Appendix A

Greenhouse Gas Technical Materials

Memo

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To: Liz McElligott and Ali Abbors (County of Alameda)

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Subject: County of Alameda Community Climate Action Plan and Safety Element: Final Technical Memorandum – Community Greenhouse Gas Inventories

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INTRODUCTION

1.1 PROJECT OVERVIEW

The County of Alameda (County) is updating its Community Climate Action Plan (CCAP) to reduce greenhouse gas (GHG) emissions within the unincorporated county and build capacity to strengthen community resilience to climate change. Simultaneously, the County is updating its Safety Element. The County has aligned these efforts to complement each other and provide a comprehensive pathway for the County to accommodate anticipated growth in an economically, environmentally, and socially responsible way.

The CCAP will focus on GHG emissions generated from activities occurring in unincorporated Alameda County (i.e., community emissions). The CCAP is different from but complementary to the Alameda County Climate Action Plan for Government Services and Operations, which focuses on County municipal buildings, the County fleet, and other County municipal operations and services. The first step in preparation of the CCAP includes developing a production-based community GHG emissions inventory for the year 2019. This technical memorandum provides the results of the 2019 production-based community inventory and describes associated methods, assumptions, emissions factors, and data sources. Future steps in developing the CCAP will involve preparing GHG emissions forecasts and establishing GHG emissions reduction targets for years aligned with State mandates and goals.

In addition to completing a production-based inventory to prepare for the CCAP, the County is also completing a consumption-based emissions inventory and natural lands carbon storage inventory. The results from these inventories are also included in this memorandum.

ORGANIZATION OF THIS MEMORANDUM

This memorandum consists of three main parts:

- Section 2: Production-based Emissions Inventory outlines considerations for preparing a community GHG emissions inventory; summarizes industry-leading protocols and methods for inventories; discusses inventory

boundaries; and presents the data, methods, and assumptions used in the County's 2019 community production-based inventory by sector.

- Section 3: Consumption-based Emissions Inventory (CBEI) presents an overview of the County's CBEI and outlines the sector-specific data and methods used.
- Section 4: Natural and Working Lands Carbon Stock Inventory presents estimates of the amount of carbon stored in natural and working lands through aboveground vegetation and belowground soil in the unincorporated areas of the County using Bay Area Greenprint.

2 PRODUCTION-BASED INVENTORY

2.1 INTRODUCTION

2.1.1 Inventory Purpose and Description

The first step in the climate action planning process is to develop a GHG emissions inventory, which is a snapshot of the GHG emissions associated with a jurisdiction in a given year. The purpose of an inventory is to:

- establish a baseline against which future emissions levels and future reduction targets can be measured,
- understand the sectors and sources generating GHG emissions and their relative contribution to total emissions, and
- monitor progress towards achievement of GHG reduction targets.

Preparing a GHG emissions inventory is a critical step in climate action planning. To develop and implement a climate action plan that will effectively reduce GHG emissions, local governments must first have a comprehensive understanding of the emissions that are generated by activities within their jurisdictions. GHG emissions inventories not only serve to provide this knowledge, but they also act as the basis for measuring progress and provide agencies with a framework to track emissions over time and assess the effectiveness of plan implementation. Additionally, local governments often prepare inventories to exhibit accountability and leadership, motivate community action, and demonstrate compliance with regulations.

A GHG emissions inventory estimates emissions generated within a defined geographic boundary during a single year. It identifies the sectors, sources, and activities that produce these emissions and the relative contribution of each, while also providing a baseline used to forecast emissions trends into the future. This information is used to set reduction targets that are consistent with State objectives and then to create solutions for reducing GHG emissions locally through the creation of a climate action plan.

2.1.2 Considerations for Developing an Inventory

Nations, states, local jurisdictions, public agencies, and corporations estimate GHG emissions for different purposes. Several approaches exist to quantify GHG emissions, and the method chosen by governments or private entities is driven by the purpose for developing an inventory. State, federal, and international agencies have developed industry protocols and recommendations for local governments preparing GHG emissions inventories at the community level.

The traditional GHG emissions inventory used by local governments in the climate action planning process, known as a "production-based" inventory, estimates GHG emissions generated by activities occurring within a defined boundary during a single year. This has become the standard approach recommended by industry protocols and includes emissions that are generated from community activities that occur within the jurisdictional boundary of the community, such as those emitted from natural gas furnaces used for heating buildings throughout a community. It

also includes certain "trans-boundary" emissions that are associated with activities occurring within the inventory's boundary but are released into the atmosphere outside of the boundary. For example, electricity emissions in a production-based inventory are attributed to a community based on electricity consumption within the inventory boundary, even if the electricity was generated and produced GHG emissions outside of the inventory boundary. More information regarding considerations for preparing production-based inventories is included in Section 2.2.

While three types of inventories are presented in this memorandum, the production-based inventory will be used to develop the CCAP. This is consistent with recommendations and guidance from industry protocols (described further below), as well as State agencies, including the California Air Resources Board (CARB) and the California Governor's Office of Planning and Research (OPR). Production-based inventories provide local governments with the information needed to develop effective climate action policy within their communities; because of this, the production-based inventory method is the most common approach taken by local governments across California.

2.2 PROTOCOLS AND METHODOLOGIES

2.2.1 U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions

Several inventory protocols have been developed to provide guidance for communities and local governments to account for emissions accurately and consistently. ICLEI – Local Governments for Sustainability USA (ICLEI) develops protocols for local-scale accounting of emissions that have become the industry standard for local governments developing GHG emissions inventories. The most recent guidance for community-scale emissions inventories is ICLEI's July 2019 publication *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions* (Community Protocol), Version 1.2 (ICLEI 2019). State agencies, including CARB and OPR, recommend that jurisdictions prepare community GHG emissions inventories using the guidelines included in the Community Protocol (CARB 2017:100; OPR 2017:226).

The Community Protocol identifies six principles for GHG accounting and reporting. These principles were adapted from internationally recognized sources and were used to guide the development of the Community Protocol. ICLEI recommends that local governments consider the principles when preparing an inventory. The GHG accounting and reporting principles are summarized below.

- Relevance, Including Policy Relevance, and Utility for Users: The ultimate objective and intent of an inventory should be considered during the inventory development process. Inventories should be organized in a way that is understandable and useful for policy makers and the public while appropriately reflecting community GHG emissions and enabling the evaluation of emissions trends over time.
- Accuracy: The use of GHG emissions accounting methods that are expected to systematically under- or over-estimate emissions should be avoided. Decisionmakers should be able to act with reasonable assurance as to the integrity of emissions estimates.
- Completeness: Community GHG emissions inventories should be as comprehensive as possible and include all emissions associated with the community, as well as community GHG emissions "sinks" (i.e., the opposite of an emissions source; any reservoir, natural or otherwise, that accumulates and stores GHG emissions).
- Measurability: Methods used to quantify GHG emissions should be readily available, adequately substantiated and of known quality, and updated regularly as established methods evolve.
- Consistency and Comparability: Community inventories should consistently use preferred, established methods to enable tracking of emissions over time, evaluation of reduction measures effectiveness, and comparison between communities. Alternative methods should be documented and disclosed.

- **Transparency**: All relevant data sources, methods, and assumptions should be disclosed and described to allow for future review and replication. Similarly, all relevant issues should be documented and addressed coherently.

Consistent with these recommendations as well as industry standards and best practices, the County's community GHG emissions inventory primarily follows methodologies provided by the Community Protocol. However, additional established methods were used for selected GHG emissions sources where the Community Protocol does not provide guidance, or where updated methods have been established that improve the accuracy of emissions estimates. Table 1 below provides a summary of places in which alternate methods were used. This approach is consistent with guidance from the Community Protocol: "Protocol estimation methods must be used in Protocol-compliant inventories except where the user identifies and documents another method that is likely to better satisfy the Protocol reporting principles" (ICLEI 2019:20-21). The following sections describe additional methods used for estimating GHG emissions in the County.

2.2.2 California Air Resources Board Methods

Each year, CARB develops and publishes the California GHG Emission Inventory for emissions statewide. CARB follows Intergovernmental Panel on Climate Change (IPCC) guidelines for national reporting, and its overarching approach and many of its methods align with the Community Protocol. As climate change science and GHG emissions accounting practices have evolved, CARB has implemented additional methodologies for certain emissions sectors and sources that are not included in the Community Protocol.

