture, forestry, and land use) (ICLEI 2013:19).

1.3.1 Comparison of 2005 and 2014 Inventory Approaches

Table 3 below compares the differences in data sources, calculation methods, and emission factors by sector and between the two GHG inventory years.

Table 3 Unincorporated Napa County GHG Inventory: Data Sources and Methods by Year and Sector

Sector	2005 Inventory	2014 Inventory[1]
Residential and Commercial Building Energy Use	**Data sources:** Energy consumption provided by sector from PG&E **Method:** ICLEI CACP software.	**Data sources:** PG&E Green Communities Report for 2013 for the unincorporated Napa County. Scaled to 2014 by population growth between 2013 and 2014. **Method:** PG&E 2014 Emission Factors for CO_2 electricity generation emissions. EPA's eGrid2010 emission factors for CH_4 and N_2O from electricity generation. Natural gas emission factors from 2014 TCR emissions factor report.
Wastewater	**Data sources:** Residential wastewater volumes and populations served (provided by County). On-site septic based on number of homes with septic (provided by the County). Commercial wastewater based on volume of	**Data sources:** Population of unincorporated Napa County from DOF. Percentage of unincorporated Napa population served by septic and sewer systems, provided by the County. Total winery wastewater produced based on gallons of wastewater generated

Table 3 Unincorporated Napa County GHG Inventory: Data Sources and Methods by Year and Sector

Sector	2005 Inventory	2014 Inventory[1]
	wine produced annually in Napa County and default values for wastewater produced per gallon of wine. **Method:** LGOP methods for residential wastewater; EPA methods for commercial wastewater.	per ton of grape from a Napa San report. Profile of winery wastewater treatment from Napa Green, Napa San, and EBMUD. **Method:** Equations WW.11 (Alt) and WW.6 from the ICLEI Community Protocol to calculate domestic wastewater CH_4 emissions. Winery wastewater emissions based on industrial wastewater method from Chapter 7 of U.S. GHG Inventory 1990-2013.
Imported Water Conveyance	Sector not included	**Data sources:** Total volume of potable and recycled water delivered by incorporated cities to the unincorporated areas in 2014. Volume broken down by water source (e.g., State water project). **Method:** Electricity factors for each water source from CEC water-energy study, when electricity use was not provided by a utility. PG&E 2013 Emission Factors for CO_2 electricity generation emissions. EPA's eGrid2010 emission factors for CH_4 and N_2O from electricity generation.
Solid Waste (Waste Generation and Waste-in-Place Emissions)	**Data sources:** Waste generation data provided by waste provider. Waste-in-place emissions not included. **Method:** ICLEI CACP software.	**Data sources:** Unincorporated County solid waste generation by amount, type, and disposal landfill available from CalRecycle. Landfill gas emissions within the unincorporated County from EPA's LMOP Landfill/Project database. **Method:** Equation SW.4.1 from ICLEI Community Protocol combined with known CH_4 capture rates at landfills to calculate CH_4 from waste generation. Waste type emissions based on EPA WARM emission factors. EPA landfill gas reports provided CH_4emissions from American Canyon and Clover Flat landfills located within the unincorporated area. These landfills did not accept unincorporated waste, so there was no double-counting.
On-Road Vehicles	**Data sources:** VMT estimates using the Napa-Solano travel demand model; origin-destination analysis; **Method:** EMFAC emissions factors applied to total VMT	**Data source:** VMT from MTC using the RTAC origin-destination method **Method:** EMFAC 2014 Emission Factors per vehicle mile CARB approved methods for N_2O, PG&E 2014 Emission factors for electric vehicles.
Off-Road Vehicles	**Data source/Method:** ARB Off-Road model used for lawn/garden and construction/industrial sectors only. No indication of whether emissions were scaled to the unincorporated area.	**Data source/Method:** ARB's OFFROAD 2007 model, scaled to unincorporated areas by unincorporated jobs or population depending on the vehicle category (e.g., recreational equipment scaled by population).
Agriculture	**Data sources:** Vehicle and equipment data from ARB Off-Road model. Enteric fermentation and manure management data from livestock populations from Napa County agriculture report. Fertilizer data from crop acres from Napa County agriculture report and UC Davis Cost Return Studies. **Method:** ARB methods	**Data sources:** Vehicles and equipment from ARB's OFFROAD 2007 model for agricultural equipment only. Agricultural diesel pump estimates from ARB. Enteric fermentation and manure management from livestock populations from Napa County agriculture report. Nitrogen fertilizer used in County from ARB 2013 GHG Inventory. Lime and urea sold in County from 2012 CDFA Fertilizer Tonnage Report. 2014 Napa County Crop Report. Fertilizer use by crop from UC Davis Cost Return Studies. Open burning permit data for burns in 2014 from BAAQMD. **Method:** ARB agricultural emissions inventory methods. BAAQMD emissions inventory methodology for open burning.

Table 3 Unincorporated Napa County GHG Inventory: Data Sources and Methods by Year and Sector

Sector	2005 Inventory	2014 Inventory[1]
Land Use Change	**Data sources:** Acres and land cover types converted for period 1993-2007 provided by Napa County Conservation, Development and Planning Department. Existing acres and land cover types in Napa Baseline Data Report **Method:** IPCC methods	**Data source:** Change in land cover acreages from 2005 through 2015 provided by Napa County. Tree densities, carbon storage rates for above and belowground biomass, and net carbon sequestration rates were available or derived from published research (USDA 2005, CUFR 2009, IPCC 2006a, and Liang et. al. 2005). These data sources were selected based on their regional or state-specific contexts. The definition of riparian species was provided by Napa County. **Method:** Carbon sequestration and storage factors by land use type from various studies applied to estimated change in land use. For oak woodlands, coniferous forests, and riparian lands, average annual change in carbon sequestration accounts for the cumulative loss of trees over time.
High-GWP Gases	Sector not included	**Data source/Method:** SF_6 emissions based on total electricity usage. SO_2F_2 emissions based on CDPR pesticide sales reports. HFC, PFC, and PFE emissions based on unincorporated population and statewide per-capita emission factors calculated from the most recent California 2013 inventory. These emission factors were scaled to 2014 assuming that per capita emissions would increase by two percent between 2013 and 2014, consistent with recent historical trends.

Notes: ARB = California Air Resources Board, BAAQMD = Bay Area Air Quality Management District, CACP = Clean Air and Climate Protection, CDFA = California Department of Food and Agriculture, CDPR= California Department of Pesticide Regulation., CEC = California Energy Commission, CH_4 = CH_4, CO_2 = carbon dioxide, DOF=California Department of Finance, EBMUD = East Bay Municipal Utility District, eGRID = Emissions & Generation Resource Integrated Database, EMFAC = ARB's Emission Factor model, EPA = U.S. Environmental Protection Agency, GHG = greenhouse gases, GWP = global warming potential, HFC = hydrofluorocarbons, ICLEI = International Council for Local Environmental Initiatives, IPCC = Intergovernmental Panel on Climate Change, LMOP = Landfill Methane Outreach Program, N_2O = nitrous oxide, Napa San = Napa Sanitation District, RTAC = Regional Technical Advisory Committee, NA = Not Applicable, PFC = perfluorinated compounds, PFE = perfluoroethane, PG&E = Pacific Gas & Electric, SF_6 = sulfur hexafluoride, SO_2F_2 = sulfuryl fluoride, TCR= The Climate Registry, UC = University of California, WARM = Waste Reduction Model

1 Demographic data used in the 2014 inventory related to population, jobs, and housing in the unincorporated County were obtained from the California Department of Finance (DOF) and the California Employment Development Department (EDD) (DOF 2015, EDD 2015).

Source: Napa County 2012: Table A-1; 2014 Inventory prepared by Ascent Environmental 2016

1.3.2 Global Warming Potentials

GHG emissions other than carbon dioxide (CO_2) generally have a stronger insulating effect (e.g., ability to warm the earth's atmosphere or greenhouse effect) than CO_2. This effect is measured in terms of a pollutant's global warming potential (GWP). CO_2 has a GWP factor of one while all other GHGs have GWP's measured in multiples of one. ARB currently uses GWP factors published in the Fourth Assessment Report (FAR) from the Intergovernmental Panel on Climate Change (IPCC), where CH_4 and N_2O have GWP's of 25 and 298, respectively (IPCC 2007). This means that CH_4 and N_2O would be 25 and 298 times stronger than CO_2, respectively, in their potential to insulate solar radiation within the atmosphere. This inventory uses the same FAR GWP values. (In comparison, the Second Assessment Report, used in the development of the 2005 inventory, reported GWP's of 21 and 310 for CH_4 and N_2O, respectively.)

Additionally, the 2014 GHG inventory includes an additional assessment of high-GWP gas emissions, including sulfur hexafluoride (SF_6), sulfuryl fluoride (SO_2F_2), hydrofluorocarbons (HFCs), perfluorinated compounds (PFCs), and perfluoroethane (PFEs). GWP values for high-GWP gases range from 124 to 22,800. SF_6 is most commonly used as an electrical insulator in electricity transmissions and any associated emissions are primarily due to leakage. SO_2F_2 is predominantly used as a pest fumigant in residential and commercial buildings. The IPCC formally identified SO_2F_2 and its associated GWP in IPCC's Fifth Assessment Report. HFCs, PFC, and PFEs are most commonly used in refrigerants, aerosols, fire protection, foams, and solvents. Other high-GWP gases are used in specific industrial applications like semiconductor manufacturing or make up less than 0.01 percent of the overall State's emissions inventory (CARB 2015b). Because Napa County is not a major center for semiconductor manufacturing and because these other high-GWP gases make minimal contributions to the State's inventory, other high-GWP emissions are not included in the County's GHG inventory.

BUILDING ENERGY SECTOR

Based on GHG emissions modeling conducted, residential and non-residential building energy use in 2014 resulted in approximately 148,338 $MTCO_2e$ in 2014. This sector comprised approximately 31 percent of the unincorporated County's emissions, resulting in the largest emissions sector in the inventory. These emissions were a result of electricity and natural gas energy use at buildings and facilities. The building energy sector consumed 336 megawatt-hours (MWh) of electricity and 12 million therms of natural gas. This estimate includes a negative credit for electricity consumption from electric vehicle charging to avoid double-counting with the on-road vehicle sector. PG&E supplied all electricity and natural gas in the County in 2014, and provided electricity with a renewable mix of 27 percent (PG&E 2015a).

Marin Clean Energy (MCE), a new community choice aggregation (CCA) program offering additional renewable electricity options to northern Bay Area counties through PG&E, did not begin automatic enrollment of customers in the unincorporated County until February 2015. Through automatic enrollment, MCE customers would immediately have a 50 percent renewable mix in their electricity consumption and customers are allowed to either increase their renewable mix for an additional fee or opt out of the program. Those opting out would have, by default, PG&E's renewable mix (MCE 2015a).

Natural gas and electricity use each accounted for approximately half of total emissions from the building energy sector. Approximately 68 percent of building energy emissions were from commercial and industrial facilities, contributing a total of 100,379 $MTCO_2e$ in 2014. Residential buildings generated 47,984 $MTCO_2e$, or approximately 32 percent of total building energy sector emissions. Table 4 presents building energy use and associated emissions by fuel and source. Table 5 presents emission factors used to quantify emissions from electricity and natural gas use, which are also used to quantify emissions in other sectors that also use electricity and natural gas.

Table 4 2014 Unincorporated Napa County GHG Inventory: Building Energy Use and GHG Emissions by Source

Source		$MTCO_2$/yr	MT CH_4/yr	MT N_2O/yr	$MTCO_2e$/yr
Electricity	MWh/yr				
Residential	116,340	21,756	2	0	21,893
Commercial	214,162	40,048	3	1	40,300
Industrial	5,281	987	<1	<1	994
Electric Vehicles[1]	-137	-24	>-1	>-1	-25
Electricity Total	335,643	62,767	4	1	63,149
Natural Gas	Therms/yr				
Residential	3,809,649	20,199	190	4	26,096
Commercial	8,626,723	45,739	431	9	59,093
Industrial[2]	0	0	0	0	0
Natural Gas Total	12,436,372	65,938	622	12	85,189

Table 4 2014 Unincorporated Napa County GHG Inventory: Building Energy Use and GHG Emissions by Source

Source		$MTCO_2$/yr	MT CH_4/yr	MT N_2O/yr	$MTCO_2e$/yr
Energy Combined	MMBTU/yr				
Residential	777,935	41,954	192	4	47,984
Commercial	1,593,424	85,787	434	9	99,385
Industrial	18,018	987	<1	<1	993
Electric Vehicles	-445	-24	>-1	>-1	-26
Total	2,388,931	128,703	626	13	148,338

Notes: Totals in columns may not add due to rounding. PG&E provided electricity and natural gas use for 2013. 2014 was not available at the time of this writing. 2013 emissions are scaled to 2014 levels by population for residential energy use and employment for commercial and industrial energy use.

MWh = megawatt-hours; MT = metric tons; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent, MMBTU = Million British Thermal Units, PG&E=Pacific Gas and Electric

1. Electric vehicle charging is subtracted from total building electricity, based on the total kilowatt-hours (kWh) of charging already estimated under the on-road vehicle fleet sector.

2. PG&E reported zero natural gas usage in the unincorporated area in 2013 from the industrial sector.

Source: Data provided by Ascent Environmental in 2016 based on modeling using data provided by PG&E's Green Communities program.

Table 5 2014 Unincorporated Napa County GHG Inventory Building Energy Emission Factors

Emission Factor	Unit	Source
Electricity		
0.187	$MTCO_2$/MWh	PG&E 2015b for 2014
28.49	lb CH_4/GWh	EPA eGrid 2010 (2014)
6.03	lb N_2O/GWh	EPA eGrid 2010 (2014)
Natural Gas		
53.02	kg CO_2/MMBtu	2014 Climate Registry Emission Factors. Table 12.1. (TCR 2014)
5	g CH_4/MMBtu	2014 Climate Registry Emission Factors. Table 12.9. (TCR 2014)
0.1	g N_2O/MMBtu	2014 Climate Registry Emission Factors. Table 12.9. (TCR 2014)

Notes: CH_4 = CH_4; CO_2 = carbon dioxide; eGrid = Emissions & Generation Resource Integrated Database; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; GWh = gigawatt-hours; kg = kilograms; lb = pounds; MMBTU = million British thermal units; MT = metric tons; MWh = megawatt-hours; N_2O = nitrous oxide; PG&E = Pacific Gas and Electric; TCR = The Climate Registry

Source: PG&E 2015b, EPA 2014, TCR 2014; data compiled by Ascent Environmental 2016.

1.4 WASTEWATER GENERATION

Based on modeling conducted, wastewater generation in 2014 resulted in emissions of approximately 11,189 $MTCO_2e$, or 2 percent of total emissions, primarily from fugitive CH_4. The County does not own or operate any wastewater treatment plants. All wastewater generated by the unincorporated areas of the County is treated in a number of methods: (1) conveyed to other wastewater treatment facilities in the region through sewer systems, (2) stored in septic or winery waste tanks then occasionally hauled to an off-site wastewater treatment facility, or (3) treated on-site, particularly in the case of winery wastewater.

This sector accounts for both the CH_4 emissions from wastewater treatment processes and emissions resulting from electricity use for treatment. Because wastewater treatment facilities are located outside of the unincorporated area, electricity use at those facilities is not captured in the building energy sector and is included in the wastewater sector instead. Wastewater process and electricity use emissions were evaluated in two parts: 1) domestic wastewater and 2) commercial winery wastewater. These emissions are summarized in Table 6.

Table 6 2014 Unincorporated Napa County Wastewater Methane Emissions by Source

Wastewater Treatment Process Emissions					
Wastewater Source	**MG /yr**	**$MTCO_2$/yr**	**MT CH_4/yr**	**MT N_2O/yr**	**$MTCO_2e$/yr**
Domestic - Septic	214	0	22	0	546
Domestic - Sewer	759	0	209	0	5,230
Domestic - Total	*973*	*0*	*231*	*0*	*5,776*
Winery Wastewater[1]	80	0	202	0	5,053
Conveyance and Treatment Electricity Use					
Wastewater Source	**Electricity Use (kWh)**	**$MTCO_2$/yr**	**MT CH_4/yr**	**MT N_2O/yr**	**$MTCO_2e$/yr**
Domestic – Septic[2]	0	0	0	0	0
Domestic – Sewer[3]	1,730,868	324	0	0	326
Domestic – Total	*1,730,868*	324	0	0	*326*
Winery Wastewater[1,3]	182,194	34	0	0	34
Total[4]	**1,913,062**	**358**	**433**	**0**	**11,189**

Notes: MG = million gallons; MT = metric tons; CH_4 = methane; CO_2e = carbon dioxide equivalent, LGOP = Local Government Operations Protocol, MGD = million gallons per day, PG&E= Pacific Gas and Electric

1. Estimates only account for winery wastewater sent to off-site treatment facilities and assumes those facilities use aerobic systems. On-site treatment of wastewater is not accounted for here because it is generally aerobically treated on-site and would not generate significant CH_4 emissions. Building energy use at on-site treatment facilities are captured under the building energy sector.
2. According to the LGOP Community protocol, wastewater discharge and treatment energy intensities associated with septic tanks and other on-site systems are assumed negligible. Also, electricity use for facilities that require discharge pumping is difficult to separate from treatment plant energy use as a whole (ICLEI 2013:Appendix F (80)). Hauling emissions are captured in the on-road vehicle sector.
3. Wastewater conveyance and treatment electricity factors were obtained from Tables WW.15.2 (median values) and WW.15.3 for a 5-20 MGD treatment facility, based on Napa Sanitation District's treatment capacity. Emission factors were based on PG&E factors for 2014.
4. Totals may not add due to rounding.

Source: ICLEI 2013; data provided by Ascent Environmental in 2016.

1.4.1 Wastewater Treatment Process Emissions

DOMESTIC WASTEWATER

Domestic wastewater CH_4 emissions were based on average population-generated wastewater rates from:

- equations WW.11 (alt) for septic systems and WW.6 (alt) for sewer systems from the ICLEI Community Protocol;
- the County's estimate of the percent of the population that are serviced by sewer connections and septic connections; and
- the 2014 population estimate for the unincorporated county, available from the California Department of Finance.

The County estimated that approximately 78 percent of the unincorporated population is served by sewer connections while the other 22 percent use septic tanks for wastewater treatment. Table WW.15.1 from the LGOP shows that California's average wastewater generation factor is 100 gallons per day per capita. Using this factor, the County is estimated to have generated 973 million gallons (MG) in 2014. Although only population was required to calculate CH_4 emissions from wastewater treatment process, total wastewater volumes were used to estimate electricity use associated with wastewater conveyance and treatment.

WINERY WASTEWATER

Winery wastewater emissions are unique to the region due to the wine industry's presence in the County, warranting a separate calculation from domestic wastewater emissions. Napa Sanitation District (Napa San) estimates that 1,100 gallons of wastewater are generated for every ton of grapes produced (Napa San 2009). Based on Napa San's wastewater generation factor and the 2014 Napa County Crop Report, Napa County produced 175,607 tons of grapes and 193 million gallons of winery wastewater. According to the Napa County Winery Database listing available from the County website, wineries in the unincorporated area produced 95 percent of the county's total wine production (Napa County 2015a). Thus, the unincorporated County would have produced approximately 183 million gallons of winery-related wastewater. However, wineries differ in their disposal and treatment methods of wastewater, affecting potential downstream GHG emissions. The discussion below addresses these differences.

According to a survey done by Napa Sanitation District (Napa San) for the district's service area, wineries within the County are known to use a wide variety of methods to treat wastewater generated from the winemaking process (Napa San 2009). These methods include on-site aerobic and anaerobic treatment, pre-treatment prior to off-site treatment, and hauling of untreated wastewater to an off-site treatment facility. However, the Napa San survey did not quantify the overall level of anaerobic treatment used for winery wastewater within the County. Thus, the assessment of the County's wastewater treatment profile for wineries depended on total estimated winery wastewater production, known winery wastewater volumes accepted by wastewater treatment plants, the treatment processes at those plants, and estimated volumes of wastewater generated by Napa Green certified wineries.

Communications with Napa San and East Bay Municipal Water District (EBMUD) revealed that winery wastewater treated at these facilities either underwent aerobic treatments generating no CH_4 or anaerobic treatments where generated CH_4 was captured and flared or converted to energy. Napa San and EBMUD together accepted 25 million gallons of winery wastewater in 2014, primarily through hauled delivery (Damron, pers. comm., 2015; Pham, pers. comm., 2015).

Napa Green, the County's local sustainability certifier, reports that approximately 4.5 million cases of wine were produced by Napa Green Certified Wineries in 2014 (Novi, pers. comm., 2015). Assuming 9 liters per case and 64 cases per ton of grapes, this would translate to 154 million gallons of wine and 79 million gallons of wastewater (Napa San 2009). Although Napa Green does not explicitly require aerobic treatment for certification, many certified sustainable wineries use on-site aerobic wastewater treatment systems or pretreat wastewater such that most solids are filtered out and used as compost. Thus, it is assumed that that all wastewater produced at Napa Green certified wineries are treated aerobically, generating no CH_4.

After subtracting the winery wastewater sent to Napa San and EBMUD and those generated by Napa Green certified wineries from total estimated wine production in the unincorporated county (183 minus 104 million gallons), the remaining 79 million gallons of winery wastewater were assumed to undergo anaerobic treatment. According to the EPA, on average, 4.2 percent of wastewater from fruit and vegetable processing was treated anaerobically during secondary treatment. Using the industrial wastewater equation provided in Chapter 7 of the U.S. GHG Inventory 1990-2013 and biochemical oxygen demand (BOD) levels identified in the Napa San report, the CH_4 emissions from winery wastewater were estimated to be 202 MT CH_4/year or 5,053 $MTCO_2e$/year (EPA 2015a: 7-21).

WASTEWATER CONVEYANCE AND TREATMENT EMISSIONS

Electricity used to convey and treat wastewater generated by the unincorporated County was based on total wastewater volumes in 2014, as shown in Table 6, and energy intensity factors per gallon of wastewater (ICLEI 2013: Tables WW.15.2 and WW.15.3). In 2014, no municipal wastewater treatment facilities were located within the unincorporated County, confirming that emissions from conveyance and treatment of wastewater are not double-counted in the building energy sector. For wastewater conveyed to and treated at these off-site wastewater treatment facilities, it is assumed that 280 kWh/MG is required for conveyance and 2,000 kWh/MG is required for treatment. This assumes a median level of conveyance energy intensity and a treatment facility with a capacity size between 5 and 20 MGD, similar to that of Napa San.

According to the ICLEI Community Protocol, wastewater discharge and treatment energy intensities associated with septic tanks and other on-site systems are assumed negligible. In addition, electricity use for facilities that require discharge pumping is difficult to separate from treatment energy use as a whole. (ICLEI 2013:Appendix F (80)). Hauling emissions associated with maintenance of septic tanks are captured in the on-road vehicle sector and not included in this sector.

1.4.2 Imported Water Conveyance

Based on modeling conducted, water imports into the unincorporated area accounted for 88 $MTCO_2e$ in 2014, less than one percent of the County's 2014 GHG inventory. These resulted from GHG emissions from electricity generation required to deliver and treat water outside unincorporated areas. Water conveyance within the unincorporated County is accounted for under the electricity usage reports from PG&E. However, the unincorporated area imported over 194 million gallons of potable and recycled water in 2014 from water suppliers located within the five incorporated city areas. Much of this water was used for vineyard irrigation.

Water suppliers from each of the five incorporated cities provided total water volume deliveries to the unincorporated area in 2014 broken out by water source and type of water (e.g., recycled or potable). Water conveyance and treatment energy rates per gallon vary by water source and type. These factors were available from a 2006 California Energy Commission report (CEC 2006). Water conveyed from the State Water Project (SWP) requires thirty times more energy than water sourced from local surface water. Approximately 44 percent of water imported to the unincorporated county was sourced from the SWP, as shown in Table 8.

Water energy intensity rates are shown in Table 9. Emission factors in Table 5 were applied to the calculated electricity use to estimate associated GHG emissions. Results are shown below in Table 7 and 8 below.

Table 7 2014 Unincorporated Napa County Imported Water Conveyance GHG Emissions by Supplier

Water Suppliers	$MTCO_2e$/yr
City of Napa	8
City of American Canyon	8
Town of Yountville	47
City of Calistoga	7
City of St. Helena	18
Total	**88**

Notes: MWh = megawatt-hours; MT = metric tons; CO_2e = carbon dioxide equivalent.
Source: Data compiled by Ascent Environmental in 2016.

Table 8 2014 Unincorporated Napa County Imported Water Conveyance Energy Use by Supplier

Water Suppliers	Volume Transported (MG/yr)	Water Source Breakdown by Percent (%)			Percent Recycled Water[1] (%)	MWh/yr
		Local Surface Water	State Water Project (Bay Area)	Groundwater		
City of Napa	18	44	56	0	22	42
City of American Canyon	13	0	100	0	0	44
Town of Yountville	116	100	0	0	93	252
City of Calistoga	16	35	65	0	0	35
City of St. Helena	31	79	0	21	0	94
Total	**194**	**52**	**44**	**4**	-	467

Notes: MG = million gallons; MWh = megawatt-hours; MT = metric tons; CO_2e = carbon dioxide equivalent

1. Potable Water Volume = Total water volume – Recycled Water Volume

Source: City of Napa 2015, Hade, pers. Comm., 2015a, Baer, pers. comm., 2015, Moore, pers. comm., 2015, Harrington, pers. comm., 2015, Tuell, pers. comm., 2015; data compiled by Ascent Environmental in 2016.

Table 9 2014 Unincorporated Napa County GHG Inventory: Water Energy Intensity Factors

Water Source	Conveyance Energy Intensity (kWh/MG)	Treatment Intensity (kWh/MG)
Local Surface Water	120	100
State Water Project (Bay Area)	3,150	100
Groundwater	4.45 kWh/MG/foot	100
Recycled (Average)	2,100	0

Notes: kWh = kilowatt-hours; MG = million gallons

Source CEC 2006: Table 9

Sufficient stormwater pumping energy use was not available from the incorporated water suppliers and was not included in the 2005 inventory. Incorporated utilities either could not apportion stormwater pumping energy use to the unincorporated area or did not provide stormwater pumping services to the unincorporated area (Moore, pers. comm., 2015, Tuell, pers. comm., 2015, Baer, pers. comm., 2015). Thus, energy and emissions associated with stormwater management by incorporated utilities were not included in this analysis or in the County's GHG inventory.

1.5 SOLID WASTE (WASTE GENERATION AND WASTE-IN-PLACE EMISSIONS)

Based on modeling conducted, the solid waste sector was responsible for approximately 83,086 $MTCO_2e$, or 17 percent of the County's 2014 GHG inventory. The ICLEI Community Protocol recommends that community GHG inventories include emissions from both solid waste facilities located in the community (i.e., "waste-in-place") and waste generated by the community. Waste-in-place CH_4 emissions from landfill gas (LFG) generated at solid waste facilities located within the unincorporated area accounted for 63,125 $MTCO_2e$, or 76 percent of emissions from the solid waste sector. CH_4 emissions from decay of waste generated annually by residences and businesses in the unincorporated community accounted for 22,357

$MTCO_2e$, or 24 percent of emissions from the solid waste sector. Table 10 summarizes emissions from the solid waste sector.

Table 10 2014 Unincorporated Napa County GHG Inventory: Solid Waste Emissions by Source

Source	Disposal Tonnage	MT CH_4	$MTCO_2e$
Waste-in-Place LFG emissions within Unincorporated Napa County	N/A	2,525	63,125
Solid Waste generated by Unincorporated Napa County	20,155	798	19,961
Total	20,155	3,324	83,086

Notes: LFG = Landfill Gas

Source: Data provided by Ascent Environmental 2015 based on data from EPA 2015b.

LFG is a mix of gases, primarily composed of CH_4, generated from decomposing organic waste and waste chemical reactions and evaporation in landfills. If a landfill has an impermeable membrane that covers a portion or all of the landfill (i.e., cover-and-capture), it can harvest the LFG and prevent CH_4 emissions from being released into the atmosphere. Once captured, a landfill can either convert the CH_4 to CO_2 through flaring or use it as a fuel for other energy-related applications. For the two landfills in the unincorporated County, LFG generation and flaring rates for 2014 were available from EPA's GHG emissions database and EPA's Landfill Methane Outreach Program (LMOP). Any CO_2 emissions from flaring were not counted toward the County's inventory because the IPCC considers any CO_2 emissions from flaring or fugitive emissions to be of biogenic origin and not significant to overall solid waste emissions (IPCC 2006b).

The only landfills located within the unincorporated area are the American Canyon Sanitary Landfill (ACSL) and the Clover Flat Landfill near Calistoga. While Clover Flat is open and currently accepting waste, ASCL closed in 1995 and currently has an active LFG collection system. According to EPA's Facility-Level Information on Greenhouse Gases (FLIGHT) database, in 2014, the American Canyon landfill generated 2,044 MT CH_4 in fugitive CH_4 emissions from accumulated waste at the landfill in 2014 (EPA 2015b). Clover Flat also has an active LFG collection system, but does not anticipate closure of the landfill until 2053. In 2014, Clover Flat generated 481 MT CH_4 in fugitive CH_4 emissions (EPA 2015b). CH_4 emissions from closed landfills generally decrease overtime due to the gradual reduction in organic decomposition. According to CalRecycle, the landfills within the unincorporated area do not contain any waste generated by the unincorporated County itself (CalRecycle 2015).

For emissions related to annual solid-waste generation from the community in the unincorporated County, CH_4 emissions are also generated from organic decomposition. The release of CH_4 emissions from community-generated waste depends on the LFG management systems of the landfills at which the waste are disposed. According to CalRecycle reports, 98 percent (19,751 tons) of the waste generated by the unincorporated County in 2014 were sent to the Potrero Hills Landfill in Solano County, approximately 30 miles east of the County (CalRecycle 2015). In 2014, Potrero Hills Landfill did not have an active LFG collection system in place; although, according to EPA's LMOP database, the landfill plans to install such a system by January 2016 (EPA 2015c). Calculations of emissions from County-generated waste used factors unique to the unincorporated area. EPA's WARM model provides decay emissions factors for various types of waste, such as food or paper waste. The latest profile of the unincorporated County's waste stream was available from CalRecycle for the 1990 calendar year. The data from EPA and CalRecycle were used to calculate a weighted CH_4 emissions factor per ton of waste generated by the unincorporated County. The result was applied to the unincorporated County's total waste tonnage to calculate CH_4 emissions. However, because the waste stream profile for the County was only available for 1990, the County could have shown improved recycling rates of paper and reduction in food waste due to recent composting efforts, meaning that actual waste generation emissions could be lower than estimated.

1.6 ON-ROAD VEHICLES

Based on modeling conducted, on-road vehicle usage in the unincorporated County resulted in 125,711 $MTCO_2e$ in 2014, or 26 percent of the County's inventory. On-road vehicle emissions are primarily the result of exhaust from the combustion of gasoline and diesel fuels. To a smaller degree, emissions from on-road vehicles also result from upstream electricity generation for electric vehicles. Due to lack of available data, emissions from the combustion of natural gas and other non-electric alternative fuels in on-road vehicles were not included in this analysis, and are assumed to have minimal contribution to total emissions.

On-road passenger vehicle emissions were calculated by estimating the annual vehicle miles traveled (VMT) associated with trips that begin or end in the unincorporated County. These vehicle trips included 100 percent of vehicle trips that both originate from and end in the unincorporated area (i.e., fully internal trips), 50 percent of trips that either end in or depart from the unincorporated area (i.e., internal-external or external-internal trips), and zero percent of vehicle trips that are simply passing through the area (i.e., external-external, or "pass-through," trips). This passenger vehicle trip accounting method is consistent with the method recommended to ARB in 2010 by the RTAC (established through the Sustainable Communities and Climate Protection Act of 2008 [Senate Bill 375]). Table 11 shows total annual VMT by vehicle fuel type and associated emissions estimates for the unincorporated County.

Table 11 2014 Unincorporated Napa County GHG Inventory: On-Road Vehicle Fleet Activity and Emissions by fuel type

Vehicle Type	VMT/yr	Fuel Use (1000 gallons or MWh)/yr	$MTCO_2$/yr	MT CH_4/yr	MT N_2O/yr	$MTCO_2e$/yr
Gasoline	238,043,173	111,497	94,146	4.64	2.44	94,990
Diesel	23,527,464	27,721	27,943	0.56	9.19	30,696
Electric	450,077	131	24	0.00	0.00	25
Total	262,020,714		122,113	5	12	125,711

Notes: VMT = vehicle miles traveled; kWh = kilowatt-hour; MT = metric tons; CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent

Source: Metropolitan Transportation Commission (Brazil, pers. comm., 2016a); data compiled by Ascent Environmental 2016

MTC provided vehicle travel information for the unincorporated County based on their regional travel demand model. MTC provided average daily VMT estimates in 2014 for both passenger and commercial vehicles for the unincorporated area, which were multiplied by 347 days per year to estimate annual VMT to account for lower VMT during weekends, holidays, and summer periods. Passenger VMT was calculated using the RTAC method with VMT available by origin and destination categories from MTC. However, due to modeling limitations, MTC was only able to provide commercial VMT using the boundary method. The boundary method accounts for all vehicle travel occurring within the physical boundaries of a given jurisdiction regardless of origin or destination. This means the commercial VMT estimates only include travel within the physical boundary of the unincorporated area. Without commercial VMT available by origin and destination, the RTAC method could not be applied to commercial VMT. As a proxy, the available commercial VMT was scaled based on the ratio between passenger VMT calculated by the RTAC method (available from MTC) and passenger VMT calculated by the boundary method (calculated from Caltrans VMT data) (Caltrans 2014:72, Caltrans 2016). This alternative method for estimating commercial VMT is consistent with MTC recommendations (Brazil, pers. comm., 2016b).

MTC also provided the speed distribution profile by fuel and vehicle class, which allowed for the use of detailed emission factors calculated for the same categories from EMFAC 2014. Although, EMFAC provides CO_2 and CH_4 emissions data, direct N_2O emission factors were not available. Instead, N_2O emissions were calculated using ARB inventory methods that assume N_2O emissions are equal to 4.16 percent of NO_X emissions for gasoline vehicles and 0.3316 g N_2O per gallon fuel for diesel vehicles (CARB 2014a). Emissions from electricity use in electric vehicles were quantified using the same methods used for the building energy inventory.

1.7 OFF-ROAD VEHICLES

Based on modeling conducted, off-road vehicles operating in the unincorporated County emitted approximately 42,508 $MTCO_2e$ in 2014, or nine percent of the County's 2014 inventory. These emissions were the result of fuel combustion in off-road vehicles and equipment used in construction, industry, and recreation and were available from ARB's OFFROAD 2007 model. Unfortunately, the OFFROAD 2007 model only provides emissions detail at the State, air basin, or county level. Napa County emissions data from OFFROAD 2007 were apportioned to the unincorporated area using custom scaling factors depending on the off-road fleet type, as shown in Table 12. For example, due to the likely correlation between commercial activity and employment, the unincorporated portion of emissions from light commercial equipment in the County is assumed to be proportional to the number of jobs in the unincorporated County as compared to the County as a whole. On the other hand, emissions from pleasure craft are assumed to occur entirely within the County because the majority of navigable waterways in the County are located in the unincorporated area. Further details on how OFFROAD emissions from each fleet type were scaled to the unincorporated area are discussed below. Note that, although reported by the OFFROAD model, emissions from agricultural equipment included separately in the agriculture sector and are excluded from the off-road vehicles sector.

Emissions from locomotives are not included in the OFFROAD model and were added in separately to account for the Napa Valley Wine Train, which is the only operating locomotive in the County at this time. The estimated annual emissions and scaling factors are presented in Table 12 below by fleet type.

Table 12 2014 Unincorporated Napa County GHG Inventory: Off-Road Emissions by Fleet Type

Off-Road Fleet Type	$MTCO_2$/yr	MT CH_4/yr	MT N_2O/yr	$MTCO_2e$/yr	Unincorporated: Countywide Scaling Method
Pleasure Craft[1]	29,004	20	6	31,440	not scaled
Construction and Mining Equipment	6,546	1	0	6,575	jobs
Transport Refrigeration Units	1,413	0	0	1,420	jobs
Industrial Equipment	1,182	0	0	1,212	jobs
Light Commercial Equipment	851	0	0	899	jobs
Lawn and Garden Equipment	460	1	0	568	population
Recreational Equipment[1]	196	1	0	325	population
Oil Drilling	34	0	0	34	jobs
Locomotives (Napa Valley Wine Train) [1]	20	0	0	20	not scaled
Entertainment Equipment[1]	14	0	0	14	jobs
Railyard Operations	0	0	0	0	jobs
Total	**39,721**	**24**	**7**	**42,508**	

Notes: MT = metric tons; CO_2 = carbon dioxide; CH_4 = CH_4; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas

1. Not in 2005 emissions inventory

Source: Data provided by Ascent Environmental in 2016, based on modeling from the OFFROAD 2007 model.

All commercial and industrial off-road emissions were scaled from countywide estimates by the unincorporated percentage of jobs in 2014. Emissions related to lawn and garden and recreational equipment were scaled by population. Countywide emissions from pleasure craft were assumed to entirely occur in the unincorporated areas such as Lake Berryessa and Lake Hennessey. Locomotive emissions were based on locomotive information from the Napa Valley Wine Train website, which provided engine model types, fuel types, car weights, average trip distance, and number of daily trips (Napa Valley Wine Train 2015). Locomotive fuel efficiency and emissions factors were available from the Alternative Fuels Data Center and the Climate Registry, respectively (U.S. Department of Energy 2014, TCR 2014).

Although ARB has released newer category-specific models designed to replace OFFROAD 2007, these newer models estimate statewide emissions without county-level detail and focus primarily on criteria pollutant emissions. ARB recommends using OFFROAD 2007 where desired information is unavailable from the newer off-road models (CARB 2015a). Notwithstanding ARB recommendations, OFFROAD 2007 model may tend to overestimate emissions in 2014. The model was developed prior to the 2009-2010 recession and, thus, presumes a higher growth rate in equipment population than what may have actually transpired in 2014 (CARB 2010). Additionally, the model does not include recent regulatory changes such as idling limits and newer engine tier requirements (CARB 2014b).

1.8 AGRICULTURE

Based on modeling conducted, emissions from the agriculture sector accounted for approximately 52,198 from agricultural activity such as farm equipment operations, direct emissions from livestock, and fertilizer use. Fuel combustion in farm equipment and CH_4 emissions from livestock made up 60 percent and 32 percent of total emissions from the sector, respectively. Other emissions estimated for this sector were from fertilizer use, lime application, burning of agricultural residue, and diesel-powered agricultural pumps. These emissions are summarized in Table 13 below.

Table 13 2014 Unincorporated Napa County GHG Inventory: Agriculture Emissions by Source

Source	$MTCO_2$/yr	MT CH_4/yr	MT N_2O/yr	$MTCO_2e$/yr
Farm Equipment	31,359	4	0	31,571
Enteric Fermentation from Livestock	0	414	0	10,345
Manure Management from Livestock	0	165	2	4,829
Fertilizer Use	0	0	9	2,683
Agricultural Irrigation Pumps	1,657	0	0	1,657
Residue Burning	533	10	1	1,094
Urea Fertilization	16	0	0	16
Lime Application	4	0	0	4
Pesticide Application[1]	0	0	0	0
Total	**33,568**	**593**	**13**	**52,198**

Notes: MT = metric tons; CO_2 = carbon dioxide; CH_4 = CH_4; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas

1. Pesticide application emissions were less than 0.5 MT.

Source: Data compiled by Ascent Environmental, 2016.

GHG emissions associated with farming equipment were obtained from ARB's OFFROAD2007 model. ARB has a more recent off-road equipment model, the 2011 off-road inventory model, but it is limited to construction, industrial, and oil drilling equipment types and does not include agricultural equipment. In cases where the new model does not cover a desired category, the ARB recommends using OFFROAD2007 as the current tool for estimating emissions. Farming equipment emissions reported for Napa County are assumed to occur entirely within the unincorporated County.

With respect to livestock emissions, CH_4 and nitrous oxide emissions are released through enteric fermentation (a type of digestion process) and exposure of manure produced by these animals. The 2014 Napa County Crop Report provided estimates of total weight of cattle, lamb, and slaughter sheep in the County. Average weight per head of livestock were calculated by comparing historical County livestock population estimates from the California Agricultural Statistical Review and total livestock weights reported in the County crop reports in the same year. This was used to calculate livestock population needed for emissions estimates. All livestock-generated GHG emissions were estimated using population-based emission factors and quantification methods identical to those by ARB in the statewide inventory.

Emissions from fertilizer use vary by crop type and acreage. The acreage of crops cultivated in the County was based on the *2014 Napa County Crop Report* (Napa County 2015b). The amount of fertilizer application for each crop type grown in the County was based on sample cost reports for each crop that are published by the University of California Cooperative Extension (UCCE). UCCE have special fertilizer reports available for wine grapes grown in the Napa region. Information about the mass amounts of urea and lime was provided in the Fertilizing Materials Tonnage Report for January to June of 2012. Emission factors and quantification methods for GHG emissions associated with urea and lime fertilizer application were obtained from IPCC (IPCC 2000). These emission factors and quantification methods were also used by ARB in its development of the statewide GHG inventory and subsequent updates (CARB 2015b).

The GHG emission factor and quantification method for agricultural irrigation pumps and number of pumps were obtained from ARB reports on diesel irrigation pumps (CARB 2003, 2006). Latest reports provided total diesel pumps in the Bay Area Air Quality Management District in 2006, but did not break down the inventory by County. However, an older report reported pumps at both the county-level and air district-level. Assuming the ratio of pumps in the air district remained the same as in 2003, approximately 26 pumps were estimated to operate in the County in 2006. The County's pump inventory in 2014 was assumed unchanged from 2006. (CARB 2006: Table D-2).

Residue burning refers to the burning of croplands after they are harvested to clear the land of residual vegetation. The GHG emissions from residue burning in Napa County were based on BAAQMD emissions inventory methods for open burning (emissions per ton of material burned), 2014 open burning permit data submitted to the air district (ton or cubic yard of material burned), and organic waste densities from CalRecycle (tons per cubic yard) (BAAQMD 2014, Reed, pers. comm., 2016, CalRecycle 2010). BAAQMD provided the permit information in response to a public records request. However, the air district had not yet quantified emissions from open burning for the 2014 calendar year. The permit data provided either cubic yards or tons of material (e.g. orchard pruning, crop replacement) burned by material category and location. Thus, it was necessary to calculate emissions separately. In Napa County, over 102,000 cubic yards, or 82 percent, of material openly burned in Napa County consisted of discarded grapevines (Reed pers. comm., 2016). BAAQMD opening burning permits also included open burning of flood control debris, forest and fire management, and other non-agricultural prescribed burns. Although these are not necessarily agricultural, emissions from those burns are included in the residue burning sub-sector to facilitate a more complete inventory.

A common pesticide that is also categorized as a GHG is methyl bromide. Based on the published factors from IPCC's Fifth Assessment Report, methyl bromide is assumed to have a GWP factor of 2. However, according to the California Pesticide Information Portal, no methyl bromide was used in 2013. 2014 information was not available, but no changes in methyl bromide use are expected. Sulfuryl fluoride is also considered a pesticide, but is most often used in structural pest control as a fumigant, and is not included as an agricultural emissions source. Sulfuryl fluoride is discussed in the High-GWP sector.