The County aims to align with CARB's inventory as much as possible. Consistency with the State's methodologies and approaches will be beneficial for upcoming phases of the CCAP development process, including estimating projected GHG emissions in the future (i.e., forecasting emissions), setting GHG emissions reduction targets, and measuring progress towards established targets.

The County's inventory utilizes methods provided by CARB and the California GHG Emission Inventory for several emissions sectors and sources. For example, although the Community Protocol recommends using the US Environmental Protection Agency's (EPA's) NONROAD model, emissions from off-road vehicles and equipment in the unincorporated area of the County were obtained from CARB's OFFROAD models, which provide more geographic-specific emissions estimates for California using the best available data.

2.2.3 Alternative Methods

Although nearly all emissions calculations relied on protocols and methods from the Community Protocol and CARB, some emissions estimates were prepared using alternative methodologies from established sources. This approach was only taken when methods were not provided by the Community Protocol or CARB, which aligns with Community Protocol guidance.

2.3 EMISSIONS SECTORS AND SOURCES

There are several approaches for categorizing and grouping GHG emissions in community inventories. Generally, GHG emissions are organized into emissions sectors, which frequently include building energy, transportation, solid waste, water, and wastewater. Sometimes these sectors are broken down further, such as residential building energy and nonresidential building energy, and sectors may also be combined, such as water and wastewater. The purpose of categorizing GHG emissions into broad sectors is to provide local governments and the public with a useful organization of community emissions. Importantly, GHG emissions sectors may not align directly with economic sectors (e.g., hospitality), but there may be overlap for some communities.

Within GHG emissions sectors, emissions are generated in a variety of ways. Motor vehicles burn fossil fuels and emit GHGs directly into the atmosphere; the electricity used in homes and businesses produces indirect emissions from

power plants; and solid waste that ends up in landfills breaks down and releases GHG emissions over time. The Community Protocol organizes different types of community GHG emissions into two general categories:

- GHG emissions **sources** are those that release emissions directly into the atmosphere as a result of any physical process that occurs within the jurisdictional boundary of the inventory. Natural gas combustion for heating in homes and diesel fuel combustion in motor vehicles within the community are considered GHG emissions sources.
- GHG emissions **activities** are those that release emissions into the atmosphere either directly or indirectly as a result of the use of energy, materials, and/or services within the community. For example, GHG emissions from a community's electricity use are accounted for and considered GHG emissions activities, even if the burning of fossil fuels to generate the electricity occurred and produced emissions outside of the inventory boundary.

For the sake of clarity, this memo uses "GHG emissions sources" to represent both direct in-boundary emissions *sources* as well as indirect emissions that are produced out-of-boundary as a result of *activities* that occur within the community. The GHG emissions sources in the County's community inventory are organized under seven sectors: building energy (residential and nonresidential), on-road transportation, off-road vehicles and equipment, solid waste, water supply, wastewater treatment, and agriculture.

Figure 1 depicts how sectors, sources, and activities are considered and categorized in the County's inventory.

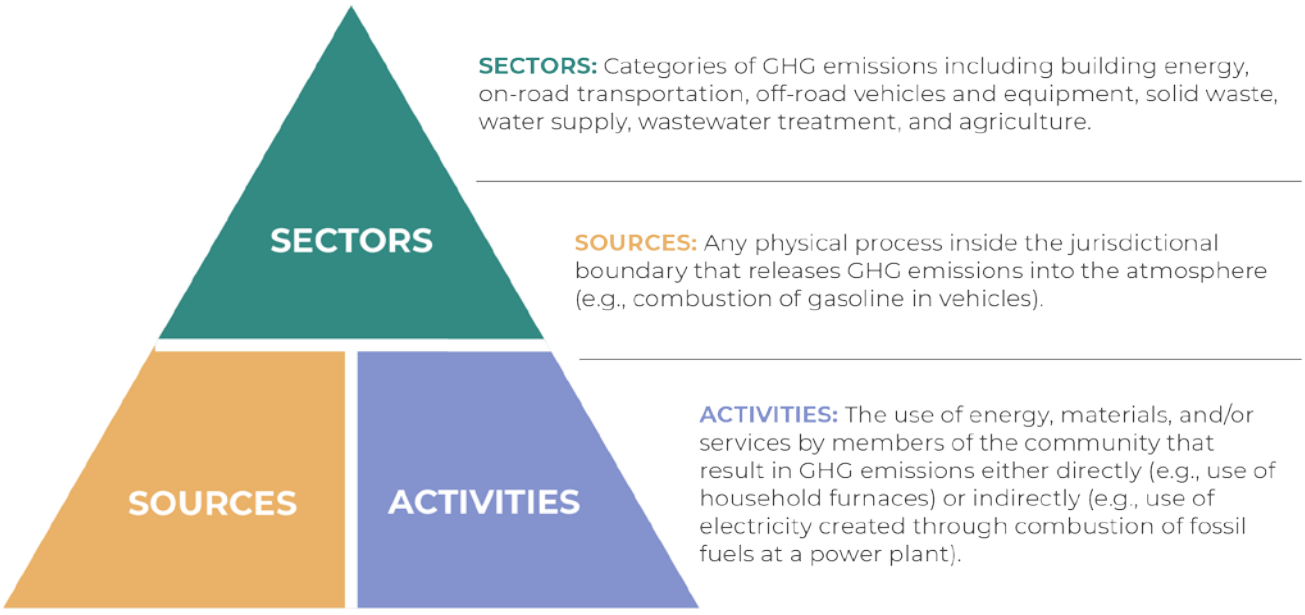


Figure 1 Emissions Sectors, Sources, and Activities Hierarchy

2.3.1 Community Protocol-Compliant Sources

When developing a community inventory, it is important for local governments to determine what will be included in the inventory scope. This may be influenced by factors such as the purpose and intended narrative of the inventory, the reporting framework that will be used, and the GHG emissions sources present in the community. While local governments have some flexibility in determining an inventory's scope, the Community Protocol requires the inclusion of a minimum of five emissions sources in community inventories:

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

The Community Protocol strongly encourages local governments to include other emissions-generating sources in accounting and reporting as well. Considerations for including additional sources are outlined in the following section.

2.3.2 Additional Sources

Many local governments go beyond the minimum requirements of the Community Protocol. For example, many community inventories in California account for GHG emissions from off-road vehicles and equipment. Communities that have agricultural land uses also commonly include agriculture-related emissions in inventories.

Beyond the five emissions sources required by the Community Protocol, the additional GHG emissions sources included in a community's inventory are determined by the jurisdiction conducting the inventory. The Community Protocol recommends the Local Government Significant Influence reporting framework, where local governments account for all emissions sources over which they have authority or significant influence. This approach benefits the overall climate action planning process because it emphasizes the emissions sources that the local government has the greatest ability to address (ICLEI 2019:29). For example, because California's local air districts regulate permits issued for open burning, the County decided to include emissions from open burning in the CCAP's inventory.

2.3.3 County Inventory Boundary

The scope and boundary chosen for estimating GHG emissions may vary depending on the focus and/or intent of the inventory. For example, while corporate inventories use the concept of ownership to guide GHG emissions accounting—where emissions generated by all sources and activities owned by the entity are accounted for, regardless of where emissions are produced—community-scale inventories serve to convey information about emissions associated with politically defined communities (ICLEI 2019:12).

As described in the previous sections, production-based community inventories include emissions that are produced within a community's geographic boundary as well as those that are produced outside the boundary but result from activities within the community. Inventories following the Community Protocol are required to include several emissions sources; however, certain emissions sources that are located within the inventory boundary may be excluded from a community inventory. The following section outlines considerations and the decision-making framework for determining what GHG emissions sources are included or excluded from an inventory.

The CCAP aims to reduce GHG emissions from sources within the unincorporated areas of Alameda County over which the County has regulatory authority or significant influence. Importantly, the CCAP will not apply to the incorporated areas of Alameda County. Because of this, the County's inventory only includes emissions generated from sources and activities occurring within the boundaries of the unincorporated county; it does not account for GHG emissions generated from activities occurring outside of the County's jurisdiction, as the County does not have operational control of or authority over these emissions sources. Therefore, GHG emissions generated from activities within incorporated places adjacent to the unincorporated county and/or managed by State and federal agencies (e.g., Federal Responsibility Areas) are excluded from the inventory.

Additionally, this inventory does not account for embedded or lifecycle GHG emissions. This inventory evaluates emissions using the production-based approach; therefore, this inventory does not consider the upstream emissions

generated by the consumption of goods and services within the community. These emissions, however, are presented in Section 3, where the consumption-based inventory is presented.

The GHG emissions sectors and sources included and excluded in the County's 2019 production-based inventory are presented in Table 1 below. Additionally, Table 1 identifies the protocol that provided the methodology for estimating GHG emissions from each emissions source. Emissions sources that identify multiple protocols used a combination of data and methods from multiple protocols. Fertilizer application and off-road vehicles and equipment calculations used methods consistent with IPCC and the Community Protocol but substituted California-specific data obtained from CARB for less geographic-specific data provided by the protocols. More information can be found in Appendix A.

Table 1 2019 Unincorporated Alameda County Summary of Sectors and Sources

Sector/Source	Included	Excluded	Protocol(s)
On-Road Transportation			
On-Road Transportation	Emissions from all vehicle miles traveled (VMT) associated with vehicles registered in the unincorporated county	Emissions from VMT associated with vehicles registered outside the unincorporated county, even if the vehicle is driven within the incorporated county	CARB
Building Energy			
Electricity	Emissions associated with electricity consumed within the unincorporated areas of the county		ICLEI
Natural Gas	Emissions from natural gas consumed within the unincorporated areas of the county		ICLEI
Backup Generators	Emissions from diesel, propane, liquid propane gas, and natural gas consumed in backup generators within the unincorporated areas of the county		ICLEI
Solid Waste			
Community-Generated Solid Waste	Emissions from all waste generated within the unincorporated areas of the county	Emissions from waste generated outside of the unincorporated county but disposed of within the unincorporated county	ICLEI
Off-Road Vehicles and Equipment			
Off-Road Vehicles and Equipment	Emissions from off-road vehicles and equipment within the unincorporated areas of the county, agricultural off-road vehicles and equipment		ICLEI/CARB
Wastewater Treatment			
Wastewater Treatment	Emissions associated with wastewater generated within the unincorporated areas of the county	Emissions from wastewater generated outside of the county but treated within the unincorporated areas of the county	ICLEI

Sector/Source	Included	Excluded	Protocol(s)
Water Supply			
Water Supply	Emissions associated with water use within the unincorporated areas of the county		ICLEI
Agriculture			
Fertilizer Application	Emissions associated with fertilizer use within the unincorporated areas of the county		CARB/IPCC
Livestock	Emissions from livestock, which include enteric fermentation (i.e., the metabolic process that takes place in the digestive systems of animals) and manure management		ICLEI/CARB
Open Burning	Emissions from open burning of vegetative matter within the county		NWCG

Notes: CARB = California Air Resources Board; ICLEI = ICLEI – Local Governments for Sustainability; IPCC = Intergovernmental Panel on Climate Change; NWCG = National Wildfire Coordinating Group.

Source: Ascent Environmental 2023.

2.4 DATA, METHODS, AND ASSUMPTIONS

2.4.1 Overview of Activity Data and Emissions Factors

The basic calculation for estimating GHG emissions involves two primary inputs: activity data and emissions factors. Activity data refers to the relevant measurement of a community's activity resulting in emissions, and emissions factors represent the amount of a GHG emitted on a per unit of activity basis. Emissions factors are applied to activity data (i.e., the two values are multiplied together) to estimate GHG emissions. For example, in the residential energy sector, activity data of annual community electricity consumption in megawatt-hours (MWh) is multiplied by an emissions factor in pounds of GHG per MWh, which results in a pounds of GHG emissions value. This calculation-based methodology is used for estimating emissions from most sources in the County's inventory. An overview of activity data and emissions factors for each emissions source, along with data sources, is shown in Table 2. Detailed methods are described in the following sections.

Table 2 2019 Unincorporated Alameda County Summary of Activity Data and Emissions Factors

Sector/Source	Input Type	Description and Data Sources
On-Road Transportation		
On-Road Transportation	Activity data	VMT associated with vehicles registered in unincorporated Alameda County
	Emissions factor	Alameda County-specific emissions factors from CARB
Building Energy		
Electricity	Activity data	Electricity consumption data from PG&E and EBCE
	Emissions factor	Utility-specific emissions factors from TCR and EPA
Natural Gas	Activity data	Natural gas consumption data from PG&E
	Emissions factor	Average emissions factors from TCR
Backup Generators	Activity data	Fuel consumption data from BAAQMD
	Emissions factor	Average emissions factors from TCR

Sector/Source	Input Type	Description and Data Sources
Solid Waste		
Community-Generated Solid Waste	Activity data	Waste disposal data from CalRecycle
	Emissions factor	Mixed municipal solid waste emissions factor from EPA
Off-Road Vehicles and Equipment		
Off-Road Vehicles and Equipment	Activity data	Off-road vehicles and equipment activity and emissions factors data from CARB
	Emissions factor	
Wastewater Treatment		
Wastewater Treatment	Activity data	Wastewater generation and process-related data from the County and Oro Loma Sanitary District
	Emissions factor	Emissions factors based on treatment processes from the County and ICLEI
Water Supply		
Water Supply	Activity data	Water consumption and associated electricity data from the County, EBMUD, and SFPUC
	Emissions factor	Electricity emissions factors from EBCE
Agriculture		
Fertilizer Application	Activity data	California Department of Food and Agriculture 2019 Fertilizer Tonnage Report
	Emissions factor	Fertilizer emissions factors from CARB
Livestock	Activity data	Alameda County 2019 Crop Report and USDA's 2017 Census of Agriculture
	Emissions factor	Emissions factors for livestock were obtained from the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018, Annex 3 and CARB's statewide GHG inventory
Open Burning	Activity data	Data provided by BAAQMD
	Emissions factor	Emissions factors from the NWCG

Notes: BAAQMD = Bay Area Air Quality Management District; CalRecycle = California Department of Resources Recycling and Recovery; CARB = California Air Resources Board; EBCE = East Bay Community Energy; EBMUD = East Bay Municipal Utility District; EPA = US Environmental Protection Agency; ICLEI = ICLEI – Local Governments for Sustainability; IPCC = Intergovernmental Panel on Climate Change; NWCG = National Wildfire Coordinating Group; PG&E = Pacific Gas and Electric Company; SFPUC = San Francisco Public Utilities District; TCR = The Climate Registry; VMT = vehicle miles traveled.

Source: Ascent Environmental 2023.

2.4.2 Global Warming Potentials and Emissions Units

GHG emissions other than carbon dioxide (CO_2) generally have a stronger insulating effect and thus, a greater ability to warm the Earth's atmosphere through the greenhouse effect. 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 factors measured in multiples of one relative to the GWP of CO_2. This conversion of non-CO_2 gases to one unit enables the reporting of all emissions in terms of carbon dioxide equivalent (CO_2e), which allows for the consideration of all gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to climate change. The standard unit for reporting emissions is metric tons of carbon dioxide equivalent ($MTCO_2e$).

Consistent with the best available science, these inventories use GWP factors published in the Sixth Assessment Report from IPCC, where methane (CH_4) and nitrous oxide (N_2O) have GWP factors of 27.9 and 273, respectively (IPCC 2021). These values represent the GWP of GHG on a 100-year time horizon. This means that methane is approximately 28 times

stronger than CO_2 and N_2O is 273 times stronger than CO_2 in their potential to warm Earth's atmosphere over the course of 100 years. The use of 100-year GWP values is consistent with CARB methods and reflects the long-term planning horizon of the CCAP.

2.4.3 Data Quality and Accuracy

When preparing a GHG emissions inventory, the goal is to use the best available data and methodologies to develop the most accurate picture of a community's emissions. However, some degree of inaccuracy is inherent to all inventories. As described by the Community Protocol, "While no community inventory is fully comprehensive (some emissions cannot be estimated due to a lack of valid methods, a lack of emissions data, or for other reasons), community inventories often aim to provide as complete a picture of GHG emissions associated with a community as is feasible" (ICLEI 2019:12). The accuracy of a GHG emissions inventory is primarily dependent on activity data (e.g., tons of solid waste generated by a community), emissions factors (e.g., grams of CO_2 per vehicle mile traveled [VMT] in a county), and scaling factors (e.g., percentage of county-level off-road vehicles and equipment emissions attributed to a local jurisdiction).

Development of the County's production-based GHG emissions inventory was a robust and comprehensive process rooted in industry standards and best practices, and it included extensive research and consultation with County staff and departments as well as regional agencies to ensure data was as accurate as feasible.