1.9 LAND USE CHANGE

As urban development and vineyards continue to expand with the growth of the wine industry and the County's population, certain natural land cover types are replaced with vineyards, residential/commercial development, and other anthropogenic development. Natural flora present on these lands such as forests, shrublands, and grasslands remove CO_2 from the atmosphere and sequester carbon in plant material through photosynthesis. Due to the relatively low rate of carbon sequestration associated with vineyards and urban development, the conversion of undeveloped lands to vineyards or urban development generally reduces or eliminates further carbon sequestration and removes stored carbon from plant life on the original undeveloped lands, depending on the type of vegetation removed or replaced. This displacement of natural vegetation on undeveloped lands leads to an overall net increase in emissions from a carbon cycle perspective.

Land use change and associated sequestration and stored carbon losses due to vineyard and urban development in Napa County resulted in the indirect emissions of approximately 7,746 $MTCO_2e$ in 2014, or two percent of total emissions, due to lost carbon sequestration potential and removal of stored carbon. According to County records, from 2005 to 2014, vineyard expansions displaced an estimated 1,492 acres of natural land cover, including over 700 acres of grasslands, 300 acres of shrubland, and 250 acres of oak woodland. This means that, on average, 166 acres of natural lands have been converted to vineyards every year between 2005 and 2014. Historical land use conversions to vineyards are shown in Table 14, and historical land use inventories between 2005 and 2015 are shown in Table 15.

Table 14 Historical Conversion of Land Uses to Vineyards by Land Cover Type between 2002 and 2014 in Unincorporated Portion of Napa County

Land Cover Type	2005-2007	2007-2010	2010-2014	2005-2014
Grasslands	170.1	300.0	243.0	713.2
Shrublands	129.5	86.4	121.0	336.9
Oak woodlands	81.5	83.7	87.4	252.6
Developed	64.9	79.9	89.2	234.1
Coniferous forest	45.5	58.8	21.5	125.8
Riparian woodlands	6.9	4.9	3.3	15.1
Other	2.5	2.2	37.9	42.6
Wetlands	1.4	0.0	2.4	3.8
Streams and reservoirs	0.4	0.1	0.1	0.6
Rock Outcrop	0.0	0.4	0.8	1.2
Total Natural Land Cover	**437.9**	**536.4**	**517.5**	**1,491.8**
Total	**502.8**	**616.4**	**606.7**	**1,725.8**

Note: Conversions represent land use change in the unincorporated areas of Napa County.

Source: Lamborn, pers. comm., 2015; data compiled by Ascent Environmental, 2016.

Table 15 Historical Land Use Estimates by Land Cover Type between 2005 and 2015 in Unincorporated Portion of Napa County

Land Cover Type	2005[1]	2007[2]	2010[2]	2013[2]	2014[2]	2015[1]
Oak Woodlands	160,146	160,077	159,975	159,872	159,838	159,803
Chaparral/Shrublands	106,190	106,149	106,086	106,024	106,003	105,983
Vineyards	50,317	50,820	51,436	51,891	52,043	52,803
Coniferous Forest	42,469	42,461	42,450	42,439	42,435	42,431
Grasslands	48,844	48,786	48,699	48,612	48,583	48,554
Rock Outcrop/Other	38,096	38,637	39,448	40,259	40,529	40,800
Developed	28,619	28,588	28,540	28,493	28,478	28,462
Non-vineyard Cropland	19,591	19,229	18,686	18,143	17,962	17,781
Riparian Woodlands	7,838	7,833	7,826	7,820	7,817	7,815
Wetlands	5,328	4,864	4,167	3,471	3,239	3,007
Total[3]	**507,438**	**507,444**	**507,314**	**507,023**	**506,926**	**507,438**

1. Land use estimates provided directly from the County.

2. Except for vineyards, all land use estimates for these years were interpolated between 2005 and 2015. Vineyard acreages were based on historical vineyard conversion data shown in Table 14. Vineyard acreages in 2013 were interpolated between 2010 and 2014.

3. Totals between 2007 and 2014 do not add up to the total acreage provided by the County for 2005 and 2015. This is because of the two different methods used to estimate acreages by land use between 2007 and 2014, as described in Note 2. Interpolated estimates assume a linear trend between 2005 and 2015. Actual acreages may vary from the interpolated results. Conversely, vineyard acreages were based on historical data, which does not show a linear trend between the two years. Therefore, the total acres shown for years from 2007 to 2014 do not reflect actual acreage totals in the County, but are within 99.9 percent of the totals shown for 2005 and 2015.

Source: Hade, pers. comm., 2015b; data compiled by Ascent Environmental, 2016.

As mentioned, land use change affects emissions in two ways: 1) change in carbon sequestration potential and 2) change in carbon storage. To estimate net emissions in 2014 associated with land use change, per-acre carbon sequestration and carbon storage factors were applied to the change in acreage by land cover type between 2013 and 2014. Table 16, on the next page, presents the per-acre carbon sequestration and storage factors that were derived for region-specific tree densities and species and collected from various sources.[1] These factors are converted to carbon dioxide equivalents by multiplying by 44/12, the molecular weight ratio of CO_2 to carbon. Attachment A provides presents the calculations used to derive the per-acre carbon storage and sequestration factors in this analysis.

[1] In the April 2016 version of the inventory, the carbon sequestration and storage factors were based on per-acre carbon storage and sequestration rates that were specific to California at the state level only and not at the regional level. This current version of the inventory update revises the rates used for oak woodlands, coniferous forests, and riparian woodlands based on tree densities representing a 12-county northern California region that includes Napa County, as directed by the County (Hade, pers. comm., 2015b). These densities are published in the USDA report "Oak Woodlands and Other Hardwood Forests of California, 1990s" (USDA 2005).

Table 16 2014 Unincorporated Napa County GHG Inventory: Lost Carbon Stock and Sequestration Factors by Land Use Type[1]

Land Use Type	Stored Carbon		Annual Sequestration	
	Carbon stored per acre (MT C/acre)	Method or Sources	Annual Net Carbon Sequestration per acre (MT C/acre/yr)	Method or Sources
Oak Woodlands	34.9	Calculated from carbon fractions and biomass ratios from IPCC 2006a and per-acre aboveground biomass factors and tree densities from USDA 2005. Tree densities represent 12 northern California counties, including Napa County. Calculated factor represents above and below ground live biomass only. Represents average of eight oak species.	2.017	Calculated from annual growth rates derived from Table 13 in USDA 2005 calculated carbon storage values per tree from IPCC 2006a and USDA 2005, and tree densities from USDA 2005. Represents average of eight oak species.
Coniferous Forest	47.0	Calculated from carbon fractions and biomass ratios from IPCC 2006a, per-tree aboveground biomass factors from CUFR 2009, and tree densities from USDA 2005. Tree densities represent 12 northern California counties, including Napa County. Calculated factor represents above and below ground live biomass only.	3.129	Softwood factors calculated from ratio of growth and mortality rates between California softwoods and hardwoods from Table 3 in Liang et. al. 2005 and adjusted against hardwood growth rates in USDA 2005.
Riparian Woodlands	57.0	Calculated based on average of eight oak species, tanoaks, and redwoods using same sources as above IPCC 2006a, USDA 2005, and CUFR 2009, as directed by the County. Calculated factor represents above and below ground live biomass only.	4.744	Average of 8 oak species, tanoaks, and redwoods, a softwood, using same methods as above depending on wood type.
Grasslands	2.6	Factor calculated from total area and total carbon stocks for grassland from Table 5 in Battles, et. al. 2014.	0	Factor available directly from page 19 of Brown, et. al. 2004.
Shrublands	12.8	Factor calculated based on page 18 in Battles, et. al. 2014 that states that on average, the carbon density of grassland is only 20% of shrublands.	0	Factor available directly from page 19 of Brown, et. al. 2004.
Croplands (Not Vineyards)	2.2	Includes the County mix of olives, vegetables, and hay as reported in the County's 2014 Crop Report. Carbon storage factors from Battles, et. al. 2014 and Brown, et. al. 2004 scaled by acreage for each crop type.	0.081	Weighted average of olives, vegetables, and hay sequestration rates based on acreages in Proietti et. al. 2014 and the 2014 Crop Report. Assumes vegetables and hay have zero annual sequestration.
Vineyards	1.2	Factor converted directly from Table 2.6 in Brown, et. al. 2004.	0.016	Factor converted directly from page 1980 of Kroodsma, et. al. 2006. Includes sequestration in woody mass, pruning, removal of vineyards after a 25-year lifetime, burial in soil, and an average level of conversion to biomass energy.

Note: MT = metric tons; C = carbon; GHG = greenhouse gas. See Attachment A for detailed calculations of the carbon storage and sequestration factors.

1. Changes in land use patterns do not immediately change soil carbon levels. Instead, changes to soil carbon may be gradual, while change in land use patterns would have immediate impacts on aboveground and some belowground biomass. As such, soil carbon is not included in this analysis.

Source: IPCC 2006a, USDA 2005, CUFR 2009, Battles, et. al. 2014, Brown, et. al. 2004, Liang et. al. 2005, Proietti et. al. 2014, Napa County 2015b, Kroodsma, et. al. 2006, Hade, pers. comm., 2015b; data compiled by Ascent Environmental, 2016.

With respect to sequestration from vineyard growth and production, the information on carbon sequestration in vineyards is very limited. One study found that vineyards, over their lifetime, sequester approximately 4 g C per square meter per year (or 0.016 MT C/acre/year) in its woody biomass (Kroodsma and Field 2006:1980). Soil carbon was also quantified in this study, but is outside the scope of this inventory. This study accounted for pruning levels and usage of vineyard biomass at the end of a 25-year lifetime. It assumed that mature vines convert 35 to 50 percent of sequestered carbon as fruit, which was assumed to release the sequestered carbon after consumption. The study also noted that actual sequestration rates depend on what is done with the discarded vineyard biomass. Burying biomass can help increase soil carbon rates, but carbon levels in soil can saturate and decomposition would also return some sequestered carbon back into the atmosphere. Burning biomass, either out in the open or in a biomass plant, would return sequestered carbon into the atmosphere. However, using biomass as energy also offsets fossil fuel emissions. The Kroodsma study assumed some statewide level of biomass-to-energy conversion. Given this research and the uncertainty of how vineyard biomass in Napa County is treated, Napa County vineyards are assumed have an average statewide net annual sequestration level of 0.016 MT C/acre/year.

Based on the methods and data sources discussed above, Table 17 below presents a summary of the land use changes that occurred between 2013 and 2014 along with the estimated net GHG emissions due to lost carbon storage and sequestration potential. Total net emissions with respect to each land use type in baseline year of 2014 equal total lost carbon storage and the lost sequestration potential associated with removed vegetation between 2013 and 2014.

Methods used to forecast emissions differ from the method used for the inventory year for the land use change sector. Emissions forecasting methods are discussed under the Forecast section.

Table 17 2014 Unincorporated Napa County GHG Inventory: Lost Carbon Stock and Sequestration Potential from Land Use Change between 2013 and 2014

	Change in acreage between 2013 and 2014	Lost Carbon Storage due to Land Use Change (MT CO_2)	Loss in carbon sequestration potential (MT CO_2)	Total Net Emissions (MT CO_2)
Coniferous Forest	-4	657	12	669
Croplands (Not Vineyards)[1]	-181	1,455	54	1,508
Grasslands	-29	272	0	272
Oak Woodlands	-34	4,383	69	4,452
Riparian Woodlands	-2	483	11	494
Shrublands	-21	973	0	973
Vineyards	152	-675	-9	-684
Other[2]	119	0	0	0
Total	0	7,547	137	7,684

Notes: Land use change based on acreages provided by Napa County. Values may not sum due to rounding. MT = metric tons; CO_2 = carbon dioxide; GHG = greenhouse gas

1. "Cropland (Not Vineyards)" includes the County mix of olives, vegetables, and hay as reported in the 2014 Napa County Crop Report.

2. "Other" refers to wetlands and non-vegetative land uses such as developed areas and rock outcrops. Non-vegetative land uses are assumed to have no carbon storage or sequestration potential and are not included here. Carbon sequestrations and storage potential of wetlands vary greatly depending on location, ecosystem, and other factors. Factors for wetlands unique to Napa County are not available and were assumed to be zero.

Source: Napa County (Hade, pers. comm., 2015b); data compiled by Ascent Environmental, 2016.

1.10 HIGH-GWP GASES

High-GWP gases accounted for 13,481 $MTCO_2e$, or approximately three percent of total emissions in 2014. This sector includes emissions from SO_2F_2, a fumigant; SF_6, an electric insulator used in electricity transmission; and a list of other high-GWP gases including various HFCs, PFE, and PFCs as listed in Table 18. HFCs and CFCs are generally emitted into the atmosphere through off-gassing, leakage, or direct emission of refrigerants, solvents, aerosols, foams, and fire protection. County-specific information was available for inventorying of SO_2F_2 and SF_6; however, estimates of other high-GWP gases were only available at the State level and were scaled from the statewide GHG inventory to the unincorporated area by population. Emissions from the various high-GWP gases included in the unincorporated County's 2014 inventory are shown in Table 18, by GHG.

Table 18 2014 Unincorporated Napa County GHG Inventory: High-GWP Gases by Greenhouse Gas

Greenhouse Gas[1]	GWP	Application	2013 State Mass Emissions (MT/yr)	2014 State per capita Emissions (MT/yr-cap)[2]	Unincorporated Napa County Emissions (MT/yr)	Unincorporated Napa County Emissions ($MTCO_2e$/yr)
HFC-125	3,500	Fire Protection, Refrigerants	1359	3.65 X 10^{5}	0.9720	3,402
HFC-134a	1,430	Aerosols, Foams, Refrigerants	5676	1.52 X 10^{4}	4.0593	5,805
HFC-143a	4,470	Refrigerants	758	2.03 X 10^{5}	0.5419	2,422
HFC-152a	124	Aerosols, Refrigerants	4080	1.09 X 10^{4}	2.9176	362
HFC-227ea	3,220	Fire Protection, Aerosols	58	1.56 X 10^{6}	0.0416	134
HFC-236fa	9,810	Fire Protection, Refrigerants	10	2.59 X 10^{7}	0.0069	68
HFC-245fa	1,030	Foams, Solvents	466	1.25 X 10^{5}	0.3330	343
HFC-32	675	Refrigerants	673	1.80 X 10^{5}	0.4810	325
HFC-365mfc	794	Solvents	0	1.10 X 10^{8}	0.0003	0
HFC-43-10mee	1,640	Solvents, Aerosols	18	4.77 X 10^{7}	0.0127	21
PFC-14 (CF_4)	7,390	Fire Protection, Solvents	0	8.19 X 10^{9}	0.0002	2
Other PFC and PFE's	9,300	Solvents	0	6.40 X 10^{9}	0.0002	2
Sulfuryl Flouride[3]	4,090	Fumigant	5	NA	0.0950	389
Sulfur Hexaflouride[4]	22,800	Electrical Insulator	NA	NA	0.0091	207
				TOTAL	9.4709	13,481

Note: ARB= California Air Resources Board, DPR = California Department of Pesticide Regulation, GHG = greenhouse gas, MT = metric tons, CO2e = carbon dioxide equivalents, HFC = hydrofluorocarbons, IPCC = Intergovernmental Panel on Climate Change, NA = not applicable, PFC = perfluorinated compounds, PFE = perfluoroethane

1. Names of gases consistent with ARB's list of "Use of substitutes for ozone depleting substances." Sulfur hexafluoride is also accounted for in the State's GHG inventory. IPCC recently included sulfuryl fluoride in its list of GHGs, but it has not yet been included in the State's inventory. (IPCC 2013)
2. Assumes a 2% growth in per capita emissions from 2013 to 2014. This is based on historical year-to-year changes in per-capita emissions from compounds used in ARB category, "Use of substitutes for ozone depleting substances."
3. Calculations based on statewide emissions scaled to the unincorporated area by total electricity usage in the unincorporated area in 2014, not population.
4. Calculations based on actual consumption reports for Napa County from DPR and scaled to the unincorporated area by population.

Source: ARB 2015b, DPR 2013, IPCC 2007: Table 2.14, IPCC 2013; data compiled by Ascent Environmental in 2016.

As mentioned, HFC, PFC, and PFE emissions were calculated based on ARB's 2013 State GHG inventory. 2013 statewide per-capita emission factors were calculated from the most recent California 2013 inventory. These emission factors were then scaled to 2014 assuming that per capita emissions would increase by 2 percent between 2013 and 2014, consistent with recent historical trends. The final 2014 emission factors were applied to the known population of unincorporated County to obtain county-level emissions. As shown in Table 18 and following statewide trends, emissions of HFC-134a, HFC-143a, and HFC-125 account for 86 percent of the high-GWP gas sector in 2014. According the breakdown of these emissions in Table 19, most of these gases are used as refrigerants in the commercial and in refrigerated vehicles, such as trucks transporting perishables. Given the prominence of the wine industry in the County where wine, grape juice, and grapes may be transported in refrigerated trucks, the percent of refrigerants used in transportation could be higher than what is reported in Table 18 and 19.

Table 19 2014 Unincorporated Napa County GHG Inventory: HFC-125, HFC-134a, and HFC-143a emissions by Source and Application

Emissions Source and Application	Unincorporated Napa County Emissions ($MTCO_2e/yr$)
Commercial	**5,456**
Aerosols	102
Fire Protection	2
Foams	57
Refrigeration and Air Conditioning	5,294
Industrial	**1,908**
Aerosols	14
Fire Protection	1
Foams	332
Refrigeration and Air Conditioning	1,561
Residential	**1,776**
Aerosols	653
Foams	139
Refrigeration and Air Conditioning	983
Transportation	**2,490**
Aerosols	140
Refrigeration and Air Conditioning	2,350
Grand Total	**11,629**

Note: GHG = greenhouse gas, MT = metric tons, CO_2e = carbon dioxide equivalents, HFC = hydrofluorocarbon

Source: ARB 2015b, DPR 2013, IPCC 2007: Table 2.14, IPCC 2013; data compiled by Ascent Environmental in 2016.

With respect to SO_2F_2, the latest report from the California Department of Pesticide Regulation indicates that Napa County used 1,627 pounds of SO_2F_2 in 2013 (DPR 2013). A 2009 article in the Journal of Geophysical Research estimated that approximately one third of SO_2F_2 used in fumigation would be destroyed in the fumigation process (Mühle et.al. 2009). Assuming that all sulfuryl fluoride used in the County was for fumigation and scaling the resulting emissions by the unincorporated population in 2013 and population growth to 2014, total sulfuryl fluoride emissions from the unincorporated County in 2014 are estimated to be 389 $MTCO_2e$.

To estimate emissions from SF_6, an average statewide emissions factor (MT SF_6 per kWh) was calculated using ARB's 2013 GHG inventory that reported both total emissions and total associated electricity use. Using the total 2014 electricity use for the unincorporated area based on data provided by PG&E, total SF_6 emissions from the unincorporated County in 2014 are estimated to be 207 $MTCO_2e$.

2 GHG EMISSIONS FORECASTS TO 2020, 2030, AND 2050

Legislative-adjusted BAU emissions forecasts provide the County with an assessment of how the County's emissions would change over time without further action from the County. In addition to accounting for the County's growth, a legislative-adjusted BAU forecast accounts for legislative actions at the local, State, and federal levels that would affect emissions, such as through participation in MCE or regulatory requirements to increase vehicle fuel efficiency. These forecasts provide the County with the information needed to focus efforts on certain emissions sectors and sources that have the most GHG reduction opportunities. The selected future milestone years of 2020, 2030, and 2050 are generally based on the State's GHG reduction target years established in key State legislation and policies, including Assembly Bill (AB 32), Executive Order B-30-15, and Executive Order S-305.

BAU emissions forecasts, for most sectors, were based on predicted growth in existing demographic forecasts, including population, jobs, and household growth between 2014 and 2040 for Napa County, as shown in Table 20 below. The calculated growth rates were used as scaling factors and extrapolated for years other than 2040. These scaling factors were then applied to background calculations for a given emissions sector depending on what was most appropriate for the sector (e.g. household growth was used to scale residential energy use). For the land use change sector, forecasted emissions relied on the anticipated changes various land uses in the unincorporated County through 2050 based on the build-out of the County's 2008 General Plan. Any legislative adjustments were applied on top of the BAU forecasts.

Table 20 Napa County Demographic Forecasts

Input	2014	2040	Change from 2014
Napa County (Countywide)			
Households	49,859	56,312	6,453 (13%)
Population	136,550	158,792	22,242 (16%)
Employment	74,697	89,550	14,853 (20%)
Unincorporated Napa County Only			
Households	11,635	13,893	2,258 (19%)
Population	30,958	38,225	7,267 (23%)
Employment	17,320	19,503	2,183 (13%)

Source: Metropolitan Transportation Commission (Brazil, pers. comm., 2016a); data compiled by Ascent Environmental in 2016.

Legislative-adjusted forecasted emissions account for anticipated changes in future vehicle emissions factors and electricity emissions factors due to State and federal policies that would occur with or without County action, which can be referred to as "legislative adjustments" to the forecasts. These actions are reflected in forecasted emissions factors either provided by PG&E or assumed in EMFAC 2014.

The unincorporated County's BAU emissions, accounting for applicable legislative reductions, would decrease by 24 percent between 2014 and 2050, as shown in Table 21 and Figure 2. Figure 2 also shows the emissions trend that would occur without anticipated legislative reductions and accounting only for population, housing, and employment changes and the anticipated build-out of land uses. Without the legislative reductions, discussed above, emissions would be 51 percent higher in 2050 compared to BAU forecasts.

Table 21 Unincorporated Napa County Emissions Inventory and Legislative-adjusted BAU Forecasts ($MTCO_2e$/yr)

Sector	2014	2020	2030	2050
Building Energy	148,338	131,643	59,150	67,184
Water and Wastewater	11,277	11,858	12,959	14,335
On-Road Vehicles	125,711	112,854	84,846	85,735
Waste	83,086	62,345	56,711	48,854
Off-Road Vehicles and Equipment	42,508	45,164	49,592	58,474
Agriculture	52,198	52,521	53,588	57,446
Land Use Change	7,684	35,608	18,239	21,669
High-GWP Gases	13,481	11,828	13,169	15,867
Total	**484,283**	**463,821**	**348,253**	**369,563**
Percent Change from 2014 (%)	0	-4	-28	-24

Notes: BAU = Business as usual, CO_2e = carbon dioxide equivalents, NA = Not Available, GWP = global warming potential, MT = metric tons

Source: Ascent Environmental, 2016

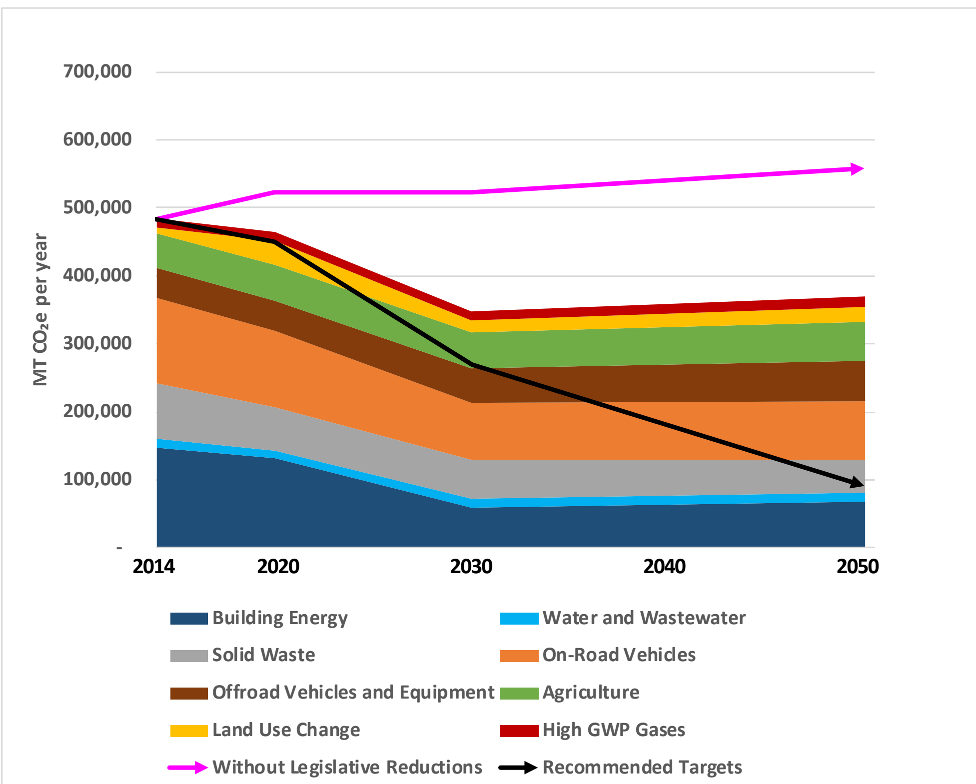

Figure 2: Unincorporated Napa County Legislative-Adjusted BAU Emissions Forecast by Sector

Note that the temporary increase in 2020 for the "Without Legislative Reductions" trend line is due to forecasted changes in land usage that are not associated with any legislative reductions. Otherwise this trend is solely due to demographic forecast data shown in Table 20.

Emissions forecasts are detailed for each sector and discussed below.

2.1 BUILDING ENERGY

Between 2014 and 2050, electricity and natural gas emissions in the unincorporated County, together representing the building energy sector, would decrease by 55 percent from 148,338 to 67,184 $MTCO_2e$ per year, with legislative adjustments and despite growth in the County's housing and employment levels. Table 22 shows the forecasted emissions from the building energy sector by customer class for 2014, 2020, 2030, and 2050.

Table 22 Unincorporated Napa County Electricity and Natural Gas Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Customer Class	2014	2020	2030	2050
Electricity Emissions				
Residential	116,340,405	120,241,375	68,572,790	81,817,108
Commercial	214,162,060	218,753,327	119,324,410	134,380,854
Industrial	5,280,679	5,391,267	2,935,240	3,297,896
Electricity Total	**335,783,143**	**344,385,969**	**190,832,440**	**219,495,859**
Natural Gas Emissions				
Residential	3,809,649	3,937,389	2,245,464	2,679,159
Commercial	8,626,723	8,811,666	4,806,541	5,413,034
Industrial[1]	0	0	0	0
Natural Gas Total	**12,436,372**	**12,749,054**	**7,052,005**	**8,092,193**
Total Building Energy Emissions				
Residential	47,984	42,497	19,436	22,914
Commercial	99,385	88,606	39,981	44,573
Industrial[1]	993	696	174	184
Electric Vehicles[2]	-25	-156	-441	-487
Building Energy Total	**148,338**	**131,643**	**59,150**	**67,184**
Percent Change from 2014 (%)	0	-11	-60	-55

Notes: $MTCO_2e$ = metric tons of CO_2 equivalent, PG&E=Pacific Gas and Electric

1. PG&E reported zero natural gas usage in the unincorporated area in 2013 from the industrial sector.

2. Electric vehicle emissions from electricity generation are already accounted for in the on-road transportation sector.

Source: Ascent Environmental 2016

Emissions from future electricity and natural gas use were estimated by multiplying anticipated energy use with forecasted emission factors. Future energy use was forecasted in two parts. First, energy use was scaled by the growth in housing units for residential energy use and by employment numbers for commercial and industrial energy use. Second, the level of energy use was adjusted to reflect California's energy efficiency targets. Electricity emission factors are also anticipated to decline based on current regulations, while natural gas emission factors stay constant using the same emission factors presented in Table 5. Table 23 summarizes the scaling factors and legislative reductions used to scale electricity use by customer type.

Table 23 Building Energy Emissions Forecast Methods and Legislative Reductions by Source

Customer Type	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Residential Electricity	Scaled by housing units	MCE 50% renewables baseline applied to 89% of energy use, based on current participation rates starting in early 2015. RPS scheduled targets applied to PG&E emission factors for 11% of customers assumed to opt out of MCE. Accounts for 2016 Title 24 energy efficiency gains for all new construction. Accounts for 50% renewable mix by 2050 for P&GE emission factors and 50% improvement in energy efficiency in all existing buildings starting in 2030, per SB 350.
Residential Natural Gas	Scaled by housing units	Accounts for 2016 Title 24 energy efficiency gains for new construction. Accounts for 50% improvement in energy efficiency in all existing buildings starting in 2030, per SB 350.
Commercial and Industrial Electricity	Scaled by employment	MCE 50% renewables baseline applied to 89% of energy use, based on current participation rates starting in early 2015. RPS scheduled targets applied to PG&E emission factors for 11% of customers assumed to opt out of MCE. Accounts for 2016 Title 24 energy efficiency gains for all new construction. Accounts for 50% renewable mix by 2050 for P&GE emission factors and 50% improvement in energy efficiency in all existing buildings starting in 2030, per SB 350.
Commercial and Industrial Natural Gas[1]	Scaled by employment	Accounts for 2016 Title 24 energy efficiency gains for new construction. Accounts for 50% improvement in energy efficiency in all existing buildings starting in 2030, per SB 350.

Notes: BAU = business as usual, RPS = Renewable Portfolio Standard, MCE= Marin Clean Energy, PG&E = Pacific Gas and Electric, SB = Senate Bill

1. Industrial natural gas was not provided by PG&E and was assumed to be included in commercial natural gas.

Source: Ascent Environmental, 2016

The assumptions behind the adjustments to energy efficiency and future electricity emission factors are described below.

2.1.1 Electricity Emission Factors

Emissions from the building energy sector would see gradual declines into the future without additional County action, even with population increase, due to local and State measures already in place. As mentioned previously, MCE is a CCA that began servicing unincorporated County in February 2015. As part of MCE's service, MCE automatically provides customers within its service area with 50 percent renewable electricity, although customers are allowed to opt out of MCE's service or pay into MCE's "Dark Green" program that would allow for a higher percentage renewable mix. Those that opt out would remain under PG&E's electricity service, which is currently 27 percent renewable (MCE 2015a). According to MCE's Integrated Resource Plan, MCE plans to increase the minimum renewable energy supply of the program from 50 to 80 percent by 2025 (MCE 2015b).

With respect to BAU forecasts, it is assumed that the unincorporated County would continue to participate in the MCE program. This assumes that the unincorporated County's current opt-out rate would remain at approximately 11 percent into future years (MCE 2015b). Thus, the BAU forecast estimates that 50-percent-renewable electricity emission factors would be applied to 89 percent of future electricity use in unincorporated County buildings. The remaining 11 percent of electricity use would use PG&E emission factors that are scheduled to reach a 33 percent renewable mix by 2020 and 50 percent by 2050, pursuant to statewide legislation of the Renewable Portfolio Standard and SB 350.

PG&E anticipates that by 2020, the utility's CO_2 emission factor will be 0.131 $MTCO_2$ per MWh (PG&E 2015b). This takes into account the utility's achievement of the State's RPS goal to source 33 percent of electricity generation from renewables by 2020. Assuming emission factors from non-renewable sources remain the same, a 50 percent and 80 percent renewable mix would have emissions of 0.127 and 0.051 $MTCO_2$ per MWh, respectively. CH_4 and N_2O electricity emission factors in future years are assumed to be reduced from 2014 levels proportional to the anticipated change in CO_2 emission factors.

2.1.2 Energy Efficiency

California has two major policies that would affect the energy efficiency of buildings in future years. The State's Title 24 Building Energy Efficiency Standards and SB 350 would affect energy efficiency rates in new construction and existing buildings, respectively. The 2016 Title 24 standards were adopted in December 2015 and will go into effect January 2017. The California Energy Commission (CEC) estimates that new residential buildings built to these standards would be 28 percent more efficient than buildings built to the current 2013 Title 24 standard. Relative savings for non-residential buildings was not readily available from the CEC; thus, it was assumed that non-residential buildings built to 2016 standards would have similar improvements as the residential standards. (CEC 2015).

SB 350, in addition to targeting a 50 percent renewable mix in California electricity by 2030, targets a cumulative doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030 with annual targets established by the CEC. SB 350's energy efficiency goals are applicable to both existing building stock and new construction, but would have the most impact on existing building stock.

Forecasts of future building energy use account for both Title 24 and SB 350 policies. It is assumed that all new construction taking place between 2014 and 2050 would have energy efficiencies 28 percent better than current energy usage rates (i.e., energy use per household and employment). Although this method does not exactly reflect improvements from 2013 Title 24 standards, this method is a conservative approach as a 28 percent reduction from current energy usage rates would result in more energy use than a 28 percent reduction from building built to the 2013 Title 24 standard. In addition, it is assumed that all existing building stock (i.e., buildings built before 2015) would continue to operate through 2050 and would use 50 percent less energy starting in 2030. The forecasted energy efficiency improvements in existing building stock are meant to reflect implementation of SB 350 energy efficiency goals met by 2030. As a conservative assumption, estimated energy efficiency levels in existing buildings are assumed to stay constant from 2030 through 2050.

2.2 WATER AND WASTEWATER

Between 2014 and 2050, water- and wastewater-related emissions in the unincorporated County would increase by 27 percent from 11,277 to 14,335 $MTCO_2e$ per year, with legislative adjustments and despite a 44 percent increase in population over the same period[2]. This change reflects an increase in water consumption proportional to population growth in the unincorporated County in combination with lower electricity emissions factors related to the MCE, RPS, and SB 350 legislative actions described in Section

[2] In the April 2016 version of this memorandum, the totals incorrectly double counted for electricity from wastewater treatment. This memorandum removes the double counting and corrects the total emissions from water and wastewater activity.

2.1.1. Table 24 shows the forecasted emissions from each water supply activity source for 2014, 2020, 2030, and 2050. Forecasted population growth in the unincorporated County and electricity emissions factors are available in Table 5 and Section 2.1.1.

Table 24 Unincorporated Napa County Water and Wastewater Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Activity	2014	2020	200	2050
Imported Water Conveyance	88	66	65	59
Wastewater (Domestic)	6,102	6,443	7,151	8,540
Wastewater (Wine Making)	5,087	5,348	5,743	5,737
Total	**11,277**	**11,858**	**12,959**	**14,335**
Percent Change from 2014 (%)	0	5	15	27

Note: There was insufficient information on stormwater energy use for the unincorporated County. Thus, stormwater energy use and related emissions were excluded.

GHG = greenhouse gas, $MTCO_2e$ = metric tons of CO_2 equivalent

Source: Ascent Environmental 2016

Most of the electricity use for water imports, wastewater conveyance, and wastewater treatment occurs outside of the unincorporated County in the incorporated Napa cities. Although MCE currently does not serve incorporated areas in Napa County, many cities in the County have expressed interest in joining MCE in the future (Choi, pers. comm., 2016). In fact, the City of Calistoga currently already participates in MCE's program (Kirn pers. comm., 2015). Because City applications for MCE are not yet public, forecasts for the water and wastewater sector assume electricity emissions factors consistent with PG&E's progress towards RPS and SB 350 targets, except for water conveyance from the City of Calistoga and wastewater treatment at wineries within the unincorporated County that would follow MCE's targets.

Table 25 summarizes the scaling factors and legislative reductions used to scale water and wastewater activity.

Table 25 Water and Wastewater Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Imported Water Conveyance	Scaled by population	Assumes only City of Calistoga has joined MCE's program with at least a 50% renewable mix. All other water providers outside the unincorporated area are assumed to follow the RPS and SB 350 target schedule.
Wastewater Treatment (Domestic)	Scaled by population	Assumes electricity use at all treatment plants outside the unincorporated area follow the RPS and SB 350 target schedule.
Wastewater Treatment (Wine Making)	Scaled by vineyard acres	Assumes electricity use at all treatment plants are located in the unincorporated area and follow MCE, RPS, and SB 350 target schedule.

Notes: RPS = Renewable Portfolio Standard, MCE= Marin Clean Energy, PG&E = Pacific Gas and Electric, SB = Senate Bill. "Target schedule" refers to a utility or policy's renewable energy target by milestone year.

Source: Ascent Environmental, 2016

2.3 SOLID WASTE

Between 2014 and 2050, solid waste emissions in the unincorporated County would decrease by 41 percent from 83,086 to 48,854 $MTCO_2e$ per year, with legislative adjustments and despite growth in unincorporated County's population and employment levels. Table 26 shows the forecasted emissions from the solid waste sector by emissions source for 2014, 2020, 2030, and 2050.

Table 26 Unincorporated Napa County Solid Waste Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Source	2014	2020	2030	2050
Solid Waste	19,961	3,537	3,938	4,744
Waste-In-Place	63,125	58,809	52,773	44,109
Total	**83,086**	**62,345**	**56,711**	**48,854**
Percent Change from 2014 (%)	0	-25	-32	-41

Note: MT CO_2e = metric tons of CO_2 equivalent

Source: Ascent Environmental, 2016

The forecasts shown in Table 26 account for the decay rate of waste-in-place at landfills located within the unincorporated County, California's 75 percent waste diversion target effect on per-capita waste disposal rates, and the anticipated population growth affecting overall waste disposal in the unincorporated County. The forecasts also assume that current operational LFG capture systems will continue to operate into the future.

With respect to solid waste generation, CalRecycle established a target pursuant to AB 341 (Chapter 476, Statutes of 2011) to achieve a statewide waste diversion rate of 75 percent by 2020, or 2.7 pounds of waste per resident per day (lb/resident/day). Emissions forecasts for this sector assume the County would reduce its disposal rate from 4.1 lb/resident/day to the State's target of 2.7 lb/resident/day by 2020, a 34 percent reduction from 2014 (CalRecycle 2015, CalRecycle 2012: 7). Future years would see additional open landfills adopting LFG capture systems. This includes Potrero Hills Landfill to which the unincorporated County sent 98 percent of its waste in 2014. Potrero Hills Landfill is anticipated to begin LFG capture 2016, according to EPA reports (EPA 2015c).

With respect to waste-in-place emissions, ASCL and Clover Flat Landfill are assumed to continue current LFG capture and flaring operations into the future. Because the landfill is currently closed, fugitive methane emissions from ASCL are expected to decrease over time as the finite amount of organic material decomposes. EPA's first order decay model, Landfill Gas Emissions Model (LandGEM Version 3.02), was used to scale future emissions from both unincorporated County landfills, based on the landfill open and past and future closure dates and average annual tonnage received by the landfill.

Table 27 summarizes the methods and legislative reductions used to forecast emissions from the solid waste sector.

Table 27 Solid Waste Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Solid Waste	Waste tonnage scaled by population.	Incorporates completion dates of near term LFG projects, including Potrero Hills Landfill. Assumes California's 75% waste diversion goal would be achieved in Napa by 2020.

Table 27 Solid Waste Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Waste-in-Place	Emissions scaled by population for open landfills. For both open and closed landfills, FOD model was used to scale methane emissions based on average annual tonnage and a given landfill's open and closure dates.	No additional legislative reduction.

Notes: FOD = first order decay, LFG = Landfill Gas

Source: Ascent Environmental, 2016

2.4 ON-ROAD VEHICLE FLEET

Between 2014 and 2050, GHG emissions from on-road transportation in the unincorporated County would decrease by 32 percent from 125,711 $MTCO_2e$ to 85,735 $MTCO_2e$, accounting for VMT growth forecasted by MTC and future vehicle emission factors modeled in EMFAC2014. Table 28 show the forecasted emissions from the on-road transportation sector by fuel type for 2014, 2020, 2030, and 2050. Consistent with the inventory, annual VMT forecasts provided by MTC were multiplied by EMFAC2014 future emission factors. Emissions from electricity use in electric vehicles were quantified using the same methods used for the building energy forecasts.

Table 28 Unincorporated Napa County On-Road Vehicle Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Fuel Type	2014	2020	2030	2050
Gasoline	94,990	82,988	56,216	54,384
Diesel	30,696	29,710	28,189	30,864
Electric	25	156	441	487
Total	**125,711**	**112,854**	**84,846**	**85,735**
Percent Change from 2014 (%)	0	-10	-33	-32

Notes: Only total VMT was provided by MTC. The distribution of annual VMT by fuel type was based on the distribution of VMT by fuel type in EMFAC2014 for Napa County for each milestone year.

$MTCO_2e$ = metric tons of CO_2 equivalent; MTC = Metropolitan Transportation Commission; VMT = vehicle miles traveled

Source: **Metropolitan Transportation Commission (Brazil, pers. comm., 2016a)**, CARB 2014c, Ascent Environmental, 2016

Annual VMT forecasts are provided in Table 29 below by fuel type.

Table 29 Unincorporated Napa County VMT Forecasts (2014-2050) (Annual Vehicle Miles Traveled)

Fuel Type	2014	2020	2030	2050
Gasoline	238,043,173	248,829,425	241,326,238	252,573,510
Diesel	23,527,464	23,154,140	22,733,499	24,702,585
Electric	450,077	4,168,201	25,705,923	30,134,106
Total	**262,020,714**	**276,151,766**	**289,765,660**	**307,410,200**

Notes: Only total VMT was provided by MTC. The distribution of annual VMT by fuel type was based on the distribution of VMT by fuel type in EMFAC2014 for Napa County for each milestone year.

VMT = vehicle miles traveled

Source: Metropolitan Transportation Commission (Brazil, pers. comm., 2016a), CARB 2014c, Ascent Environmental, 2016

With respect to the legislative adjustments included in this forecast, State and federal policies and associated regulations incorporated in the on-road vehicle emission forecasts include:

- **Tractor-Trailer Greenhouse Gas (TTGHG) Regulation (State):** Establishes stricter fuel efficiency standards in heavy-duty tractors by requiring EPA certification and low rolling resistance tires, reducing GHG emissions.
- **Pavley Clean Car Standards (State):** Establishes GHG emission reduction standards for model years 2009 through 2016 that are more stringent than federal corporate average fuel economy (CAFE) standards.
- **Advanced Clean Cars (State):** Establishes GHG emission reduction standards for model years 2017 through 2025) are more stringent than CAFE standards (State)
- **Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles (federal):** Establishes fuel efficiency standards for medium and heavy-duty engines and vehicles.

These policies are already included in EMFAC's emission factor estimates and forecasts. It should be noted that the Low Carbon Fuel Standard regulation was excluded in EMFAC 2014 forecasts because most of the emissions benefits originate from upstream fuel production.

Table 30 summarizes the scaling factors and legislative reductions used to scale on-road vehicle activity.

Table 30 On-Road Vehicle Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
On-Road Vehicle Miles Traveled	Estimated by the Metropolitan Transportation Commission	EMFAC emission factors considerations include ACC, Pavley, TTGHG, and fuel efficiency standards for medium- and heavy-duty vehicles.

Notes: ACC = Advanced Clean Cars, EMFAC = Emissions FACtor Model, TTGHG = Tractor-Trailer Greenhouse Gas

Source: Ascent Environmental, 2016

2.5 OFF-ROAD VEHICLES

Between 2014 and 2050, emissions associated with off-road vehicles in the unincorporated County would increase by 38 percent from 42,508 to 58,474 $MTCO_2e$ per year, consistent with the County's growth. Table 31 shows the forecasted emissions from the off-road vehicles sector by equipment type for 2014, 2020, 2030, and 2050.