2.4.4 Demographic and Land Use Data

Population, employment, and agricultural acres data for the county were used to scale activity levels for certain emissions sources and sectors. Population and employment data for unincorporated Alameda County for 2019 were interpolated using population estimates for 2015 and 2020 from the Metropolitan Planning Commission's (MTC's) Plan Bay Area 2040 (MTC 2017). Agricultural acres data for Alameda County were obtained from the 2019 Alameda County Crop Report. It was assumed that all agricultural acres are located in unincorporated areas of the county (County of Alameda 2021).

2.4.5 Sector-Specific Assumptions and Methods

The following sections describe in detail the methods, data, and assumptions that were used in estimating the unincorporated county's community GHG emissions in 2019.

The list below summarizes this information at a high level for each sector.

- **Building Energy:** Annual electricity usage data for the unincorporated county was provided by Pacific Gas and Electric Company (PG&E) and East Bay Community Energy (EBCE). Natural gas usage data for the unincorporated county was provided by PG&E. Utility emissions factors were provided by The Climate Registry (TCR) and EPA (see Table 3 below). Annual nonresidential backup generator usage was provided by Bay Area Air Quality Management District (BAAQMD). Emissions factors for nonresidential backup generator fuels were obtained from TCR.
- **On-Road Transportation:** For the on-road transportation sector, annual VMT at the entire county level were obtained from the 2021 Emissions FACtor (EMFAC2021) model, CARB's statewide mobile source emissions inventory model. Countywide VMT (including incorporated cities) was scaled to the unincorporated county using the proportion of households within the unincorporated county compared to the county as a whole (explained further in Section 2.4.8, "On-Road Transportation"). Vehicle emissions factors were derived from the EMFAC2021 model.
- **Off-Road Vehicles and Equipment**: Off-road vehicles and equipment emissions were estimated from CARB's OFFROAD2021 model and scaled by population, employment, or service population (i.e., the sum of population and employment) of the unincorporated county depending on the vehicle or equipment type. This sector also includes agricultural vehicles and equipment.

- **Solid Waste**: Emissions associated with waste generated by residents and businesses in the unincorporated areas of the county were estimated using disposal data available from the California Department of Resources Recycling and Recovery (CalRecycle) for landfills receiving waste from the county. Landfill gas (LFG) collection information was obtained from EPA.
- **Water Supply:** Water-related emissions were estimated using data for electricity consumption associated with supplying water in the unincorporated areas of the county. Water consumption data was provided by East Bay Municipal Utility District (EBMUD) and used to estimate water consumption for the three water suppliers in the county: EBMUD, San Francisco Public Utilities Commission and Zone 7. Water consumption from wells was also estimated using data from Alameda County Public Works Agency and Zone 7.
- **Wastewater Treatment:** Emissions from wastewater treatment depend on the types of treatment processes and equipment that centralized wastewater treatment plants (WWTPs) use. Data regarding treatment processes, average biological oxygen demand, daily wastewater volume, and average daily nitrogen discharge were obtained from the Oro Loma Sanitary District/Castro Valley Sanitary District Water Pollution Control Plant, the WWTP serving the unincorporated county's communities, to estimate emissions from wastewater treatment associated with the unincorporated county population. Emissions from septic systems were also calculated based on the number of estimated septic systems in the unincorporated county and average household size.
- **Agriculture:** Emissions associated with the agriculture sector result from fertilizer application and livestock management. Agriculture emissions were estimated using data available from the California Department of Food and Agriculture (CDFA) and the US Department of Agriculture (USDA).

2.4.6 Utility Emissions Factors

Emissions of CO_2, CH_4, and N_2O per MWh of electricity can vary by location and from year to year depending on several factors. Utility-specific emissions factors for electricity were obtained and used throughout the inventory to estimate GHG emissions from electricity, and average natural gas emissions factors were used to estimate GHG emissions associated with natural gas consumption. Sources for electricity and natural gas emissions factors are shown below.

- **Electricity:** PG&E and EBCE's electricity emissions factors for CO_2 for 2019 were obtained from TCR. California-specific emissions factors for CH_4, and N_2O were obtained from EPA's Emissions & Generation Resource Integrated Database (eGRID) 2020 model for (EPA 2022).
- **Natural Gas:** Utility natural gas emissions factors for CO_2, CH_4, and N_2O were obtained from TCR's 2021 Default Emission Factors (TCR 2021).

Specific utility emissions factors used in the inventory calculations are shown below in Tables 3 and 4. Emissions factors are shown in standard units for electricity (pounds of GHGs per MWh) and natural gas (pounds of GHGs per therm). Emissions factors are also presented in pounds of GHGs per kilo British thermal unit (kBTU) to enable a comparison between energy types in similar terms.

Table 3 2019 Unincorporated Alameda County Electricity Emissions Factors

Provider	Pollutant	Emissions Factor (lb/MWh)	Emissions Factor (lb/kBTU)
PG&E	CO_2	18.66	0.0637
	CH_4	0.033	0.00011
	N_2O	0.004	0.000014
EBCE Bright Choice	CO_2	135.10	0.461
	CH_4	0.033	0.00011

	N_2O	0.004	0.000014
EBCE Brilliant 100 & Renewable 100	CO_2	0.00	0.00
	CH_4	0.00	0.00
	N_2O	0.00	0.00

Notes: CH_4 = methane; CO_2 = carbon dioxide; EBCE = East Bay Community Energy; kBTU = kilo British thermal unit; lb = pounds; MWh = megawatt-hours; N_2O = nitrous oxide; PG&E = Pacific Gas and Electric Company.

Source: Utility emissions factors provided by TCR, and EPA. Table compiled by Ascent Environmental in 2023.

Table 4 2019 Unincorporated Alameda County Natural Gas Emissions Factors

Provider	Pollutant	Emissions Factor (lb/therm)	Emissions Factor (lb/kBTU)
PG&E	CO_2	11.7	0.117
	CH_4	0.00104	0.0000104
	N_2O	0.0000220	0.0000002

Notes: CH_4 = methane; CO_2 = carbon dioxide; kBTU = kilo British thermal unit; lb = pounds; MWh = megawatt-hours; N_2O = nitrous oxide; PG&E = Pacific Gas and Electric Company.

Source: Utility emissions factors provided by TCR. Table compiled by Ascent Environmental in 2023.

2.4.7 Building Energy

Total communitywide building energy use in the unincorporated county resulted in approximately 179,606 $MTCO_2e$ in 2019, with residential buildings and nonresidential buildings contributing approximately 122,466 $MTCO_2e$ and 57,140 $MTCO_2e$, respectively. Residential building energy use accounted for approximately 13 percent of the unincorporated county's total community emissions in 2019 and represents the second-largest emissions sector in the inventory. Nonresidential building energy use generated approximately 6 percent of the unincorporated county's community emissions.

Approximately 84 percent of total building energy emissions were a result of natural gas combustion for heating and cooking in homes and businesses. Emissions associated with electricity use, primarily for lighting and heating, ventilation, air conditioning, and cooling and to power appliances, contributed approximately 15 percent of building energy emissions. A marginal amount of nonresidential building energy emissions was associated with the combustion of diesel, propane, liquified petroleum gas (LPG), and natural gas in backup generators.

Nonresidential natural gas use accounted for approximately 25 percent of unincorporated county's 2019 building energy emissions, and residential natural gas use accounted for approximately 59 percent. Annual electricity, natural gas, and backup generator usage and GHG emissions are shown in Table 5, and additional information regarding each emissions source and calculations are discussed below.

Table 5 2019 Unincorporated Alameda County Building Energy Use and GHG Emissions

Energy Type and Source	Quantity	GHG Emissions
Electricity		
Residential	kWh	$MTCO_2e$
PG&E	19,290,201	181
EBCE Bright Choice	254,882,085	15,852
EBCE Renewable 100	304,392	0
EBCE Brilliant 100	168,947	0

Energy Type and Source	Quantity	GHG Emissions
Nonresidential	**kWh**	**$MTCO_2e$**
PG&E	83,258,490	781
EBCE Bright Choice	167,225,923	10,400
EBCE Renewable 100	43,015	0
EBCE Brilliant 100	2,497,896	0
Electricity Total	*527,670,949*	*27,214 (15%)*
Natural Gas	**therms**	**$MTCO_2e$**
Residential (PG&E)	19,999,255	106,433
Nonresidential (PG&E)	8,424,227	44,832
Natural Gas Total	*28,423,482*	*151,265 (84%)*
Backup Generators		**$MTCO_2e$**
Diesel (gallons)	3,954	40
Natural Gas (scf)	19,149,513	1,048
LPG (gallons)	6,724	39
Backup Generators Total	*NA*	*1,127 (<1%)*
Total	**NA**	**179,606**

Notes: Totals in columns may not sum exactly due to independent rounding. EBCE = East Bay Community Energy; GHG = greenhouse gas; kWh = kilowatt-hours; LPG = liquified petroleum gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable; PG&E = Pacific Gas & Electric; scf = standard cubic feet.

Source: Ascent Environmental 2023.

RESIDENTIAL ENERGY

Residential energy emissions in the county result indirectly from electricity consumption and directly from onsite combustion of natural gas. PG&E and EBCE are the providers of residential electricity in the unincorporated county. PG&E also provides residential natural gas in the unincorporated county. EBCE offers three tiers of electricity to residential customers with varying levels of clean and renewable energy in the electricity mix: Bright Choice, Brilliant 100, and Renewable 100. Bright Choice is the basic plan that was 60 percent GHG-free in 2019. Brilliant 100 and Renewable 100 are both 100 percent GHG-free, with the Renewable 100 plan procuring only renewable sources of electricity (i.e., does not include carbon-free sources like large-scale hydro or nuclear which are GHG-free).

Annual residential electricity usage data in the unincorporated county in MWh was obtained from PG&E and EBCE. To calculate the $MTCO_2e$ of residential electricity consumption, emissions factors (shown in Table 3) for CO_2, CH_4, and N_2O were applied to electricity consumption data. Annual residential natural gas consumption in therms was obtained from PG&E for the unincorporated county. Natural gas emissions factors for CO_2, CH_4, and N_2O were applied to consumption data to estimate $MTCO_2e$ from residential natural gas usage.

NONRESIDENTIAL ENERGY

Nonresidential energy emissions, which are generated by commercial and industrial uses, result indirectly from electricity consumption and directly from onsite combustion of natural gas. A small proportion of nonresidential energy emissions are generated from the onsite combustion of diesel, LPG, propane, and natural gas in generators. PG&E and EBCE provide nonresidential electricity in the unincorporated county. Nonresidential natural gas in the unincorporated county is provided by PG&E.

Annual nonresidential electricity usage data in MWh was obtained from PG&E and EBCE for the unincorporated county. Annual nonresidential natural gas consumption in therms was obtained from PG&E for the unincorporated county. Emissions associated with nonresidential energy consumption were quantified using the same methods as described above for residential energy calculations.

Data for annual nonresidential backup generators were obtained from BAAQMD, expressed as gallons for diesel fuel and standard cubic feet for propane and natural gas. Emissions factors obtained from TCR were applied to fuel consumption data to estimate GHG emissions associated with nonresidential backup generator usage.

2.4.8 On-Road Transportation

Based on modeling conducted, on-road transportation in the unincorporated areas of the county resulted in approximately 692,138 $MTCO_2e$ in 2019, or 73 percent of the unincorporated county's community emissions in 2019. The on-road transportation sector represents the largest sector in the County's production-based inventory. Annual VMT and GHG emissions from on-road transportation are shown in Table 6. Additional details and calculation methodologies and assumptions are described below.

Table 6 2019 Unincorporated Alameda County On-Road Transportation VMT and GHG Emissions

Source	Annual VMT	GHG Emissions ($MTCO_2e$)
On-Road Transportation	1,232,329,532	692,138

Notes: GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; VMT = vehicle miles traveled.

Source: Ascent Environmental 2023.

On-road transportation emissions are primarily the result of combustion of gasoline and diesel fuels in passenger vehicles (i.e., cars, light-duty trucks, and motorcycles), medium- and heavy-duty trucks, and other types of vehicles permitted to operate "on road." To a smaller degree, emissions from on-road electric vehicles also result from upstream electricity generation; these emissions are represented in annual electricity emissions in the unincorporated county. 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 the community inventory and are assumed to have minimal contribution to total emissions.

Because VMT estimates specific to the unincorporated county were not available through BAAQMD's VMT data portal, estimates for countywide VMT (including incorporated places) were obtained from CARB's EMFAC2021 model. Using household data from the Plan Bay Area 2040, countywide VMT data were scaled to the unincorporated county using the proportion of households within the unincorporated county compared to the county as a whole.

An overall emissions rate for countywide VMT was derived from EMFAC2021. EMFAC2021 was used to generate countywide emission rates for the calendar year 2019 with all vehicle classes, model years, speeds, and fuel types. The countywide $MTCO_2e$ per mile emissions factor was calculated based on the distribution of VMT for each vehicle class and its emissions factor.

2.4.9 Off-Road Vehicles and Equipment

Based on modeling conducted, off-road vehicles and equipment operating in the unincorporated county emitted approximately 22,886 $MTCO_2e$ in 2019, or 2 percent of the 2019 inventory. The largest emissions-generating off-road categories include agricultural off-road vehicles, construction and mining equipment, and transportation refrigeration units. The estimated annual emissions and scaling factors used are presented in Table 7 by vehicles and equipment type. Additional details regarding calculation methods and assumptions are discussed below.

Table 7 2019 Unincorporated Alameda County Off-Road Vehicles and Equipment GHG Emissions and Scaling Method

Off-Road Vehicles and Equipment Type	GHG Emissions ($MTCO_2e$)	Scaling Method
Agricultural Equipment	5,761	Agricultural Acres
Construction and Mining	4,072	Service Population
Industrial	2,169	Employment
Lawn and Garden Equipment	2,457	Population
Light Commercial Equipment	1,324	Employment
Pleasure Craft	792	Population
Portable Equipment	2,063	Employment
Recreational Equipment	624	Population
Transport Refrigeration Units	3,625	Service Population
Total	**22,886**	NA

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Source: Data provided by Ascent Environmental in 2023, based on modeling from CARB's OFFROAD2021.

Emissions from the off-road vehicles and equipment sector result from fuel combusted in off-road vehicles and equipment. Data associated with this sector were available from CARB's OFFROAD2021 model. This model provides emissions details at the state, air basin, or county level. Alameda County emissions data from OFFROAD2021, which include emissions from the entire county, were apportioned to the unincorporated county using custom scaling factors depending on the off-road vehicle and equipment type. For example, due to the likely correlation between commercial activity and employment, the unincorporated county's portion of emissions from light commercial equipment in the entire county is assumed to be proportional to the number of jobs in the unincorporated county as compared to the county as a whole.

2.4.10 Solid Waste

Based on modeling conducted, the solid waste sector generated approximately 20,562 $MTCO_2e$ in 2019, or 2 percent of community GHG emissions. Community-generated solid waste emissions are associated primarily with the decomposition of solid waste generated by the county in landfills, while a smaller proportion of emissions are produced by the decomposition of alternative daily cover (ADC) generated by the unincorporated county. Table 8 summarizes emissions from the solid waste sector. Additional details regarding calculation methods and assumptions are discussed below.

Table 8 2019 Unincorporated Alameda County Solid Waste Quantity and GHG Emissions

Source	Quantity (tons of waste)	GHG Emissions ($MTCO_2e$)
Community-Generated Solid Waste	**61,974**	**20,562**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2023.

COMMUNITY-GENERATED SOLID WASTE

Methane emissions produced by community-generated solid waste occur from the decay of landfill disposed waste generated annually by residences and businesses in the unincorporated county. A total of 61,968 tons of landfilled

waste was reported for the unincorporated county in 2019. In addition to landfilled waste, communities send ADC to landfills. ADC is non-earthen material used to cover an active surface of a landfill at the end of each operating day to control for vectors, fires, odors, blowing litter, and scavenging. This material can include compost, construction and demolition waste, sludge, green material, shredded tires, spray-on cement, and fabric. Given that ADC can also include organic material, methane emissions from landfills result from organic decomposition in both waste disposal and ADC. ADC from the unincorporated county was reported to be 6 tons in 2019. Data for landfilled waste and ADC were obtained from CalRecycle (CalRecycle 2022).

The amount of methane released from community-generated waste depends on the LFG management systems of the landfills at which the waste is disposed. Information regarding the use of LFG capture systems at individual landfills was available from EPA's Landfill Methane Outreach Program. It was determined that 21 of the 24 facilities receiving waste from the unincorporated county had an LFG capture system and hence the default LFG capture efficiency of 0.75 was used in emissions calculations. For facilities without LFG capture systems, a default efficiency factor of 0 was used. Default waste characterization emissions factors obtained from EPA were used in calculations.