Table 31 Unincorporated Napa County Off-Road Vehicles Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Equipment Type	2014	2020	2030	2050
Pleasure Craft	31,440	33,736	37,562	45,258
Construction and Mining Equipment	6,575	6,766	7,085	7,712
Transport Refrigeration Units	1,420	1,461	1,530	1,666
Industrial Equipment	1,212	1,247	1,306	1,422
Light Commercial Equipment	899	925	969	1,054

Table 31 Unincorporated Napa County Off-Road Vehicles Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Equipment Type	2014	2020	2030	2050
Lawn and Garden Equipment	568	610	679	818
Recreational Equipment	325	349	389	468
Oil Drilling	34	35	37	40
Locomotives	20	20	20	20
Entertainment Equipment	14	15	16	17
Railyard Operations	0	0	0	0
Total	**42,508**	**45,164**	**49,592**	**58,474**
Percent Change from 2014 (%)	0	6%	17%	38%

Note: $MTCO_2e$ = metric tons of CO_2 equivalent

Source: Ascent Environmental, 2016

Forecasted emissions from the off-road vehicle are based on MTC's forecasted changes in employment and population. Although OFFROAD 2007 incorporates regulatory actions such as reformulated fuels and more stringent emissions standards, the model was also developed before the recession and has population forecasts that would not be consistent with current estimates from the MTC. As such, current off-road emission factors are assumed to stay constant into the future and total emissions are scaled by either job or population growth depending on the off-road vehicle type. Table 32 summarizes the methods used to forecast emissions from land use change.

Table 32 Off-Road Vehicles Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Pleasure Craft	Scaled by population	No additional legislative reductions.
Construction and Mining Equipment	Scaled by employment	No additional legislative reductions.
Transport Refrigeration Units	Scaled by employment	No additional legislative reductions.
Industrial Equipment	Scaled by employment	No additional legislative reductions.
Light Commercial Equipment	Scaled by employment	No additional legislative reductions.
Lawn and Garden Equipment	Scaled by population	No additional legislative reductions.
Recreational Equipment	Scaled by population	No additional legislative reductions.
Oil Drilling	Scaled by employment	No additional legislative reductions.
Locomotives[1]	Not scaled	No additional legislative reductions.
Entertainment Equipment	Scaled by employment	No additional legislative reductions.
Railyard Operations	Scaled by employment	No additional legislative reductions.

1. Locomotives are not included in OFFROAD2007 and were calculated separately based on data from Napa Valley Wine Train.

Source: Ascent Environmental, 2016

2.6 AGRICULTURE

Between 2014 and 2050, emissions associated with land use change in the unincorporated County would increase by 10 percent from 52,198 to 57,446 $MTCO_2e$ per year. Table 33 shows the forecasted emissions from the agriculture sector by source for 2014, 2020, 2030, and 2050.

Table 33 Unincorporated Napa County Agriculture Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

Source	2014	2020	2030	2050
Soil Management	3,797	3,889	4,108	4,606
Livestock	15,174	14,600	13,527	12,533
Farm Equipment	33,228	34,032	35,953	40,307
Total	**52,198**	**52,521**	**53,588**	**57,446**
Percent Change from 2014 (%)	0	1	3	10

Note: $MTCO_2e$ = metric tons of CO_2 equivalent

Source: Ascent Environmental, 2016

Forecasted emissions from the agricultural sector are based on the County's forecasted changes in agricultural acreages from the County. Agricultural emissions are directly scaled by the anticipated change in acreages, shown in Table 33. Table 34 summarizes the methods used to forecast emissions from agriculture.

Table 34 Agriculture Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
Soil Management	Scaled by change in all cropland including vineyards as provided by the County.	
Livestock	Scaled by change in rangeland forecasts as provided by the County from 2005 through 2030 and 2050 changes in rangeland extrapolated from anticipated growth between 2005 and 2030.	
Farm Equipment	Scaled by change in all cropland including vineyards	Scaled by change in all cropland including vineyards

Source: Ascent Environmental, 2016

2.7 HIGH-GWP GASES

Between 2014 and 2050, high-GWP emissions in the unincorporated County would increase by 18 percent from 13,481 to 15,867 $MTCO_2e$ per year, with legislative adjustments and growth in unincorporated County's population and employment levels. Table 35 shows the forecasted emissions from the high-GWP sector by gas for 2014, 2020, 2030, and 2050.

Table 35 Unincorporated Napa County High-GWP Emissions Forecasts (2014-2050) ($MTCO_2e$/yr)

High-GWP Gas	2014	2020	2030	2050
HFC-125	3,402	2,608	2,903	3,498
HFC-134a	5,805	6,229	6,935	8,356
HFC-143a	2,422	1,454	1,618	1,950
HFC-152a	362	388	432	521
HFC-227ea	134	112	124	150
HFC-236fa	68	19	21	25
HFC-245fa	343	368	410	494
HFC-32	325	348	388	467
HFC-365mfc	0	0	0	0
HFC-43-10mee	21	22	25	30
PFC-14	2	1	1	1
Other PFC and PFE	2	0	1	1
SF_6	389	255	284	342
S_2O_2	207	24	27	33
Total	**13,481**	**11,828**	**13,169**	**15,867**
Percent Change from 2014 (%)	0	-12	-2	18

Notes: $MTCO_2e$ = metric tons of CO_2 equivalent, GWP = global warming potential, HFC = hydrofluorocarbon, PFC = perfluorocarbon, PFE = perfluorocarbon ethers, SF_6= sulfur hexafluoride, S_2O_2 = sulfuryl fluoride

Source: Ascent Environmental, 2016

A few current and potential policies could affect emissions of high-GWP gases included in this sector. At the federal level, effective on August 15, 2015, the EPA enacted a national ban on a variety of HFC emissions with very high-GWP values (many over 2,500) under 40 CFR Part 82. ARB estimates that this ban would reduce California's HFC emissions by ten percent annually below current emission rates by 2025 (CARB 2015c: 58). At the State level, ARB's current program in reducing fluorinated gases (F-gases), including HFCs, is the Refrigerant Management Program. This program requires facilities with refrigeration systems to inspect and repair leaks, maintain service records, and in some cases, report refrigerant use (CARB 2015c: 58). ARB is also considering additional reduction measures to reduce high-GWP gases in the state. ARB developed a draft paper in September 2015 that addresses the State's strategy to reduce emissions of short-lived climate pollutants, including F-gases. The draft strategy estimates that the additional State reduction measures could reduce F-gases by 40 percent below forecasted 2030 emissions that take into account current federal and State regulations (CARB 2015c). ARB is also considering developing regulatory requirements to use refrigerants with GWP values less than 150 in new commercial refrigeration systems no later than 2025.

Despite the State's proposed strategies, reduction targets for F-gases have not yet been adopted. Thus, the BAU forecast for this sector only applies EPA's current ban and assumes the ban would stay in place through 2050. However, it is speculative as to what gases would be used to replace the banned high-GWP gases. For the sake of simplifying calculations, it is assumed that high-GWP gases used in the County in future years would have GWP values of no more than 2,500 and overall gas usage would grow proportionally with population.

Table 36 summarizes the scaling factors and legislative reductions used to forecast high-GWP emissions by activity.

Table 36 High-GWP Emissions Forecast Method Summary

Source	Forecast Methods	
	Scaling Factors	Applied Legislative Reductions
All High-GWP Gases	Scaled by population	Assumes federal ban on refrigerants with GWP higher than 2,500. Assumes that refrigerants would have a GWP no higher than 2,500 starting from 2020.

Notes: GWP = global warming potential

Source: Ascent Environmental, 2016

2.8 LAND USE CHANGE FORECASTS

Between 2014 and 2050, emissions associated with land use change in the unincorporated County would increase by 182 percent from 7,684 to 21,699 $MTCO_2e$ per year, accounting for the build out of the County anticipated under the County's current General Plan. This increase in emissions is considerably higher than other sectors and is primarily due to forecasted land use changes under the General Plan. This method is more accurate than scaling changes by historical trends or population. Table 37 shows the forecasted emissions from the land use change waste sector by land use type for 2014, 2020, 2030, and 2050.

Table 37 Unincorporated Napa County Land Use Change Emissions[1] Forecasts (2014-2050) ($MTCO_2e$/yr)

Land Use Type	2014	2020	2030	2050
Coniferous Forest	669	10,602	965	3,943
Croplands (Not Vineyards)[2]	1,508	1,508	1,508	1,508
Grasslands	272	3,394	1,629	1,440
Oak Woodlands	4,452	12,155	7,510	10,089
Riparian Woodlands	494	559	669	888
Shrublands	973	9,212	7,791	5,348
Vineyards	-684	-1,823	-1,835	-1,547
Total	**7,684**	**35,608**	**18,239**	**21,669**
Percent Change from 2014 (%)	0	363	137	182

Notes: $MTCO_2e$ = metric tons of CO_2 equivalent

1 "Emissions" refers to the lost carbon sequestration or stored carbon associated with land use change.

Source: Ascent Environmental, 2016

The emissions forecasting method for the land use change sector differs somewhat from the land use change inventory method. As in the inventory, the methods used for land use change emissions forecasts account for annual net changes in carbon storage. However, the land use change forecast method differs from the inventory method in that it accounts for the cumulative effect of lost sequestration potential from the net losses in vegetation since 2014, the baseline inventory year. For example, removing a 40-year old tree that can live for 100 years removes the potential annual carbon sequestration that would occur for another 60 years if the tree is not removed. Over time, as the total number of trees decline, fewer trees sequester carbon; thus, the effect of land use change over time is cumulative. This cumulative lost sequestration potential is not applied to other smaller vegetation types that have much shorter lifetimes, such as grasslands and croplands.

These vegetation types are assumed to have lifespans of one year or less and, at the end of their lives, would naturally release sequestered carbon through decomposition or consumption.[3]

Fundamentally, emissions forecasts from land use change are based on anticipated land use changes and associated land cover types under buildout of the County's 2008 General Plan. Guided by the General Plan, the County provided acreage forecasts of anticipated conversions of natural lands to vineyards or urban uses from 2005 to 2020 and 2030, as shown in Table 38.

Table 38 Projected Acres of Vineyard Development by Lost Land Cover Type in Unincorporated Napa County, 2005-2020 and 2005-2030

Land Cover Type	2005 - 2020	2005 - 2030
Forest	319	322
Woodland	778	1,217
Shrub	1,188	2,847
Grassland	2,097	3,832
Wetland	21	75
Other	104	281
Total	**4,507**	**8,574**

Note: As a conservative assumption, woodland is assumed to refer to oak woodlands.

Source: Hade, pers. comm., 2015b

Using the data provided in Table 38 above, an estimate of forecasted changes in land use by land cover type was developed for 2020 and 2030 and extrapolated for 2050. For land use types not included in Table 38, land use forecasts were based on historical trends between 2005 and 2015, shown in Table 15. Land use forecasts for 2020, 2030, and 2050 for each land use type is shown in Table 39 below.

Table 39 Forecasted Acres of Land Cover in Unincorporated Napa County by Type and Year

Land Cover Type	2020	2030	2050[1]
Grasslands	46,747	45,012	41,946
Chaparral / Shrublands	105,002	103,343	101,065
Oak Woodlands	159,368	158,929	157,956
Riparian Woodlands [2]	7,803	7,780	7,734
Coniferous Forests	42,150	42,147	41,889
Croplands (not vines) [2]	16,876	15,065	11,445
Vineyards	54,824	58,891	65,749
Wetlands	3,007	3,007	1,149
Rock Outcrops / Other [2]	42,152	44,856	50,263
Developed Areas [2]	28,383	28,226	27,912
Total	**506,311**	**507,255**	**507,109**

Notes: Unless otherwise noted, forecasted land uses were based on data provided in Table 38 which was added to the 2005 values shown in Table 15.

1. All 2050 values were extrapolated from trends between 2020 and 2030.
2. Values extrapolated from trends between 2005 and 2015, as shown in Table 15.

Source: Ascent Environmental 2016

[3] In the previous April 2016 version of this memorandum, land use change forecasts were based on year-to-year changes in carbon storage and carbon sequestration. It did not account for annual sequestration losses from a cumulative loss of trees. The revised method in the current version would result in increasing "emissions" from this sector further into the future as more forest lands and woodlands are converted to vineyards.

Future emissions from land use change for each milestone year was estimated by summing for each land use type 1) the year-to-year carbon storage losses and 2) year-to-year carbon sequestration losses from non-forest land uses or cumulative carbon sequestration losses from forest/woodland land lost between 2014 and the milestone year. The per-acre carbon storage and sequestration rates are the same as the ones used in the inventory (see Table 16). Table 40, below, shows the forecasted annual and cumulative acreage and tree losses alongside the estimated net losses in carbon storage and cumulative sequestration potential.

Table 40 Unincorporated Napa County GHG Inventory: Lost Carbon Stock and Sequestration Potential from Land Use Change in 2020, 2030, and 2050

Land Use Type[1]	Change in acres from previous year	Change in acres (number of trees) since 2014	Lost carbon storage due to land use change from previous year (MT CO_2)	Loss in annual carbon sequestration potential (MT CO_2)	Total net emissions (MT CO_2)
2020					
Coniferous Forest	-56	-289 (-40,134)	9,699	903	10,602
Croplands (Not Vineyards)[2]	-181	-1,267 (0) [3]	1,455	54	1,508
Grasslands	-361	-1,865 (0) [3]	3,394	0	3,394
Oak Woodlands	-87	-504 (-76,527)	11,138	1,017	12,155
Riparian Woodlands	-2	-16 (-3,547)	483	77	559
Shrublands	-196	-1,022 (0) [3]	9,212	0	9,212
Vineyards	404	2,933 (0) [3]	-1,799	-24	-1,823
Total	**-480**	**-2,031 (-120,208)**	**33,581**	**2,026**	**35,608**
2030					
Coniferous Forest	0	-292 (-40,555)	52	913	965
Croplands (Not Vineyards)[2]	-181	-3,077 (0) [3]	1,455	54	1,508
Grasslands	-174	-3,600 (0) [3]	1,629	0	1,629
Oak Woodlands	-44	-942 (-143,119)	5,609	1,901	7,510
Riparian Woodlands	-2	-39 (-8,614)	483	186	669
Shrublands	-166	-2,682 (0) [3]	7,791	0	7,791
Vineyards	407	6,999 (0) [3]	-1,810	-24	-1,835
Total	**-160**	**-3,633 (-192,287)**	**15,209**	**3,030**	**18,239**
2050					
Coniferous Forest	-13	-550 (-76,385)	2,223	1,719	3,943
Croplands (Not Vineyards)[2]	-181	-6,698 (0) [3]	1,455	54	1,508
Grasslands	-153	-6,666 (0) [3]	1,440	0	1,440
Oak Woodlands	-49	-1,916 (-290,916)	6,224	3,865	10,089
Riparian Woodlands	-2	-85 (-18,747)	483	406	888
Shrublands	-114	-4,959 (0) [3]	5,348	0	5,348
Vineyards	343	13,858 (0) [3]	-1,527	-20	-1,547
Total	**-169**	**-7,015 (-386,048)**	**15,646**	**6,023**	**21,669**

Notes: Land use change based on acreages provided by Napa County. Values may not sum due to rounding. MT = metric tons; CO_2 = carbon dioxide; GHG = greenhouse gas

1. Developed areas, rocky outcrops, and wetlands are assumed to have no carbon storage or sequestration potential and are not included here. Carbon sequestrations and storage potential of wetlands vary greatly depending on location, ecosystem, and other factors. Factors for wetlands unique to Napa County are not available and are assumed to be zero.

2. "Cropland (Not Vineyards)" includes the County mix of olives, vegetables, and hay as reported in the 2014 Napa County Crop Report.

3. Cumulative acreage changes for non-forested land uses are presented for informational purposes only and are not used to quantify the change in carbon sequestration potential due to the shorter lifetimes of vegetation on these lands compared to trees.

Source: Hade, pers. comm., 2015b; data compiled by Ascent Environmental, 2016.

Table 41 summarizes the methods used to forecast emissions from land use change.

Table 41 Land Use Change Emissions Forecast Method Summary

Source	Forecast Method
Land Use Change	Emissions forecasts are based on forecasted changes in all land use types as provided by the County. County provided forecasted land use changes for land cover types lost to vineyard development from 2005 to 2020 and 2030. County also provided 2015 land use cover estimates. Where forecast data were not available, future land cover estimates were extrapolated from available land use data between 2005 and 2015 or between 2015 and 2030. Emissions forecasts account for the cumulative effect of lost carbon sequestration potential from trees lost between 2014 and future forecasted years. Lost carbon sequestration potential from non-forested land use types and carbon storage losses are accounted for based on changes in land use from year-to-year.
Source: Ascent Environmental, 2016	

The land use change forecast method does not separately account for individual project-level losses in trees or native vegetation; however, the cumulative effect of land use changes from individual projects that are within the envelope of anticipated land use changes associated with General Plan buildout means that future project-level impacts are generally captured in the analysis.

The land use change forecast method assumes that all future development assumed under the General Plan would result in a complete loss of all existing vegetation on a typical project site. This is a conservative, worst-case assumption and differs from typical losses sustained in actual individual development projects, in which not all existing vegetation is typically permitted for removal due to open space conservation, mitigation, and buffering requirements.

2.9 DISCUSSION

As discussed above and shown in Figure 2 and Table 21, the unincorporated County's legislative-adjusted BAU emissions would decrease by 24 percent between 2014 and 2050. This reduction is a result of multiple legislative regulations, local actions, and County-level land use planning in combination with overall residential and commercial growth in the County.

Between 2014 and 2020, emissions would decrease by four percent although population would grow by about one percent during the same time. This decrease would be due to several near term legislative actions including:

- The unincorporated County's membership in MCE starting from February 2015 which provides electricity with a 50 percent renewable mix (compared to 33 percent under PG&E) by 2020,
- New 2016 Building Energy Efficiency standards, improving energy efficiency in new buildings,
- The inception of a new LFG collection facility at Potrero Hills Landfill, which take 98 percent of the unincorporated County's waste, starting in early 2016,
- Reductions in vehicle emission factors forecasted in EMFAC 2014 (e.g. fuel efficiency improvements, 2 percent EV usage by 2020), and
- Reduced carbon sequestration from forecasted reductions in forest land, oak woodlands, and shrub lands by 2020, resulting in an increase in "emissions" from land use change.

From 2020 to 2030, emissions would decrease by 28 percent below 2014 levels alongside a two percent population increase from 2014. This decrease would be due to a combination of continued and future planned legislative actions including:

- A 50 percent improvement in energy efficiency in existing buildings by 2030 as targeted under SB 350, considerably decreasing energy use in existing buildings,
- An increase in MCE's renewable mix to 80 percent by 2030, further reducing electricity related emissions,
- Non-MCE participants reaching the SB 350 schedule of meeting a 50 percent renewable mix goal by 2050 (this equates to 39 percent by 2030), and
- Reductions in vehicle emission factors forecasted in EMFAC 2014 (e.g. fuel efficiency improvements, 9 percent EV usage by 2030),

From 2030 to 2050, fewer new legislative actions are assumed to be in place, due to the lack of available information about potential State or federal actions beyond 2030. Thus, the County's population growth would begin to overtake any reductions afforded by existing legislative reductions. The main legislative reductions beyond 2030 would come from SB 350's target of a minimum 50 percent renewable mix for all electricity providers, which would apply to non-MCE participants. Other minor additional reductions would be in forecasted improvements in vehicle fuel economy and increased VMT share of EVs (10 percent by 2050), as estimated in the EMFAC2014 model. Other previous legislative actions would continue to apply into the future, but would not outpace growth in population, employment, and housing.

From the sector perspective, emissions from the on-road vehicle sector would replace building energy as the largest emissions sector in 2050, accounting for 23 percent of the County's emissions. From 2014 to 2050, building energy would transition from accounting for 31 percent of total emissions to 18 percent. Emissions from solid waste and agriculture would contribute equally to the inventory, between 13 and 16 percent per sector. Emissions from high-GWP gases, off-road equipment, and agriculture would remain steady between 2030 and 2050. Emissions from lost carbon sequestration would peak in 2020 due to forecasted land use changes by 2020 as natural land cover types would be converted to vineyards. Land use changes after 2020 would be more gradual, but the cumulative effect of lost trees over time tends to increase emissions from this sector. Thus, future legislative-adjusted BAU emissions would decrease through 2050, even though total population would increase by 23 percent between 2014 and 2050.

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Appendix B

Technical Memo #2 - Greenhouse Gas Emissions Reduction Targets and Gap Analysis

Memo

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Date: February 13, 2019

To: David Morrison, Jason Hade (County of Napa)

From: Honey Walters, Erik de Kok, Brenda Hom

Subject: **Napa County Climate Action Plan – Revised Technical Memorandum #2: Greenhouse Gas Emissions Reduction Targets, Measures, and Gap Analysis**

INTRODUCTION

This technical memorandum summarizes the results of the quantitative GHG reduction measures "gap analysis" process for the Napa County Climate Action Plan (CAP). This version of the memo includes revisions to GHG reduction measures since the revised gap analysis results were published in the Revised Draft CAP and released for public review in July 2018. Revisions to greenhouse gas (GHG) reduction measures are based on comments from the public and County staff, and additional revisions to GHG reduction measures proposed by staff in 2018 that will be incorporated into the Second Revised Draft CAP to be released for public review in early 2019.

The purpose of the gap analysis is two-fold: 1.) to ensure that all GHG-reducing actions to be incorporated in the CAP will set the community on course to meet the County's proposed GHG reduction targets; and 2.) to ensure that specific actions and associated GHG emissions reduction calculations are defensible and appropriate for the purposes of California Environmental Quality Act (CEQA) streamlining benefits for proposed projects in the future.

The gap analysis process accounts for several steps in the climate action planning process, which are listed below and addressed in subsequent sections.

1. Summary of 2014 community-wide GHG emissions inventory;

2. Summary of the GHG emissions projections for 2020, 2030 and 2050;

3. Identification and evaluation of recommended GHG emissions reduction targets for 2020 and 2030, as well as a long-term goal for 2050; and,

4. Quantification of GHG emissions reductions and evaluation of the calculated gap between the estimated GHG reductions and the recommended targets.

In addition to the quantitative GHG analysis, we qualitatively addressed the proposed GHG measures in terms of potential environmental co-benefits, cost/benefit and economic impacts, and administrative feasibility.

GREENHOUSE GAS EMISSIONS INVENTORY

The baseline GHG emissions inventory for the year 2014 includes emissions from community-wide sources in the unincorporated County. The purpose of the baseline inventory is to gain an understanding of the sources and levels of GHG emissions within a jurisdiction, as well as to establish a level of GHG emissions against which future GHG emissions can be compared. The 2014 GHG emissions inventory is summarized below in Table 1. Total emissions from all sectors in the 2014 inventory were 484,283 metric tons of carbon dioxide equivalent ($MTCO_2e$) emissions. The 2014 inventory updates a previous baseline inventory for the year 2005 and includes new emissions sources and accounts for new data sources, calculation methodologies, and an updated set of global warming potential (GWP) factors.

Further details with respect to the 2014 inventory are discussed in the Revised Final Technical Memorandum #1 to the County, dated August 25, 2016, found in Appendix A of the CAP.

Table 1 2014 Unincorporated Napa County Greenhouse Gas Emissions Inventory

Sectors	2014[1] ($MTCO_2e$/yr)
Building Energy Use	148,338
On-Road Vehicles	125,711
Solid Waste	83,086
Agriculture	52,198
Off-Road Vehicles	42,508
High GWP Gases	13,481
Wastewater	11,189
Land Use Change	7,684
Imported Water Conveyance	88
Total	**484,283**

Notes: Columns may not add to totals due to rounding.

MTCO2e = metric tons of carbon dioxide equivalent; GWP = Global Warming Potential; IPCC = Intergovernmental Panel on Climate Change

1. Uses GWP factors from IPCC's Fourth Assessment Report.

Source: Data compiled by Ascent Environmental in 2016. See Revised Final Tech. Memo #1, August 25, 2016.

Greenhouse Gas Emissions Projections

GHG emissions projections for a community are used to estimate future levels in the absence of climate action measures. Emissions projections were prepared for both "business-as-usual" (BAU) and legislative-adjusted BAU scenarios for 2020, 2030, and 2050. BAU projections were based on population, housing, and employment growth anticipated in the unincorporated County as forecasted by the Metropolitan Transportation Commission (MTC), assuming no actions would be taken to reduce emissions by Federal, State or local agencies pursuant to Assembly Bill (AB) 32 or other legislation. The BAU projections represent theoretical "worst-case" future conditions, while the legislative-adjusted forecast accounts for future emissions reductions pursuant to AB 32 and other legislation in California from a variety of regulations and programs, including the Renewable Portfolio Standard (RPS), improving vehicle fuel economy standards due to Advanced Clean Cars, and other State and Federal policies.

The legislative-adjusted BAU forecast for community-wide GHG emissions are summarized below in Table 2. Under the legislative-adjusted BAU scenario, community-wide GHG emissions are projected to decrease by approximately 4 percent by 2020, 28 percent by 2030, and 24 percent by 2050 for the unincorporated Napa County compared to 2014 emissions.

Further details with respect to the GHG emissions projections are discussed in Appendix A of the CAP.

Table 2 Unincorporated Napa County Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/yr)

Sector and Subsector	2014	2020	2030	2050
Energy	148,338	131,643	59,150	67,184
Transportation	125,711	112,854	84,845	85,735
Waste	83,086	62,345	56,711	48,854
Agriculture	52,198	52,521	53,589	57,446
Off-Road Vehicles and Equipment	42,508	45,164	49,592	58,474
High-GWP Gases	13,481	11,828	13,169	15,867
Water and Wastewater	11,277	11,858	12,959	14,335
Land Use Change	7,684	35,608[1]	18,239	21,669
Total	**484,283**	**463,821**	**348,253**	**369,563**
Percent change from 2014 (%)	NA	-4	-28	-24

Notes: Columns may not add to totals due to rounding.

BAU = Business as usual; NA = Not Applicable; GWP = Global Warming Potential; MTCO2e = metric tons of carbon dioxide equivalent

1. The large increase in land use change "emissions" is due to sequestration and carbon storage losses associated with land use forecasts from the County that show a high rate of land use change between 2015 and 2020 compared to other years.

Source: Ascent Environmental, 2016

GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

California's 2017 Climate Change Scoping Plan (Scoping Plan) released by the California Air Resources Board (CARB) recommends that local governments "evaluate and adopt robust and quantitative locally-appropriate goals that align with the statewide per-capita targets and the State's sustainable development objectives" for plan-level GHG emissions reduction goals (CARB 2017:99). The statewide per-capita targets consist of reducing emissions to no more than 6 $MTCO_2e$ per capita and 2 $MTCO_2e$ per capita by 2030 and 2050, respectively. These per-capita targets align with directives in AB 32, SB 32, Executive Order (EO) B-30-15, and EO S-3-05, where the State aims to reduce annual GHG emissions to:

- 1990 levels by 2020;
- 40 percent below 1990 levels by 2030; and
- 80 percent below 1990 levels by 2050.

In terms of the State's guidance to local governments and local actions to reduce GHG emissions through plan-level and project-level analysis, the Scoping Plan considers it appropriate for local jurisdictions to develop targets based on local emissions sectors, consistent with the framework used to develop statewide targets. The Scoping Plan has set varying sector-specific GHG emissions reduction targets based on state policies and programs developed to meet these statewide targets. For example, the Scoping Plan anticipates a 51 to 72 percent reduction in statewide electric power-related emissions from 1990 levels by 2030, whereas it anticipates a lesser 4 to 8 percent reduction in emissions from agriculture between the same time period. Across all sectors, the state's emissions would be reduced consistent with the statewide targets listed above. The Scoping Plan sectors include: agriculture, residential and commercial on-site energy use, electric power generation, high global warming potential gases (GWP), industrial, recycling and waste, transportation, and natural working lands. All of these sectors are represented in Napa County's GHG 2014 inventory (See Table 2). Thus, it is appropriate for the County to have similar objectives to the statewide targets by achieving reductions equivalent to reducing the County's emissions to 1990 levels by 2020, 40 percent below 1990 levels by 2030, and making progress towards the State's longer-term goal of 80 percent below 1990 levels by 2050. By having percent reduction targets proportional to the State's goals and based on the State's guidance on local plan-level GHG targets, Napa County's target will contribute its fair share in GHG reductions relative to statewide reductions. This approach to setting targets and longer-term goals is supported by the Scoping Plan's statement that local governments can "calculate GHG emissions thresholds by applying the percent reductions necessary to reach 2030 and 2050 climate goals (i.e., 40 percent and 80 percent, respectively) to their community-wide GHG emissions target." (CARB 2017:100).

While the County does not have a 1990 GHG inventory from which to estimate GHG reductions, equivalent targets and goals were calculated relative to a 2014 baseline to allow for comparison with the County's 2014 GHG emissions inventory. To stay consistent with the State's goals, Ascent compared the State's 2014 GHG emissions inventory to the State's 2020, 2030, and 2050 mass emissions goals relative to its 1990 inventory and then calculated new percent reductions relative to 2014. At the time these adjusted targets were first calculated in 2015, the state's 2014 GHG emissions inventory was not yet published. Thus, the state's 2013 GHG inventory was scaled to 2014 based on the change in the state's population. As a result, the adjusted GHG emissions reductions targets were estimated to be 7 percent below 2014 emissions by 2020, 44 percent below by 2030, and a longer-term goal of 81 percent below by 2050. As a result, the following 2020 and 2030 targets and long-term goal for 2050 would reduce annual community-wide GHG emissions in unincorporated Napa County consistent with CARB's recommended goals:

- 2 percent below 2014 levels by 2020;
- 40 percent below 2014 levels by 2030; and
- 77 percent below 2014 levels by 2050.

These calculations and resulting equivalent targets and goal are shown in Table 3 and in Attachment 1.

Table 3 Calculation of Greenhouse Gas Emissions Reduction Targets relative to 2014 levels

Year	State Emissions (MMT CO_2e)	State Population (thousands)
1990	431	Not Used
2013	459	38,202,206
2014	463[1]	38,548,204
State Target Years	**Percent Reductions below 1990 levels**	**Applicable Rule**
2020	0%	AB 32
2030	40%	EO B-30-15
2050	80%	EO B-30-15
State Target Years	**Calculated Equivalent Percent Reductions below 2014 levels**	**Applicable Rule**
2020	7%	AB 32
2030	44%	EO B-30-15
2050	81%	EO B-30-15

Table 3 Calculation of Greenhouse Gas Emissions Reduction Targets relative to 2014 levels

Notes: MMT CO_2e = million metric tons of carbon dioxide equivalents, AB = Assembly Bill, EO = Executive Order

[1] Scaled from 2013 values by change in population from 2013 to 2014.

Source: CARB 2015, DOF 2014, Data provided by Ascent Environmental in 2016

Based on the County's 2014 inventory shown in Table 1, the targets and long-term goal above aim to reduce annual County emissions to 474,598, 290,570, and 111,385 $MTCO_2e$ by 2020, 2030, and 2050, respectively. As shown in Figure 1, the County is already meeting the 2020 target due to existing legislative actions but would require significant additional GHG reductions to meet the 2030 and 2050 targets. The County would need to reduce annual legislative-adjusted BAU 2030 emissions by 57,683 $MTCO_2e$ (17 percent). However, meeting the long-term 2050 goal would require annual emissions reduction of 258,178 $MTCO_2e$, or 70 percent, beyond the effect of current legislative reductions.

The recommended mass emission reduction targets for 2020 and 2030, along with a longer-term goal for 2050, and estimated reductions required to achieve the targets and longer-term goal for the County, are summarized below in Table 4.

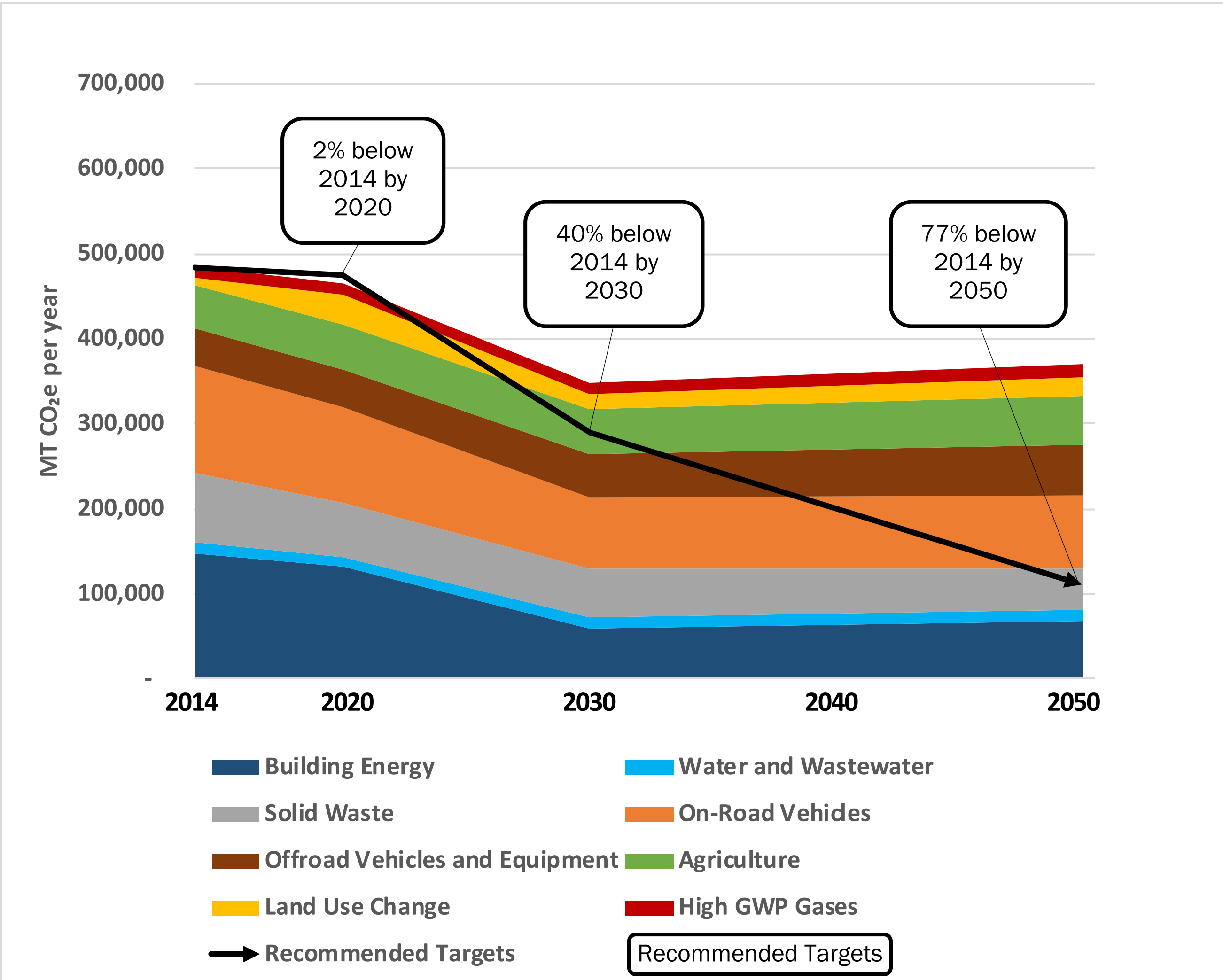
Table 4 Recommended Greenhouse Gas Emissions Reduction Targets and Long-Term Goal for Unincorporated Napa County: 2020, 2030, and 2050

Scenario or Target	2014	2020	2030	2050
Baseline and Projections				
2014 Baseline GHG Inventory ($MTCO_2e$)	484,283	NA	NA	NA
Legislative-Adjusted BAU Forecast ($MTCO_2e$)	NA	463,821	348,253	369,563
Legislative-Adjusted BAU Forecast: Percent below Baseline (%)	NA	4	28	24
Targets				
Target Percent Reduction below Baseline (%)	NA	2	40	77
Target Annual Emissions ($MTCO_2e$)	NA	474,598	290,570	111,385
Gap Analysis				
Reduction from Baseline needed to meet Target ($MTCO_2e$)	NA	9,686	193,713	372,898
Reduction from Legislative-Adjusted BAU needed to meet Target ($MTCO_2e$)	NA	0	57,683	258,178
Additional Percent Reduction below Legislative-Adjusted BAU needed to meet Target (%)	NA	0	17	70

Notes: BAU = Business as usual, $MTCO_2e$ = metric tons of carbon dioxide equivalent, GHG = greenhouse gas, NA = Not Applicable

Source: Ascent Environmental, 2016

Figure 1, below, depicts the baseline and legislative-adjusted BAU GHG emissions forecasts by sector, as distinguished by colored wedges. The sum of the wedges represents annual anticipated GHG emissions in each year. Each wedge shows how an emissions sector is expected to contribute to the County's annual inventory over time. For example, the reduction in BAU building energy emissions (dark blue wedge) between 2020 and 2030 illustrates the effect of SB 350 energy efficiency and renewable energy policies on this sector. The black line indicates the recommended GHG emissions reduction targets for 2020, 2030, and 2050. The additional reductions needed to meet the 2020 and 2030 targets to close the expected "gap" between the expected legislative-adjusted BAU emissions levels and the recommended targets are also apparent in Figure 1. With respect to emissions beyond 2030, current legislation, such as SB 350 and the Federal Corporate Average Fuel Economy (CAFE) standards, have specific targets and policies that only address activities up to the year 2030. Advances in new technologies and policy strategies may allow for additional significant reductions in the future.



Notes: BAU = Business as Usual; GHG = Greenhouse Gas Emissions; MT CO_2e = metric tons of carbon dioxide equivalent
Source: Ascent Environmental, 2018

Figure 1 Legislative-Adjusted Business-as-Usual Forecast Emissions by Sector and Recommended Emissions Reduction Targets: 2020 through 2050

Greenhouse Gas Emissions Reductions and Estimated Gap

As discussed above, additional GHG reductions are needed to achieve the recommended GHG reduction targets for 2020 and 2030 and long-term 2050 goal. As a local government, the County can act to adopt or update land use plans, enforce or update County ordinances, adjust municipal operations, encourage or influence County residents and business by partnering with local organizations, and work with local and regional transportation planning or other agencies that provide services or maintain infrastructure that is not directly in the County's control. The County can effectively reduce emissions in some sectors where the County has jurisdictional control (e.g., municipal operations, land use change), but in some cases the County has limited ability to influence reductions because the County has limited jurisdictional control (e.g., on-road transportation).

Since the original Draft and Final CAP documents were circulated for public review in 2017 (and since the Revised Draft CAP was circulated for further public review in 2018), Ascent worked with the County to further refine the recommended GHG reduction measures based on the County's jurisdictional influence, public input, and other measures based on best practices. These GHG reduction measures are organized according to "primary" and "supporting" measure categories.

Primary measures include those for which GHG reductions have been quantified and are the primary measures that the County would rely upon to meet the GHG reduction targets identified. Many of the primary measures include specific and enforceable components that could be applied to future projects seeking to tier and streamline from the CAP in the future; however, not all primary measures are regulatory in nature. Some of the primary GHG reduction measures identified that will result in quantifiable GHG reductions do not rely on County regulation. All primary GHG reduction measures were quantified wherever substantial evidence and reasonable assumptions were available to support calculations.

GHG reductions associated with the primary measures were calculated in a step-wise manner for the future years of 2020, 2030, and 2050. In other words, GHG reductions (in $MTCO_2e$/year), relative to the legislative-adjusted forecast, were assessed during a snapshot in 2020, 2030, and 2050. This is a simplified method of characterizing GHG reductions, which would more realistically occur on a continuous basis. However, a step-wise method is appropriate for a planning-level document because the County's GHG reduction targets and monitoring of CAP implementation progress would be tied to these future years.

Supporting measures are qualitative and are not identified as part of the primary set of quantifiable GHG reduction measures to meet the targets. Supporting measures are still important to include because they contribute to achieving GHG reductions and may also result in other important co-benefits. However, supporting measure are not quantifiable due to lack of available data or quantification methods, or were not quantified to avoid double-counting of GHG reductions achieved by other similar measures under the same strategy. The supporting measures could be tracked for potential quantification in the future if data and/or quantification methods become available.

Although supporting measures were not quantified, implementation of supporting measures would further reduce GHG emissions depending on a variety of factors. These factors include the level of participation from the public and other partners, potential of technological improvements to reduce emissions, and changes to the regulatory environment outside of the County.

Summary of Results

Estimates of GHG emissions reductions, along with an estimated emissions reduction "gap," are summarized below in Table 5 and illustrated in Figure 2. Detailed measure descriptions, calculations, and assumptions supporting the GHG reduction estimates are provided in Attachment 1.

Table 5 **Summary of Greenhouse Gas Emissions Reduction Measures Performance**

Measure Number	Measure Name	GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
Agriculture				
Primary Measures				
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuels	0	591	995
AG-2	Support the use of electric or alternatively-fueled agricultural equipment	0	11,273	15,166
AG-3	Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment	0	57	58
Supporting Measures				
AG-4	Support reduced application of inorganic nitrogen fertilizer		-	
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris		-	
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County		-	
	Agriculture Subtotal	0	11,922	16,218
Building Energy				
Primary Measures				
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	0	73	80
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	0	2,037	10,730
BE-3	Increase participation in MCE's Deep Green option (100 percent Renewable Energy) and encourage ongoing participation in MCE	35,948	9,155	8,633
BE-4	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	0	11,575	12,550
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	545	605	571
BE-6	Select MCE's Deep Green Option for all County Facilities	382	170	205
BE-7	Support waste-to-energy programs at unincorporated landfills	0	5	5
Supporting Measures				
BE-8	Work with PG&E, BayREN, MCE, and PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings		-	
BE-9	Require energy audits for major additions to or alterations of existing buildings		-	
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings		-	
BE-11	Encourage solar panel installations on commercial roof spaces		-	
	Building Energy Subtotal	36,875	23,620	32,773
Land Use Change				
Primary Measures				
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	0	3,525	12,956

Table 5 Summary of Greenhouse Gas Emissions Reduction Measures Performance

Measure Number	Measure Name	GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
LU-2	Refine protection guidelines for existing riparian lands	0	602	799
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	0	3,453	4,731
	Land Use Subtotal	0	7,580	18,487
Off-Road Transportation				
Primary Measures[1]				
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030	0	5,668	6,169
OR-2	Require the use of renewable diesel or other alternative fuel for all construction activity and mining operations as a condition for approval by 2030			
	Off-Road Transportation Subtotal	0	5,668	6,169
On-Road Transportation				
Primary Measures				
TR-1	Update Transportation System Management Ordinance (for Employers)	0	3,582	3,547
TR-2	Adopt parking reduction ordinance revisions	0	58	57
TR-3	Increase affordable housing, especially workforce housing, in Napa County	0	23	23
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-ways	0	403	711
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG	0	247	169
Supporting Measures				
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information		-	
TR-7	Support alternatives to private vehicle travel for visitors		-	
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region		-	
TR-9	Support interregional transit solutions		-	
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers		-	
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county		-	
TR-12	Increase the supply of electric vehicle charging stations		-	
TR-13	Promote telecommuting at office-based businesses		-	
TR-14	Develop and implement active transportation projects		-	
TR-15	Require new development projects to evaluate and reduce vehicle miles traveled (VMT)		-	
TR-16	Convert at least 50% of County fleet vehicles to alternative fuels by 2030		-	
	On-Road Transportation Subtotal	0	4,312	4,508
Solid Waste				
Primary Measures				
SW-1	Encourage expansion of composting programs for both residential and commercial land uses	372	1,106	1,332

Table 5 Summary of Greenhouse Gas Emissions Reduction Measures Performance

Measure Number	Measure Name	GHG Reductions ($MTCO_2e$/year)		
		2020	2030	2050
SW-2	Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030	335	1,257	1,514
	Solid Waste Subtotal	707	2,363	2,847
Water and Wastewater				
Supporting Measures				
WA-1	Amend or revise water conservation regulations for landscape design	-		
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	-		
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	-		
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	-		
High-GWP Gases				
Primary Measures				
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	0	5,127	7,762
Supporting Measures				
HG-2	Incentivize the use of low-GWP refrigerants	-		
	High-GWP Gases Subtotal	0	5,127	7,762
Multi-Sector Measures				
Primary Measures				
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	0	5,743	5,737
Supporting Measures				
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	-		
MS-3	Promote the sale of locally-grown foods and/or products	-		
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	-		
	Total GHG Emissions Reductions	37,583	66,334	94,500
	Recommended GHG Emissions Reduction Target	0	57,683	258,178
	Remaining GHG Emissions Reduction Gap (Surplus)	(48,359)[2]	(8,651)[3]	163,678

Notes: "-" = Not enough data to quantify or relies on participation from external or private entities over which the County has no control, BAAQMD = Bay Area Air Quality Management District, BayREN = Bay Area Regional Energy Network, CARB = California Air Resources Board, CNG = compressed natural gas, CO_2e = carbon dioxide equivalents, GHG = greenhouse gas, GWP = global warming potential, NA = Not Applicable, NVTA = Napa Valley Transportation Authority, MCE = Marin Clean Energy, MT = metric tons, MTC = Metropolitan Transportation Commission, PACE = property assessed clean energy, PG&E = Pacific Gas and Electric, RMP = Refrigerant Management Program, ZNE = zero net energy.