2.4.11 Water Supply

Based on modeling conducted, water supply in the unincorporated county resulted in GHG emissions of approximately 350 $MTCO_2e$, which represents less than 1 percent of total emissions. Water is supplied by EBMUD, San Francisco Public Utilities Commission, and Zone 7. GHG emissions associated with water consumption occur from the indirect use of energy associated with water extraction, conveyance, treatment, and distribution to the point of use (e.g., residences, businesses). Water supply emissions were estimated by applying energy intensity factors (i.e., the total amount of energy required to produce a unit of water for a particular use) to water consumption values estimates for each water supplier for the unincorporated county in 2019.

Private wells also account for an estimated 5 percent of annual water consumption. Data on the number of estimated wells in the unincorporated county were provided by Alameda County Public Works Agency and Zone 7. The average water consumption per well was assumed to be 0.5 acre-feet per year, based on data from Zone 7. Water from private wells is supplied from local sources within the unincorporated county; therefore, it was assumed that all electricity usage associated with extracting and conveying well water is captured in the emissions estimates of the building energy sector because these activities occur within the unincorporated county.

The methods used are explained in more detail below. Table 9 presents water supply and associated GHG emissions for the unincorporated county.

Table 9 2019 Unincorporated Alameda County Water Supply Quantity and GHG Emissions

Source	Quantity (AF)	Electricity Consumption (kWh)	GHG Emissions ($MTCO_2e$)
East Bay Municipal Utility District	11,155	4,180,104	260
Zone 7 and San Francisco Public Utilities Commission	3,896	1,445,293	90
Alameda County Public Works Agency wells	50	17,600	0[1]
Zone 7 wells	800	281,600	0[1]
Total	**15,901**	**5,924,597**	**350**

Notes: Totals may not sum exactly due to independent rounding. AF = acre-feet; GHG = greenhouse gas; kWh = kilowatt-hours; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

[1] Water supply emissions from wells are captured in the building energy sector because all water supplied by wells was assumed to be extracted and conveyed from local sources within the unincorporated county.

Source: Ascent Environmental 2023.

ENERGY INTENSITY FACTOR

An energy intensity factor, regarding water supply emissions, is defined by the amount of energy (e.g., electricity, natural gas) required to produce a unit of water for a particular use. Electricity is the primary source of energy used for water extraction, conveyance, treatment, and distribution in the San Francisco Bay hydrologic region. The San Francisco Bay hydrologic region is the geographical region with water basins draining into San Francisco, San Pablo, and Suisun bays, and into the Sacramento River downstream from Collinsville in western Contra Costa County, and basins directly tributary to the Pacific Ocean below the Russian River watershed to the southern boundary of the Pescadero Creek basin (Navigant Consulting 2015). Other energy sources may include fossil fuel-powered pumps and backup generators at treatment plants, but these sources that may be used were considered negligible. Thus, for purposes of this analysis, energy intensity is based on electricity use only, and is expressed as kilowatt-hours per million gallons (kWh/AF).

In 2015, the California Public Utilities Commission authored a study of hydrologic regions in California and their relative energy intensities for water extraction, conveyance, treatment, and distribution. Alameda County is within the San Francisco Bay hydrologic region, which has specific energy intensities by supply type (e.g., local surface water, imported deliveries). Average energy intensities for the San Francisco Bay hydrologic region were used to calculate emissions.

ENERGY CONSUMPTION

EBMUD provided data on annual water consumption volume per capita for the unincorporated county. Data were not available for San Francisco Public Utilities Commission and Zone 7 so water consumption for these suppliers was estimated using per capita data from EBMUD. To estimate water supply emissions, the energy intensity factors discussed above were applied to total water consumption for each water supplier. GHG emissions were estimated using electricity emissions factors for EBCE's Bright Choice option since this option served over 80 percent of the unincorporate county in 2019.

2.4.12 Wastewater Treatment

Based on modeling conducted, wastewater treatment associated with the unincorporated county resulted in GHG emissions of approximately 2,404 $MTCO_2e$, which represents less than 1 percent of total emissions. Septic systems accounted for approximately 55 percent of emissions from wastewater treatment, while centralized wastewater treatment plants (WWTPs) make up the remaining 45 percent of emissions from this sector. Wastewater treatment emissions are summarized in Table 10, and additional details for this sector are included below.

Table 10 2019 Unincorporated Alameda County Wastewater Treatment GHG Emissions

Wastewater Treatment Type	GHG Emissions ($MTCO_2e$)
Centralized Wastewater Treatment Plants	1,079
Septic Systems	1,326
Total	**2,404**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: Ascent Environmental 2022.

CENTRALIZED WASTEWATER TREATMENT PLANTS

Emissions associated with the treatment of sewage are highly dependent on the processes and components used by specific WWTPs such as lagoons, nitrification or denitrification, and digester gas or combustion devices. Oro Loma Sanitary District/Castro Valley Sanitary District Water Pollution Control Plant is the centralized wastewater treatment

provider in the unincorporated county. It collects wastewater from customers' homes and businesses in the urban unincorporated communities of San Lorenzo, Ashland, Fairview, Cherryland, Castro Valley, and parts of Hayward and San Leandro. Collected wastewater enters the regional sewer system, which is operated by Oro Loma Sanitary District, and is then conveyed and pumped to the facility where it is treated before being safely reintroduced to the environment. Specific data regarding the type of WWTP and associated processes, average biological oxygen demand, daily wastewater volume, and average daily nitrogen discharge were available from Oro Loma Sanitary District. To be conservative (and due to lack of available data), it was assumed that Oro Loma Sanitary District serves all individuals in the unincorporated county who do not have a septic system.

Process N_2O emissions for WWTPs with nitrification or denitrification were calculated based on population and an industrial-commercial equivalent factor of 1.25 since both industrial and commercial land uses are served by the WWTP, using Community Protocol equation WW.7. Fugitive N_2O emissions from effluent discharge were calculated based on average daily nitrogen load and an effluent factor of 0.0025 since discharge is direct to the ocean, using Community Protocol equation WW.12. Process emissions from the WWTP's experimental levee and wetlands were calculated based on biological oxygen demand load and the fraction of biological oxygen demand removed during primary treatment, using Community Protocol equation WW.6 for wastewater treatment lagoons.

Energy-related emissions result from the energy required for wastewater treatment operations, including the energy used in wastewater conveyance as well as energy used throughout wastewater treatment processes and to provide power to the Oro Loma Sanitary District/Castro Valley Sanitary District Water Pollution Control Plant. However, because it is located within the unincorporated area of the county, it was assumed that energy-related emissions from wastewater treatment are captured in the building energy sector emissions estimates.

SEPTIC SYSTEMS

Onsite septic systems are used to collect wastewater in rural areas of the county. These systems collect wastewater onsite in underground tanks, which create anaerobic conditions. Microorganisms biodegrade the soluble organic material found in waste, which results in fugitive methane emissions. Consistent with the Community Protocol, wastewater discharge and treatment energy intensities associated with septic tanks and other onsite systems are assumed to be negligible.

It was determined that the unincorporated areas of the county have an estimated 3,750 septic systems. Methane emissions from the septic systems were calculated based on population served by these systems, using Equation WW.11(alt) of the Community Protocol. It was assumed each septic system served one household and average household size was used to calculate total population served by septic systems. This method resulted in an estimate of 10,950 individuals in the unincorporated county are served by septic systems.

2.4.13 Agriculture

Based on modeling conducted, emissions from the agriculture sector accounted for approximately 32,288 $MTCO_2e$ in 2019, or 3 percent of the unincorporated county's emissions. Emissions in this sector are generated from fertilizer application, livestock management, and open burning. Emissions from livestock, which include enteric fermentation (i.e., the metabolic process that takes place in the digestive systems of ruminant animals) and manure management, accounted for 88 percent of emissions from the agriculture sector, and emissions from fertilizer application accounted for 12 percent. Emissions associated with open burning are not reported in 2019 because there were no BAAQMD permit records for open burning. However, open burning typically occurs in the unincorporated county and will be included in emissions forecasts as part of additional tasks to develop the CCAP. The unincorporated county's agriculture emissions in 2019 are summarized in Table 11, and additional details and information about this sector are included below.

Table 11 2019 Unincorporated Alameda County Agriculture GHG Emissions

Agricultural Activity	GHG Emissions ($MTCO_2e$)
Fertilizer Application	3,887
Livestock Management	28,401
Open Burning[1]	0
Total	**32,288**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

[1] There was no open burning in Alameda County in 2019 according to Bay Area Air Quality Management District permit records.

Source: Ascent Environmental 2023.

FERTILIZER APPLICATION

The application of fertilizers and other soil amendments produces GHG emissions. Nitrogen fertilizers produce N_2O emissions, and application of lime produces emissions of CO_2. Data for nitrogen (including urea) and lime application were obtained from CDFA's *2019 Fertilizer Tonnage Report* (CDFA 2019). It was assumed that all countywide agricultural activity occurs in the unincorporated area of the county so the data was not scaled down as it typically is for other sectors. Emissions factors and quantification methods for GHG emissions associated with application of nitrogen and lime were obtained from IPCC. Data for fertilizer and lime application and associated emissions are presented in Table 12 below.

Table 12 2019 Unincorporated Alameda County Fertilizer and Lime Application Data and Emissions

Application Type	Application Amount (tons)	Source	GHG Emissions ($MTCO_2e$)
Nitrogen	791	CDFA	3,848
Lime	98	CDFA	39

Notes: CDFA = California Department of Food and Agriculture; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent. It was assumed that all countywide agricultural activity occurs in the unincorporated area of the county.

Source: Ascent Environmental 2023.

Emissions factors and data sources for fertilizer and lime application are shown in Table 13.

Table 13 2019 Unincorporated Alameda County Fertilizer and Lime Application Emissions Factors and Sources

Application Type	Emissions Factor	Source
Nitrogen (g N_2O/ton N)	17,820	IPCC
Lime (g CO_2/ton lime)	398,886	IPCC

Notes: CO_2 = carbon dioxide; g = grams; IPCC = Intergovernmental Panel on Climate Change; N = nitrogen; N_2O = nitrous oxide; NA = not applicable.

Source: Ascent Environmental 2023.

LIVESTOCK MANAGEMENT

Livestock produce CH_4 and N_2O emissions through enteric fermentation (i.e., the metabolic process that takes place in the digestive systems of ruminant animals) and decomposition of manure produced by these animals. The Alameda County 2019 Crop Report and USDA's 2017 Census of Agriculture provided total heads of cattle and calves, sheep and lambs, goats, layers (i.e., poultry birds raised for egg production), and horses (County of Alameda 2021; USDA 2019). Emissions factors for livestock were obtained from the EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018, Annex 3* and CARB's statewide GHG inventory (EPA 2020; CARB 2021).

2.5 2019 INVENTORY RESULTS

2.5.1 Summary of Results

Table 14 2019 Unincorporated Alameda County Community Production-Based GHG Emissions Inventory

Sector	GHG Emissions ($MTCO_2e$)	Percent of Total
Building Energy	179,606	19
On-Road	692,138	73
Off-Road	22,886	2
Agriculture	32,288	3
Water	350	<1
Wastewater	2,404	<1
Solid Waste	20,562	2
Total	**950,235**	**100**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.
Source: Ascent Environmental 2023.

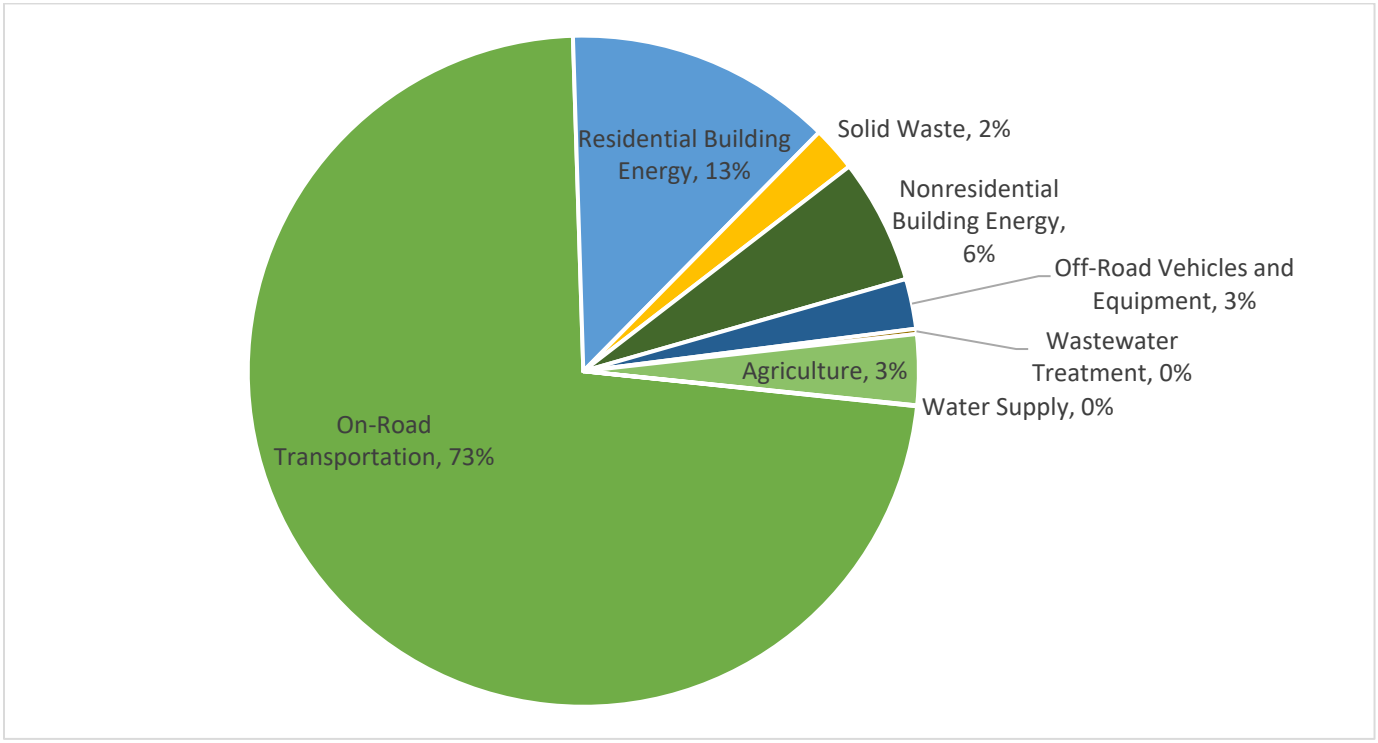


Figure 2 Unincorporated Alameda County 2019 Community Production-Based GHG Emissions Inventory

3 CONSUMPTION-BASED INVENTORY

3.1 INTRODUCTION

To further understand the contributions of unincorporated communitywide activities to global climate change, the County has prepared a CBEI. A CBEI accounts for the total quantity of GHG emissions associated with the production (e.g., extraction of raw materials, manufacturing, and transportation), use (e.g., gasoline used to drive a personal vehicle; electricity used to power a residential appliance), and disposal of products and services consumed by residents of a community within a given year. Unlike production-based inventories, which estimate GHG emissions generated from activities that occur within specific geographic boundaries, CBEIs account for indirect lifecycle GHG emissions, or "embedded" emissions, and attribute them to residents of a jurisdiction (e.g., the unincorporated areas of a county) where consumption of products and services occurs, regardless of where the emissions are released into the atmosphere. For example, if a resident of California purchases a car that was made in Japan, the emissions embedded within the supply chain of producing and shipping that car are allocated to the California consumer, rather than to Japan where the car was produced or to the entity shipping the car (as they would be in a production-based approach). In addition to these embedded GHG emissions, all emissions produced from the resident driving the car – both within and outside of the community – are accounted for in the consumption-based inventorying approach.

By accounting for lifecycle emissions generated outside of a community's boundaries, CBEIs capture emissions from activities and sources that are different than those included in production-based inventories. Therefore, CBEIs can be used to complement the findings of traditional production-based inventories and provide an additional perspective for understanding contributions to climate change. In particular, the information on communities' carbon footprints (i.e., the amount of GHG emissions attributable to a community) associated with the consumption of foods, goods, and services offers information on additional opportunities to reduce GHG emissions, as these sectors are unique to the consumption-based inventorying approach. CBEIs typically report emissions at the household level, although they are often scaled to a jurisdiction (e.g., unincorporated countywide levels) using per capita metrics. The methods by which CBEIs are estimated, while based on resident populations, are affected by the goods and services available to them by businesses within the county and beyond. Therefore, the results of this CBEI reflect private sector consumption but is not presented as such.

Reducing consumption-based emissions requires individuals to change their behavior towards more climate-friendly choices. It is important to note that the lifecycle emissions included in CBEIs often reflect activities and sources that are outside of the authority and influence of the jurisdiction (including Alameda County). The ability of local governments to change residents' behavior is limited and can be challenging to achieve. However, there are measures that the County could employ to induce, encourage, or compel unincorporated-areas residents to engage in more sustainable consumption practices.