[1] OR-1 and OR-2 have been calculated together.

[2] 37,583 $MTCO_2e$ of the surplus comes from the reduction measures. 10,777 $MTCO_2e$ comes from legislative reductions at the state and federal level.

[3] Entire surplus comes from the reduction measures.

Source: Data provided by Ascent Environmental 2018.

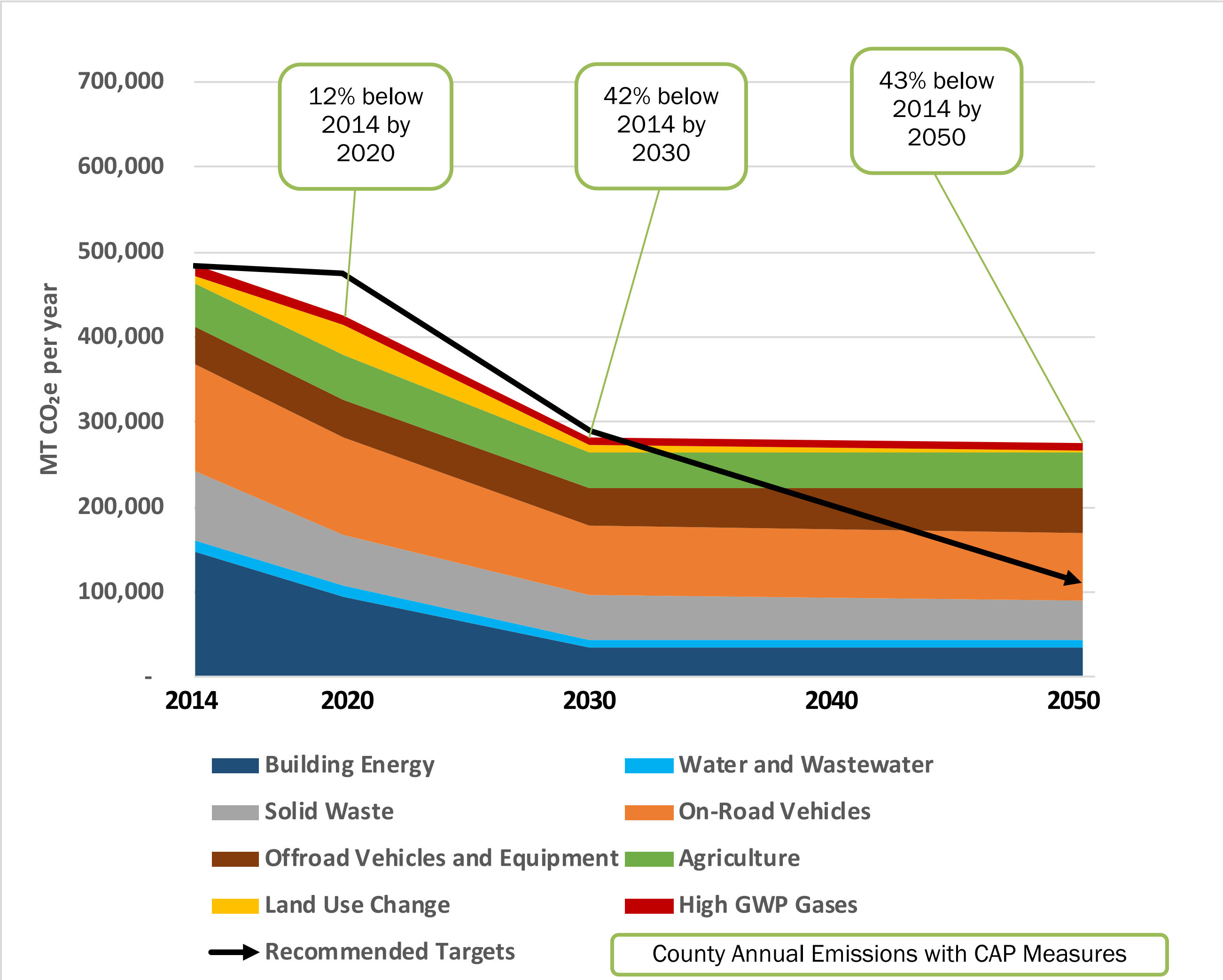


Figure 2 **Projections of Greenhouse Gases by Sector with Implementation of CAP Measures and Recommended Targets: 2020 through 2050**

The total estimated GHG emissions reductions from all measures quantified is approximately 37,583 $MTCO_2e$ in 2020, 66,334 $MTCO_2e$ in 2030, and 94,500 $MTCO_2e$ in 2050. The total estimated reductions in 2020 would be more than sufficient to meet the recommended 2020 target, with a 48,359 $MTCO_2e$ annual surplus of GHG reductions beyond legislative-adjusted forecasts. Legislative-adjusted forecasts show that the County's emissions would be 10,777 $MTCO_2e$ lower than the 2020 target. Implementation of the revised draft GHG reduction measures identified in Table 5 would also meet the recommended 2030 target, with a surplus of 8,651 $MTCO_2e$ in reductions. However, the projected GHG reductions from all measures in 2050 would fall considerably short of the long-term goal for 2050, requiring an additional 163,678 $MTCO_2e$ to be reduced per year by 2050.

Certainly, the scale of reductions required to achieve the much more aggressive longer-term 2050 goal outlined earlier will require significant improvements in the availability and/or cost of near-zero and zero-emissions technology, as well as potential increased reductions from ongoing State and Federal legislative actions, most of which are currently unknown. The State's 2017 Scoping Plan does not currently demonstrate a feasible pathway for the State to achieve its 2050 goal, and while it is possible to calculate the scale of emissions reductions at a local level to achieve a similar goal, it is not possible to demonstrate how a local government can achieve a 2050 target based on local actions alone.

The Revised Draft CAP provides for the County to monitor and report on the CAP's progress at least annually, update the GHG inventory every three years, and update the CAP periodically to keep pace with new legislative actions, such as future updates to the Scoping Plan or new post-2030 legislative targets. Future updates to the CAP may also account for new technological solutions that can be incorporated into the gap analysis and future forecasts can be adjusted accordingly.

Ascent recommends that the County's CAP be updated at least every 5 years after adoption to periodically assess the County's progress toward meeting the GHG reduction targets, identify potential new or revised GHG measures that may be implemented as new technology and policy strategies become available, and adjust future forecasts accordingly.

Additional Considerations and Co-Benefits

In addition to the GHG emissions gap analysis process identified above, we also qualitatively considered potential implementation costs and regional economic impacts, administrative feasibility of the proposed GHG reduction measures, and environmental co-benefits. Detailed results are shown in Attachment 1, with general discussion below.

The feasibility of the final GHG reduction measures described above may depend on program participation rates, cooperation from partnering agencies, available County resources, and various economic factors. For example, measure AG-5 in Table 5 requires participation and enforcement by the Bay Area Air Quality Management District (BAAQMD); implementation of BE-1 and BE-2 would depend on the size and number of alterations and new construction that would occur in the future, which are closely linked to the health of the economy; and the various transportation measures would require participation from the Napa Valley Transportation Authority (NVTA), residents, and businesses. Many of the measures, such as ordinance revisions, may be implemented by the County, but the effectiveness of those measures would still depend on general compliance to proposed ordinances and the effectiveness of compliance and enforcement efforts.

The GHG reduction measures would result in considerable environmental co-benefits, including improvements to air quality, water quality and supply reliability, biological resources, public health outcomes, and other resources.

- Air Quality: GHG reduction measures that reduce fossil fuel combustion will also help to reduce criteria air pollutants such as ozone or particulate matter, as well as toxic air contaminants, which would help to improve air quality and health risk. Several measures would reduce natural gas combustion in stationary sources or building space heating and water heating, while transportation sector measures would reduce on- and off-road mobile source emissions. Improvements in air quality helps to benefit public health, as well as improves visibility.

- Water Quality and Supply Reliability: GHG reduction measures that reduce the strain on local and State water supply or improve water quality would provide water system benefits. For example, several GHG reduction measures would improve landscape water conservation and efficiency in existing developed areas and require new construction to comply with CALGreen Tier 1 building standards that increase indoor and outdoor water efficiency and conservation.

- Biological Resources: GHG reduction measures that improve or preserve natural ecosystems and habitats would provide co-benefits for biological resources. For example, preserving oak woodlands, forests, and other carbon-sequestering land uses would also conserve habitats for native plant and animal species, maintain water quality, prevent soil erosion, and provide other benefits to help to balance the local ecosystem.

- Public Health: Many of the GHG reduction measures would help to reduce criteria pollutants, toxic air contaminants, and other hazards, and increase physical activity; thus, benefitting public health. For example, transportation measures promote alternative modes of transportation such as walking and biking, which increase physical activity and can help to reduce obesity and may decrease deaths caused by cardiovascular disease, stroke, and cancer (among the top 10 causes of death in the County). Measures that improve air quality also have significant public health benefits and could decrease respiratory diseases such as asthma.

- Non-Renewable Energy Resources: several GHG reduction measures would help to reduce reliance on finite fossil fuel resources by increasing the use of alternative and renewable energy sources (e.g., solar and geothermal resources or renewable biofuels).

In addition to these environmental co-benefits, GHG reduction measures would also provide economic benefits through long-term operational cost savings and quality of life improvements. For example, reduced electricity and natural gas use through energy efficiency and conservation efforts allows utilities, residents, and businesses to require less alternative and conventional energy resources and help residents save money. Transit-oriented development and siting of affordable housing in the County would allow for residents to live closer to jobs, schools, and services; thus, reducing the amount of time and money spent on commuting and transportation.

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DOF. *See* California Department of Finance.

ATTACHMENT 1

Appendix B - Attachment 1

This attachment contains detailed background information of the CAP measures that includes the following components. (Note to County: Changes from previous gap analysis have been highlighted in RED.)

GHG Measure Reduction Summary

GHG Emission Reductions by Sector

Sector	Notes	Annual GHG Reduction ($MTCO_2e$) 2020	2030	2050
Agriculture		0	11,922	16,218
Building Energy		36,875	23,620	32,773
Land Use Change		0	7,580	18,487
Wastewater	Includes MS-1	0	5,743	5,737
On-Road Transportation		0	4,312	4,508
Off-Road Transportation		0	5,668	6,169
Solid Waste		707	2,363	2,847
High GWP		0	5,127	7,762
TOTAL Reductions from Proposed Measures		**37,583**	**66,334**	**94,500**
Needed reductions to meet CAP Targets from 2014 levels (MTCO2e)		0	57,683	258,178

Forecasts with Legislative Reductions	Annual GHG Emissions ($MTCO_2e$) 2014	2020	2030	2050
Building Energy	148,338	131,643	59,150	67,184
Water and Wastewater	11,277	11,858	12,959	14,335
Solid Waste	83,086	62,345	56,711	48,854
On-Road Vehicles	125,711	112,854	84,845	85,735
Offroad Vehicles and Equipment	42,508	45,164	49,592	58,474
Agriculture	52,198	52,521	53,589	57,446
Land Use Change	7,684	35,608	18,239	21,669
High GWP Gases	13,481	11,828	13,169	15,867
TOTAL	**484,283**	**463,821**	**348,253**	**369,563**
Forecasted Percent Reduction from 2014		-4%	-28%	-24%
CAP Targets (adjusted for percent reduction from 2014)		-2%	-40%	-77%
CAP Targets (MTCO2e)		474,598	290,570	111,385
Needed reductions to meet CAP Targets from 2014 levels (MTCO2e)		9,686	193,713	372,898
Needed reductions to meet CAP Targets from forecasts (MTCO2e)		-10,777	57,683	258,178

Forecasts with Legislative Reductions and County CAP Measures	Annual GHG Emissions ($MTCO_2e$) 2014	2020	2030	2050
Building Energy	148,338	94,768	35,530	34,410
Water and Wastewater	11,277	11,858	7,216	8,598
Solid Waste	83,086	61,638	54,348	46,007
On-Road Vehicles	125,711	112,854	80,533	81,227
Offroad Vehicles and Equipment	42,508	45,164	43,924	52,305
Agriculture	52,198	52,521	41,667	41,227
Land Use Change	7,684	35,608	10,659	3,182
High GWP Gases	13,481	11,828	8,042	8,105
TOTAL	**484,283**	**426,238**	**281,919**	**275,063**
Percent below 2014		-12%	-42%	-43%
Additional Reductions Needed to meet CAP Targets (negative indicates surplus) (MTCO2e)		-48,359	-8,651	163,678

GHG Measure Reduction Summary (continued)			
Percent below 2014 by Sector. Legislative reductions only			
Sector	**2020**	**2030**	**2050**
Building Energy	-11%	-60%	-55%
Water and Wastewater	5%	15%	27%
Solid Waste	-25%	-32%	-41%
On-Road Vehicles	-10%	-33%	-32%
Offroad Vehicles and Equipment	6%	17%	38%
Agriculture	1%	3%	10%
Land Use Change	363%	137%	182%
High GWP Gases	-12%	-2%	18%
Percent below 2014 by Sector. Combined effect of legislative reductions and proposed actions			
Sector	**2020**	**2030**	**2050**
Building Energy	-36%	-76%	-77%
Water and Wastewater	5%	-36%	-24%
Solid Waste	-26%	-35%	-45%
On-Road Vehicles	-10%	-36%	-35%
Offroad Vehicles and Equipment	6%	3%	23%
Agriculture	1%	-20%	-21%
Land Use Change	363%	39%	-59%
High GWP Gases	-12%	-40%	-40%
Percent below BAU by Sector. Effect of proposed actions			
Sector	**2020**	**2030**	**2050**
Building Energy	-28%	-40%	-49%
Water and Wastewater	0%	-44%	-40%
Solid Waste	-1%	-4%	-6%
On-Road Vehicles	0%	-5%	-5%
Offroad Vehicles and Equipment	0%	-11%	-11%
Agriculture	0%	-22%	-28%
Land Use Change	0%	-42%	-85%
High GWP Gases	0%	-39%	-49%

GHG Reduction Target Calculations		
Year	**State Emissions (million metric tons of CO_2 equivalent based upon IPCC Fourth Assessment Report's Global Warming Potentials - all sectors) (1)**	**State Population (2)**
1990	431	Not Used
2013	459	38,202,206
2014 (Emissions scaled by population from 2013)	463	38,548,204
State Targets		**Applicable Rule**
Percent below 1990 emissions by 2020	0%	AB 32
Percent below 1990 emissions by 2030	40%	EO B-30-15
Percent below 1990 emissions by 2050	80%	EO B-30-15
Equivalent State Targets for Reduction below 2014		**Applicable Rule**
Percent below 2014 emissions by 2020	7%	AB 32
Percent below 2014 emissions by 2030	44%	EO B-30-15
Percent below 2014 emissions by 2050	81%	EO B-30-15

Source: (1) ARB 2015 applies to 1990 and 2013 inventories only (http://www.arb.ca.gov/cc/inventory/data/data.htm), (2) DOF 2014 Report P-2. State and County Population Projections by Race/Ethnicity and Age (5-year groups). 2010 through 2060 (as of July 1 (http://www.dof.ca.gov/Forecasting/Demographics/projections/) (Note: These calculations were completed prior to the update of California's GHG 2014 emissions inventory in 2017).

GHG Reductions by Measure							
#	Lead Agency	Sector	Community or Municipal	Measure Name	Annual GHG Reduction (MT CO_2e)		
					2020	2030	2050
AG-1	Napa County	Agriculture	Community	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel	0	591	995
AG-2	Napa County	Agriculture	Community	Support the use of electric or alternatively-fueled agricultural equipment	0	11,273	15,166
AG-3	Napa County	Agriculture	Community	Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment	0	57	58
AG-4	Napa County	Agriculture	Community	Support reduced application of inorganic nitrogen fertilizer	NA	NA	NA
AG-5	Napa County	Agriculture	Community	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	NA	NA	NA
AG-6	Napa County	Agriculture	Community	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	NA	NA	NA
BE-1	Napa County	Building Energy	Community	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	0	73	80
BE-2	Napa County	Building Energy	Community	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	0	2,037	10,730
BE-3	Napa County	Building Energy	Community	Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.	35,948	9,155	8,633
BE-4	Napa County	Building Energy	Community	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	0	11,575	12,550
BE-5	Napa County	Building Energy	Community	Expand current renewable energy and green energy incentives and update local ordinances	545	605	571
BE-6	Napa County	Building Energy	Municipal	Select MCE's Deep Green Option for all County Facilities	382	170	205
BE-7	Napa County	Building Energy	Municipal	Support waste-to-energy programs at unincorporated landfills	0	5	5
BE-8	Napa County	Building Energy	Community	Work with PG&E, BayREN, MCE, and PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	NA	NA	NA
BE-9	Napa County	Building Energy	Community	Require energy audits for major additions to or alterations of existing buildings	NA	NA	NA
BE-10	Napa County	Building Energy	Community	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	NA	NA	NA
BE-11	Napa County	Building Energy	Community	Encourage solar panel installations on commercial roof spaces	NA	NA	NA
HG-1	Napa County	High GWP	Community	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	0	5,127	7,762
HG-2	Napa County	High GWP	Community	Incentivize the use of low-GWP refrigerants	NA	NA	NA
LU-1	Napa County	Land Use Change	Community	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	0	3,525	12,956
LU-2	Napa County	Land Use Change	Community	Refine protection guidelines for existing riparian lands	0	602	799

Measure Details							
#	Lead Agency	Sector	Community or Municipal	Measure Name	Annual GHG Reduction (MT CO_2e)		
					2020	2030	2050
LU-3	Napa County	Land Use Change	Community	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	0	3,453	4,731
MS-1	Napa County	Wastewater	Community	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	0	5,743	5,737
MS-2	Napa County and Cities in Napa County	Multiple	Community	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	NA	NA	NA
MS-3	Napa County	Multiple	Community	Promote the sale of locally-grown foods and/or products	NA	NA	NA
MS-4	Napa County	Multiple	Community	Establish a local carbon offset program in partnership with Sustainable Napa County	NA	NA	NA
OR-1/OR-2	Napa County	Off-Road Transportation	Community	Require Tier 4 equipment and promote the use of renewable diesel for all construction activity and mining operations as a condition for approval by 2030	0	5,668	6,169
SW-1	Napa County/ Landfill Owners Operators	Solid Waste	Municipal	Encourage expansion of composting program for both residential and commercial land uses	372	1,106	1,332
SW-2	Napa County/ Waste Management Companies	Solid Waste	Community	Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030	335	1,257	1,514
TR-1	NVTA/Napa County	On-Road Transportation	Community	Update Transportation System Management Ordinance (for Employers)	0	3,582	3,547
TR-2	Napa County	On-Road Transportation	Community	Adopt parking reduction ordinance revisions	0	58	57
TR-3	Napa County	On-Road Transportation	Community	Increase affordable housing, especially workforce housing, in Napa County	0	23	23
TR-4	NVTA/Napa County	On-Road Transportation	Community	Support efforts to allow commuter service to operate on railroad rights-of-ways	0	403	711
TR-5	Napa County	On-Road Transportation	Municipal	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG	0	247	169
TR-6	NVTA/Napa County	On-Road Transportation	Community	Support efforts of transit agencies to increase availability and accessibility of transit information	NA	NA	NA
TR-7	Napa County	On-Road Transportation	Community	Support alternatives to private vehicle travel for visitors	NA	NA	NA
TR-8	NCTPA/Napa County	On-Road Transportation	Community	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	NA	NA	NA
TR-9	NVTA/Napa County	On-Road Transportation	Community	Support interregional transit solutions	NA	NA	NA
TR-10	NCTPA/Napa County	On-Road Transportation	Community	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	NA	NA	NA
TR-11	NCTPA/Napa County	On-Road Transportation	Community	Promote existing ride-matching services for people living and working in the unincorporated county	NA	NA	NA
TR-12	NVTA/Napa County	On-Road Transportation	Community	Increase the supply of electric vehicle charging stations	NA	NA	NA

Measure Details							
#	Lead Agency	Sector	Community or Municipal	Measure Name	Annual GHG Reduction (MT CO_2e)		
					2020	2030	2050
TR-13	NCTPA/Napa County	On-Road Transportation	Community	Promote telecommuting at office-based businesses	NA	NA	NA
TR-14	NCTPA/Napa County	On-Road Transportation	Community	Develop and implement active transportation projects	NA	NA	NA
TR-15	Napa County	On-Road Transportation	Community	Require new development projects to evaluate and reduce VMT	NA	NA	NA
TR-16	Napa County	On-Road Transportation	Municipal	Convert at least 50% of County fleet vehicles to alternative fuels by 2030	NA	NA	NA
WA-1	Napa County	Water	Community	Amend or revise water conservation regulations for landscape design	NA	NA	NA
WA-2	Napa County	Water	Community	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	NA	NA	NA
WA-3	Napa County	Water	Community	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	NA	NA	NA
WA-4	Napa County	Water	Community	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	NA	NA	NA

Environmental Co-Benefit Potential						
#	Measure Name	**Air Quality** *Reduces criteria air pollutants directly or indirectly*	**Water** *Reduces strain on local and state water supply or improves water quality*	**Biological Resources** *Improves or preserves natural ecosystems and habitats*	**Health** *Improves public health through reduced pollutants and hazards, and increasing physical activity*	**Non-Renewable Energy Resources** *Reduces reliance on finite fossil fuel resources*
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel	Yes	No	Yes	Yes	Yes
AG-2	Support the use of electric or alternatively-fueled agricultural equipment	Yes	No	Yes	Yes	Yes
AG-3	Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment	Yes	No	Yes	Yes	Yes
AG-4	Support reduced application of inorganic nitrogen fertilizer	Yes	Yes	Yes	Yes	No
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	Yes	No	Yes	Yes	No
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	Yes	Yes	Yes	Yes	Yes
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	Yes	Yes	Yes	Yes	Yes
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	Yes	Yes	Yes	Yes	Yes
BE-3	Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.	Yes	No	No	No	Yes
BE-4	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	Yes	No	No	No	Yes
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	Yes	No	No	No	Yes
BE-6	Select MCE's Deep Green Option for all County Facilities	Yes	No	No	No	Yes
BE-7	Support waste-to-energy programs at unincorporated landfills	Yes	Yes	No	Yes	Yes

Environmental Co-Benefit Potential						
#	Measure Name	**Air Quality** *Reduces criteria air pollutants directly or indirectly*	**Water** *Reduces strain on local and state water supply or improves water quality*	**Biological Resources** *Improves or preserves natural ecosystems and habitats*	**Health** *Improves public health through reduced pollutants and hazards, and increasing physical activity*	**Non-Renewable Energy Resources** *Reduces reliance on finite fossil fuel resources*
BE-8	Work with PG&E, BayREN, MCE, and PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	Yes	No	No	No	Yes
BE-9	Require energy audits for major additions to or alterations of existing buildings	Yes	No	No	No	Yes
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	Yes	Yes	No	Yes	Yes
BE-11	Encourage solar panel installations on commercial roof spaces	Yes	No	No	Yes	Yes
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	Yes	No	No	No	No
HG-2	Incentivize the use of low-GWP refrigerants	Yes	No	No	No	No
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	Yes	Yes	Yes	Yes	No
LU-2	Refine protection guidelines for existing riparian lands	No	Yes	Yes	Yes	No
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	Yes	No	No	Yes	No
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	Yes	Yes	Yes	Yes	Yes
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	Yes	Yes	Yes	Yes	Yes
MS-3	Promote the sale of locally-grown foods and/or products	Yes	Yes	No	Yes	No
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	Yes	Yes	Yes	Yes	Yes
OR-1/OR-2	Require Tier 4 equipment and promote the use of renewable diesel for all construction activity and mining operations as a condition for approval by 2030	Yes	No	Yes	Yes	Yes

Environmental Co-Benefit Potential						
#	Measure Name	Air Quality *Reduces criteria air pollutants directly or indirectly*	Water *Reduces strain on local and state water supply or improves water quality*	Biological Resources *Improves or preserves natural ecosystems and habitats*	Health *Improves public health through reduced pollutants and hazards, and increasing physical activity*	Non-Renewable Energy Resources *Reduces reliance on finite fossil fuel resources*
SW-1	Encourage expansion of composting program for both residential and commercial land uses	Yes	Yes	Yes	No	No
SW-2	Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030	No	Yes	Yes	Yes	No
TR-1	Update Transportation System Management Ordinance (for Employers)	Yes	No	No	Yes	Yes
TR-2	Adopt parking reduction ordinance revisions	Yes	No	No	Yes	Yes
TR-3	Increase affordable housing, especially workforce housing, in Napa County	Yes	No	No	Yes	Yes
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-ways	Yes	No	No	Yes	Yes
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG	Yes	No	No	No	No
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information	Yes	No	No	Yes	Yes
TR-7	Support alternatives to private vehicle travel for visitors	Yes	No	No	Yes	Yes
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	Yes	No	No	Yes	Yes
TR-9	Support interregional transit solutions	Yes	No	No	Yes	Yes
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	Yes	No	No	Yes	Yes
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county	Yes	No	No	Yes	Yes
TR-12	Increase the supply of electric vehicle charging stations	Yes	No	No	Yes	Yes
TR-13	Promote telecommuting at office-based businesses	Yes	No	No	Yes	Yes
TR-14	Develop and implement active transportation projects	Yes	No	No	Yes	Yes
TR-15	Require new development projects to evaluate and reduce VMT	Yes	No	No	Yes	Yes

Environmental Co-Benefit Potential						
#	Measure Name	**Air Quality** *Reduces criteria air pollutants directly or indirectly*	**Water** *Reduces strain on local and state water supply or improves water quality*	**Biological Resources** *Improves or preserves natural ecosystems and habitats*	**Health** *Improves public health through reduced pollutants and hazards, and increasing physical activity*	**Non-Renewable Energy Resources** *Reduces reliance on finite fossil fuel resources*
TR-16	Convert at least 50% of County fleet vehicles to alternative fuels by 2030	Yes	No	No	Yes	Yes
WA-1	Amend or revise water conservation regulations for landscape design	Yes	Yes	Yes	No	Yes
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	Yes	Yes	Yes	No	Yes
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	Yes	Yes	Yes	No	Yes
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	No	Yes	No	No	No

Measure Cost and Administrative Feasibility					
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility	
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel	Medium	May involve costs with respect to rebates or other incentives provided to operators who choose to convert the pumps.	County and BAAQMD	County may work with BAAQMD to acquire funds and possibly administration to support this measure.
AG-2	Support the use of electric or alternatively-fueled agricultural equipment	Low	Some costs to the County associated with program-level management	County and BAAQMD	County may work with BAAQMD to acquire funds and possibly administration to support this measure.
AG-3	Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment	Medium	Some costs to the County associated with program-level management. May involve increased costs to equipment operators.	County and Agricultural Community	County would need to establish code or program to enforce requirement. Requires collaboration with agricultural equipment operators.
AG-4	Support reduced application of inorganic nitrogen fertilizer	Medium	Some costs to the County associated with program-level management	County and Agricultural Community	Requires County to establish a new program. County would need to work with agricultural community to establish program goals.
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	Medium	Some costs to the County associated with program-level management	County and BAAQMD	Requires collaboration with BAAQMD. County does not have direct jurisdiction over open burning activities related to agriculture, but may have some jurisdiction over burning of flood control and forest debris.
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	Medium	Some costs to the County associated with program-level management	County and Agricultural Community	Requires County to establish a new program. County would need to work with agricultural community to establish program goals.
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	Low	Potential increased costs to building applicants associated with green building and efficiency requirements. Low additional cost to the county due to current code enforcement.	County only	Requires updating current building code ordinances. County already does building code enforcements.
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	Low	Potential increased costs to building applicants associated with green building and efficiency requirements. Low additional cost to the county due to current code enforcement.	County only	Requires updating current building code ordinances. County already does building code enforcements.

Measure Cost and Administrative Feasibility						
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility		
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
BE-3	Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.	Medium	Assuming an additional cost of $0.01 per year, this measure would cost the County between approximately $282,000 and $343,000 per year based on acheiving a 15% participation rate measured by energy purchased from MCE. See quantification in separate spreadsheet. Some funding could be available through BAAQMD, who currently funds a similar program in the City of Fairfax through a grant.	County, MCE, and potential funding sources	Requires starting and maintaining an annual subsidy program. May require proposal development to request grant funding. Requires funding for programs to work with MCE to promote retention in the MCE program and outreach to customers who have opted out of MCE.
BE-4	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	Low	Potential increased costs to building applicants associated with efficiency requirements. Low additional cost to the county due to current code enforcement.	County only	Requires updating current building code ordinances. County already does building code enforcements.
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	Varies	Potential increased costs associated with monetary incentives. Cost would depend on any changes in level of incentives.	County only	Requires maintaining current program and monitoring total kW of approved solar permits
BE-6	Select MCE's Deep Green Option for all County Facilities	Low	Assuming an additional cost of $0.01 per kWh, this would cost the County approximately $30,000 per year. See quantification in separate spreadsheet.	County and MCE	Requires a one-time selection of Deep Green for all facilities located in the unincorporated County.
BE-7	Support waste-to-energy programs at unincorporated landfills	High	Costs would be associated with construction and operation of the new facility	Landfills and County	Requires coordination with landfill operators located in the unincorporated County.
BE-8	Work with PG&E, BayREN, MCE, and PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	Medium	Some costs to the County associated with program-level management	County, PG&E, BayREN, and MCE	Requires collaboration with PG&E, BayREN, MCE, California Energy Commission to determine applicable energy efficiency incentives.
BE-9	Require energy audits for major additions to or alterations of existing buildings	Medium	Some costs to the County associated with program-level management.	County only	May require County to establish a new energy audit program.
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	Medium	Some costs to the County associated with program-level management	County Only	Requires County to establish a new program.

Measure Cost and Administrative Feasibility					
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility	
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
BE-11	Encourage solar panel installations on commercial roof spaces	Medium	Some costs to the County associated with program-level management	County Only	Requires County to establish a new program.
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	Medium	Some costs to the County associated with program-level management and potential incentives.	County, CARB, and eligible businesses/ organizations	Requires County to establish a new incentive program and coordinate with CARB's RMP representatives.
HG-2	Incentivize the use of low-GWP refrigerants	Medium	Some costs to the County associated with program-level management and potential incentives.	County and eligible businesses/ organizations	Requires County to establish a new incentive program.
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	Low	Costs associated with code enforcement, project design to prioritize preservation, and replanting efforts	County, Project Applicants, and Volunteers	Requires updating code and enforcement of code and coordination with volunteer replanting efforts.
LU-2	Refine protection guidelines for existing riparian lands	Low	Costs associated with code enforcement	County Only	Requires updating code and enforcement of code.
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	Low	Costs associated with developing, maintaining, and operating a new program and research. Some costs also associated with contracts with eligible businesses and services.	County and eligible businesses/ organizations	May require dedicated staff time to research feasible repurposing pathways and contracts with eligible businesses or services.
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	Medium	Potential costs to winery and land owners to pay certification costs. Costs to County associated with target monitoring. Potential County costs associated with monetary or other incentives (e.g. increased presence on Napa Visitors website).	County, Napa Green, and Businesses	Requires coordination with Napa Green and Napa wineries and land owners and operators. May require discussion with Napa Green on feasibility of 2030 target.
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	High	Costs associated with coordination and CAP development. May take over a year to complete and require dedicated staff resources to manage technical studies and public participation.	County and Cities	Requires working with local jurisdictions.
MS-3	Promote the sale of locally-grown foods and/or products	Low	Costs associated with promotion of locally grown foods/products	County Only	May require establishment and promotion program and dedicated staff time to achieve measure goals.

Measure Cost and Administrative Feasibility						
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility		
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	High	Costs associated with developing, maintaining, and operating a new program	County and Sustainable Napa County	May require establishment and promotion program and dedicated staff time to manage carbon offsets.
OR-1/OR-2	Require Tier 4 equipment and promote the use of renewable diesel for all construction activity and mining operations as a condition for approval by 2030	Medium	Some costs to the County associated with program-level management. May involve increased costs to project applicants.	County and Project Applicants	County would need to establish code or program to enforce requirement. Requires participation from and collaboration with developers or project applicants.
SW-1	Encourage expansion of composting program for both residential and commercial land uses	Medium	Some increased costs associated with promotion of composting.	County and Waste Management Companies	Requires increased County efforts to promote composting of food and yard waste generated in the County.
SW-2	Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030	Medium	Some increased costs associated with promotion of waste reduction options (e.g. Recycling, composting, reuse).	County and Waste Management Companies	Requires increased County efforts to promote recycling, composting, and reuse of waste materials generated in the County.
TR-1	Update Transportation System Management Ordinance (for Employers)	Medium	Increased costs associated with enforcement and monitoring of ordinance.	County and MTC	Requires ordinance update and a new program to be established to monitor progress of and enforce the new ordinance. Some coordination may be needed with MTC to synergize with Bay Area's Commuter Benefits Program.
TR-2	Adopt parking reduction ordinance revisions	Medium	Increased costs associated with enforcement and monitoring of ordinance.	County Only	Requires ordinance update and regular enforcement of ordinance.
TR-3	Increase affordable housing, especially workforce housing, in Napa County	Medium	Costs to be shared throughout the region, depending on location of affordable housing.	County and Cities	The County has land use authority and can influence design and approval of projects for affordable workforce housing.
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-ways	Medium	High initial capital costs associated with new commuter train cars and annual costs from regular service operation. Train would not be operated by the County. Operation costs would need to be negotiated between agencies (e.g. cities, NVTA, Napa Wine Train).	County, NVTA, and Private Railroad Entities	The County has seats on the NVTA Board and can influence transportation planning decisions.

Measure Cost and Administrative Feasibility						
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility		
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG	High	High capital cost of performing the vehicle conversions to CNG. May rely on grant funding.	Solid Waste Collection Services and County	Requires coordination with solid waste collection services located in the unincorporated County.
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information	Low	Low initial costs associated with linking current transit data with transit information providers, such as Google.	County, NVTA, and Regional Transit Agencies	The County has seats on the NVTA Board and can influence transportation planning decisions. Would require some coordination with Google and other transit information providers.
TR-7	Support alternatives to private vehicle travel for visitors	Low	Low costs associated with updating and maintaining visitor bureau website to include focus on private vehicle alternatives.	County and Visit Napa Valley	County funds the VisitNapaValley.com website through Napa County Special Projects Funding. County has some influence over the contents of the website. Requires coordination with Visit Napa Valley.
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	Varies	Costs associated with land use planning and development. Funding sources would depend on the location of proposed developments.	County, Cities, and NVTA	The County has seats on the NVTA Board and can influence transportation planning decisions related to transit oriented development.
TR-9	Support interregional transit solutions	Varies	Costs may vary depending on the solutions needed. Higher costs would be associated with developments of new transit infrastructure, stations, or fleet. Lower costs would be associated with coordination of schedules, routes, and information between transit agencies.	County, Cities, NVTA, and Regional Transit Agencies	The County has seats on the NVTA Board and can influence transportation planning decisions related to transit solutions. A more aggressive approach requires coordination with local and regional transit agencies to promote synergy across transit service areas.
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	Medium	Costs associated with coordination and development of a pilot project. Project moves foreword, may require regular monitoring of program progress.	County and NVTA	The County has seats on the NVTA Board and can influence transportation planning decisions related to transit solutions. A more aggressive approach requires coordination with vineyards and Vine or private ridesharing companies, such as Enterprise, to explore the ridership potential of and best schedule for harvest season ride services.

Measure Cost and Administrative Feasibility						
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility	
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county	Varies	Some costs associated with coordination. Cost of park and ride facilities will depend on whether the facilities are located in the unincorporated area or not.	County, Cities, and NVTA	The County has seats on the NVTA Board and can influence transportation planning decisions related to park and ride facilities. Most facilities would likely be located in Cities where the greatest concentration of residential units are. Park and ride facilities could be located in the unincorporated County if located close to nearby residential concentrations.
TR-12	Increase the supply of electric vehicle charging stations	High	High capital costs associated with construction of EV charging stations, signage, and related infrastructure throughout County. Some costs associated with maintenance.	County and County businesses	Requires coordination with businesses and multi-family complexes to install EV chargers. May require routine maintenance that can be contracted out.
TR-13	Promote telecommuting at office-based businesses	Low	Costs associated with identifying eligible businesses and promotion of telecommuting.	County only	Requires some staff time dedicated to achieving measure goals.
TR-14	Develop and implement active transportation projects	Medium	Costs associated with project research, program funding, and project funding.	County and NVTA	The County would work with NVTA to develop and fund projects, as part of countywide efforts to implement bicycle and pedestrian master plans that exist.
TR-15	Require new development projects to evaluate and reduce VMT	High	Costs associated with project review, program funding, and project funding.	County and NVTA	Requires staff time dedicated to reviewing project applications and determining whether projects meets VMT reduction goals.
TR-16	Convert at least 50% of County fleet vehicles to alternative fuels by 2030	Medium	Costs associated with purchase of alternative fueled vehicles when replacing older vehicles or increasing fleet size.	County Only	Requires staff to research on available alternatively fueled vehicles that are suited to County activities.
WA-1	Amend or revise water conservation regulations for landscape design	Low	Low additional cost to the county due to current code enforcement.	County only	Requires updating current water conservation ordinance. County already does code enforcements.
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	Low	Low additional cost to the county due to current code enforcement.	County only	Requires updating current water conservation ordinance. County already does code enforcements.

Measure Cost and Administrative Feasibility					
		Estimated Cost/Benefit and Regional Economic Impact Considerations		Administrative Feasibility	
#	Measure Name	High-Level Cost Assessment	Detail	Coordination Level	Detail
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	Low	Low additional cost for expedited permits. Slightly reduced revenue from lowered permit fees.	County only	Requires updating County permit fee list.
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	Medium	Some costs associated with developing water audit methods, performing audits themselves, providing feedback to businesses, and recommending solutions.	County only	Requires some staff time dedicated to achieving measure goals. May require establishing a water audit program.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
AG-1	Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel	This measure assumes 50% to 75% of existing and new diesel irrigation pumps in Napa County would be converted to use renewable diesel by 2030 and 2050, respectively. Based on CARB's 2006 statewide emissions inventory estimates extrapolated by the trend in the county's crop acreage, there were approximately 26 diesel irrigation pumps operating in Napa County in 2013, which would grow to 28 pumps by 2030 and 31 pumps by 2050 (CARB 2006, Napa County 2016). This means that only 14 pumps would need to be converted by 2030. CARB 2006 data was the most recent available data on diesel irrigation pumps at the time the inventory was developed. Background data on the inventory and forecast development can be found in the Inventory and Forecast Technical Memorandum. This assumption is conservative because renewable diesel is assumed to be the most feasible alternative to conventional diesel pumps and renewable diesel tends to have the least GHG reduction on a per energy unit-bases. The carbon intensity of renewable diesel is 66 percent less than conventional diesel, according to a study performed for BAAQMD and SCAQMD in 2017 (BAAQMD/SCAQMD 2017). A 75% target for 2050 was used assuming that even if none of the pumps were converted to solar, renewable or other alternative diesel fuel would still be available to use as a alternative fuel without any equipment modifications. Renewable diesel is already currently being sold in Napa County. Alternative fuels are defined as non-petroleum-based fuels. The implementation of the State's Low Carbon Fuel Standard would lower the price of alternative fuels through a pricing-scheme. CARB identified renewable diesel to be the most readily available through the 2030 timeframe, anticipating approximately 2.4 billion gallons per year to be available by 2030 (CARB 2017). CARB anticipates adopting a Low Emissions Diesel rule by 2020 that would require 50% of the state's current diesel demand to be replaced by renewable diesel by 2030 (CARB 2016:152). For other alternatives, replacement electric pumps could either be powered by electricity from the grid or with on-site solar generation and battery storage. Solar-powered irrigation pumps are commonly used in the agricultural industry and require less vehicle trips for refueling and maintenance than diesel pumps due to their on-site generation and storage of electricity. Electric solar and grid-based pumps do not require refueling. Electrification of the pumps also reduces fuel costs.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
AG-2	Support the use of electric or alternatively-fueled agricultural equipment	This measure assumes 50% to 60% of existing and new diesel agricultural equipment in Napa County would use renewable diesel fuel by 2030 and 2050, respectively. Diesel agricultural equipment forecasts are based on the OFFROAD 2007 and are explained in the Inventory and Forecast Technical Memorandum. This assumption is conservative because it is anticipated that the adoption of renewable diesel in place of conventional diesel would be more commonplace than the conversion of equipment to electric or other alternative fuel and because there are less GHG reductions associated with renewable diesel. The carbon intensity of renewable diesel is 66 percent less than conventional diesel, according to a study performed for BAAQMD and SCAQMD in 2017 (BAAQMD/SCAQMD 2017), but electric pumps would be both more efficient than internal combustion engines and have less emissions than renewable diesel. According to the measure calculations, a 50% conversion rate in agricultural equipment would result in the demand of 1.7 million gallons of diesel equivalents. This represents approximately 25% of all diesel sold throughout Napa County (including incorporated areas) in 2017 (CEC 2018a). However, CARB identified renewable diesel to be the most readily available through the 2030 timeframe, anticipating approximately 2.4 billion gallons per year to be available by 2030 statewide (CARB 2017). CARB anticipates adopting the Low Emissions Diesel rule by 2020 that would allow 50% of the state's current diesel demand to be replaced by renewable diesel by 2030 (CARB 2016:152). The implementation of the State's Low Carbon Fuel Standard would lower the price of alternative fuels through a pricing-scheme. Based on fuel availability, adjusted fuel price, and energy demand, CARB anticipates that statewide consumption of renewable diesel could increase by up to 57 times of the baseline rate by 2020, from 7 to 400 million gallons (Table VII-7 [LCFS Staff report] CARB 2014). CARB is working to increase the supply of low carbon fuels, including renewable diesel, through the implementation of the Scoping Plan, LCFS, and Mobile Source Strategy. For other alternatives, alternative equipment could either be powered by renewable natural gas, compressed natural gas, or electricity.
AG-3	Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment	This measure conservatively assumes that 5% of off-road agricultural equipment other than irrigation pumps would operate with a Tier 4 Final engine rating. This measure assumes that emissions and fuel efficiency are directly proportional. Based on industry reports, Tier 4 Final-rated equipment have at least a 5% improvement in fuel economy compared to Tier 4 initial equipment. The measure conservatively assumes that a 5 % improvement in fuel efficiency would occur with every replacement with Tier 4 final equipment. Actual improvement in fuel efficiency may be greater if equipment with ratings lower than Tier 4 initial are replaced with Tier 4 final. Tier 4 Final off-road agricultural equipment have been offered by multiple manufacturers at least since 2013. (Caterpillar 2018)
AG-4	Support reduced application of inorganic nitrogen fertilizer	Not quantified
AG-5	Support BAAQMD in efforts to reduce open burning of removed agricultural biomass and flood debris	Not quantified
AG-6	Encourage and support the use of carbon farming and other sustainable agricultural practices in the County	Not quantified

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
BE-1	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings	This measure assumes a 100% compliance rate for eligible residential and commercial alteration/addition projects over 1,000 sq ft in size would comply with the CALGreen Tier 1 green building standards (2019 standards). Renovated residential energy use is assumed to be 42.9% less than existing residential energy use. Renovated commercial energy use is assumed to be 51.8% less than existing commercial energy use. Measure assumes that 50% of the eligible areas would be subject to the energy efficiency requirements and have the Tier 1 reduction in energy use applied. Because the requirements would not be in effect until 2020, it is assumed that the reductions would not be realized until after 2020. Between 2008 and 2019, four iterations of the CalGreen Tier 1 standards have been published (2010 CalGreen, 2013 CalGreen, 2016 CalGreen, and 2019 CalGreen). The 2019 standards will be in effect starting January 1, 2019. The 2013 and 2016 standards claim a 15% reduction in energy use over each preceding standard for residential buildings and a 10% reduction for over each preceding standard for commercial buildings. The 2019 standard claims a 52% percent (45% associated with solar generation) increase in energy efficiency over 2016 standards for residential energy use and 30% for commercial. Due to BE-5 also include reductions from solar, the solar reduction component of the 2019 residential standards were excluded from this calculation. (CEC 2018b) The compounded reductions across the three iterations resulted in 2019 Tier 1 standards being 42.9% and 51.82% more efficient than 2008 standards, for residential and commercial land uses, respectively. It is assumed that those properties undergoing eligible renovations were built before 2008, which were likely less efficient that 2008 CA energy standards. Thus, the percent reduction in energy use is likely conservative. In order to capture any buildings built after 2008 that would undergo eligible alterations and because the standards only apply to the renovated portion of an existing building, it was assumed that the percent reduction in energy use would only apply to 50% of eligible projects.
BE-2	Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030	This measure assumes that all new construction would comply with California ZNE standards and use net zero electricity and natural gas during operation. New residential ZNE requirements would be effective by 2020 and non-residential ZNE requirements would be effective by 2030. Although the requirements would be effective by those dates, it is assumed that residential and non-residential buildings undergoing construction in 2020 or 2030 would not realize GHG reductions until 2021 or 2031, respectively. Reductions are based on the reduction of emissions relative to the legislative-adjusted BAU forecasted energy use in new construction. The legislative-adjusted BAU forecasted energy use existing energy use scaled by changes in population and jobs then divided the result by two to reflect the mandate in SB 350 that requires the state to double statewide energy efficiency savings in electricity and natural gas end uses by 2030.
BE-3	Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.	MCE's recently approved their 2019 Integrated Resource Plan (IRP). In the 2019 IRP, MCE plans to achieve a minimum of a 94 percent and 100 percent GHG-free portfolio for all customers by 2020 and 2022, respectively (MCE 2018:Table 8). Instead of accounting for this portfolio plan in the business-as-usual (BAU) GHG forecast, the reductions from MCE's GHG-free plan are accounted for under this measure. It is assumed that any GHG reductions associated with the additional participation in Deep Green would be overshadowed by MCE's GHG-free plan. However, the County will still pursue additional participation in Deep Green due to the option's focus on renewable sources, rather than GHG-free energy sources. "GHG-free" energy sources differ from "renewable" sources in that some GHG-free sources are not considered "renewable" due to the environmental impacts they may cause (e.g., large scale hydroelectric and nuclear energy).

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
BE-4	Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.	This measure assumes that starting in 2030, all new or replacement residential water heaters will be electric or solar powered. Measure reductions are based on anticipated turnover in residential natural gas water heaters and their associated natural gas savings if this measure were to be implemented. The calculations are based on legislative-adjusted BAU forecasts of residential natural gas use and the percent of natural gas used in homes that is used for water heating in California from the U.S. Energy Information Administration's (US EIA) 2009 Residential Energy Consumption Survey (RECS) (U.S. EIA 2009). The data on the water heater age distribution in California was available from the US Department of Energy (DOE). According to the DOE, natural gas water heaters are replaced on average every 13 years (DOE 2010). Note that US EIA released a 2015 version of the RECS in spring 2018; however, this newer data set does not have data broken out for California (U.S. EIA 2015). Based on the total natural gas usage in the unincorporated county and the EIA's estimate that 34% of residential natural gas used in California is used for water heating, it is estimated that this measure would affect the replacement of approximately 5,000 residential water heaters by 2030, assuming an average usage rate of 250 therms per water heater per year (EERE 2018).
BE-5	Expand current renewable energy and green energy incentives and update local ordinances	The measure assumes that average annual kW in solar permit approvals by the County between 2014 and 2018 will continue into the future through 2030. The calculations assume that homes/businesses that choose to install solar would not opt into MCE's Deep Green Option. The measure also assumes that the electricity generated by solar PV systems in the County will have similar generation rates as anticipated in the National Renewable Energy Laboratory's PV Watts Calculator (pvwatt.nrel.gov). The actual total size (in kW) of solar permits approved by the County may depend on the solar requirements under new building codes in the future. A historical trend basis is used in this measure as a conservative estimate because building codes prior to 2019 do not require solar installations.
BE-6	Select MCE's Deep Green Option for all County Facilities	The County has already opted into Deep Green for all County facilities as of 2017. (MCE 2017)
BE-7	Support waste-to-energy programs at unincorporated landfills	This measure accounts for anticipated emissions reduction at the Clover Flat Landfill's waste-to-energy program. Measure assumes that the waste-to-energy project would be successful and accounts for the reduction in forecasted energy use from CFL, estimated in the "Climate Action Management Plan to 2020 for Clover Flat Landfill and Upper Valley Recycling" (CAMP) (UVDS 2016). Measure reductions rely on estimates from UVDS's CAMP. As noted in Chapter 3 of the CAP, American Canyon Sanitary Landfill, the only other landfill currently in the unincorporated county, has discontinued their landfill gas capture program due to declining gas supply at the closed landfill. Thus, no reductions are quantified for American Canyon Sanitary Landfill.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
BE-8	Work with PG&E, BayREN, MCE, and PACE financing programs, and other regional partners to incentivize energy efficiency improvements in existing buildings	Not quantified
BE-9	Require energy audits for major additions to or alterations of existing buildings	Not quantified
BE-10	Develop a program to allow new development to offset project GHG emissions by retrofitting existing income-qualified homes and buildings	Not quantified
BE-11	Encourage solar panel installations on commercial roof spaces	Not quantified
HG-1	Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems	Measure assumes that forecasted hydrofluorocarbon (HFC) emissions for 2030 will be 40% less than HFC emissions in the 2014 baseline year. Although SB 1383 targets a 40% reduction in HFC emissions below 2013 levels, it is assumed that the county's 2014 emissions can be used as a proxy for 2013 emission levels. Measure also assumes that the State will continue to achieve the HFC reduction goal through 2050. At the time the inventory and forecast were being developed, SB 1383 had not yet been adopted. Thus, the potential legislative reductions from SB 1383 were not included in the forecast. This measure accounts for the potential reductions from SB 1383 as they apply to Napa County. This quantification is expected to reflect the additional legislative reduction in high-GWP gases that were not reflected in this CAP's GHG forecast (See Appendix A).
HG-2	Incentivize the use of low-GWP refrigerants	Not quantified
LU-1	Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting	This measure assumes 30% of trees forecasted to be lost under the General Plan would be conserved and up to 2,500 oak and coniferous trees would be planted per year. Replanting efforts assume a 20% mortality rate. Original forecasts assume a certain reduction in oak woodland based on land use forecasts. The county is assumed to start planting 2,500 trees per year in 2020, but the credits associated with the planting in 2020 are not given until 2021, as a conservative approach. The mortality rate, tree planting targets, and preservation rates are based on discussions with County staff on what is feasible in terms of County resources and experience.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
LU-2	Refine protection guidelines for existing riparian lands	This measure assumes all riparian land in 2014 would remain in future years. Emissions forecasts assume a certain reduction in riparian acreage from existing levels based on land use forecasts under the General Plan. Reductions associated with this measure assume that the anticipated removal of riparian lands under the General Plan would not occur. According to County General Plan maps, the County would experience a loss of 37 acres of riparian woodlands between 2014 and 2030. This loss increases to 83 acres by 2050. Riparian woodlands were assumed to be the average of coastal oak species types, tanoaks, and redwoods. Other riparian vegetation, such as shrubs and understory vegetation, were not included in the carbon storage and sequestration baseline and forecasts.
LU-3	Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests	This measure assumes 80% of the lumber from removed oak and coniferous trees would be repurposed, buried, or otherwise unburned and prevented from releasing stored CO_2 back into the atmosphere. The 80% repurpose rate would allow for any removed trees or lumber milling byproducts unsuitable for repurposing, aerobic composting, or conversion to biochar or biomass fuel to be burned or landfilled. Information is limited on the experience of other jurisdictions with programs similar to this one.
MS-1	Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030	For all certified businesses, it is assumed that 75% of businesses already undergoing energy retrofits pursuant to SB350 programs would seek to be or are already Napa Green Certified. Calculations assumes a 100% certification rate for wineries by 2030 by production volume. As of 2018, at least 40% of wine production and more than 50% of vineyard land are Napa Green Certified (Napa Valley Vintners 2018). Although this measure would theoretically reduce emissions across all sectors, there is not enough information available to determine the average savings associated with being Napa Green Certified. Only reductions in wastewater emissions from wineries were accounted for in this measure because the inventory assumed that all Napa Green Wineries treat their wastewater aerobically.
MS-2	Work with other local jurisdictions within the County to develop a unified Climate Action Plan	Not quantified
MS-3	Promote the sale of locally-grown foods and/or products	Not quantified
MS-4	Establish a local carbon offset program in partnership with Sustainable Napa County	Not quantified

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
OR-1	Require Tier 4 equipment for all construction activity and mining operations as a condition for approval by 2030	This measure assumes that the majority of construction and mining equipment emissions would be affected. An 80% participation rate is included to allow for any exceptions that could occur. Construction activities are inherently related to new projects and would be affected by this measure through the implementation of the CAP checklist. Construction and mining equipment emissions cannot be separated due to their combined emissions provided through OFFROAD 2007, where the off-road emissions forecasts originated. This measure conservatively assumes that all construction and mining equipment would operate with a Tier 4 Final engine rating. This measure assumes that emissions and fuel efficiency are directly proportional. Based on industry reports, Tier 4 Final-rated equipment have at least a 5% improvement in fuel economy compared to Tier 4 initial equipment. The measure conservatively assumes that a 5 % improvement in fuel efficiency would occur with every replacement with Tier 4 final equipment. Actual improvement in fuel efficiency may be greater if equipment with ratings lower than Tier 4 initial are replaced with Tier 4 final. Tier 4 Final off-road agricultural equipment have been offered by multiple manufacturers at least since 2013. (Caterpillar 2018).
OR-2	Require the use of renewable diesel or other alternative fuel for all construction activity and mining operations as a condition for approval by 2030	This measure assumes that 80% of construction and mining equipment emissions would comply with this measure. An 80% participation rate is included to allow for any exceptions that could occur. Construction activities are inherently related to new projects and would be affected by this measure through the implementation of the CAP checklist. Construction and mining equipment emissions cannot be separated due to their combined emissions provided through OFFROAD 2007, where the off-road emissions forecasts originated. According to the measure calculations, an 80% participation rate would result in the demand of approximately 550,000 gallons of diesel equivalents. This represents approximately 8% of all diesel sold throughout Napa County (including incorporated areas) in 2017 (CEC 2018a). However, CARB identified renewable diesel to be the most readily available through the 2030 timeframe, anticipating approximately 2.4 billion gallons per year to be available by 2030 statewide (CARB 2017). CARB anticipates adopting the Low Emissions Diesel rule by 2020 that would allow 50% of the state's current diesel demand to be replaced by renewable diesel by 2030 (CARB 2016:152). The implementation of the state's Low Carbon Fuel Standard would lower the price of alternative fuels through a pricing-scheme. Based on fuel availability, adjusted fuel price, and energy demand, CARB anticipates that statewide consumption of renewable diesel could increase by up to 57 times of the baseline rate by 2020, from 7 to 400 million gallons (Table VII-7, 2015 LCFS Staff report) (CARB 2015). CARB is working to increase the supply of low carbon fuels, including renewable diesel, through the implementation of the Scoping Plan, LCFS, and Mobile Source Strategy.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
SW-1	Encourage expansion of composting program for both residential and commercial land uses	This measure is adapted from calculations from Edgar and Associates who worked on the CAMP for UVDS. The measure calculates the reductions associated with composting additional commercial organics under AB 1826 and specific composting targets for residential land uses under SW-1. AB 1826 was not accounted for in the legislative-adjusted BAU forecast, so the GHG reductions in 2020 associated with that bill are accounted for in this measure. AB 1826 seeks to reduce the amount of commercial organic waste sent to landfills to 50% of 2014's level by 2020. This measure seeks to expand upon those efforts by setting a target for an 85% reduction in food waste and 100% reduction in green waste by 2030 and 2050 for both commercial and residential organics relative to 2014 levels. The calculations start by assessing the 2014 and forecasted landfilled organic waste. This was calculated by combining the forecasted landfilled waste tonnages from the inventory and forecast exercise with CalReycle's 1999 waste stream profile for the unincorporated Napa County, which was the latest available data at the time this CAP was developed. This waste profile, or characterization, list was developed for the waste disposed, not landfilled. However, there was not enough data at the time to provide an estimate of the actual amount of organics that were composted v.s. landfilled in 2014 to say whether the waste profile approach would over or underestimate the actual organics waste landfilled. Thus, the use of CalReycle's waste profile was the best approach that could be used at the time the County's 2014 GHG inventory was being developed. Once the commercial and residential landfilled organics tonnages were established, the tonnages were further divided into the type of organics waste (e.g., food, green waste, lumber), based on the same CalRecycle waste profile data. The targets in this measure address food and green waste only. It was assumed that green waste would be much easier to collect and prevent from being landfilled than food waste, thus a higher diversion target was applied to green waste. The 85% diversion target for food waste by 2030 was based on a general extrapolation of CalReycle's 75% diversion goal by 2020. To estimate methane emissions associate with offset organic waste, emission factors from EPA's WARM model were applied to food and green waste diverted tonnage under SW-1 (EPA 2016). Based on WARM's available metrics, the selected emission factors assumed no stored carbon or transportation emissions and accounted for the application of LFG recovery and flaring.
SW-2	Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030	This measure assumes that County will achieve an 80% diversion rate for all waste disposed by 2020, such that 80% of all waste generated by weight would either be recycled, composted, or reused. This target increases to 90% by 2030. The measure targets were based on the County exceeding the 75% diversion target CalRecycle set statewide for 2020. The County's 2014 diversion rate was 70%, so it was assumed it would be feasible for the County to exceed the 75% diversion target by 5% by 2020. The reductions from this measure were back-calculated from the BAU landfill emissions that had assumed a 75% diversion rate, then applying an 80% or 90% diversion rate, depending on the target year.

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
TR-1	Update Transportation System Management Ordinance (for Employers)	This measure applies CAPCOA measures TRT-1/TRT-3/TRT-11 (Commute Trip Reduction measures) and TRT-2 (Commute Trip Reduction Monitoring Program), which have a minimum VMT reduction of 1-2% and 4.2%, respectively (CAPCOA 2010). CAPCOA assumes a maximum of a 21% reduction in VMT among these measures. Calculations assume a rural context and applicability to large employers in the unincorporated area. The measure applies only to commute VMT, which was available from MTC. The calculations are based on the daily commute VMT forecasted for each milestone year. This commute VMT was compared against the total daily VMT for passenger vehicles and all vehicles. The resulting ratios (commute VMT: all passenger VMT) were applied to the total forecasted transportation emissions to extract the emissions only associated with commuting. The resulting commute emissions were multiplied by the percent reductions from selected CAPCOA commute measures to get the total emissions reduction for this measure. Percent reductions in commute VMT were obtained from CAPCOA's estimates for three different commute trip reduction measures (6.2% cumulative reduction in commute VMT). CAPCOA's recommended measures were based on a literature review of multiple studies. The CAP's measure calculations assign a 2% reduction in VMT to the implementation of Commute Trip Reduction Measures (e.g., a general commute trip reduction program and a ride sharing program). With monitoring, CAPCOA assigns a minimum of a 4.2% reduction in VMT. Thus, the selected 6.2% cumulative reduction in VMT is conservative relative to the range of effectiveness shown in CAPCOA. (CAPCOA 2010).
TR-2	Adopt parking reduction ordinance revisions	This measure applies CAPCOA TRT-14 and TRT-15 measures which assume a 0.1-19.7% reduction in commute VMT. This measure assumes a low rate (0.1%) of VMT reduction due to rural nature of Napa County. Baseline commute VMT was taken from the results calculated in TR-1. (CAPCOA 2010). As with TR-1, this measure conservatively assumed the lowest percent reduction in commute VMT estimated by CAPCOA. (CAPCOA 2010).
TR-3	Increase affordable housing, especially workforce housing, in Napa County	Applies CAPCOA LUT-6 measure which assumes a 0.04 - 1.2% reduction in VMT. This measure assumes a low rate (0.04%) of VMT reduction due to distance from cities in Napa County to destinations in the unincorporated area. Commute from cities is closer than commuting from neighboring counties, depending on work locations. Baseline commute VMT was taken from the results calculated in TR-1. (CAPCOA 2010). As with TR-1, this measure conservatively assumed the lowest percent reduction in commute VMT estimated by CAPCOA. (CAPCOA 2010).
TR-4	Support efforts to allow commuter service to operate on railroad rights-of-ways	The reductions in this measure were based on reports of a potential pilot program instigated and run by Napa Valley Wine Train. Wine Train assumed that up to 4 rail cars could be used for commuters by 2030 and 6 by 2050. To calculate the estimated emissions reduction, the emissions associated with diesel locomotives based on the anticipated ridership capacity of the 4 rail cars were compared to emissions from single occupancy vehicles. To build on this pilot, it was assumed that two more cars would be added by 2050. (CAPCOA 2010, Scott Pers. Comm. 2018, Sweeney 2017). The Napa Valley Wine Train pilot program was used as proxy for the potential reductions (or possibly the minimum reductions) that would occur if a similar commute program were to be successful in the future. Given that only a handful of rail cars were involved in the pilot, it is assumed that the reductions associated with this measure are also conservative.
TR-5	Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG	UVDS and Clover Flat Landfill already have plans to convert their fleet from diesel to CNG in their CAMP. Assumptions based on the difference in emission factors between diesel and CNG fuels. Baseline diesel use in UVSD's fleet was available from the CAMP for 2014 (UVDS 2016). Although UVDS's actions are not specifically related to the CAP, the emissions reductions are not captured in the legislative-adjusted BAU forecast. Thus, the estimated reductions are accounted for under this measure. The reductions are based on data and calculations in the CAMP (UVDS 2016).

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
TR-6	Support efforts of transit agencies to increase availability and accessibility of transit information	Not quantified
TR-7	Support alternatives to private vehicle travel for visitors	Not quantified
TR-8	Support Napa County's incorporated cities in developing transit-oriented development unique to the needs of the Napa Region	Not quantified
TR-9	Support interregional transit solutions	Not quantified
TR-10	Work with Napa County's incorporated cities, NVTA, and neighboring regions to increase presence of park and ride facilities near residential centers	Not quantified
TR-11	Promote existing ride-matching services for people living and working in the unincorporated county	Not quantified
TR-12	Increase the supply of electric vehicle charging stations	Not quantified
TR-13	Promote telecommuting at office-based businesses	Not quantified
TR-14	Develop and implement active transportation projects	Not quantified
TR-15	Require new development projects to evaluate and reduce VMT	Not quantified
TR-16	Convert at least 50% of County fleet vehicles to alternative fuels by 2030	Not quantified

Quantification Background and Assumptions		
#	Measure Name	Background and Assumptions
WA-1	Amend or revise water conservation regulations for landscape design	Not quantified
WA-2	Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering	Not quantified
WA-3	Expedite and/or reduce permit fees associated with water conservation installations in existing facilities	Not quantified
WA-4	Require water audits for large new commercial or industrial projects and significant expansions of existing facilities	Not quantified

Quantification Background - References			
References	Author	Title	Link
BAAQMD/SCAQMD 2017	BAAQMD and SCAMQD. Prepared by Gladstein, Neandross, and Associates	renewable diesel as a Major Heavy-Duty Transportation Fuel in California	https://www.gladstein.org/wp-content/uploads/2018/05/Final-Report-August-2017.pdf
CAPCOA 2010	California Air Pollution Control Officers Association	Quantifying Greenhouse Gas Mitigation Measures	http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
CARB 2006	California Air Resources Board	Appendix D. Emission Inventory Methodology. Agricultural Irrigation Pumps - Diesel	https://www.arb.ca.gov/regact/agen06/append.pdf
CARB 2014	California Air Resources Board	STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING	https://www.arb.ca.gov/regact/2015/lcfs2015/lcfs15isor.pdf
CARB 2016	California Air Resources Board	Mobile Source Strategy	https://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf
CARB 2017	California Air Resources Board	Responses to Comments on the Draft Environmental Analysis for THE PROPOSED 2016 STATE STRATEGY FOR THE STATE IMPLEMENTATION PLAN	https://www.arb.ca.gov/planning/sip/2016sip/2016statesip_RTC.pdf
Caterpillar 2018	Caterpillar	CATERPILLAR AT TIER 4: FREQUENTLY ASKED QUESTIONS	https://www.cat.com/en_AU/news/machine-press-releases/caterpillar-at-tier4frequentlyaskedquestions.html
CEC 2018a	California Energy Commission	California Retail Fuel Outlet Annual Reporting (CEC-A15) Results	https://www.energy.ca.gov/almanac/transportation_data/gasoline/piira_retail_survey.html
CEC 2018b	California Energy Commission	Building Energy Efficiency Program	https://www.energy.ca.gov/title24/
DOE 2010	Department of Energy	Water Heater Market Profile	https://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/Water_Heater_Market_Profile_2010.pdf
EERE 2018	Office of Energy Efficiency and Renewable Energy	Energy Cost Calculator for Electric and Gas Water Heaters	https://www.energy.gov/eere/femp/energy-cost-calculator-electric-and-gas-water-heaters-0#output
EPA	U.S. Environmental Protection Agency	Waste Reduction Model (WARM 14)	https://www.epa.gov/warm
MCE 2018	Marin Clean Energy	2019 Integrated Resource Plan	https://www.mcecleanenergy.org/wp-content/uploads/2019/01/MCE-2019-Integrated-Resource-Plan_11-8-2018_V_12-21-18.pdf
Napa County 2016	Napa County	GIS data from County staff of current land uses and land uses under the General Plan.	
Napa Valley Vintners 2018	Napa Valley Vintners	Public comment on Revised Draft CAP	
Scott, Pers. Comm. 2018	Goldie, Scott, Co-Corporate Executive Officer. Brooks Street, Napa, CA.	April 4, 2018—telephone discussion with Brenda Hom of Ascent Environmental regarding verification of assumptions to be used in the calculation of measure TR-5.	
Sweeney 2017	Sweeney, C. North Bay Business Journal.	Wine Train commuter service among possible Napa Valley traffic solutions. (February 7, 2017)	http://www.northbaybusinessjournal.com/northbay/napacounty/6606349-181/wine-train-napa-valley-traffic-solutions?artslide=2
US EIA 2009	U.S. Energy Information Administration	Fuels Used and End Uses in Homes in West Region, Divisions, and States, 2009	https://www.eia.gov/consumption/residential/data/2009/
US EIA 2015	U.S. Energy Information Administration	Fuels Used and End Uses in Homes in West Region, 2015	https://www.eia.gov/consumption/residential/data/2015/index.php?view=consumption
UVDS 2016	Upper Valley Disposal Service	Climate Action Management Plan to 2020 for Clover Flat Landfill and Upper Valley Recycling	https://www.countyofnapa.org/DocumentCenter/View/1492/Climate-Action-Plan---Upper-Valley-Disposal-Service-PDF

Reduction Measure Quantification

Building Energy Assumptions	2020	2030	2050
Napa County Average Electricity Emissions Factor (MTCO2e/MWh)	1.29E-01	5.91E-02	5.58E-02
Natural Gas Emissions Factor (MTCO2e/therm)		0.00685	
Source: Final Technical Memorandum #1: 2014 Greenhouse Gas Emissions Inventory and Forecasts			

AG-1 Support the conversion of stationary diesel or gas-powered irrigation pumps to solar, electric, or other alternative fuel		2014	2020	2030	2050
Number of Diesel Irrigation Pumps in Napa County		25.9	26.5	28.0	31.4
Emissions from Diesel Irrigation Pumps (MTCO2)		1,657	1,697	1,792	2,009
Reductions conservatively assume all diesel irrigation pumps will use renewable diesel					
Diesel Emission Factor (kg CO2/gal)	10.21				
Renewable Diesel Carbon Intensity (kg CO2/gal) (66% lower than conventional diesel)	3.47				
Source: Renewable Diesel as a Major Heavy-Duty Transportation Fuel in California (BAAQMD 2017)					
Conversion Rate			0%	50%	75%
Number of converted pumps			0	14	24
Calculated fuel use with assumed conversion rate (gal)			-	87,807	147,660
Emissions from renewable diesel (MTCO2)			-	305	512
Emissions from Unconverted Irrigation Pumps (MTCO2)			1697	896	502
Total Emissions from Irrigation Pumps under this measure (MTCO2)			1,697	1,201	1,015
Net GHG Reduction from AG-1 (MTCO2e)			-	591	995

AG-2 Support the use of electric or alternatively-fueled agricultural equipment		2014	2020	2030	2050
Emissions from Agricultural Equipment Except for Irrigation Pumps. Scaled by change in cropland. (MTCO2e)		31,571	32,336	34,161	38,297
Percent of Equipment Converted to Alternative Fuel (e.g., electric, renewable diesel, biodiesel)			0%	50%	60%
Reductions conservatively assume all diesel irrigation pumps will use renewable diesel					
Diesel Emission Factor (kg CO2/gal)	10.21				
renewable diesel Carbon Intensity (kg CO2/gal) (66% lower than conventional diesel)	3.47				
Source: Renewable Diesel as a Major Heavy-Duty Transportation Fuel in California (BAAQMD 2017)					
For reference, 7 million gallons of diesel were sold in Napa County in 2017 (Transportation Fuels Data Unit CEC-A15 report)					
Calculated fuel use from converted equipment (gal)			-	1,673,490	2,251,361
Emissions from renewable diesel			-	5,807	7,813
Emissions from Unconverted Equipment (MTCO2)			32,336	17,080	15,319
Total Emissions from Ag equipment under this measure (MTCO2)			32,336	22,888	23,132
Net GHG Reduction from AG-2 (MTCO2e)			-	11,273	15,166

AG-3 Support the use of Tier 4 final Diesel Equipment for Off-Road Agricultural Equipment		2014	2020	2030	2050
Emissions from Agricultural Equipment **Except** for Irrigation Pumps (MTCO2e)		31,571	32,336	34,161	38,297
Emissions Reduced from AG-2			-	11,273	15,166
Remaining emissions from diesel agricultural equipment			32,336	22,888	23,132
Participation rate of equipment that are Tier 4 Final			-	5%	5%
Average percent improvement in fuel efficiency with Tier 4 Final equipment			5%	5%	5%
Net GHG Reduction from AG-3 (MTCO2e)			-	57	58

Reduction Measure Quantification (continued)

BE-1					
Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for eligible alterations or additions to existing buildings			2020	2030	2050

From Inventory Demographics Assumptions (Unincorporated County)		***2014***	***2020***	***2030***	***2050***
Households (HH)		12,356	12,931	13,890	15,844
Population		26,665	28,612	31,857	38,384
Jobs		11,400	11,732	12,284	13,372
Source: Fehr and Peers 2015 (Technical Memorandum to Ascent dated November 5, 2015)					
Residential					
Average number of eligible residential permits per year scaled by population growth		50	52	56	64
Average electricity use per HH (from County HH data and PGE estimates for 2013) (kWh)		9,406	9,406	9,406	9,406
Average natural gas use per HH (from County HH data and PGE estimates for 2013) (therms)		308	308	308	308
Percent of HH applicable to energy audit (conservative assumption)	50%				
Percent reduction in energy use between 2008 and 2010 standard	15%				
Percent reduction in energy use between 2010 and 2013 standard	15%				
Percent reduction in energy use between 2013 and 2016 standard	15%				
Percent reduction in energy use between 2016 and 2019 standard (excludes reductions due to solar to avoid double counting with BE-5)	7%				
CalGreen Tier 1 Percent Reduction from 2008 standards (conservative assumption)	42.9%				
Source: 2010, 2013, 2016, and 2019 California Green Standards Building Code					
Residential Compliance Rate			0%	100%	100%
Electricity Savings per year (kWh)			-	113,372	129,317
Natural Gas Savings per year (therms)			-	3,712	4,235
Emissions savings per year (MTCO2e)			**-**	**32.13**	**36.22**
Commercial					
Average number of eligible non-residential permits per year		50	51	54	59
Sqft of new or improved space per permit		1,000	1,001	1,002	1,003
Total SQFT of new or improved existing building space		50,000	51,506	53,986	58,823
Percent of Commercial area applicable to energy audit	50%				
Percent reduction in energy use between 2008 and 2010 standard	15%				
Percent reduction in energy use between 2010 and 2013 standard	10%				
Percent reduction in energy use between 2013 and 2016 standard	10%				
Percent reduction in energy use between 2016 and 2019 standard	30%				
CalGreen Tier 1 Percent Reduction from 2008 standards (conservative assumption)	51.8%				
Source: 2010, 2013, 2016, and 2019 California Green Standards Building Code					
Average kwh per commercial sqft (kwh/sqft)	14				
Average therm per commercial sqft (therms/sqft)	0.30				
Commercial Compliance Rate			0%	100%	100%
Electricity Savings per year (kWh)			-	196,589.45	214,204.69
Natural Gas Savings per year (therms)			-	4,260	4,641
Emissions savings per year (MTCO2e)			**-**	**40.80**	**43.74**
Net GHG Reduction from BE-1 (MTCO2e)			-	73	80

Reduction Measure Quantification (continued)

BE-2					
Require compliance with CALGreen Tier 1 Green Building standards and Tier 1 Building Energy Efficiency Standards for all new construction, and phase in ZNE standards for new construction, beginning with residential in 2020 and non-residential by 2030		2014	2020	2030	2050

Note: All energy usage shown on an annual basis.

Residential					
Forecast energy usage (w/o SB350)					
Electricity (kWh)		116,340,405	121,689,479	130,714,390	149,098,861
Natural Gas (therms)		3,809,649	3,984,808	4,280,335	4,882,347
New Energy Use Only (w/o SB350)					
Electricity (kWh)			5,349,074	14,373,986	32,758,457
Natural Gas (therms)			175,159	470,686	1,072,699
New Energy Use Only (w/ SB350) (Doubling existing energy efficiency)					
Electricity (kWh)			3,851,334	7,186,993	16,379,228
Natural Gas (therms)			126,115	235,343	536,349
Percent Reduction in Energy Use from CalGreen Tier 1 or ZNE from prior set of standards			0%	100%	100%
Calgreen Tier 1 or ZNE			ZNE	ZNE	ZNE
New Energy Use Only (w/ SB350 + CalGreen Tier 1 or ZNE)					
Electricity (kWh)			3,851,334	-	-
Natural Gas (therms)			126,115	-	-
Residential Energy Reductions					
Electricity (kWh)			-	7,186,993	16,379,228
Natural Gas (therms)			-	235,343	536,349
Emissions Reductions (MTCO2e)					
Electricity			**-**	**425**	**913**
Natural Gas			**-**	**1,612**	**3,674**

Commercial					
Forecast energy usage (w/o SB350)		2014	2020	2030	2050
Electricity (kWh)		214,162,060	220,391,174	230,773,030	251,200,573
Natural Gas (therms)		8,626,723	8,877,640	9,295,835	10,118,682
New Energy Use Only (w/o SB350)					
Electricity (kWh)			6,229,114	16,610,971	37,038,513
Natural Gas (therms)			250,917	669,111	1,491,959
New Energy Use Only (w/ SB350)					
Electricity (kWh)			4,484,962	8,305,485	18,519,256
Natural Gas (therms)			180,660	334,556	745,979
Percent Reduction from CalGreen Tier 1 or ZNE from prior set of standards			0%	0%	100%
Calgreen Tier 1 or ZNE			ZNE	ZNE	ZNE
New Energy Use Only (w/ SB350 + CalGreen Tier 1 or ZNE)					
Electricity (kWh)			4,484,962	8,305,485	-
Natural Gas (therms)			180,660	334,556	-
			2020	2030	2050
Commercial Energy Reductions					
Electricity (kWh)			-	-	18,519,256
Natural Gas (therms)			-	-	745,979
Emissions Reductions (MTCO2e)					
Electricity			**-**	**-**	**1,033**
Natural Gas			**-**	**-**	**5,110**
Commercial and Residential					
Emissions Reductions (MTCO2e)					
Electricity			**-**	**425**	**1,946**
Natural Gas			**-**	**1,612**	**8,784**
Net GHG Reduction from BE-2 (MTCO2e)			-	2,037	10,730

Reduction Measure Quantification (continued)

BE-3					
Increase participation in MCE's Deep Green (100% renewable) option and encourage ongoing participation in MCE.			2020	2030	2050
Target Participation Rate under BE-3 (Adjusted per MCE's 2019 Integrated Resource Plan to increase to 94% GHG-free electricity by 2020 and 100% GHG-free electricity for all customers by 2022 and to account for unincorporated County's 86% participation rate in MCE).			81%	86%	86%
County electricity use prior to measures (with Legislative Reductions) (kWh)			344,385,969	190,832,440	219,495,859
Reductions from other measures (kWh)					
BE-1			-	196,589	214,205
BE-2			-	7,186,993	34,898,485
BE-4			-	(2,386)	(2,411)
BE-7			-	78,914	85,904
Adjusted County Electricity Use (kWh)			344,385,969	183,372,330	184,299,677
Emissions from Electricity use under MCE/PGE (MTCO2e)			44,468	10,844	10,277
Emissions removed under BE-3 (MTCO2e)			35,948	9,326	8,838
Reductions from MU-1 (assumes that County's participation is accounted for in County's total participation rate)			-	170	205
Net GHG Reduction from BE-3 (MTCO2e)			35,948	9,155	8,633

Reduction Measure Quantification (continued)

BE-4

Require new or replacement water heating systems to be electrically powered or alternatively fueled (e.g., solar water heating) for all residential land uses.			2020	2030	2050
Percent of natural gas use in homes by end use in California		***2009***			
Space Heating		25%			
Water Heating		**34%**			
Cooking		25%			
Other		16%			
Water heating usage by fuel type		***2009***			
Natural Gas		**85%**			
Electric		11%			
Propane		4%			
Source: EIA 2009. http://www.eia.gov/consumption/residential/data/2009/					
Average age of natural gas water heater at replacement (years)		13	U.S. DOE		

		Percent of existing water heaters replaced by this year			
Percent of current main water heaters by age		***2009***	***2020***	***2030***	***2050***
Less Than 2 Years		16%	0	100%	100%
2 to 4 Years		16%	0	100%	100%
5 to 9 Years		30%	50%	100%	100%
10 to 14 Years		18%	100%	100%	100%
15 to 19 Years		7%	100%	100%	100%
20 Years or More		14%	100%	100%	100%
Source: EIA 2009. http://www.eia.gov/consumption/residential/data/2009/					
		2014	***2020***	***2030***	***2050***
Annual Residential Natural Gas Use in Napa with Legislative Reductions (therms)		3,809,649	3,937,389	2,245,464	2,679,159
Savings from BE-3 (therms)			-	4,260	4,641
Adjusted Residential Natural Gas Use (therms)			3,937,389	2,241,205	2,674,518
Compliance Rate			0%	100%	100%

Natural Gas Savings from replacement of Existing Water Heaters		2014	2020	2030	2050
Natural gas usage from existing water heaters with turnover (therms)		1,282,333	593,867	-	-
Natural Gas reduced from replacement of complying Existing Water Heaters (therms)			-	1,282,333	1,282,333
Natural Gas Savings from elimination of new Natural Gas water heaters					
Water heater usage in all residences before measure (therms)			1,325,330	755,826	901,808
Eliminated new water heater usage (therms) (accounts for compliance rate)			-	755,826	901,808
Total reduction in Natural Gas Use due to Measure (therms)			-	2,038,159	2,184,141
GHG Reductions from Natural Gas Savings (MTCO2e)			-	13,961	14,961
Assuming all natural gas replaced by electric water heaters (conservative)					
Therms needed to heat 45 gallons of hot water (61% efficiency)		0.333333			
kWh needed to heat 45 gallons of hot water (99% efficiency)		6.6			
kwh per therm conversion for water heating		19.8000198			
Total electricity use needed to offset natural gas water heating (kWh)			-	40,355,588	43,246,038
Additional GHG emissions from Electricity Use (discounted from reductions) (MTCO2e)			-	2,386	2,411
Net GHG Reduction from BE-4 (MTCO2e)			-	11,575	12,550

Reduction Measure Quantification (continued)

BE-5

Expand current renewable energy and green energy incentives and update local ordinances

The quantification of this measure only accounts for the GHG reductions associated with solar installations. Forecasts are based on historical trends in permit applications. Measure assumes that homes/businesses that choose to install solar would not opt into MCE's Deep Green Option.

Annual Approved Solar Permits by total kW	Commercial	Residential	Total kW
2014	233	242	475
2015	380	142	523
2016	325	47	372
2017	83	197	279
2018	85	241	326

Source: County of Napa

Average Annual kW Approved	221	174	395

Forecasted Cumulative Permit Approvals from 2014	Commercial	Residential	Total kW	Notes
2014	233	242	475	
2015	614	384	998	
2016	939	431	1,370	Based on County data
2017	1,022	628	1,650	
2018	1,107	869	1,975	
2019	1,328	1,042	2,371	
2020	1,550	1,216	2,766	
2021	1,771	1,390	3,161	
2022	1,992	1,563	3,556	
2023	2,214	1,737	3,951	
2024	2,435	1,911	4,346	Based on the average annual approved kW by land use type
2025	2,657	2,085	4,741	
2026	2,878	2,258	5,136	
2027	3,099	2,432	5,531	
2028	3,321	2,606	5,926	
2029	3,542	2,779	6,321	
2030	3,763	2,953	6,717	

	2020	2030	2050
Target size of all solar permits approved starting from 2014 (kW) (Rounded for 2030 and 2050)	2,766	6,700	6,700
Annual electricity generated for a 10 kW rooftop system *(based on National Renewable Energy Laboratory's PV Watts Calculator for a rooftop system in Napa County) (kWh)*	15,271	15,271	15,271
Source: pvwatts.nrel.gov			
Annual Electricity Generated by new Solar PVs from new permits (kWh)	4,223,395	10,231,570	10,231,570
Annual Electricity Generated by new Solar PVs from new permits (MWh)	4,223	10,232	10,232
Additional GHG emissions from Electricity Use (discounted from reductions) (MTCO2e)	545	605	571
Net GHG Reduction from BE-5 (MTCO2e)	545	605	571

Reduction Measure Quantification (continued)

BE-6

Select MCE's Deep Green Option for all County Facilities		2015	2020	2030	2050
County unincorporated population		26,899	28,612	31,857	38,384
County's Facility Electricity Usage (kWh)		7,425,183	7,898,067	8,793,861	10,595,445
County's Facility Electricity Usage in the Unincorporated Area Only (kWh)		2,789,619	2,967,280	3,303,827	3,980,677
MCE Light Green Emission Factors (MTCO2e/MWh)			1.29E-01	5.15E-02	5.15E-02
MCE Deep Green Emission Factors (MTCO2e/MWh)			0	0	0
BAU Emissions Associated with Electricity Consumption at County Facilities (MTCO2e)			382.08	170.17	205.03
Reduced Emissions Associated with Electricity Consumption at County Facilities (MTCO2e)			-	-	-
Net GHG Reduction from BE-6 (MTCO2e)			382	170	205
Additional GHG Reduction if County uses Deep Green at County facilities located within cities.			638	350	386

BE-7

Support waste-to-energy programs at unincorporated landfills		2014	2020	2030	2050
This measure quantifies the potential of having a waste-to-energy program at Clover Flat Landfill					
BAU Electricity Demand at CFL (scaled by incorporated population because CFL served incorporated area) (kWh)		73,216	75,353	78,914	85,904
Electricity Demand from Grid with Waste-to-Energy (assumes no sell back to grid. See note.)			0	0	0
Source: *Egdar & Associates 2016 ("Climate Action Management Plan to 2020 for Clover Flat Landfill and Upper Valley Recycling")*					
Note: This does not count reductions from electricity sold back to the grid because those reductions are already accounted for in the RPS targets. Also, the waste-to-energy facility began operations in 2014, which means the project is already accounted for in the inventory. The facility is anticipated to ramp up production in the future.)					
Incorporated Population based on MTC forecasts		112,409	115,690	121,157	131,889
Percent Implemented			0%	100%	100%
Electricity Reduction (kWh)			-	78,914	85,904
Net GHG Reduction from BE-7 (MTCO2e)			-	5	5

HG-1

Encourage registration of facilities in CARB's RMP and incentivize installation of low-GWP refrigerant systems		2014	2020	2030	2050
BAU Legislative-Adjusted HFC Emissions Forecast (MTCO2e)		12,882	11,548	12,856	15,491
Note: Legislative adjustments in these figures did not account for SB 1383. Emissions are based on CARB GHG Inventory scaled down to the county level by population.					
Target Percent Reduction in HFC emissions under SB 1383 from 2013 levels			0%	40%	40%
Assumes that 2014 levels are equivalent to 2013 levels for purposes of this measure quantification and 2050 targets are the same as 2030.					
HFC Emissions with Acheivement of SB 1383 target (MTCO2e)		12,882	12,882	7,729	7,729
Reduction in HFC Emissions from forecast (MTCO2e)			-	5,127	7,762
Net GHG Reduction from HG-1 (MTCO2e)			-	5,127	7,762

MS-1

Support efforts to increase Napa Green Certified wineries and land in the County, with a goal of achieving a 100-percent certification rate for all eligible wineries and properties by 2030		2014	2020	2030	2050
Wastewater Emissions Reductions					
Winery wastewater emissions (Napa Green Certified Wineries are assumed to have no wastewater emissions)		5,087	5,348	5,743	5,737
Percent of Napa Green Certified Wineries under current projections		40%	40%	40%	40%
Percent of Napa Green Certified Wineries under MS-1			40%	100%	100%
Emissions reductions from winery wastewater			-	***5,743***	***5,737***
Net GHG Reduction from MS-1 (MTCO2e)			-	5,743	5,737

Reduction Measure Quantification (continued)

LU-1						
Establish targets and enhanced programs for oak woodland and coniferous forest preservation and mandatory replanting		2014	2020	2030	2050	
See Separate Calculation for LU-1						
Target minimum percent of trees saved under project-level conservation requirement (%)				0%	30%	30%
Oak and Coniferous Tree Conservation						
Forecasted number of trees removed per year				21,039	6,701	9,181
Forecasted Annual Emissions from lost Oak and Coniferous Trees (MT CO2e)				22,757	8,475	14,032
Emissions saved from conserved trees (MT CO2e)				***0***	***2,543***	***4,210***
Replacement of Lost Trees						
Post-conservation number of trees lost per year				21,039	4,691	6,427
Maximum number of trees to be planted per year				0	2,500	2,500
Mortality Rate (%)	20%					
Number of surviving trees planted per year				0	2,000	2,000
Emissions sequestered from planted trees (MT CO2e)				***0***	***982***	***8,747***
Net GHG Reduction from LU-1 (MTCO2e)				-	3,525	12,956

LU-2						
Refine protection guidelines for existing riparian lands			2014	2020	2030	2050
Assumes that future losses in riparian lands would not occur. Thus, reductions are equivalent to forecasted losses in annual carbon sequestration from riparian woodlands.						
Equivalent Annual Emissions from Forecasted carbon storage and sequestration loss from riparian lands (MTCO2e)				559	669	888
Loss prevention rate				0%	90%	90%
Net GHG Reduction from LU-2 (MTCO2e)				-	602	799

LU-3						
Repurpose or otherwise prevent burning of removed trees and other woody material from land use conversions of oak woodlands and coniferous forests			2014	2020	2030	2050

This measure would require repurposing of usable timber from trees removed due to land use conversion and burying or chipping of non-usable timber. Repurposed wood may be either be used in construction or sold to local woodworking businesses or collectives with proceeds funding the administration of this measure. A minimum of 80% of total removed weight of trees shall be repurposed, buried, chipped, or otherwise prevented from burning. This measure only quantifies trees removed due to land use conversion of oak woodlands and coniferous forests. This measure prioritizes wood repurposing. If any portion of removed tree material cannot be repurposed due to disease or structural limitations, dispose of material either through burial, chipping, or other non-burning measures.

Preservation of Removed Tree Carbon

				2020	2030	2050
Post-conservation number of trees lost per year (LU-1)				21,039	4,691	6,427
Weighted average carbon storage rate per oak/coniferous tree removed (MTCO2/tree)				0.92	0.92	0.92
Emissions from lost trees (forecast assumes all stored carbon would return to the atmosphere) (MTCO2)				19,356	4,316	5,914
Percent of tree mass prevented from burning				0%	80%	80%
Net GHG Reduction from LU-3 (MTCO2e)				-	3,453	4,731

Reduction Measure Quantification (continued)

OR-1/OR-2

Require Tier 4 equipment and promote the use of renewable diesel for all construction activity and mining operations as a condition for approval by 2030			2020	2030	2050
Offroad Construction and Mining Emissions Forecast (MTCO2e)			6,766	7,085	7,712
Diesel Emission Factor (kg CO2/gal)	10.21				
renewable diesel Carbon Intensity (kg CO2/gal) (66% lower than conventional diesel)	3.47				
Source: renewable diesel as a Major Heavy-Duty Transportation Fuel in California (BAAQMD 2017)					
Diesel use (gal)			662,897	694,124	755,566
Participation Rate			0%	80%	80%
Estimated diesel use from participating equipment (gal)			-	555,299	604,453
Average percent improvement in fuel efficiency with Tier 4 equipment			5%	5%	5%
Percent emissions reduction from switching to renewable diesel			66%	66%	66%
Calculated fuel use from particiating equipment (gal)			-	527,534	574,231
Emissions from renewable diesel (MTCO2)			-	1,831	1,993
Emissions from unconverted equipment (MTCO2)			6,766	1,417	1,542
Total Emissions from construction and mining equipment under this measure (MTCO2)			-	5,668	6,169
Net GHG Reduction from OR-1/OR-2 (MTCO2e)			-	5,668	6,169

Reduction Measure Quantification (continued)

SW-1

Encourage expansion of composting program for both residential and commercial land uses	2014	2020	2030	2050
Generation of Organic Waste In Unincorporated Napa County (Ascent Adjusted)				
Historical and Landfilled Tonnage	20,156	14,099	15,698	18,914
Commercial				
*Percentage of Disposal that is Commercial**	71.4%	71.4%	71.4%	71.4%
Commercial Disposal	14,396	10,070	11,212	13,509
Percentage of Commercial Disposal that is Organic †*	32.8%	32.8%	32.8%	32.8%
Commercial Organic Disposal	4,716	3,299	3,673	4,425
Residential				
*Percentage of Disposal that is Residential**	28.6%	28.6%	28.6%	28.6%
Residential Disposal	5,760	4,029	4,486	5,405
Percentage of Residential Disposal that is Organic †*	39.8%	39.8%	39.8%	39.8%
Residential Organic Disposal	2,291	1,603	1,784	2,150

*Based on 1999 Waste Characterization Study for the Unincorporated Napa County. Same source used for the inventory. Newer sources unavailable. Split between would most likely reduce the number of landfilled recyclables and increase the percentage of overall organics per ton of disposal. However, the BAU forecast is also conservative because it assumes the percent organics does not change.

COMMERCIAL COMPOSTING

Tons to Be Landfilled, Which Will Be Composted Instead	2020	2030	2050
AB 1826's Commercial Organic Waste Disposal Limit (AB 1826 seeks to reduce the amount of commercial organic waste sent to landfills to 50% of 2014's level)	2,358	2,358	2,358
Tons Composted Instead of Landfilled (Commercial Organic Disposal substracted by AB1326 Commercial Organic Disposal Limit)	941	1,315	2,067

Organic Breakdown	Residential	Commercial
Food	45%	50%
Green	39%	19%
Lumber	4%	17%
Paper	12%	13%
Manure	0%	1%

Composition of Composted Commercial Tons per AB1826 (no less than 50% of 2014 organics) (For reference only)

	2020	2030	2050
Food	466	651	1,023
Green	181	253	398
Lumber	160	223	351
Paper	126	176	277
Manure	8	11	18

Percent of commercial organics composted under SW-1

	2020	2030	2050
Food	50%	85%	85%
Green	50%	100%	100%

Composted Commercial Tons

	2020	2030	2050
Food	816	1,545	1,862
Green	318	707	852

Reduction Measure Quantification (continued)

SW-1	(Continued)				
RESIDENTIAL COMPOSTING			2020	2030	2050
Percent of residential organics composted under SW-1					
Food			0%	85%	85%
Green			0%	100%	100%
Composted Residential Tons					
Food			0	683	823
Green			0	695	837
TOTAL ORGANICS COMPOSTED INSTEAD OF LANDFILLED under SW-1					
Food			816	2,228	2,685
Green			318	1,402	1,689
Total			1,134	3,630	4,374

Note: Calculations adapted from Edgar and Associates.

EMISSIONS CALCULATIONS

Emissions reductions per ton of food waste composted instead of landfilled (MTCH4/ton)			1.566E-02	1.566E-02	1.566E-02
Emissions reductions per ton of green waste composted instead of landfilled (MTCH4/ton)			6.659E-03	6.659E-03	6.659E-03
Note: Landfill emission factors from WARM Model, assuming no stored carbon or transportation emissions and with landfill gas recovery and flaring.					
Emissions reductions from food waste composted instead of landfilled (MTCH4)			13	35	42
Emissions reductions from green waste composted instead of landfilled (MTCH4)			2	9	11
Emissions reductions from food waste composted instead of landfilled (MTCO2e)			320	872	1051
Emissions reductions from green waste composted instead of landfilled (MTCO2e)			53	233	281
	Total Emissions Reduction (MTCO2e)		372	**1,106**	**1,332**
Net GHG Reduction from SW-1 (MTCO2e)			372	1,106	1,332

SW-2					
Meet an 80 Percent Waste Diversion Goal by 2020 and a 90 Percent Goal by 2030		2014	2020	2030	2050
BAU Diversion Rate		70%	75%	75%	75%
Target Diversion Rate			80%	90%	90%
Legislative-Adjusted Forecasted Emissions from Solid Waste Generation		19,961	3,537	3,938	4,744
Reduced Solid Waste Emissions with New Diversion Rate			2,829	1,575	1,898
Reduction from SW-1			372	1,106	1,332
Net GHG Reduction from Net GHG Reduction from SW-1 (MTCO2e) (MTCO2e)			335	1,257	1,514

TR-1					
Update Transportation System Management Ordinance (for Employers)			2020	2030	2050
Total Daily Passenger VMT (MTC only provided forecasts through 2040. This assumes 2040 VMT sufficiently represents 2050 VMT.)			747,377	782,909	800,945
Work-related or Commute, daily VMT (from MTC)			547,462	567,609	570,091
Percent Commute			73%	72%	71%
Total Legislative Adjust BAU On-Road Transportation Emissions (MTCO2e)			112,854	84,846	85,735
Percent Passenger			94%	94%	94%
Total Legislative Adjust BAU On-Road Transportation Emissions (MTCO2e) (Commute Passenger Only)			77,703	57,768	57,213
CAPCOA TRT-1/TRT-2/TRT-3 Minimum percent reduction in VMT from Commute Trip Reduction Measures	2%				
CAPCOA TRT-1/TRT-2/TRT-3 Minimum percent reduction in VMT from Commute Trip Reduction Monitoring	4.20%		2020	2030	2050
Percent Implemented			0%	100%	100%
Net GHG Reduction from TR-1 (MTCO2e)			-	3,582	3,547

Reduction Measure Quantification (continued)

TR-2

Adopt parking reduction ordinance revisions			2020	2030	2050
Total Legislative Adjust BAU On-Road Transportation Emissions (MTCO2e) (Commute Passenger Only)			77,703	57,768	57,213
CAPCOA TRT-14 and TRT-15 Minimum percent reduction in VMT from Pricing Workplace Parking and Implementing Employee Parking Cash-Out	0.10%		2020	2030	2050
Percent Implemented			0%	100%	100%
Net GHG Reduction from TR-2 (MTCO2e)			-	58	57

TR-3

Increase affordable housing, especially workforce housing, in Napa County			2020	2030	2050
Total Legislative Adjust BAU On-Road Transportation Emissions (MTCO2e) (Commute Passenger Only)			77,703	57,768	57,213
CAPCOA LUT-6 Minimum percent reduction in VMT from Integrating Affordable and Below Market Rate Housing	0.04%				
Percent Implemented			0%	100%	100%
Net GHG Reduction from TR-3 (MTCO2e)			-	23.11	22.89

TR-4

Support efforts to allow commuter service to operate on railroad rights-of-ways			2020	2030	2050
Number of rail cars in use for commuters			0	4	6
Number of passengers per rail car	80				
Round trip miles per day per passenger	40				
Commuting days per year	260				
Total Passenger Miles Travelled per year			-	3,328,000	4,992,000
Assumed occupancy rate of offset vehicles trips (persons per vehicle)	1				
Average light duty gasoline vehicle emissions per mile (g CO2e/mi) (EMFAC 2014)			246	183	215
Ratio of Caltrain locomotive to light duty gasoline vehicle emissions	0.20				
Caltrain passengers per train car (based on 677 passengers per locomotive and 5 rail cars per locomotive)	135.40				
Source: Tang et. al. 2015 (https://www.sciencedirect.com/science/article/pii/S1352231015300741?via%3Dihub) Caltrain.com					
Adjusted Ratio of Napa Valley Wine Train locomotive to light duty gasoline vehicle emissions based on difference in passengers per rail car	0.34				
			2020	2030	2050
Emissions from locomotives per passenger mi (g CO2e/mi)			83.38	61.98	72.89
Percent of Pilot Project Implemented			0%	100%	100%
Emissions reduced per year (MTCO2e/year)			-	403	711
Net GHG Reduction from TR-4 (MTCO2e)			-	403	711

Reduction Measure Quantification (continued)

TR-5

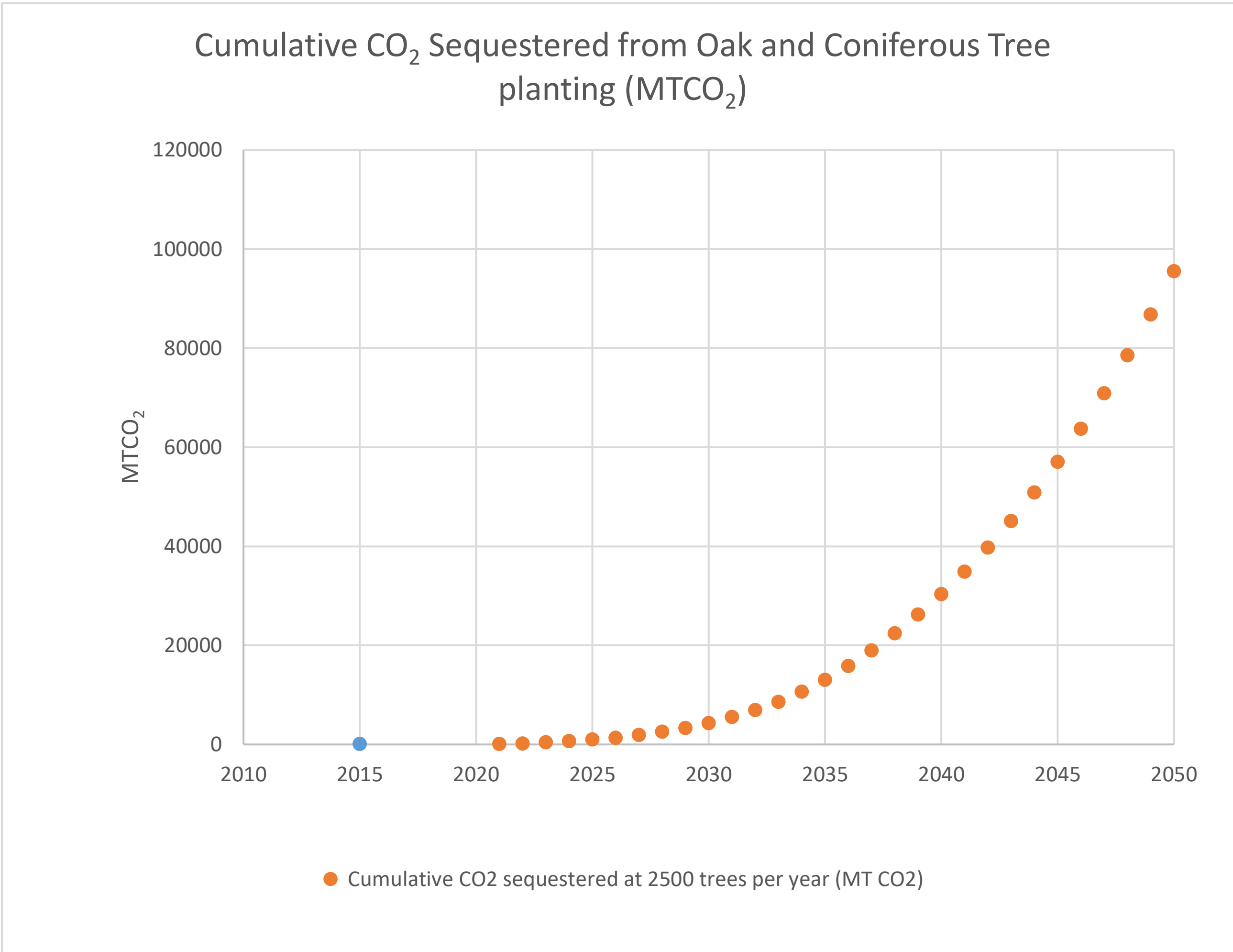
Support efforts of solid waste collection services to convert diesel solid waste collection vehicles to CNG			2020	2030	2050
Quantification of this measure is based on fuel use Clover Flat Landfill and UVDS in 2014				Scaled by incorporated population	
BAU Diesel Use (Gallons)			203,700	213,327	232,224
Equivalent CNG (MMBTU)			28,858	30,221	32,898
Equivalent CNG (scf)			28,098,892	31,285,854	37,695,336
Incorporated Population based on MTC forecasts			115,690	121,157	131,889
Diesel Emission Factor (kg CO2/gal)	10.21				
Diesel Emission Factor (kg CH4/gal)	5.04E-04				
Diesel Emission Factor (kg N2O/gal)	3.60E-04				
CNG Emission Factor (kg CO2/scf)	0.05				
CNG Emission Factor (kg CH4/scf)	2.67E-06				
CNG Emission Factor (kg N2O/scf)	1.91E-06				
Factor sources: The Climate Registry 2015 and SEMS (as sourced by Edgar & Associates 2016)					
			2020	2030	2050
BAU Diesel Emissions (MTCO2e)			2,104	2,203	2,398
Percent Implemented			0%	100%	100%
Project CNG Emissions (MTCO2e)			2,104	1,709	2,059
Emissions Difference from BAU			-	494	339
50% Apportionment to account for customers in the incorporated areas, consistent with the RTAC method used in the Transportation Sector.			-	246.81	169.29
Net GHG Reduction from TR-5 (MTCO2e)			-	246.81	169.29

LU-1: Carbon Storage Loss and Potential Associated with Loss and Replanting of Oak and Coniferous Trees

Calculation of Equivalent New Tree Planting to Offset Lost Carbon Storage/Sequestration		
2020 Target minimum percent of trees preserved under project-level avoidance (%)	0%	
Post-2020 Target minimum percent of trees preserved under project-level avoidance (%)	30%	
Forecasted Annual Emissions from Lost Oak and Coniferous Trees (MT CO2e)		
2020	22,757	
2030	8,475	
2050	14,032	
Emissions reduced from conserved trees (MT CO2e)		
2020	-	
2030	2,543	
2050	4,210	
Replaced Trees		
Maximum number of trees replanted **per year** (trees)	2,500	Assumes constant rate of tree removal
Mortality Rate (%)	20%	
Annual Emissions Sequestered from Planted Trees (MT CO2e)		Accounts for growth rates over time
2020	-	
2030	982	
2050	8,747	
Total Emissions Reductions from LU-1 (MT CO2e)		
2020	-	
2030	3,525	
2050	12,956	

Cumulative Carbon Storage

Year	Annual Oak Trees Lost (Forecasted)	Annual Coniferous Trees Lost (Forecasted)	Annual Oak and Coniferous Trees Replanted	Cumulative CO2 sequestered at 2500 trees per year (MT CO2)	Annual Sequestration from Replanted Trees (MTCO2/year)	Replanted Trees under the 2:1 ratio
2015	5,203	529				
2016	6,808	1,986				
2017	8,412	3,443				
2018	10,016	4,901				
2019	11,620	6,358				
2020	13,224	7,815				
2021	12,568	7,038	2,500	4	4	39,211
2022	11,911	6,261	2,500	150	146	36,343
2023	11,255	5,483	2,500	342	191	33,476
2024	10,598	4,706	2,500	591	249	30,608
2025	9,942	3,929	2,500	911	320	27,740
2026	9,285	3,151	2,500	1,315	404	24,873
2027	8,629	2,374	2,500	1,832	518	22,005
2028	7,972	1,597	2,500	2,483	651	19,138
2029	7,316	819	2,500	3,288	805	16,270
2030	6,659	42	2,500	4,270	982	13,403
2031	6,696	130	2,500	5,456	1,186	13,651
2032	6,732	217	2,500	6,876	1,420	13,899
2033	6,769	305	2,500	8,565	1,689	14,147
2034	6,805	392	2,500	10,567	2,002	14,395
2035	6,842	479	2,500	12,939	2,372	14,643
2036	6,878	567	2,500	15,764	2,825	14,891
2037	6,915	654	2,500	18,892	3,129	15,139
2038	6,951	742	2,500	22,342	3,450	15,387
2039	6,988	829	2,500	26,131	3,789	15,635
2040	7,025	917	2,500	30,276	4,145	15,883
2041	7,061	1,004	2,500	34,795	4,520	16,131
2042	7,098	1,092	2,500	39,707	4,912	16,379
2043	7,134	1,179	2,500	45,031	5,324	16,627
2044	7,171	1,267	2,500	50,785	5,754	16,875
2045	7,207	1,354	2,500	56,989	6,204	17,123
2046	7,244	1,442	2,500	63,661	6,672	17,371
2047	7,280	1,529	2,500	70,822	7,161	17,619
2048	7,317	1,617	2,500	78,492	7,669	17,867
2049	7,353	1,704	2,500	86,690	8,198	18,115
2050	7,390	1,791	2,500	95,437	8,747	18,363
Total	292,272	79,643	75,000			583,200
					Average Trees Planted per year	19,440



Land Use	Description (as provided by the County)	Trees per acre (USDA 2005)
Oak Woodlands	Straight average of all oak species	152
Coniferous Forest	Mixed Conifer	139
Source: USDA 2005: Oak Woodlands and Other Hardwood Forests of California, 1990s by K.L. Waddell and T.M. Barrett		

Tree Carbon Calculator Results

	Total CO_2 Stored (Coastal Live Oak)	Total CO_2 Stored (Coastal Redwood)	Average Oak/Coniferous Mix (Starting in 2017)*
(years)	(kg/tree)	(kg/tree)	(kg/tree)
1	2	0	2
2	75	1	58
3	106	5	77
4	143	11	100
5	187	20	128
6	237	33	162
7	295	51	207
8	359	73	260
9	430	100	322
10	508	133	393
11	594	173	474
12	687	218	568
13	787	270	676
14	895	329	801
15	1011	395	949
16	1134	469	1130
17	1265	551	1251
18	1404	640	1380
19	1550	738	1515
20	1705	845	1658
21	1867	960	1808
22	2038	1084	1965
23	2216	1217	2130
24	2402	1360	2302
25	2597	1512	2481
26	2799	1673	2669
27	3009	1845	2864
28	3228	2026	3068
29	3455	2217	3279
30	3690	2418	3499
31	3933	2630	3727
32	4184	2852	3963
33	4443	3084	4207
34	4711	3326	4460
35	4986	3579	4722
36	5270	3843	4992

*The ratio of oak to coniferous trees lost varies by year, based on the land use forecasts provided by the county and average tree densities unique to the region.

Legislative Reductions and Existing Programs					
Lead Agency	**Sector**	**Measure Name**	**Measure Description**	**Current or Recommended**	**Included in Inventory Forecasts?**
State	Building Energy	Renewable Portfolio Standard	The State has a goal of achieving a 33% renewable portfolio standard (RPS) for electricity generated and sold to retail customers in the State by 2020.	Current	Yes
State	Building Energy	Senate Bill (SB) 350	Signed into law in October 2015, Senate Bill (SB) 350 extends the State's Renewable Portfolio Standard (RPS) target from 33% by 2020 to 50% renewables by 2030. In addition, SB 350 calls for a doubling of building energy efficiency by 2030.	Current	Yes
State	Building Energy	Title 24 Building Energy Efficiency Standards	The 2016 Title 24 building energy efficiency standards were adopted in December 2015 and went into effect January 2017. The California Energy Commission (CEC) estimates that new residential buildings built to these standards would be 28 percent more efficient than buildings built to the current 2013 Title 24 standard. Relative savings for non-residential buildings was not readily available from the CEC; thus, it was assumed that non-residential buildings built to 2016 standards would have similar improvements as the residential standards. The 2019 standards adopted after the forecast was completed and were not included in the forecast.	Current	Yes
PG&E	Building Energy	Napa County Energy Watch Program	Free evaluation of energy usage from residences and businesses. Connects utility customers with available financing and low cost options for energy upgrades.	Current	No
Napa County / MCE	Building Energy	Participation in Marin Clean Energy (MCE)	In February 2015, Marin Clean Energy (MCE), a local Community Choice Aggregator, began serving the unincorporated portions of Napa County. MCE automatically provides customers within its service area with 50 percent renewable electricity, although customers are allowed to opt out of MCE's service or pay into MCE's "Dark Green" program that would allow for a higher percentage renewable mix. Those that opt out would remain under PG&E's electricity service, which is currently 27% renewable. MCE currently has an average participation rate of 89%. According to MCE's Integrated Resource Plan, MCE plans to increase the minimum renewable energy supply of the program from 50 to 80% by 2025.	Current	Yes
State	High GWP Gases	Refrigerant Management Program (RMP)	The RMP requires facilities with refrigeration systems with more than 50 pounds of high-global warming potential (GWP) refrigerant to conduct and report periodic leak inspections; promptly repair leaks; and keep service records on site. Small facilities are to begin reporting in March 2016. Applicable facilities are required to pay fees to ARB with the fee amount determined by the facility's size category (small, medium, or large) and amount of high-GWP refrigerant used.	Current	Yes

Lead Agency	Sector	Measure Name	Measure Description	Current or Recommended	Included in Inventory Forecasts?
State	High GWP Gases	Legislative Ban on Certain Hydrofluorocarbons (HFCs)	On August 19, 2015, the EPA enacted a national ban on a variety of HFC emissions with very high-GWP values (many over 2,500) under 40 CFR Part 82. ARB estimates that this ban would reduce California's HFC emissions by ten percent annually below current emission rates by 2025. NOTE: Note that the County's GHG forecast was completed prior to the reversal of the Environmental Protection Agency's proposed ruling in 2015 to phase out the use of hydrofluorocarbons (HFCs) following a federal appeals court decision in August 2017 (Mexichem Fluor, Inc. v. Environmental Protection Agency (EPA) (2017) 15-1328. D.C. Cir.). The County's GHG forecast in this CAP accounts for limiting emissions of HFCs with global warming potentials of over 2,500 as proposed in 40 CFR Part 82 (See Appendix A). However, since the Mexichem Fluor, Inc. v. EPA decision, California has adopted several pieces of state legislation regulating high-GWP gases in the state include Senate Bill (SB) 1383 (Super Pollutant Reduction Act) and SB 1013 (California Cooling Act). The legislative reductions that would occur under these state senate bills are included in the reductions shown in Measure HG-1, discussed in Chapter 3.	Current	Yes (see note in measure description)
BAAQMD/Napa County	On-Road Transportation	Commuter Benefits Program	Under the purview of MTC, Bay Area employers with 50 or more employees are now required to register and offer commuter benefits to their employees in order to comply with the Bay Area Commuter Benefits Program. Through this program, employers must offer their employees one of four Commuter Benefit options in order to comply with BAAQMD Regulation 14, Rule 1. Commuter benefits encourage employees to take transit, vanpool, carpool, bicycle and walk rather than drive alone to work. Certain federal tax benefits apply. Napa County offers additional incentives for vanpool drivers, bike commuters, and emergency ride home programs.	Current	No
Napa County	On-Road Transportation	County Employee Local Housing Fund	The County's existing program encourages County employees to buy homes locally to reduce commute travel distances and VMT. The program offers down payment financial assistance up to 10% of the home's purchase price at below market interest rates as long as the home is located within Napa County.	Current	No
NCTPA	On-Road Transportation	Expand and improve bicycle and pedestrian network	The Napa County Transportation and Planning Agency (NCTPA) has adopted a long-range strategic goal of having 10% of all trips made by bicycle in Napa County by 2035. Some efforts are already being made under the NCTPA Countywide Bicycle Plan.	Current	No
State/Federal	On-Road Transportation	Advancements in Fuel Efficiency and Clean Fuels	The State and Federal governments have several policies in place that address fuel efficiency and alternative fuels. These include the Advanced Clean Car rule, CAFÉ standards, Federal Pavley regulations, and Tractor-Trail Greenhouse Gas regulations.	Current	Yes

Lead Agency	Sector	Measure Name	Measure Description	Current or Recommended	Included in Inventory Forecasts?
BAAQMD	Solid Waste	Reduce methane emissions from Municipal Solid Waste Landfills	In August 2011, BAAQMD entered into a memorandum of understanding with ARB to implement and enforce this regulation, including engineering review of LFG collection system design plans. Each of the 14 active landfills in the Bay Area applied for permits for alterations for their gas collection systems. These permits include conditions to test for methane from flares and energy recovery devices per the ARB landfill regulation.	Current	Yes
State	Solid Waste	Landfill Methane Control Measure	ARB approved a new regulation that reduces emissions of methane, a greenhouse gas, from municipal solid waste (MSW) landfills. The regulation, which became effective June 17, 2010, is a discrete early action greenhouse gas emission reduction measure, as described in the California Global Warming Solutions Act (“AB 32”). The regulation primarily requires owners and operators of certain uncontrolled MSW landfills to install gas collection and control systems, and requires existing and newly installed gas and control systems to operate in an optimal manner. The regulation allows local air districts to voluntarily enter into a memorandum of understanding (MOU) with ARB to implement and enforce the regulation and to assess fees to cover costs.	Current	Yes
State	Solid Waste	Statewide 75% Waste Diversion Goal	The California Department of Resources Recycling and Recovery (CalRecycle) established a target pursuant to AB 341 (Chapter 476, Statutes of 2011) to achieve a statewide waste diversion rate of 75 percent by 2020, or 2.7 pounds of waste per resident per day (lb/resident/day).	Current	Yes
DWR	Water	Water Conservation Rebates	The California Department of Water Resources has a rebate program that provides rebates for removing turf and replacing toilets at California single-family residences to support the State's drought response. This program is financed by the Proposition 1 water bond approved by voters in 2014.	Current	No
Napa County	Water	Washer rebate	Residents in unincorporated Napa County are eligible for clothes washer rebates for up to $150 from PG&E and the County.	Current	No

Appendix C

Climate Change Vulnerability Assessment for Napa County

1 Introduction

The purpose of this vulnerability assessment is to identify the primary climate change threats facing Napa County (County) and its vulnerability to these threats.

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme to provide the world with a scientific view on climate change and its potential effects. Global climate change has the potential to result in many adverse effects on natural resources and the human population. These include:

- rising sea levels around the world due to melting of polar ice caps and sea ice, which can inundate low-lying areas and increase the severity of flooding risk;
- changes in the timing or amounts of rainfall and snowfall, leading to changes in water supply;
- increased stress to vegetation and habitat, leading to adverse effects on biological resources and sensitive species;
- changes in the frequency and duration of heat waves and droughts, which can affect human populations and infrastructure on which they depend; and
- increases in wildfire hazards and related effects on forest health.

These changes over the long term have the potential for a wide variety of secondary impacts including detrimental impact on human health and safety, economic continuity, water supply, ecosystem function, and provision of basic services (CNRA 2012a:3). On a more local level, climate change is already affecting and will continue to affect the physical environment throughout California, the Bay Area, and the County. However, specific effects and impacts of climate change on the County vary because of physical, social, and economic characteristics. For this reason, it is important to identify the projected severity these impacts could have on the County and ways the County can reduce vulnerability to projected climate changes. Communities that begin to plan now will have the best options for adapting to climate change and increasing resilience (CNRA 2012a:4).

2 Climate Change Adaptation Planning Process

The California Adaptation Planning Guide (APG) provides climate adaptation planning guidance to cities, counties, and local governments. The APG, developed by the California Emergency Management Agency (CalEMA) and California Natural Resources Agency (CNRA), introduces the basis for climate change adaptation planning and details a step-by-step process for local and regional climate vulnerability assessment and adaptation strategy development (CNRA 2012a:i). As shown below in Figure 1, the planning process follows a sequence of steps:

Figure 1: The Nine Steps in Adaptation Planning Development

1. Exposure: assessing exposure to climate change impacts

2. Sensitivity: assessing community sensitivity to the exposure

3. Potential Impacts: assessing potential impacts

4. Adaptive Capacity: evaluating existing community capacity to adapt to anticipated impacts

5. Risk and Onset: evaluating risk and onset, meaning the certainty of the projections and speed at which they may occur

6. Prioritize Adaptive Needs: setting priorities for adaptation needs

7. Identify Strategies: identifying strategies to address adaptation needs

8. Evaluate and Prioritize: evaluating and setting priorities for strategies

9. Phase and Implementation: establishing a phasing and implementation plan

The first five steps of the process represent the vulnerability assessment phase, which is a method for determining the potential impacts of climate change on community assets and populations. The severity of these impacts and the community's ability to respond will determine how these impacts affect a community's health, economy, ecosystems, and socio-cultural stability. The second phase of the process is adaptation strategy development. The vulnerability assessment phase helps communities understand climate change impacts so that they can prepare effective climate adaptation strategies to increase resilience to climate change. Development of climate adaptation strategies will be included in the main body of the County's Climate Action Plan (CAP).

3 Vulnerability Assessment

A vulnerability assessment involves the first five steps in climate change adaptation planning development, and is intended to answer the following questions:

1. Exposure: What climate change effects will a community experience?

2. Sensitivity: What aspects of a community (i.e., functions, structures, and populations) will be affected?

3. Potential Impacts: How will climate change affect the points of sensitivity?

4. Adaptive Capacity: What is currently being done to address the impacts?

5. Risk and Onset: How likely are the impacts and how quickly will they occur?

Based on the work of IPCC and research conducted by the State and partner agencies and organizations, climate change is already affecting the County and will continue to further in the future. These effects are analyzed further below.

3.1 Step 1: Exposure

The first step in the vulnerability assessment is to identify what climate change effects the County will experience in the future. For purposes of this assessment, where possible, climate change effects in the County are characterized for two periods of time: midcentury (around 2050) and the end of the century (around 2100). Historical data are used to identify the degree of change by these two future periods in time.

The direct, or primary, changes analyzed for the County include average temperature, annual precipitation, and sea-level rise. Secondary impacts, which can occur because of individual or a combination of these changes, are also assessed and include extreme heat and its frequency, wildfire risk, and flooding (CNRA 2012a:16-17).

To begin identifying these impacts, the APG encourages communities to use Cal-Adapt as a means of assessing potential climate change impacts over time. Cal-Adapt is a climate change scenario planning tool developed by the California Energy Commission (CEC) and the University of California Berkeley Geospatial Innovation Facility. Cal-Adapt currently downscales global climate simulation model data to local and regional resolution under two emissions scenarios: the A-2 scenario represents a higher business-as-usual future global greenhouse has (GHG) emissions scenario, while the B-1 scenario represents a lower future GHG emissions scenario. Results from both emissions scenarios are considered in this vulnerability assessment and distinguished where possible.

While Cal-Adapt provides information on a local level, county-wide data are not readily available for all climate change effects. Most of the data presented in Cal-Adapt has been "downscaled" to grid cells that are 12 kilometer (km) by 12 km (approximately 60 square miles) in size and cannot be easily aggregated. Within the County, over a dozen grid cells are located entirely or partially within boundaries. For purposes of this vulnerability assessment, where County-wide data were not available, the same grid cell in the County was used for consistency.

Cal-Adapt data for each impact for the County are summarized in the sections below.

3.1.1 Increased Temperatures

According to IPCC, global average temperature is expected to increase relative to the 1986-2005 period by 0.3–4.8 degrees Celsius (° C) (0.5-8.6 degrees Fahrenheit [° F]) by the end of the 21st century (2081-2100), depending on future GHG emission scenarios (IPCC 2014: SPM-8). According to the California Natural Resources Agency (CNRA), downscaling of global climate simulation model data suggest that average temperatures in California are projected to increase 2.7 ° F above 2000 averages by 2050 and, depending on emission levels, 4.1–8.6 ° F by 2100 (CNRA 2012b:2).

Figures 1 and 2 below show the projected change in annual average temperatures across the County under the low-emissions scenario (i.e., Figure 1) and high-emissions scenario (i.e., Figure 2).

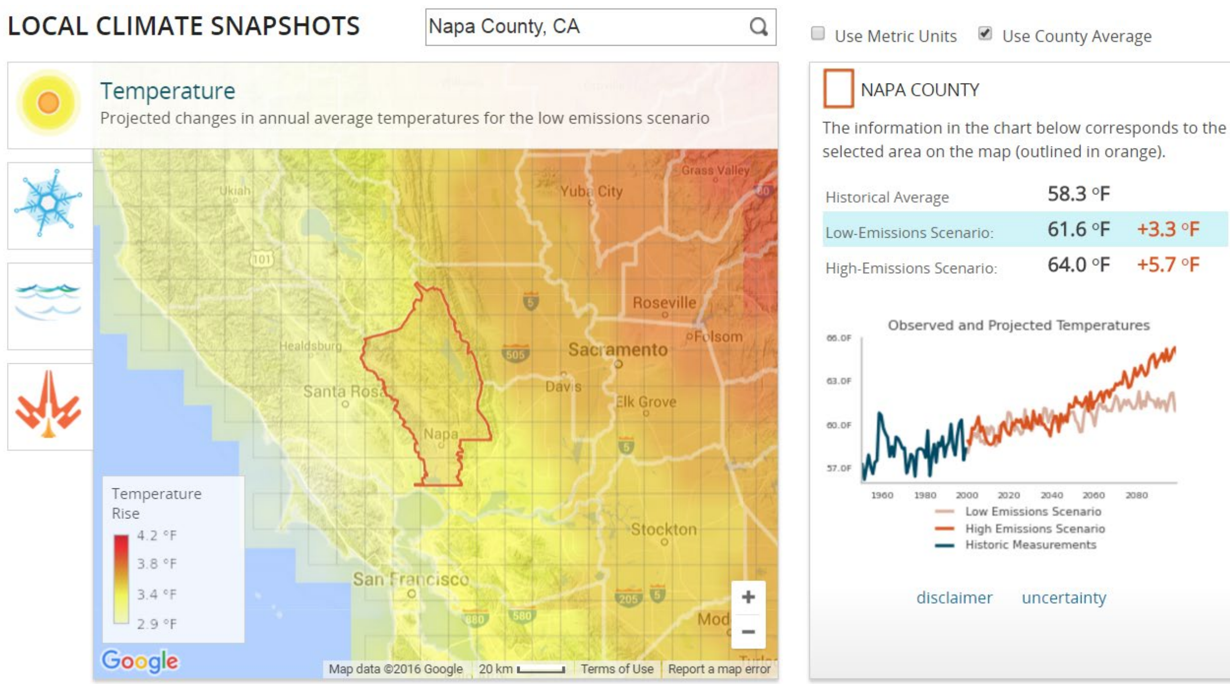


Figure 2: Projected Changes in Annual Average Temperatures for the Low-Emissions Scenario (1960-2090) (Source: CEC 2016)

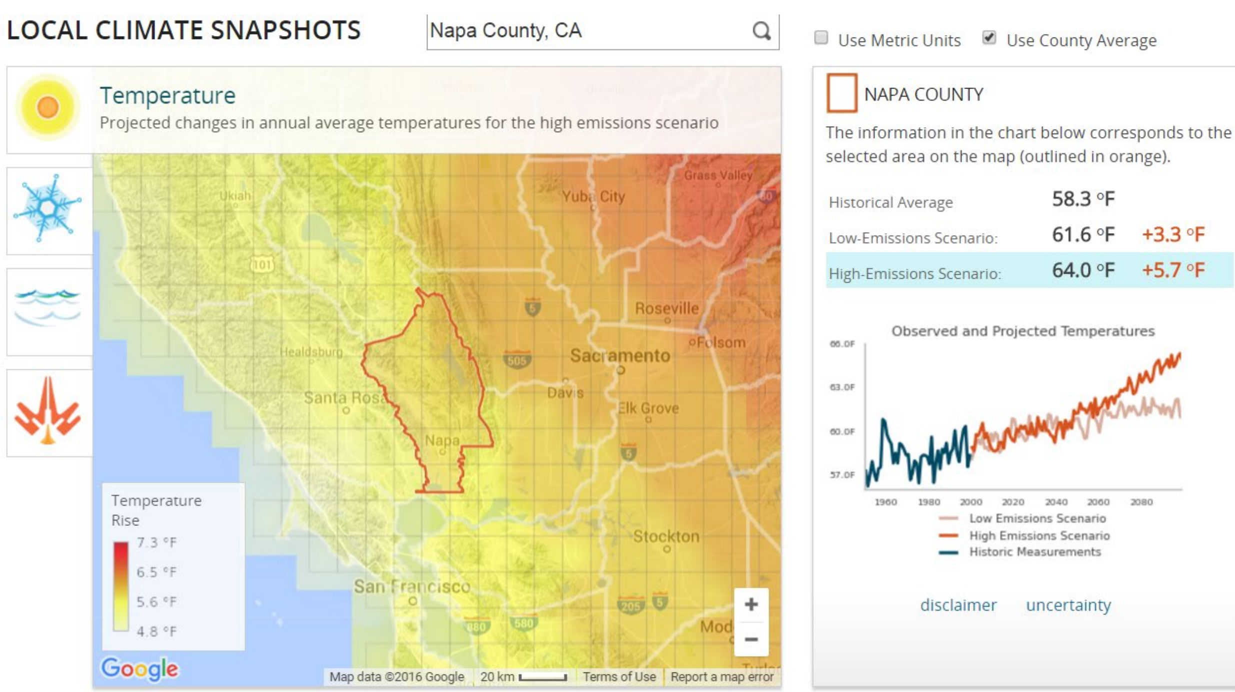


Figure 3: Projected Changes in Annual Average Temperatures for the High-Emissions Scenario (1960-2090) (Source: CEC 2016)

Figures 2 and 3 show that annual average temperatures in the County are projected to climb steadily. The County's historical average temperature, based on data from 1960-1990, is 58.3 ° F. Under the low-emissions scenario in Figure 2, annual average temperature is projected to increase to 61.6 ° F by 2090, an increase of 3.3 ° F. The annual average temperature under the high-emissions scenario in Figure 3 is projected to increase 5.7 ° F to 64.0 ° F by the end of the century.

The County's average annual low temperature, based on historical data from 1960-1990, is 44.4 ° F. Under the low-emissions scenario, annual low temperature is projected to increase to 48.56 ° F by 2090, an increase of 4.12 ° F. The annual average low temperature under the high-emissions scenario is projected to increase to 50.66 ° F in 2090 (i.e., an increase of 6.22 ° F). Historically, annual high temperatures average 70.47 ° F. Annual average high temperature is projected to increase under the low-emissions scenario by 2.94 ° F to 73.41 ° F. Under the high-emissions scenario, annual average high temperature is projected to increase to 76.32 ° F, an increase of 5.85 ° F.

3.1.2 Increased Frequency of Extreme Heat Events and Heat Waves

Changes in precipitation patterns and increased temperatures associated with climate change will alter the distribution and character of natural vegetation and associated moisture content of plants and soils (CNRA 2012b:11). Increased temperature is also expected to lead to secondary climate change impacts including increases in the frequency, intensity, and duration of extreme events and heat waves in California. Using Cal-Adapt's Extreme Heat tool, historical data from the County was used to project the change in frequency of extreme heat days, warm nights, and heat waves (including their occurrence during the year) for the low- and high-emissions scenarios in 2050 and at the end of the century (2099).

Extreme Heat Events

Cal-Adapt defines the extreme heat day threshold for the County as 92 ° F or higher. An extreme heat day is defined as a day between April through October where the maximum temperature exceeds the historical maximum temperatures from 1961-1990. The County has a historical average of four extreme heat days a year. Figures 4 and 5 below show the number of days the County is projected to exceed the area's extreme heat day threshold for each year from 1950-2099 under both emissions scenarios.

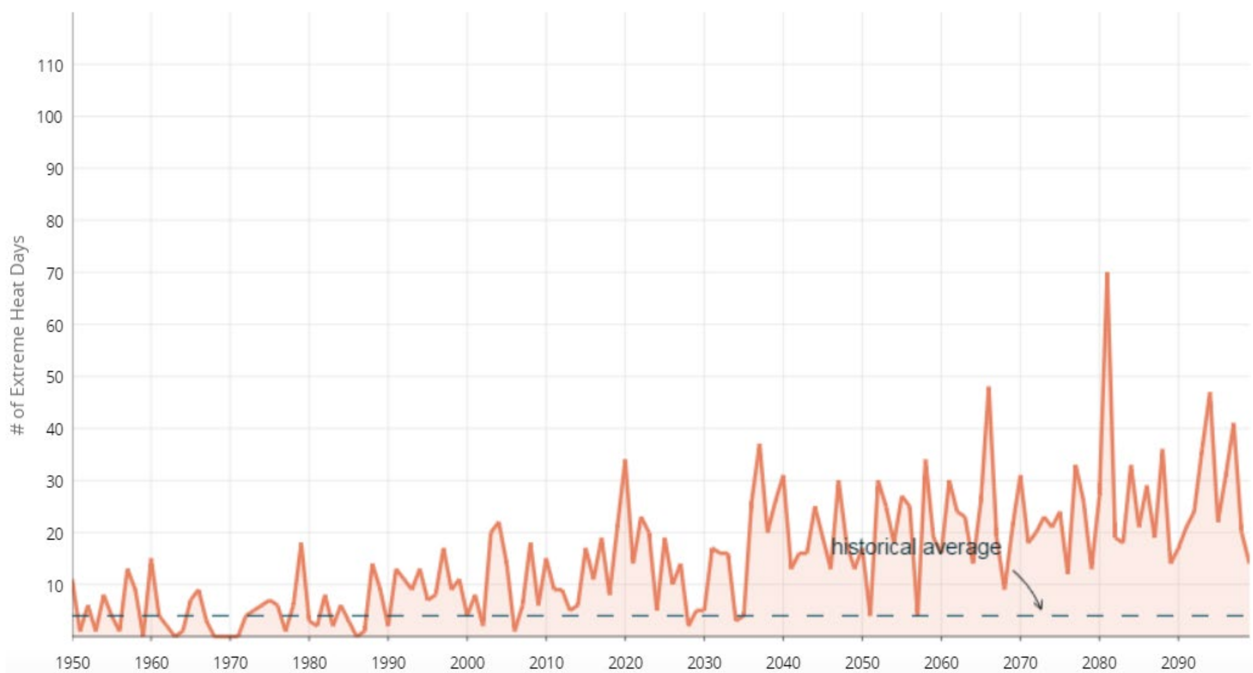


Figure 4: Number of Extreme Heat Days in Napa County Under the Low-Emissions Scenario (1950-2099) (Source: CEC 2016)

Cal-Adapt data show a range of projected increases in the number of extreme heat days by 2099, all of which are at least double the historical average in both emissions scenarios. The projected annual average number of extreme heat days is between roughly 23-26 days per year in 2050 to 54-64 days per year towards the end of the century.

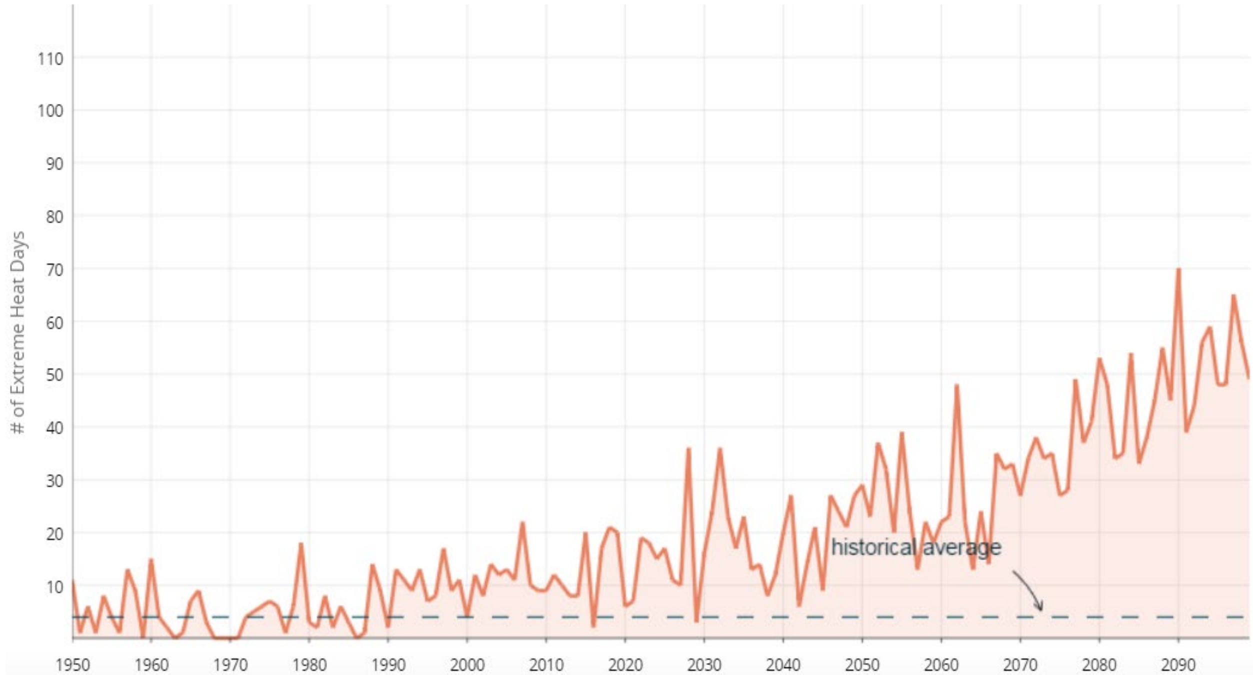


Figure 5: Number of Extreme Heat Days in Napa County Under the High-Emissions Scenario (1950-2099) (Source: CEC 2016)

In combination with extreme daytime heat, extremely warm nights are also an important factor to consider. A warm night is defined as a day between April through October where the minimum temperature exceeds the historical minimum temperatures between 1960-1990. Historically, the County has an average of four warm nights a year, with a threshold of 56 ° F. Under both the high- and low-emissions scenarios, the number of warm nights is expected to significantly increase, with an average of 17-41 warm nights in 2050 to 30-100 warm nights in 2099.

Frequency and Timing of Heat Waves

Along with individual days and nights exhibiting extreme temperature, events in which these extreme temperatures are experienced over a period of several days are known as heat waves. Cal-Adapt identifies a heat wave as an event in which the extreme heat threshold (i.e., 92 ° F in the County) is exceeded for a period of five days. Figures 6 and 7 below show the count of heat wave events in the County for each year between 1950-2099 under the low- and high-emissions scenarios. Each five-day period exceeding the extreme heat threshold is counted, so a 20-day heat wave would appear on the figures as four counted periods.

As shown in Figures 6 and 7 above, heat waves in the County are infrequent, with no more than two heat waves occurring in one year between 1950 and 2016. However, the model projects a significant rise in the frequency of heat waves under both emissions scenarios. Under the low emissions scenario, projections show an increase of heat wave events with around three at the middle of the century and up to seven in 2090. The high emissions scenario also shows an increase in heat wave events, with up to five heat wave events occurring midcentury and as high as 16 heat events at the end of the century.

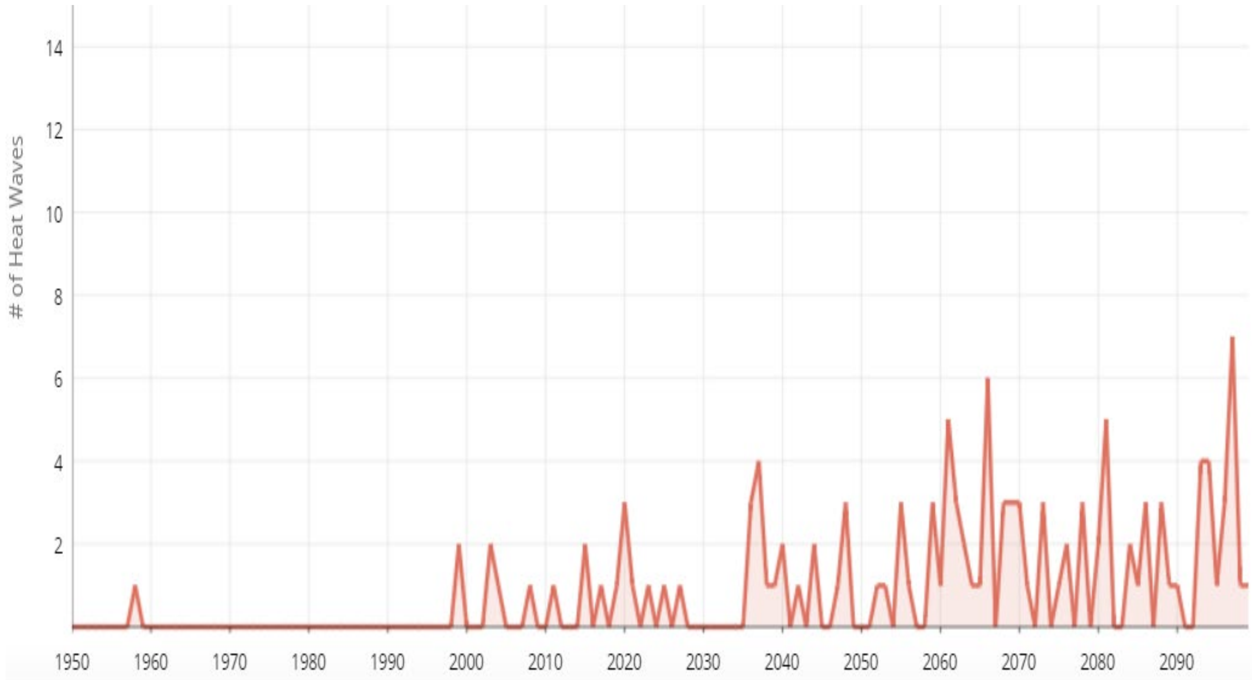


Figure 6: Number of Heat Waves in Napa County Under the Low-Emissions Scenario (1950-2099) (Source: CEC 2016)

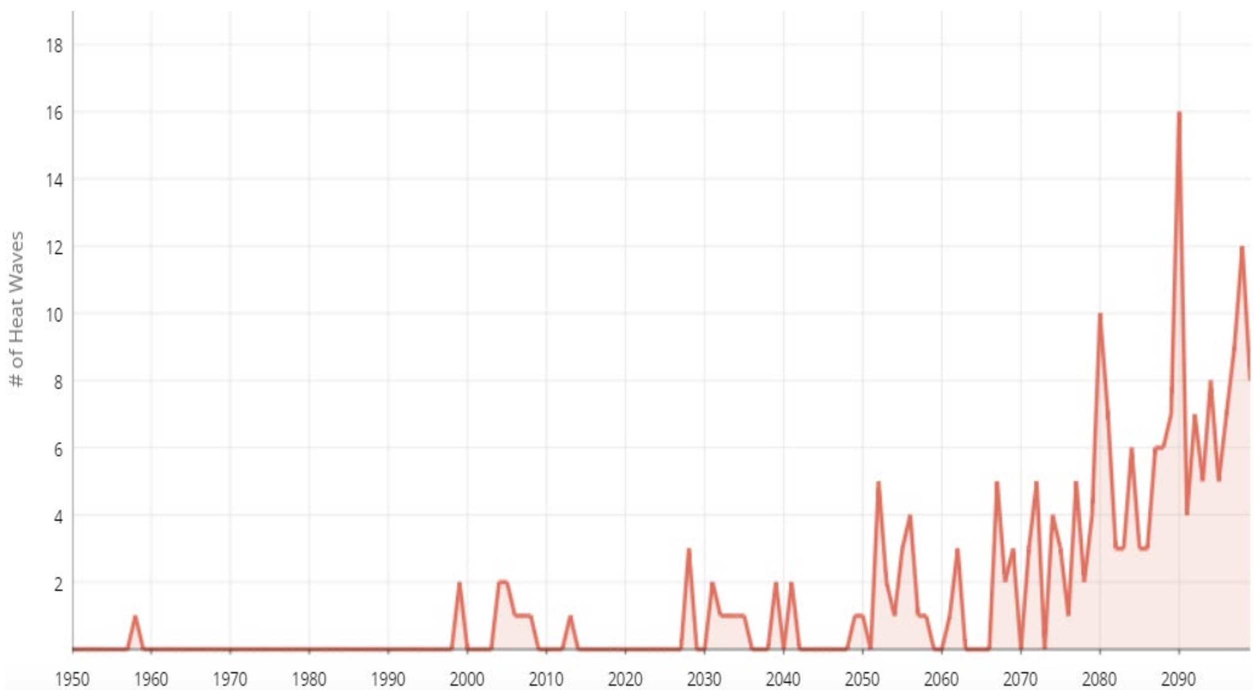


Figure 7: Number of Heat Waves in Napa County Under the High-Emissions Scenario (1950-2099) (Source: CEC 2016)

Another consideration with respect to the number of extreme heat events is the time of year when they may occur. Figures 8 and 9 below show the time of year that extreme heat conditions are projected to occur under both emissions scenarios between 1950-2099. A point on each of the figures represents each day that exceeds the extreme heat threshold for the County and what time of year, between April through October, that it occurs.

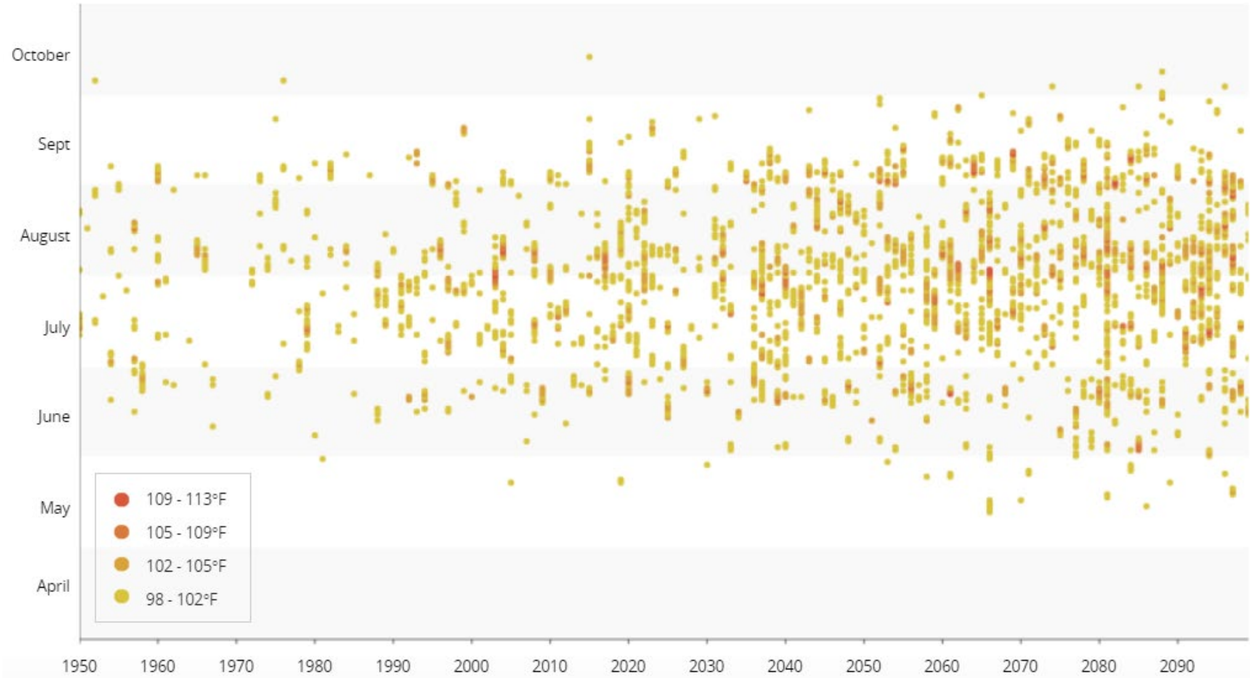


Figure 8: Timing of Extreme Heat Days by Year in Napa County Under the Low-Emissions Scenario (1950-2099) (Source: CEC 2016)

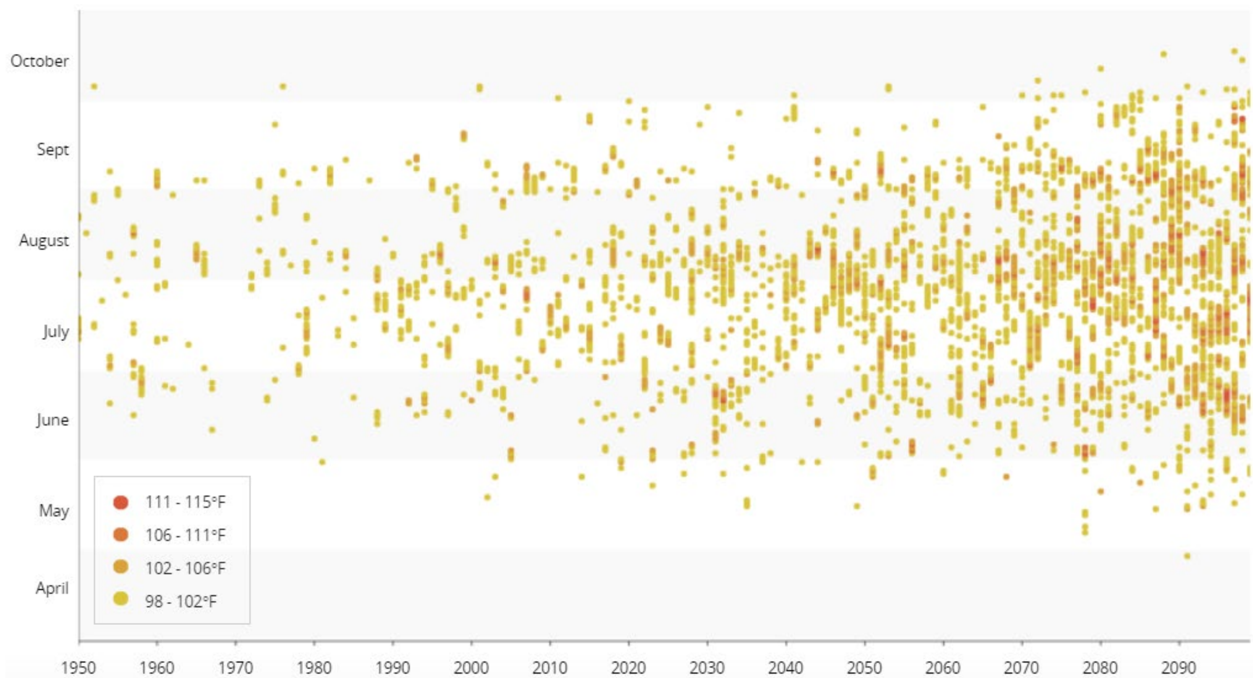


Figure 9: Timing of Extreme Heat Days by Year in Napa County Under the High-Emissions Scenario (1950-2099) (Source: CEC 2016)

As shown in Figures 8 and 9 above, the County has a history of exceeding the extreme heat threshold starting in late May/early June and ending in mid-September. As shown under both emissions scenarios, the model projects not only an increase in the frequency of exceeding the extreme heat threshold, but also their occurrence both earlier and later in the season. In Figure 9 under the high emissions scenario, longer sustained periods of exceeding the extreme heat threshold will also result in more frequent and sustained heat wave events earlier and later in the season towards the end of the century.

Changes to Precipitation Patterns

Global climate change will affect physical conditions beyond average temperatures, including changes to precipitation patterns. While projections generally show little change in total annual precipitation in California and trends are not consistent, even modest changes could have a significant effect on California ecosystems that are conditioned to historical precipitation levels (CEC 2016). Reduced precipitation could lead to higher risks of drought, while increased precipitation could cause flooding and soil erosion (CNRA 2014: 25). Changes in weather patterns resulting from increases in global average temperature could also result in a decreased volume of precipitation falling as snow in California and an overall reduction in snowpack in the Sierra Nevada. Based upon historical data and modeling, the California Department of Water Resources (DWR) projects that the Sierra snowpack will decrease by 25 to 40 percent from its historic average by 2050 (DWR 2008:4).

While the County is not located in an area where snow typically accumulates, major water districts and utilities in the County receive a significant amount of water from the State Water Project, which depends on spring and early-summer snowmelt in the Sierra Nevada for water supply. Additionally, agricultural water users in the unincorporated areas of the County are the primary user of groundwater (Napa County 2005:2). Increased average temperatures and changes in the timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies, and thus the County could face increasing challenges of providing adequate water supplies because of increased uncertainty in the amount and timing of water availability to meet future demand. If demand continues to increase, water users could face shortages in normal or dry years.

Increased Wildfire Risk

Changes in precipitation patterns and increased temperatures associated with climate change will alter the distribution and character of natural vegetation and associated moisture content of plants and soils. (CNRA 2012b:11). Increased temperature and frequency of extreme heat events, along with changes in precipitation patterns, can lead to a secondary impact of climate change: an increase in the frequency and intensity of wildfires (CNRA 2012a:17).

According to Napa County's Operational Area Hazard Mitigation Plan, the County has a history of wildfires. Before the 2017 wildfires, more than 200,000 acres of the County's 482,000 acres burned in the last thirty years, most of which occurred in the unincorporated areas (Napa County 2013:12). Mitigation efforts, including adoption of the 2010 Uniform Fire Code, the Firewise Program, and the Chipping Program, have helped reduce the County's wildfire risk, but it is still vulnerable and at high-risk for wildfires, as evidenced by the 2017 wildfires (Napa County 2013: 77). The 2017 California wildfire season was one of the most destructive seasons on record, occurring in a year of record-setting heat and persistent drought (CALFIRE 2017, 2018a, b, c). In October 2017, a series of wildfires broke out across Napa, Lake, Sonoma, Mendocino, Butte, and Solano Counties, burning over 245,000 acres. According to CALFIRE and various news outlets, the fires resulted in at least 44 casualties, the hospitalization of 185 people, and the destruction of an estimated 8,900 structures (CALFIRE 2017). Napa County was greatly impacted by the fires, with over 70,000 acres burned, and 1,200 structures damaged or destroyed, including more than 700 residences (Napa County 2018). Currently, the major wildland fire hazards risks for residential development are in the County's hilly areas characterized by steep slopes, poor fire suppression delivery access, inadequate water supply and highly flammable vegetation (Napa County 2013:75).

Figure 10 below depicts that fire risk relative to 2010 levels under the low-emissions scenario is 11 percent more likely to occur in 2020 than it would have in 2010, 15 percent more likely to occur in 2050, and 12 percent more likely to occur in 2085. Under the high-emissions scenario, as depicted in Figure 11 below, fire risk is 14 percent more likely to occur in 2020 than it would have in 2010, 13 percent more likely in 2050, and 22 percent more likely to occur in 2085. Given that the County is currently at risk for wildfire, these increases of between 10 and 20 percent under both emissions scenarios is significant and can cause additional threats and vulnerability.

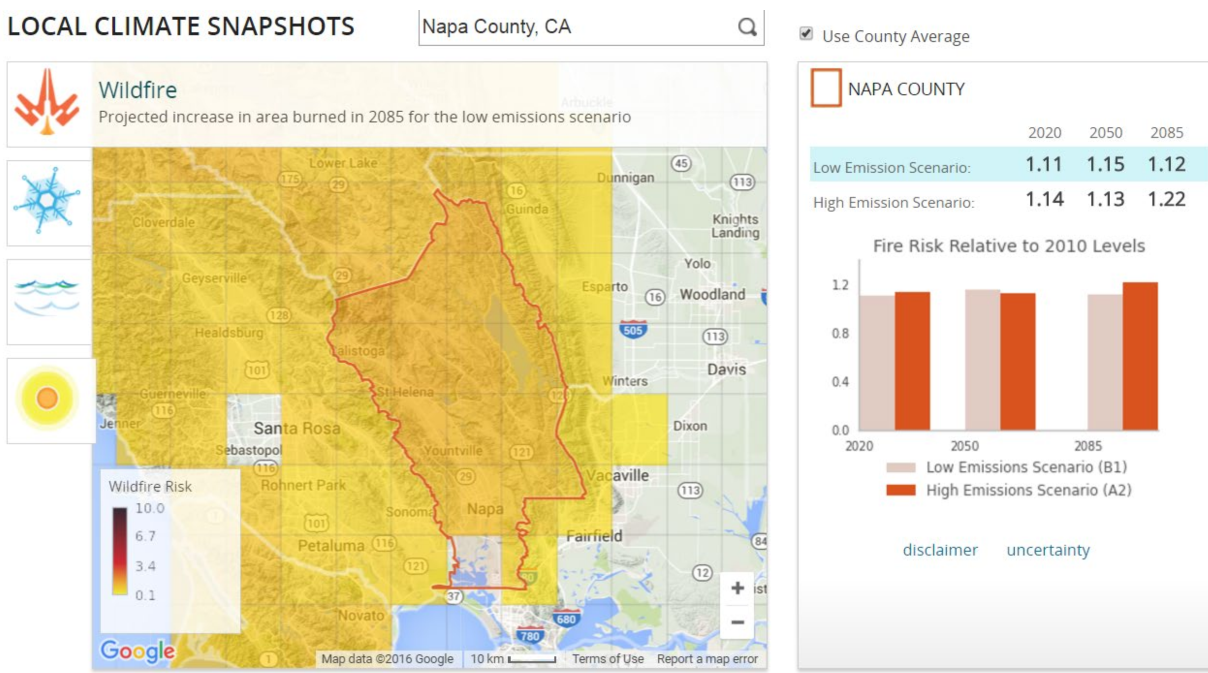


Figure 10: Projected Increase in Fire Risk Relative to 2010 Levels in Napa County for 2020, 2050, and 2085 (Source: CEC 2016)

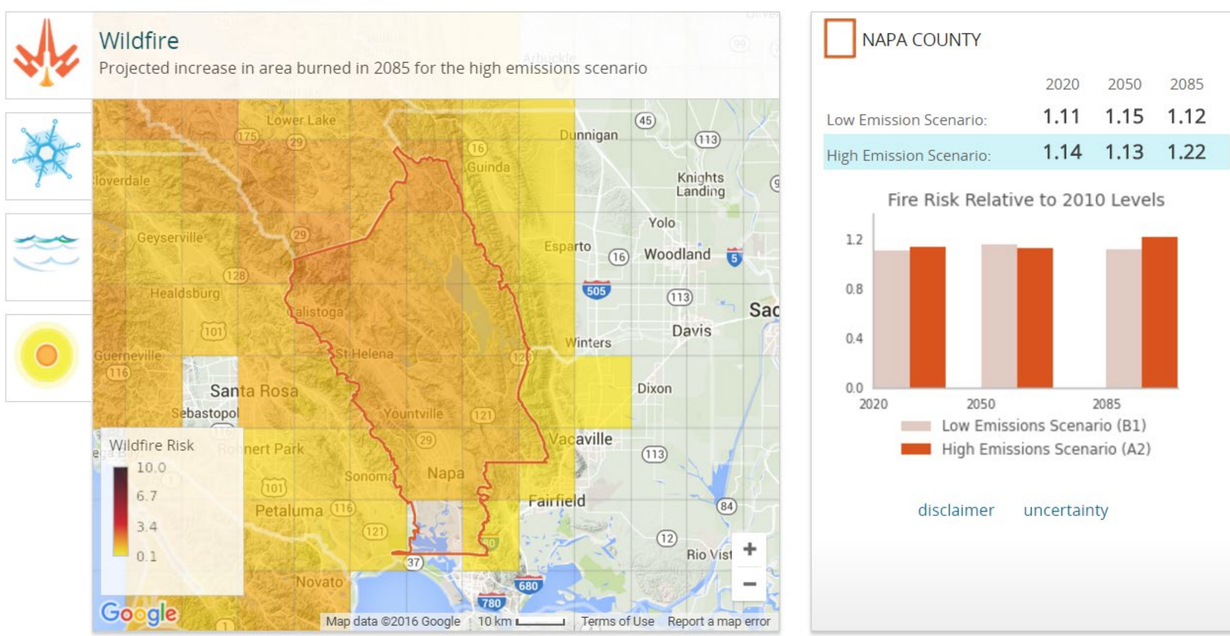


Figure 11: Projected Increase in Fire Risk Relative to 2010 Levels in Napa County for 2020, 2050, and 2085 (Source: CEC 2016)

Increased Likelihood of Flooding

Climate change is likely to lead to changes in frequency, intensity, and duration of extreme events, such as heavy precipitation and rainfall intensity. These projected changes could lead to increased flood magnitude and frequency and could place more pressure on the County, destroying land, buildings, roads, and crops (IPCC 2001:14).

According to Napa County's Operational Area Hazard Mitigation Plan, the County is considerably vulnerable to flooding. Flooding has caused the most disaster declarations and the most damage and loss of life historically in the County, with floods usually occurring during the season of highest precipitation or during heavy rainfalls after prolonged dry periods (Napa County 2013:11). The County is dry during the late spring, summer, and early fall and receives most of its rain during the winter months. A majority of the land adjacent to the Napa River is subject to flooding that has a one percent probability of occurring in any given year, or a 100-year flood event (Napa County 2013:58). While it is uncertain exactly how and to what extent climate change will affect flooding events in the County, it is reasonable to assume that any increase in flooding could have serious ramifications as the area is already considerably vulnerable. Additional information on increased risk of flooding, which could be exacerbated by sea-level rise in the southern portion of the County, is included below.

Sea-Level Rise

Another outcome of global climate change is sea-level rise. The average global sea level rose approximately seven inches during the last century. If sea-level changes along the California coast continue to reflect global trends, sea level along the State's coastline in 2050 could be 10-18 inches (0.25-0.45 meters [m]) higher than in 2000, and 31-55 inches higher (0.78-1.4 m) than 2000 levels by the end of this century (CNRA 2012b:9).

According to the CEC's 2012 report, *The Impacts of Sea-Level Rise on the San Francisco Bay*, currently 140,000 people, or 2 percent of the region's population, live in areas currently at risk of being inundated in a 100-year flood event. A 1.0 m rise in sea level will put an additional 80,000 people at risk, increasing the total number of people at risk to 220,000. With a 1.4 m rise in sea- levels, the number of people at risk of a 100-year flood event would increase to 270,000, an additional 130,000 people.

The southwestern portion of the County includes the mouth of the Napa River, which forms a tidal estuary that drains into San Pablo Bay. Less than one percent of the County's population is considered at risk and vulnerable to sea-level rise (CEC 2012:14 and Census 2014). Some critical infrastructure (i.e., roads, hospitals, schools, emergency facilities, and properties) are at risk in the County, including American Canyon Power Plant and the Napa Sanitation District Water Treatment Plant are vulnerable to a 100-year flood event with a 1.4 m sea-level rise (CEC 2012:23).

Using data developed for the Our Coast, Our Future effort, led by the United States Geological Survey (USGS), the Cal-Adapt tool depicts sea-level rise projections and existing storm-related flooding events using the Coastal Storm Modeling System (CoSMoS). CoSMos depicts coastal flooding projections for the San Francisco Bay Area due to the combination of sea-level rise and storm events, while also accounting for physical protective structures (e.g. levees), waves, tides, surge, steric effects, and fluvial discharge erosion, and other hydrodynamical factors.

Figure 12 shows land in the County that is both currently and projected to be vulnerable to flooding because of a 100-year flood event, a 1.5 m in sea-level rise, and other hydrodynamical factors. Because the CoSMos model accounts for physical structures, such as levees that protect against a 100-year flood event, only approximately 36 acres in the County are currently at risk for flooding. Taking a 1.5 m rise in sea level into account, along with other storm factors, the tool projects an additional 13,000 acres would be inundated by a 100-year flood event. Most of the area that is at risk is currently undeveloped or used for agricultural purposes. Specific areas along the Napa River include Buchli, Cuttings Wharf, Thompson, and Imola, along with areas further north along the Napa River, including some industrial uses, wineries, and parts of Downtown Napa (i.e., up to 3rd Street and portions east of State-Route 29). Additional portions of Thompson, Middleton, and American Canyon also have some flood-prone low-lying areas that would become more vulnerable to flooding because of sea-level rise. While the Napa County Airport itself is not at immediate risk for inundation, adjacent areas to the west are at increased risk of flooding due to sea-level rise.

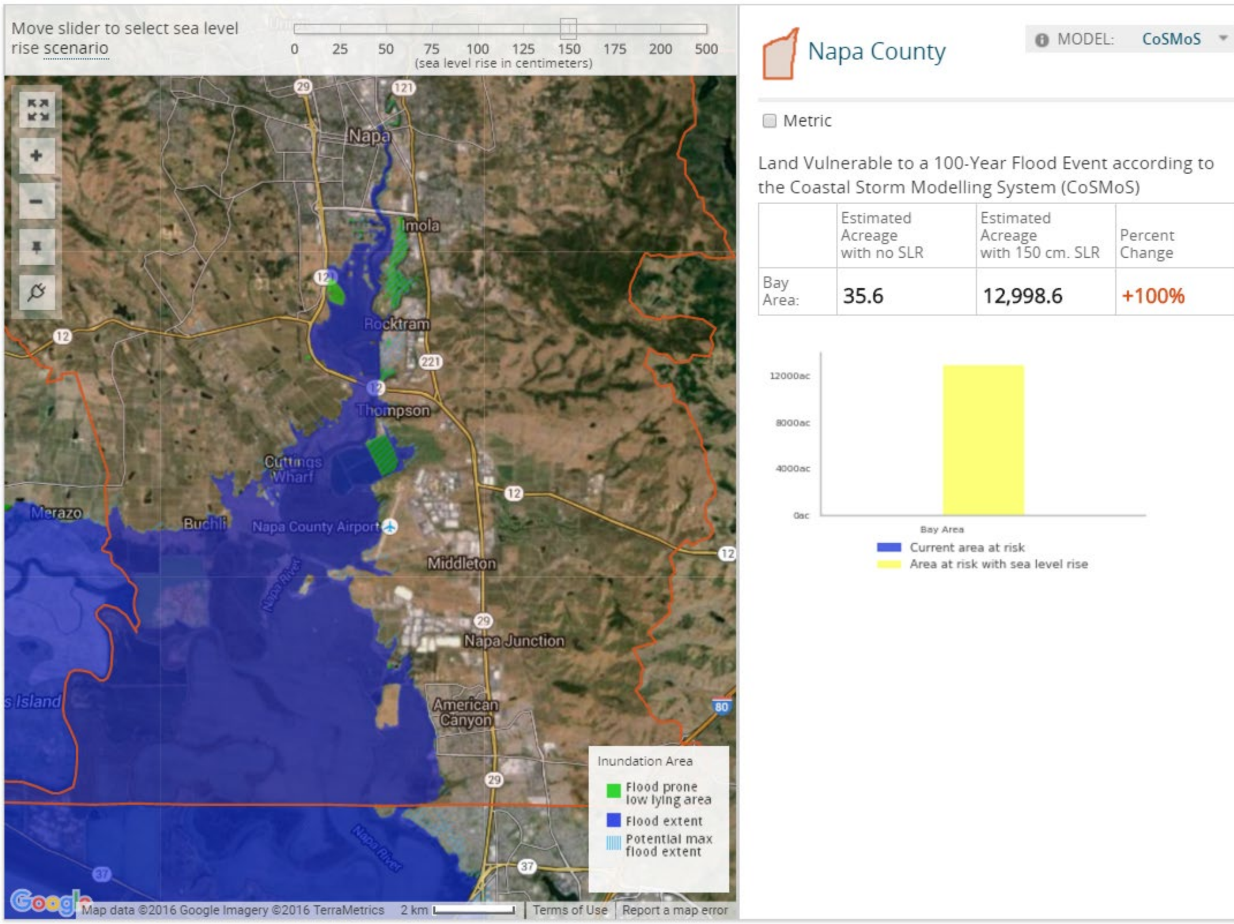


Figure 12: Sea-Level Rise, Current and Projected Areas Threatened (Source: CEC 2016)

The Adapting to Rising Tides (ART) subregional project, developed and sponsored by the San Francisco Bay Conservation and Development Commission (BCDC), studied five potential climate impact scenarios associated with sea-level rise and storm event scenarios in Alameda County (BCDC 2016a). While the subregional project looked at Alameda County specifically, potential consequences of sea-level rise and storm events identified in the project could also apply to other Bay Area counties like the County. Potential climate impacts identified include:

- more frequent flooding events due to rising Bay water levels;
- more extensive and longer duration flooding;
- permanent inundation in areas due to higher Bay water levels and shifts in the tidal range;
- increased shoreline erosion and increased potential for levy over-topping; and
- elevated groundwater and salinity intrusion (BCDC 2016b).

3.2 Steps 2 and 3: Sensitivity and Potential Impacts

The next two steps in the vulnerability assessment are closely related and are thus discussed together. The second step in the vulnerability assessment involves using a systematic evaluation to identify structures, functions, and populations that may be affected in the County by projected exposures to climate change impacts. Using the APG's recommended sensitivity checklist, this assessment focuses specifically on resources in the County potentially affected by climate change that were identified in the Exposure section of this Chapter.

The sensitivity checklist is organized into three main categories; Functions, Structures, and Populations. The categories are described in more detail below:

- **Functions**: Includes facilities that are essential to the health and welfare of the whole population and are especially important following climate-influenced hazard events. These facilities include hospitals, medical facilities, police and fire stations, emergency operations centers, evacuation shelters, and schools. Transportation systems, such as airways (e.g., airports and highways), bridges, tunnels, railways (e.g., tracks, tunnels, bridges, and rail yards), and waterways (e.g., canals, seaports, harbors, and piers) are also important to consider. Finally, lifeline utility systems such as potable water, wastewater, fuel, natural gas, electric power, and communications must also be identified.

- **Structures**: Includes the structures of essential facilities noted above. It also includes high potential loss facilities, where damage would have large environmental, economic, or public safety consequences (e.g., nuclear power plants, dams, and military installations). This category also includes hazardous material facilities that house industrial/hazardous materials.

- **Populations**: Includes a community's vulnerable populations, such as non-English-speaking people or elderly people who may require special response assistance or special medical care after a climate-influenced disaster.

Sensitivity checklists for each of the identified climate change exposures in the County are provided below, in conjunction with Step 3 of the vulnerability assessment. The third step in the assessment includes evaluating how these impacts will occur and how severe they may be. Given that climate change exposures at the local scale are inherently uncertain, the APG recommends that communities conduct a qualitative assessment that describes the potential impacts based on the exposure (CNRA 2012a:23). This assessment is not meant to be exhaustive and prescriptive, but is rather intended to provide a high-level view of potential impacts that could occur because of identified climate change exposures. Further evaluation and research would be needed to more clearly identify points of sensitivity and potential impacts, including specific facilities, structures, and areas of concern.

3.2.1 Increased Temperature and Frequency of Extreme Heat Events and Heat Waves

Based on the low- and high-emissions scenarios, annual average temperatures in the County are projected to rise three to six degrees Fahrenheit by 2090. Increased temperature can lead to secondary climate change impacts including increases in the frequency, intensity, and duration of extreme events and heat waves in the County. Points of sensitivity are identified below in Figure 13.

Higher frequency of these extreme heat conditions can cause serious public health impacts, increasing the risk of conditions directly related to heat such as heat stroke and dehydration (CNRA 2012a:3). Furthermore, public and private resources could be severely strained as the number of extreme heat occurrences increase. Older adults, particularly seniors, are more likely to experience respiratory and/or cardiovascular health complications than younger individuals. Approximately 17 percent of the County's population are elderly, which are more likely to live alone with limited mobility, all of which can exacerbate the risk of extreme heat (Census 2014).

Increases in temperature, along with the frequency of extreme heat events and heat waves, can also affect the agriculture industry, which is a large driver of the County's economy. The significant, overall outcome of warming is the likely reduction in yield of some of California's most valuable specialty crops (CNRA 2014: 21). More specifically, climate change could have serious effects to the wine industry in Napa County, which produces an average of 90 percent of American wine (Mayton 2015). The County currently has 400 wineries, producing more than 9.2 million cases of wines totaling over $1 billion dollars in sales. The wine industry in Napa accounts for $10.1 billion of $51.8 billion economic impact from winemaking and related industries in California (Napa County 2013:28). Increases in temperature and moisture could impact the growing of wine grapes, by causing late or irregular blooming and affecting yields (Lee et al. 2013:1). Limited livestock operations could also be subject to heat stress, which can result in reduced livestock pregnancy rates, longer time needed to meet market weight, and reduced milk production (CNRA: 2014:24). The County's large Hispanic agricultural worker base could also be affected by heat stress, which could reduce productivity, and may lead to illness, disability, or death in extreme exposures (CNRA 2014:24).

Higher temperatures could also threaten the County's energy system, by increasing consumer energy demand and affecting the facilities themselves. Energy usage tends to spike during extreme events and heat waves, which can create stress on the energy grid. Increased consumer demand can force utilities to ramp up the supply of energy, which can sometimes require the use of older and dirtier fossil fuel. Higher temperatures can also physically alter the thermal performance of power plants (e.g., American Canyon Power Plant), substations, and transmissions lines. (CEC 2012:14).

Functions

- [ ] Government continuity
- [ ] Water/sewer/solid waste
- [x] Energy delivery
- [x] Emergency Services
- [x] Public safety
- [x] Public health
- [x] Emotional and mental health
- [ ] Business continuity
- [ ] Housing Access
- [ ] Employment and job access
- [ ] Food security
- [ ] Mobility/Transportation/access
- [x] Quality of life
- [x] Social services
- [x] Ecological function
- [x] Tourism
- [ ] Recreation
- [x] Agriculture, forest, and fishery productivity
- [ ] Industrial operations

Structures

- [ ] Residential
- [ ] Commercial
- [ ] Industrial
- [ ] Government
- [ ] Institution (schools, churches, hospitals, prisons, etc.)
- [ ] Parks and open space
- [ ] Recreational facilities
- [ ] Transportation facilities and Infrastructure
- [ ] Marine facilities
- [ ] Communication infrastructure
- [ ] Dikes and levees
- [ ] Water treatment plant and delivery infrastructure
- [ ] Wastewater treatment plant and collection infrastructure

Populations

- [x] Seniors
- [x] Children
- [x] Individuals with disabilities
- [x] Individuals with compromised immune systems
- [x] Individuals who are chronically ill
- [x] Individuals without access lifelines (e.g. car or transit, telephones)
- [x] Non-white communities
- [x] Low-income, unemployed, or underemployed communities
- [x] Individuals with limited English skills
- [ ] Renters
- [ ] Students
- [ ] Seasonal residents
- [x] Individuals uncertain about available resources because of citizenship status

Figure 13: Napa County's Sensitivity to Increased Temperatures and Extreme Heat

3.2.2 Changes to Precipitation Patterns

Increased average temperatures and a hastening of snowmelt in distant watersheds, along with local and regional changes in precipitation and timing of runoff in local watersheds, could affect both surface and groundwater supplies in the County. As a result, the County could struggle in the future in providing adequate water supplies to its residents. Water users could face shortages in normal or dry years, if demand continues to increase. The points of sensitivity identified because of changes in precipitation patterns are shown below in Figure 14.

Functions

- [ ] Government continuity
- [x] Water/sewer/solid waste
- [ ] Energy delivery
- [ ] Emergency Services
- [x] Public safety
- [x] Public health
- [x] Emotional and mental health
- [ ] Business continuity
- [ ] Housing Access
- [ ] Employment and job access
- [ ] Food security
- [ ] Mobility/Transportation/access
- [x] Quality of life
- [ ] Social services
- [x] Ecological function
- [x] Tourism
- [x] Recreation
- [x] Agriculture, forest, and fishery productivity
- [ ] Industrial operations

Structures

- [x] Residential
- [x] Commercial
- [x] Industrial
- [x] Government
- [x] Institution (schools, churches, hospitals, prisons, etc.)
- [x] Parks and open space
- [x] Recreational facilities
- [x] Transportation facilities and Infrastructure
- [ ] Marine facilities
- [ ] Communication infrastructure
- [ ] Dikes and levees
- [ ] Water treatment plant and delivery infrastructure
- [ ] Wastewater treatment plant and collection infrastructure

Populations

- [ ] Seniors
- [ ] Children
- [ ] Individuals with disabilities
- [ ] Individuals with compromised immune systems
- [ ] Individuals who are chronically ill
- [ ] Individuals without access lifelines (e.g. car or transit, telephones)
- [ ] Non-white communities
- [x] Low-income, unemployed, or underemployed communities
- [ ] Individuals with limited English skills
- [ ] Renters
- [ ] Students
- [ ] Seasonal residents
- [ ] Individuals uncertain about available resources because of citizenship status

Figure 14: Napa County's Sensitivity to Changes in Precipitation

With intensified use of groundwater, many of California's groundwater basins are already in overdraft, with groundwater being used faster than it is being replenished and groundwater levels declining. Overdraft can also lead to land subsidence, which is the gradual settling or sudden sinking of the earth's surface. The effects of subsidence could impact houses and other structures such as transportation infrastructure, water well casing failures, and changes to the elevation and gradient of stream channels, drains, and other water transport structures (CNRA 2014:235).

In terms of agriculture, changes in timing and amounts of precipitation could affect local aquifer recharge for groundwater supplies in the future, which could in turn affect water supplies for agricultural uses. Conversely, as the weather gets warmer with climate change, agricultural demand for water could intensify because in extreme heat conditions water evaporates faster and plants need more water to move through their circulatory systems to stay cool (CNRA 2014:21). More specifically, attempts to maintain wine grape productivity and quality in the face of warming may be associated with increased water use for irrigation and to cool grapes through misting or sprinkling (Lee et al. 2013).

3.2.3 Increased Wildfire Risk

The County is already considered to be an area that is at high-risk for wildfires (Napa County 2013:77). Increased temperatures and changes in precipitation patterns associated with climate change are expected to increase the risk of wildfire in the County by approximately 10 to 20 percent by the end of the century. This increase could cause additional threats to the County and has the potential to affect emergency services, roads, water supplies to residents, housing access, and quality of life. The points of sensitivity identified for this exposure to increased wildfire risk is shown below in Figure 15.

Functions

- [x] Government continuity
- [x] Water/sewer/solid waste
- [x] Energy delivery
- [x] Emergency Services
- [x] Public safety
- [x] Public health
- [x] Emotional and mental health
- [x] Business continuity
- [x] Housing Access
- [x] Employment and job access
- [ ] Food security
- [x] Mobility/Transportation/access
- [x] Quality of life
- [x] Social services
- [x] Ecological function
- [x] Tourism
- [ ] Recreation
- [x] Agriculture, forest, and fishery productivity
- [ ] Industrial operations

Structures

- [x] Residential
- [x] Commercial
- [x] Industrial
- [x] Government
- [x] Institution (schools, churches, hospitals, prisons, etc.)
- [x] Parks and open space
- [x] Recreational facilities
- [x] Transportation facilities and Infrastructure
- [ ] Marine facilities
- [x] Communication infrastructure
- [ ] Dikes and levees
- [x] Water treatment plant and delivery infrastructure
- [x] Wastewater treatment plant and collection infrastructure

Populations

- [x] Seniors
- [x] Children
- [x] Individuals with disabilities
- [x] Individuals with compromised immune systems
- [x] Individuals who are chronically ill
- [x] Individuals without access lifelines (e.g. car or transit, telephones)
- [x] Non-white communities
- [x] Low-income, unemployed, or underemployed communities
- [x] Individuals with limited English skills
- [ ] Renters
- [ ] Students
- [x] Seasonal residents
- [x] Individuals uncertain about available resources because of citizenship status

Figure 15: Napa County's Sensitivity to Wildfire Exposure

A changing climate is expected to subject forests to increased stress because of drought, disease, invasive species, and insect pests. These stressors are likely to make forests more vulnerable to catastrophic fire (Westerling 2008:231). While periodic fires are natural processes and an important ecological function, catastrophic fire events that cannot be contained or managed, can cause serious threats to homes and infrastructure, especially for properties located at the wildland-urban interface (i.e., where residential development mingles with wildland areas) (California Dept. of Forestry and Fire Protection 2009). Ecological functions are further impacted as the risk of fire increases. When it does rain in burned areas, more soil washes off the hills and into roads, ditches, and streams.

Wildfire also threatens energy generation and transmission infrastructure, resulting in damages to facilities (e.g., hydroelectric generation facilities in remote locations), increased maintenance costs, and reduced transmission line efficiency (CEC 2012:15).

The wine industry and the thousands of acres of vines could also be affected by wildfire. For vineyards that are near fires, the smoke could potentially cause problems, particularly for red grapes, where the skin is still used to in the winemaking process. That smoke could potentially infuse with the skin and create abnormal flavors (Mayton 2015). Wildfire could also negatively impact those who pick the grapes, because of the potential degradation of transportation infrastructure. Because many agricultural workers cannot afford to live in the County (due to high housing costs and the lack of affordable housing), their access and mobility could be impaired.

3.2.4 Increased Likelihood of Flooding

The County is considerably vulnerable to flooding, which has caused the most disaster declarations and the most damage and loss of life historically in the County (Napa County 2013:11). While it is uncertain exactly how climate change will affect flooding events in the County and to what extent, it is reasonable to assume that any increase in flooding could have serious ramifications as the area is already considerably vulnerable. Points of sensitivity are identified below in Figure 16.

Functions

- [x] Government continuity
- [x] Water/sewer/solid waste
- [x] Energy delivery
- [x] Emergency Services
- [x] Public safety
- [x] Public health
- [x] Emotional and mental health
- [x] Business continuity
- [x] Housing Access
- [x] Employment and job access
- [ ] Food security
- [x] Mobility/Transportation/access
- [x] Quality of life
- [x] Social services
- [x] Ecological function
- [x] Tourism
- [ ] Recreation
- [x] Agriculture, forest, and fishery productivity
- [x] Industrial operations

Structures

- [x] Residential
- [x] Commercial
- [x] Industrial
- [x] Government
- [x] Institution (schools, churches, hospitals, prisons, etc.)
- [x] Parks and open space
- [x] Recreational facilities
- [x] Transportation facilities and Infrastructure
- [ ] Marine facilities
- [x] Communication infrastructure
- [x] Dikes and levees
- [x] Water treatment plant and delivery infrastructure
- [x] Wastewater treatment plant and collection infrastructure

Populations

- [x] Seniors
- [x] Children
- [x] Individuals with disabilities
- [x] Individuals with compromised immune systems
- [x] Individuals who are chronically ill
- [x] Individuals without access lifelines (e.g. car or transit, telephones)
- [x] Non-white communities
- [x] Low-income, unemployed, or underemployed communities
- [x] Individuals with limited English skills
- [ ] Renters
- [ ] Students
- [x] Seasonal residents
- [x] Individuals uncertain about available resources because of citizenship status

Figure 16: Napa County's Sensitivity to an Increased Likelihood of Flooding

One of the projected impacts of climate change is the increased likelihood of extreme floods capable of destroying streamside land, buildings, roads, and crops. Climate change will not only stress human communities and infrastructure, but will also threaten the biodiversity that occurs along the streams and creeks in the County. Flooding could also lead to the destruction of agriculture, erosion of topsoil, and deposits of debris and sediment on crop lands. It could also release sewage and hazardous or toxic materials as wastewater treatment plans are inundated, storage tanks are damaged, and pipelines severed. Floods also cause economic losses through closure of businesses and government facilities; disrupt communications; disrupt the provision of utilities such as water and sewer; result in excessive expenditures for emergency response; and generally, disrupt the normal function of a community. (Napa County 2013:58)

3.2.5 Sea-Level Rise

The County is not very vulnerable to sea-level rise, with less than one percent of the County's total population considered at risk (CEC 2012:14 and Census 2014). Considering a 100-year flood event, a 1.5 m rise in sea-level and other hydrodynamical factors, most of the land at increased risk for flooding is undeveloped. A small portion of critical infrastructure, such as roads, railways, hospitals, emergency facilities, and properties in the southwestern portion of the County and in areas along the Napa River, including parts of Downtown Napa, could become vulnerable. American Canyon Power Plant and the Napa Sanitation District Water Treatment Plant could also become vulnerable (CEC 2012:23). The points of sensitivity identified for this exposure risk is shown below in Figure 17.

Functions

- [X] Government continuity
- [X] Water/sewer/solid waste
- [X] Energy delivery
- [X] Emergency Services
- [X] Public safety
- [X] Public health
- [X] Emotional and mental health
- [ ] Business continuity
- [ ] Housing Access
- [ ] Employment and job access
- [ ] Food security
- [X] Mobility/Transportation/access
- [X] Quality of life
- [X] Social services
- [X] Ecological function
- [ ] Tourism
- [ ] Recreation
- [X] Agriculture, forest, and fishery productivity
- [ ] Industrial operations

Structures

- [X] Residential
- [X] Commercial
- [X] Industrial
- [X] Government
- [X] Institution (schools, churches, hospitals, prisons, etc.)
- [X] Parks and open space
- [ ] Recreational facilities
- [X] Transportation facilities and Infrastructure
- [ ] Marine facilities
- [X] Communication infrastructure
- [X] Dikes and levees
- [X] Water treatment plant and delivery infrastructure
- [X] Wastewater treatment plant and collection infrastructure

Populations

- [X] Seniors
- [X] Children
- [X] Individuals with disabilities
- [X] Individuals with compromised immune systems
- [X] Individuals who are chronically ill
- [X] Individuals without access lifelines (e.g. car or transit, telephones)
- [X] Non-white communities
- [X] Low-income, unemployed, or underemployed communities
- [X] Individuals with limited English skills
- [ ] Renters
- [ ] Students
- [X] Seasonal residents
- [X] Individuals uncertain about available resources because of citizenship status

Figure 17: Napa County's Sensitivity to Sea-Level Rise Exposure

As sea-levels rise, the area and the number of people at risk due to flooding will also rise. Rising sea levels can overwhelm existing protection structures, putting those County residents living in vulnerable areas at increased risk (CEC 2012:6). Factors that increase vulnerability to the adverse impacts of flood events associated with sea-level rise include access to preparedness information, transportation, healthcare, and insurance. Key demographics associated with these vulnerabilities include income, race, linguistic isolation (i.e., non-English speaking), and residential tenure (CEC 2012:8). Language ability is an important factor in assessing vulnerability as emergency response crews may be unable to communicate with non-English speakers (CEC 2012:9). The County has a large Hispanic population, many of which are low-income agricultural workers that speak primarily Spanish. The Hispanic population has increased from 23.7 percent in 2000 to 33.7 percent in 2014 (Census 2014). This population is especially vulnerable and would be impacted by a flood event associated with sea-level rise.

Renters are also more vulnerable, as they are less likely to reinforce buildings and buy insurance because the decision to make major home improvements typically lies with the property owner. Additionally, disaster recovery services have often targeted homeowners, to the disadvantage of renters (CEC 2012:9).

3.3 Step 4: Adaptive Capacity

Once identifying the points of sensitivity and the potential impacts of exposures, the next step is to look at the County's current adaptive capacity to address climate change. Step 4 involves determining what is or can be currently done in the County to address these challenges. Review of the County's existing local policies, plans, programs, resources, or institutions provides a good snapshot of the County's ability to adapt to climate change and reduce vulnerability. Based on this information, adaptive capacity for a County can be rated high, medium, or low. High adaptive capacity indicates that sufficient measures are already in place to address projected changes, while a low rating indicates a community is unprepared (CNRA 2012a:26).

The adaptive capacity of the County to respond to projected climate change impacts is analyzed below, based on identified exposures where possible. It is important to note that this review of local climate adaptation-related work offers a high-level perspective on the issue and is not meant to be all-inclusive. As more specific facilities, structures, and areas are identified in the future, additional review of adaptive capacity may likely be needed.

On a planning level, the County addresses current and future impacts related to existing natural hazards, as evidenced by the creation of the County's Operational Area Hazard Mitigation Plan in 2013, which identifies current hazard risks and mitigation strategies for flooding, earthquakes, and fires. Furthermore, the County's 2008 General Plan includes policies aimed at reducing local contributions to global climate change and encourages sustainable building practices, efficient use of resources (i.e., water, land, and energy), sustainable vineyard practices, and ecological stewardship. It also covers vulnerable populations, including policies aimed at achieving more equitable outcomes for the growing low-income populations in the County, as well as its aging population that require better access to public services and housing.

In addition to planning efforts, climate adaptation-related work occurring in the County includes, but is not limited, to the following:

Efforts Related to Increased Temperature and Frequency of Extreme Heat Events and Heat Waves

- The Napa County Health and Human Services Agency, Public Health Division maintains an Excessive Heat Emergency Response Plan. This plan provides information and structure to the County in heat related emergencies. A part of the plan includes identifying and allocating locations of cooling centers in the event of a heat emergency. Cooling centers can include senior centers, community centers, shopping malls, churches, possible ice skating rinks, and other places that fit the appropriate criteria (Napa County 2009).

Adaptive Capacity Ranking: Medium

Napa County's Excessive Heat Emergency Response Plan is designed to address current and projected changes in increased temperature, including extreme heat events and heat waves. The plan clearly outlines procedures and steps the County can take, including which other agencies to enlist for support, to effectively help the community in the event of excessive heat emergencies. While the plan can account for projected increases in temperature, it is reactive in nature and does not include potential solutions that could be put in place before extreme heat events occur. Therefore, the adaptive capacity ranking for increased temperature is medium.

Efforts Related to Changes to Precipitation Patterns and Water Supply

- The County participates in the Home Energy Opportunity (HERO) Program, which is part of the Property Assessed Clean Energy (PACE) Program. HERO helps homeowners reduce energy bills and decrease water consumption through special financing options, while also creating jobs for registered contractors in the County (Yune 2014).

- The County has water conservation regulations for landscape design, with the intent to conserve water through promotion of the most efficient use of water in landscape design, while respecting the economic, environmental, aesthetic, and lifestyle choices of individuals and property owners (Napa County Municipal Code Title 18, Chapter 18.118)

- The County has several water conservation programs to help combat drought and other water supply issues. These include promotion of rebate programs from DWR for single-family residences to remove turf and replace toilets, as well as clothes washer rebates for residents from PG&E and the County (Napa County 2016).

- The Napa County Flood Control and Water Conservation District Office also provides free water-saving devices to those living in the County. These include faucet aerators, showerheads, and hose times (Napa County 2016).

Adaptive Capacity Ranking: Medium

The County has several water conservation programs, including rebates for appliances and free-water saving devices for residents, that are helping to combat drought and other water supply issues; however, the County is still currently vulnerable to water supply issues because of drought and other factors. The County will face challenges in providing sufficient water supplies in the future because of climate change effects, coupled with an increasing population (i.e., mostly in the incorporated areas) and increasing water demand. While the County has already taken steps towards achieving long-term groundwater sustainability, there is still a possibility that water supply availability may change in the future and will need to be further addressed. Therefore, the adaptive capacity ranking for changes to precipitation patterns and water supply is medium

Efforts Related to the Increased Likelihood of Flooding

- Structures to control flooding have been built throughout the populated west side of the County and are operated and maintained by several agencies. A number of levees have been built along the Napa River to protect agricultural lands and populated parts of the County and to withstand a 100-year flood event. The Napa River Flood Control Project, a major flood control project on the Napa River and its tributaries, will provide a much higher level of flood protection. (Napa County 2013:59).

Adaptive Capacity Ranking: Medium

While levees and structures have been built to protect the County from a 100-year flood event, and the Napa River Flood Control Project will provide a higher level of flood protection, the County is currently not prepared to address effects associated with future sea-level rise and other hydrodynamic factors. Climate change is projected to expose 13,000 additional acres to 100-year flood risk. While a majority of these areas are undeveloped, some developed areas are at risk and should be accounted for in future plans. Therefore, the adaptive capacity for risks associated with flooding is medium.

Efforts Related to the Increased Risk of Wildfire

- The County has adopted the 2010 Uniform Fire Code to help reduce the County’s risk of wildfire (Napa County 2013:77).

- The County has provisions to help prevent the accumulation of combustible vegetation or rubbish that can be found to create fire hazards and potentially impact health, safety, and general welfare of the public. Provisions include ensuring that defensible spaces, which are adjacent to each side of a building or structure, are cleared of all brush, flammable vegetation, or combustible growth (Napa County Municipal Code Title 8, Chapter 8.36).

- The County participates in the National Fire Protection Association's (NFPA) Firewise Communities Program, which is co-sponsored by the USDA Forest Service, the US Department of the Interior, and the National Association of State Foresters. The program encourages local solutions for safety by teaching people how to adapt to living with wildfire and encourages neighbors to work together and take action to prevent losses (NFPA 2016).

- The Napa Communities Firewise Foundation, in cooperation with the Napa County Fire Department, provides a free chipping service to County residents who are working to maintain the State mandated 100-feet of defensible space around their homes and complying with the County Hazard Abatement Ordinance (Napa County 2016).

- The County has several Fire Safe Councils that are active in minimizing the potential for wildfire damage. Fire Safe Councils receive Federal grants from agencies like the U.S. Forest Service, Bureau of Land Management, and National Park Service. These funds provide Fire Safe Councils with grant money to pursue projects to reduce hazardous fuels, provide wildfire prevention education, and create risk assessments and Community Wildfire Protections Plans (California Fire Safe Council 2017).

- The County is also only one of four Counties to have road standards that meet the Board of Forestry's stringent requirements.

Adaptive Capacity Ranking: Medium

The County is an area that is currently at high-risk for wildfires. While programs and policies in place show a current capacity to address risks, the County is still vulnerable. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent. The County will need to continue to adapt to this projected increase. Therefore, the adaptive capacity for risks associated with wildfire is medium.

Other Climate-Adaptation Related Efforts

- Sustainable Napa County is a nonprofit organization that brings together County business, agriculture, nonprofit, and government entities as part of a comprehensive, collaborative campaign for long term environmental, economic, and social sustainability. With support from PG&E, their mission is to help residents get informed about sustainability and to offer resources and education on a variety of issues including green business, green building, energy, water, recycle and waste, agriculture, air, and transportation (Sustainable Napa County 2016).

- The County enforces the Green Building Standards Code to establish and encourage sustainable building construction practices having a positive environmental impact (Napa County Municipal Code Title 15, Chapter 15.14).

- The County supports the Napa Green Certification program, which is a comprehensive environmental certification program for vineyards and wineries in the Napa Valley. The program aims to reduce solid waste generation, water use, and wastewater generation, promoting sustainable agricultural practices. There is currently a 40 percent participation rate amongst wineries in Napa (Napa Green 2017).

- The County recently joined Marin Clean Energy (MCE), a Community Choice Aggregation (CCA) program. A CCA allows city and county governments to aggregate or pool electricity customers to purchase and develop power, while also allowing them to administer energy programs on behalf of their residents and businesses. A CCA works in partnership with a region's existing utility, which continues to deliver power, maintain the grid, and provide consolidated billing and other customer services. MCE offers its customers three different product offerings: Light Green, Deep Green, and

Local Sol. Customers in the MCE service territory are automatically enrolled in Light Green, which provides customers with 50 percent renewable energy from sources such as solar, wind, bioenergy, geothermal, and small hydroelectric power facilities (MCE 2017).

Adaptive Capacity Ranking: Medium

The County has practices and organizations in place that help address future issues of sustainability and climate adaptation. With organizations that educate the public and foster collaboration for longer term environmental sustainability, the County is finding ways to change behaviors and practices now. Furthermore, by adopting the Green Building Standards Code, the County is setting a precedent for reduced energy use, building with more sustainable materials, and employing better water conservation tactics. These efforts, however, would need to be expanded and applied on a much larger scale throughout the County to address future changes attributed to climate change. Therefore, the adaptive capacity for other climate-adaptation related efforts is medium.

In conclusion, the County is committed to continuing efforts to reduce and address existing risks and future climate change impacts on a program level. With a number of ordinances and programs that cover a range of exposures, the County is well equipped to handle current issues of extreme heat events and water supply issues but could still likely face increasing challenges as projected changes occur. Programs and adoption of the 2010 Uniform Fire Code has helped to mitigate the high risk for wildfires, but the County is still vulnerable to current and future fires. Other efforts, aimed at increasing energy efficiency, are commendable but cover only a small range of climate-related impacts. The County will also need to continue to adapt to better address impacts to sea-level rise and associated flooding. However, the long-term vision identified in the County’s planning documents demonstrate that the County is forward-thinking in their policy and mitigation development towards all exposures and are positioned to maintain services in the face of climate change.

3.4 Step 5: Risk and Onset

The final step in the vulnerability assessment is to rank impacts based on the level of risk and the projected timeframe. Risk is the likelihood or probability that a certain impact will occur, which is an assessment that combines the estimated certainty of the science projecting the climate change impact and the certainty of the sector sensitivity. Certainty ratings are based on percent probability of global models created by IPCC (CNRA 2012a:29). The timeframe in which the impact is most likely to occur (based on risk) can be categorized as:

- Current: Impacts currently occurring
- Near-term: 2020-2040
- Mid-term: 2040-2070
- Long-term: 2070-2100

Risk certainty has been provided based on the certainty of exposures estimated in Step 1 in Table 1 below. Onset designations have also been assigned.

The table shows that all temperature-related impacts are the most likely near-term climate change exposure facing the County and should be addressed and prioritized in future adaptation planning efforts. While sea-level rise has a high certainty rating and is already occurring, its onset is not expected to occur until closer to the end of the century in terms of changes in areas already vulnerable to flooding or causing permanent inundation in tidally-influenced areas of the County. Addressing increases in flooding and wildfire risk have mid-term onsets and should be prioritized accordingly.

Table 1 Risk and Onset for Napa County Climate Change Impacts

Impact	Certainty Rating	Timeframe
Increased Temperature	High	Near-term
Increased Frequency in Extreme Heat Events	High	Near-term
Increased Frequency in Heat Waves	High	Near-term
Sea-Level Rise	High	Long-term
Changes to Precipitation Patterns	Medium	Near-term
Increased Wildfire Risk	Medium	Mid-term
Increased Flooding	Medium	Mid-term

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Appendix D

Climate Action Plan Consistency Checklist

FILE#__________

NAPA COUNTY
PLANNING, BUILDING, AND ENVIRONMENTAL SERVICES
1195 Third Street, Suite 210, Napa, California, 94559
(707) 253-4417

A Tradition of Stewardship
A Commitment to Service

Climate Action Plan Consistency Checklist

Introduction

The Napa County Climate Action Plan (CAP), adopted by the County Board of Supervisors on XXXXXXX, 2019, outlines actions that the County will undertake to achieve its proportional share of State greenhouse gas (GHG) emissions reductions. Implementation of the CAP will require that new development projects attain higher levels of energy efficiency and incorporate more sustainable design standards. To help new development applicants plan and design projects consistent with the CAP, and to assist County staff in determining the consistency of proposed projects with the CAP during development review, the County has prepared a CAP Consistency Checklist (Checklist). This Checklist, in conjunction with the CAP, provides a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The Napa County CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to cumulative GHG emissions effect may be determined to not cumulatively be significant if it complies with the requirements of a plan for the reduction of GHG emissions. The Napa County CAP meets the criteria identified in Section 15183.5; therefore, the CAP is considered a "qualified" plan for the reduction of GHG emissions. New development projects that can demonstrate consistency with applicable GHG reduction measures in a qualified plan for the reduction of GHG emissions are eligible for CEQA streamlining, per the provisions of CEQA Guidelines Section 15183.5. Under these provisions, if a project can show consistency with applicable GHG reduction measures and such measures are included as mitigation measures in the project's environmental document or part of project design, the level of analysis for the project required under CEQA with respect to GHG emissions can be reduced considerably (i.e., a detailed analysis of project-level GHG emissions and potential climate change impacts is not needed).

This Checklist contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions regarding the implementation of relevant CAP strategies toward achieving the identified GHG reduction targets. Furthermore, a project's incremental contribution to cumulative GHG emissions may be determined to not be cumulatively considerable. Projects that are consistent with the CAP, as determined using this Checklist, may rely on the CAP for the cumulative impacts analysis of GHG emissions under CEQA. Projects requiring environmental review that cannot demonstrate consistency with the CAP using this Checklist would be required to prepare a separate, more detailed project-level GHG analysis as part of the CEQA document prepared for the project.

Checklist Applicability

This Checklist only applies to certain development projects that require discretionary review and must undergo environmental review (i.e., not exempt) pursuant to CEQA. Projects that only require ministerial review (e.g., only building permits) would not be subject to the Checklist. The CAP contains other measures that, when implemented, would apply broadly to all ministerial and discretionary projects. Some of those measures (e.g., CALGreen Tier 1 standards) are included for discretionary projects in this Checklist but could also apply to all ministerial projects broadly once the County takes action to codify specific requirements or standards.

Examples of the types of discretionary actions that are not subject to this Checklist would include: 1) discretionary actions that are otherwise exempt from CEQA because they do not result in any physical changes to the environment; 2) permits allowing wireless communication facilities; and 3.) certain infrastructure projects such as roads, pipelines, or other public works projects that are not directly tied to specific development proposals. These classes of discretionary actions would not result in changes in land use, the intensification of existing land uses, new building construction, or substantial renovations or expansions of buildings, and thus completion of this Checklist would not be applicable. However, staff may still require certain discretionary projects to complete separate, project-specific GHG analyses and incorporate such analyses and any project-level mitigation required into CEQA documents. This could include, for example, roads, pipelines, or other public works, where construction activities or physical changes in the environment could result in increases in GHG emissions. The final determination of whether the CAP Checklist may be used, or whether a project-specific analysis is required, will be made by staff during the project-level environmental review process.

Checklist Procedures

General procedures for Checklist compliance and review are described below. Specific guidance is also provided under each of the questions under Steps 1 and 2 of the Checklist in subsequent pages.

- The County's Planning Division reviews development applications and will make determinations regarding environmental review requirements under CEQA. Procedures for CEQA can be found on the County's Planning Policy Documents Homepage. County staff will make the final determination as to whether environmental review is required, and if so, whether completion of the CAP Checklist is required for a proposed project or whether a separate project-level GHG analysis is required.

- The specific requirements outlined in the Checklist, along with any items the applicant agrees to in consideration of this process, shall be required as a condition of approval and incorporated as mitigation measures in the project-level environmental document.

- The applicant must provide a written explanation that demonstrates how the proposed project will implement each Checklist requirement described herein to the satisfaction of the Planning Division.

- If a question in the Checklist is deemed not applicable (N/A) to a project, an explanation must be provided to the satisfaction of the Planning Division.

- Applicants may provide alternate GHG reduction measures to those included in this checklist, so long as the alternate measures are demonstrated to be equivalent or more effective than those being replaced. Applicants requesting use of alternate GHG reduction measures must submit supporting documentation along with the completed CAP Checklist, including detailed GHG reduction calculations and a written narrative, substantiating how the alternate measures would achieve equivalent or more GHG reductions.

- Development projects requiring discretionary review that cannot demonstrate consistency with the CAP using this Checklist would be required to prepare a separate, more detailed project-level GHG analysis as part of the CEQA document prepared for the project.

- The Checklist is an administrative document that may be updated periodically by County staff to incorporate new GHG reduction measures, comply with future updates or amendments to the CAP, or to comply with changes in local, State, or federal law. Any updates to the Checklist will be administered by the Planning Division at the staff level.

Application Information

Contact Information

Project No./Name: ______________________________

Property Address/APN: ______________________________

Applicant Name/Co.: ______________________________

Contact Phone: ____________________ Contact Email: ____________________

Was a consultant retained to complete this checklist? ☐ Yes ☐ No
If Yes, complete the following:

Consultant Name: ____________________ Contact Phone: ____________________

Company Name: ____________________ Contact Email: ____________________

Project Information

1. What is the size of the project (acres)? ____________________

2. Identify all applicable proposed land uses (indicate square footage):

☐ Residential (indicate # of one- and two-family units): ____________________

☐ Residential (indicate # of multi-family units): ____________________

☐ Commercial (indicate total square footage): ____________________

☐ Industrial (indicate total square footage): ____________________

☐ Winery (indicate total square footage): ____________________

☐ Agricultural (indicate total acreage): ____________________

☐ Other (describe): ____________________

4. Provide a brief description of the project proposed: ____________________

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CAP Consistency Checklist Questions

Step 1: Land Use Consistency

For projects that are subject to the CAP consistency evaluation, the first step in determining consistency is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the County to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
1. Is the proposed project consistent with the existing General Plan land use and zoning designations?	☐	☐
Applicant Detail: Please substantiate how the project satisfies question 1. ____ ____ ____ ____ ____ ____ ____		
If **"Yes,"** proceed to Step 2 (CAP Measures Consistency) of the Checklist. If **"No,"** proceed to the question 2 below.		
2. Does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☐	☐
Applicant Detail: Please substantiate how the project satisfies question 2 and provide estimated project emissions under both existing and proposed designations(s) for comparison. ____ ____ ____ ____ ____ ____ ____ ____ ____		
If "No," the project's GHG impact is potentially significant and must be analyzed in accordance with CEQA. The applicant must prepare a separate, more detailed project-level GHG analysis to demonstrate how it would offset the increase in emissions over the existing designations. The project must incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete a separate project-specific GHG analysis and Step 2 of the Checklist.		

Step 2: CAP Measures Consistency

The second step of the CAP consistency review is to review and evaluate a project's consistency with the applicable measures of the CAP. Each checklist item is associated with a specific GHG reduction measure(s) in the Napa County CAP.

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
New Vineyards on More than 5% Slopes				
1a. Electric, Solar, or Alternatively-Fueled Irrigation Pumps If installing new irrigation pumps, would the project install electric, solar-powered, or alternatively-fueled irrigation pumps using either on-site solar photovoltaic (PV) or small wind energy generation systems and battery storage, or via connection to overhead power lines?; OR If the site contains existing diesel-powered or gasoline-powered irrigation pumps, would the project convert them to electric pumps using on-site solar PV or small wind energy generation systems with battery storage, or via connection to overhead power lines; OR, for continued use of existing diesel pumps, would the pump operator purchase and use only renewable diesel and provide documentation annually to the County verifying the use of renewable diesel? Check "N/A" only if the project does not contain any agricultural operations.	AG-1	☐	☐	☐
1b. Applicant Detail: Please substantiate how the project satisfies questions 1a. ____ ____ ____				
2a. Electric or Alternatively-Fueled Agricultural Equipment Would the project, following project completion, use electric or alternatively-fueled agricultural equipment (i.e., renewable diesel, natural gas, or other low-carbon fuels) in its operations and provide documentation annually to the County verifying the use of such equipment?; AND If diesel equipment is used in project operations, would the project use Tier 4 diesel equipment for off-road agricultural equipment and provide documentation annually to the County verifying the use of Tier 4 equipment? Check "N/A" only if the project does not contain any agricultural operations.	AG-2 & AG-3	☐	☐	☐
2b. Applicant Detail: Please substantiate how the project satisfies questions 2a. ____ ____ ____				
3a. Sustainable Agricultural Practices Which of the following sustainable agricultural best management practices (BMPs) will the project, following project completion, include in its operations? Check all that apply: ☐ Low carbon farming ☐ Low impact farming (e.g., minimizing tractor passes) ☐ Low- or no-till farming ☐ Cover cropping strategies ☐ Low nitrogen fertilizer usage ☐ Low water usage ☐ Composting ☐ Use of fuel efficient equipment	AG-6	☐	☐	☐

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
☐ Napa Green Land certification ☐ Other Check "N/A" only if the project does not contain any agricultural operations.				

3b. Applicant Detail:
Please substantiate how the project satisfies questions 3a, providing details for each checked BMP.

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Building Energy Efficiency and Green Building				
4a. Energy Audits <u>Existing Buildings</u>: For projects that require substantial additions to or alterations to existing buildings, and the scope of work would affect greater than or equal to 50 percent of the lot's total building square footage, the project must complete an energy audit. Will the energy audit be performed prior to issuance of a building permit? And, will the project applicant agree, as a condition of approval, to incorporate all cost-effective energy improvements into the project design, per the recommendations of the energy audit? Check "N/A" only if the project is not an existing project addition or alteration.	BE-9	☐	☐	☐

4b. Applicant Detail:
Please substantiate how the project satisfies questions 4a.

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5a. CALGreen Tier I Standards for <u>Existing Nonresidential and Residential Construction</u>: For projects that require substantial alterations or additions to existing buildings over 1,000 square feet, will the project agree, as a condition of approval, to comply with current CALGreen Tier 1 Green Building standards, as outlined in the California Green Building Standards Code; and, current Tier 1 energy efficiency standards in Title 24, Part 6 of the California Code of Regulations?	BE-1	☐	☐	☐
5b. CALGreen Tier I Standards for <u>New Nonresidential and Residential</u>, and <u>ZNE Requirements for Residential:</u> For projects that include new nonresidential or residential construction, will the project agree, as a condition of approval, to comply with current CALGreen Tier 1 Green Building standards, as outlined in the California Green Building Standards Code; and, current Tier 1 energy efficiency standards in Title 24, Part 6 of the California Code of Regulations? For projects that include new residential construction for which building permits would be issued after January 1, 2020, will the project agree, as a condition of approval, to achieve zero-net energy (ZNE) performance, in accordance with standards, specifications or guidance for ZNE issued by the California Energy Commission under Title 24, Part 6 of the California Code of Regulations; OR, achieve ZNE targets stated in CALGreen Tier 2 Standards?	BE-2	☐	☐	☐

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
5c. Applicant Detail: Please substantiate how the project satisfies questions 5a and 5b. ____ ____ ____ ____ ____ ____ ____				
6a. Electric or Alternatively-Fueled Water Heating Systems in <u>Residential Projects</u>: Will the project install the following types of electric or alternatively-fueled water heating systems? Please check which types of water-heating systems will be installed: ☐ Electric (e.g., heat pump, tankless) ☐ Ground source / geothermal heat pump ☐ Solar thermal ☐ Other Natural gas water heating systems will only be permitted if natural gas water heaters proposed to be used are highly efficient and achieve uniform energy factor (UEF) ratings of 0.95 or higher. In this case, applicants must submit documentation verifying that all proposed natural gas water heaters meet this standard. Check "N/A" if the project does not contain any residential buildings.	BE-4	☐	☐	☐
6b. Applicant Detail: Please substantiate how the project satisfies questions 9a. ____ ____ ____ ____ ____ ____				
Oak Woodland and Forest Preservation and Tree Mitigation				
7a. Oak Woodland and Coniferous Forest – Preservation and Mitigation Would the project preserve a minimum of 30 percent of existing trees on-site?; <u>AND</u> For any existing trees that cannot be preserved on-site, would they be replanted at a minimum ratio of 2:1 on-site or elsewhere?	LU-1	☐	☐	☐
7b. Applicant Detail: Please substantiate how the project satisfies questions 6a. ____ ____ ____ ____ ____				
Riparian Woodland Preservation				
8a. Riparian Woodlands Would the project avoid removal of riparian woodland habitat and result in no net losses? Check "N/A" only if the project does not contain any riparian woodland habitat.	LU-2	☐	☐	☐

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
8b. Applicant Detail: Please substantiate how the project satisfies questions 7a. ______________________________ ______________________________ ______________________________ ______________________________ ______________________________				
Tree and Woody Biomass Waste Diversion				
9a. Tree and Woody Biomass Waste Diversion If the project requires existing trees and/or woody biomass to be removed, will the project applicant demonstrate in the Construction & Demolition (C&D) Waste Management Plan that at least 80 percent of the total removed weight of trees or woody biomass will be diverted for other uses or prevented from burning by implementing any of the following? ☐ Reuse of harvested wood from removed trees as lumber or furniture in on-site construction ☐ Sale of harvested wood from removed trees to local businesses ☐ Chipping non-usable wood or woody biomass for use as mulch on-site ☐ Burying non-usable woody biomass ☐ Other sustainable reuse or disposal methods Check "N/A" only if the project does not remove existing trees or woody biomass on-site.	LU-3	☐	☐	☐
9b. Applicant Detail: Please substantiate how the project satisfies questions 8a, providing details for each checked item. ______________________________ ______________________________ ______________________________ ______________________________ ______________________________				
Transportation System Management				
10a. Transportation System Management (TSM) Non-residential: For non-residential projects in which more than 20 employees will be employed on-site, will the project comply with the County's TSM ordinance? And, will the project work with County staff to implement the proper combination of the following BMPs? At least one of the following components: ☐ Parking cash out program ☐ Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools ☐ Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development At least three of the following components: ☐ Convenient access to transit ☐ On-site car-sharing vehicle(s) or bike-sharing ☐ Secure bike parking ☐ Preferential parking for carpools and vanpools ☐ Pedestrian access to public sidewalks ☐ Flexible or alternative work hours ☐ Parking management plan ☐ Telework program	TR-1	☐	☐	☐

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
☐ Transit, carpool, and vanpool subsidies ☐ Pre-tax deduction for transit or vanpool fares and bicycle commute costs ☐ Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within ¼ mile of the structure/use? Check "N/A" if the project is a residential project or if the project would not accommodate more than 20 employees.				

10b. Applicant Detail:
Please substantiate how the project satisfies questions 10a, providing details for each checked item.

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Vehicle Miles Traveled

Checklist Item	CAP Measure	Yes	No	N/A
11a. Vehicle Miles Traveled (VMT) Per the requirements of Circulation Element Policy CIR-39, will the project reduce unmitigated VMT by at least 15 percent?	TR-15	☐	☐	☐

11b. Applicant Detail:
Please substantiate how the project satisfies questions 11a.

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Parking

12a. Clean-Air Designated Parking Spaces

Non-residential projects: For new nonresidential projects, will the project comply with clean-air designated parking spaces as stated in non-residential voluntary measure A5.106.5.11 of the California Green Building Standards Code and to provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles as outlined in the table below?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
25-60	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This question does not cover electric vehicles (EVs). See Question 14 for EV parking requirements.

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

CAP Measure	Yes	No	N/A
BE-1, BE-2 and TR-2	☐	☐	☐

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
Check "N/A" only if the project is a residential project.				
12b. Applicant Detail: Please substantiate how the project satisfies questions 12a. ____ ____ ____ ____ ____				
13a. Reduced Parking Capacity Non-residential: For new nonresidential projects, will the project agree, as a condition of approval, to comply with provisions stated in non-residential voluntary measure A5.106.6.1of the California Green Building Standards Code to reduce parking capacity by employing at least one of the following strategies? 1. Use of on street parking or compact spaces, illustrated on the site plan; or, 2. Implementation and documentation of programs that encourage occupants to carpool, ride share or use alternate forms of transportation. Check "N/A" only if the project is a residential project.	BE-1, BE-2 and TR-2	☐	☐	☐
13b. Applicant Detail: Please substantiate how the project satisfies questions 12a ____ ____ ____ ____ ____				
Electric Vehicle Infrastructure				
14a. EV Charging For the following types of projects, will the project agree, as a condition of approval, to comply with applicable EV charging measures, as outlined in the California Green Building Standards Code and the added provisions below? • One- and two-family dwellings and townhouses with attached private garages: To comply with Tier 1 residential voluntary measure A4.106.8.1 of the California Green Building Standards Code, would the required parking serving each new dwelling be "EV Ready"[1] to allow for the future installation of electric vehicle supply equipment to provide an electric vehicle charging station for use by the resident? • Multi-Family Projects of 17 or more dwelling units: To comply with Tier 1 residential voluntary measure A4.106.8.2 of the California Green Building Standards Code, would 5% of the total parking spaces required, or a minimum of one space, whichever is greater, be "EV Capable"[2] to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents? Would the project also install at least one charging station in at least one of the required EV Capable spaces prior receiving a certificate of occupancy?	BE-1, BE-2 and TR-12	☐	☐	☐

[1] "EV Ready" means a parking space that is pre-wired with a dedicated 208/240 branch circuit installed in conduit that originates at the electrical service panel or sub-panel and 40 ampere minimum overcurrent protection device, and terminates into a cabinet, box or enclosure, in a manner approved by the building official.

[2] "EV Capable" means a parking space that has a cabinet, box or enclosure connected to a conduit linking the parking space to the electrical service panel in a manner approved by the building official. The electrical service panel shall provide sufficient capacity to simultaneously charge all electric vehicles with or without a load management system.

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
• Non-residential: To comply with Tier 1 nonresidential voluntary measure A5.106.5.3 .1 of the California Green Building Standards Code, would the project provide "EV Capable" spaces, as outlined in the table below, to allow for future installation of electric vehicle supply equipment to provide stations at such time as it is needed for use by future occupants? Would the project also install at least one charging station in at least one of the required EV Capable spaces prior receiving a certificate of occupancy?				

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
25-60	3
51-75	5
76-100	7
101-150	10
151-200	14
201 and over	At least 8% of total

14b. Applicant Detail:
Please substantiate how the project satisfies questions 13a.

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Off-Road Vehicles				
15a. Use of Alternative Fuels or Zero-Emission Vehicles in Construction Equipment Will all heavy-duty construction equipment use alternative fuels, such as renewable diesel, biodiesel, renewable compressed natural gas (CNG), or other renewable low-carbon fuels; or, zero-emission vehicles, such as electric or fuel cell? 15b. Use of Alternative Fuels or Zero-Emission Vehicles in Mining Equipment. If the proposed project includes modification of existing mining operations or new mining operations, will all heavy-duty construction equipment use alternative fuels, such as renewable diesel, biodiesel, renewable compressed natural gas (CNG), or other renewable low-carbon fuels; or, zero-emission vehicles, such as electric or fuel cell?	OR-1, OR-2	☐	☐	☐

15c. Applicant Detail:
Please substantiate how the project satisfies questions 15a and 15b.

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Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
Recycling and Composting				
16a. Recycling and Composting Multi-Family Projects of 5 or more dwelling units: Would the project provide a readily accessible area(s) that serve all buildings on the site and is identified for the depositing, storage and collection of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics, organic waste, and metals? Commercial and Wineries: Would the project facilitate or participate in food or winery waste composting for small and large businesses, in coordination with applicable food waste and winery waste composting programs offered by various recycling and waste disposal services within the County? Check "N/A" if the project is single-family residential, multi-family less than five units, and industrial.	SW-1	☐	☐	☐
16b. Applicant Detail: Please substantiate how the project satisfies questions 16a.				
Water Efficiency and Conservation				
16a. For residential and non-residential projects, would the project comply with all applicable indoor and outdoor water efficiency and conservation measures required under CALGreen Tier 1, as outlined in the California Green Building Standards Code?	BE-1, BE-2 and WA-1	☐	☐	☐
16b. Applicant Detail: Please substantiate how the project satisfies questions 16a.				
17a. Water Audits Existing Commercial and Industrial: For commercial and industrial projects that require substantial addition, alteration, and expansion to existing facilities, the project must comply with a water audit. Will the water audit be performed prior to issuance of a building permit? And, will the project agree, as a condition of approval, to incorporate all cost-effective water efficiency improvements into the project design, per recommendations in the water audit?	WA-4	☐	☐	☐
17b. Applicant Detail: Please substantiate how the project satisfies questions 17a.				

Step 2: CAP Measures Consistency				
Checklist Item (Check the appropriate box and provide explanation for your answer)	CAP Measure	Yes	No	N/A
Low-Global Warming Potential Refrigerants				
18a. Low-Global Warming Potential (GWP) Refrigerant Use Non-residential: For new nonresidential projects, will the project agree, as a condition of approval, to comply with CALGreen Tier 1 non-residential voluntary measure A5.508 as stated in the California Green Building Standards Code, which would require the installation of HVAC equipment that complies with either of the following: 1. Install HVAC, refrigeration and fire suppression equipment that do not contain HFCs or that do not contain HFCs with a global warming potential greater than 150. 2. Install HVAC and refrigeration equipment that limit the use of HFC refrigerant through the use of a secondary heat transfer fluid with a global warming potential no greater than 1. Check "N/A" if the project is residential.	BE-1, BE-2 and HG-2	☐	☐	☐

18b. Applicant Detail:
Please substantiate how the project satisfies questions 18a.

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