In the first effort to comprehensively explore household carbon footprints at a fine geospatial resolution, University of California, Berkeley (UC Berkeley) developed CBEIs for all census block groups, cities, and counties within the U.S., including Alameda County. Using existing national household survey data to develop econometric models of demand, UC Berkeley researchers estimated household carbon footprints for the years 2010 and 2030. The methods and results were published in *Spatial Distribution of U.S. Household Carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits of Urban Population Density* (hereafter referred to as "Carbon Footprint Study") (Jones and Kammen 2013). The Carbon Footprint Study provides consumption-based emissions estimates for six emissions sectors: transportation, food, goods, services, housing, and composting.

The researchers published jurisdiction-specific consumption and carbon footprint data for each emissions sector. This analysis includes estimates for the activities within each emissions sector by applying Alameda County average data to the unincorporated area-specific consumption data at the sector level. Additional details are included in Section

3.3, "Data and Methods." While the County does not have a production-based inventory for 2010, the 2010 consumption rates available through the Carbon Footprint Study were applied to 2019 household numbers to align with the production-based inventory. There has not been an update to the Carbon Footprint Study with new consumption-based emissions estimates and this remains the best available data for the unincorporated county. With the increase in remote-based work, e-commerce, and other advances in the movement of goods, consumption estimates may change as researchers conduct updates to the assumption integrated in the Carbon Footprint Study.

3.2 2019 CBEI RESULTS

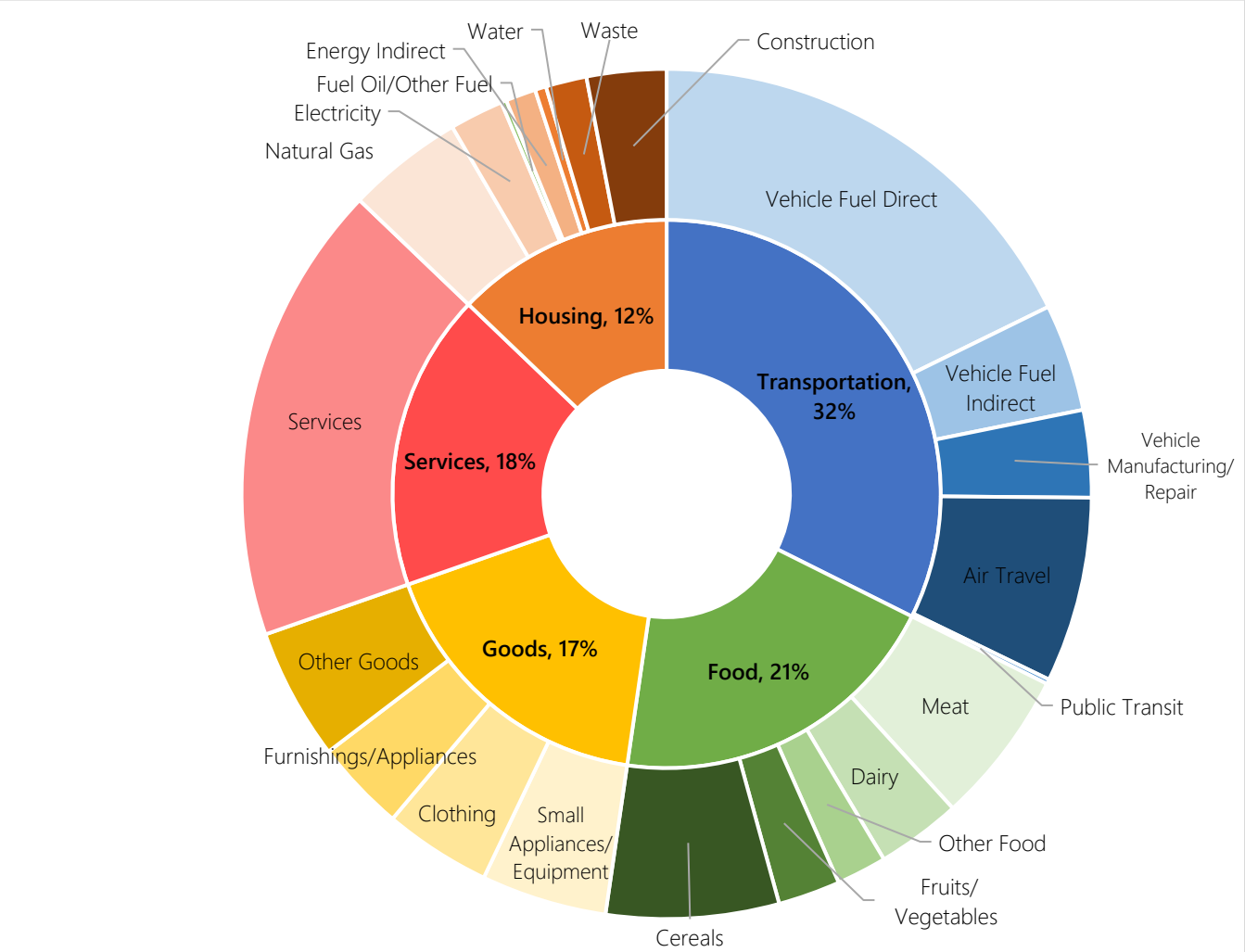
Based on the modeling conducted, consumption by residents in the unincorporated areas of Alameda County generated approximately 2,417,015 $MTCO_2e$ in 2019, equivalent to approximately 15.5 $MTCO_2e$ per person or 45.3 $MTCO_2e$ per household. Major emissions sectors and sources included transportation, food, goods, services, and housing. Table 15 and Figure 3 present the results of the unincorporated county's 2019 CBEI by sector and source.

Table 15 2019 Unincorporated Alameda County Consumption-Based Emissions Inventory by Sector and Source

Sectors/Sources	$MTCO_2e$/person	$MTCO_2e$/household	Total $MTCO_2e$/year	Percent of Total
Transportation	**5.1**	**14.8**	**789,777**	**33%**
Vehicle Fuel Direct	2.8	8.1	432,870	18%
Vehicle Fuel Indirect	0.6	1.9	99,565	4%
Vehicle Manufacturing/Repair	0.5	1.5	80,891	3%
Air Travel	1.1	3.2	172,042	7%
Public Transit	0.03	0.1	4,408	0.2%
Food	**3.1**	**9.1**	**486,253**	**20%**
Meat	0.9	2.7	143,268	6%
Dairy	0.5	1.5	78,424	3%
Fruits/Vegetables	0.3	0.9	46,531	2%
Cereals	0.4	1.1	57,752	2%
Other Food	1.0	3.0	160,278	7%
Goods	**2.7**	**7.9**	**423,022**	**18%**
Small Appliances/Equipment	0.7	2.2	116,526	5%
Clothing	0.6	1.9	99,484	4%
Furnishings/Appliances	0.5	1.6	84,921	4%
Other Goods	0.8	2.3	122,092	5%
Services	**2.7**	**8.0**	**427,145**	**18%**
Housing	**2.0**	**5.9**	**313,521**	**13%**
Natural Gas	0.7	2.0	108,281	4%
Electricity	0.3	0.9	50,054	2%
Fuel Oil/Other Fuel	0.03	0.1	4,942	0.2%
Energy Indirect	0.2	0.5	28,044	1%
Water	0.1	0.2	10,385	0.4%
Waste	0.2	0.7	37,971	2%
Construction	0.5	1.4	73,844	3%
Composting	**(0.1)**	**(0.4)**	**(22,703)**	**-1%**
Total	**15.5**	**45.3**	**2,417,015**	**100%**

Notes: Totals may not sum exactly due to independent rounding. Values in parentheses represent net negative emissions, or emissions reductions. $MTCO_2e$ = metric tons of carbon dioxide equivalent.

Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.



Source: Ascent Environmental 2023.

Figure 3 **Unincorporated Alameda County 2019 Consumption-Based GHG Emissions Inventory by Sector and Source[1]**

As shown in Table 15 and Figure 3, transportation represented the unincorporated county's largest emissions sector in 2019, accounting for 33 percent of the county's CBEI. Transportation sector emissions result primarily from the consumption of vehicle fuel, which includes both direct emissions from the combustion of fuel and indirect emissions from fuel production. Transportation emissions also include embedded emissions associated with vehicle manufacturing and repair, as well as emissions from air travel and public transit. The second largest emissions-generating sector was food, which contributed 20 percent of the unincorporated county's consumption-based emissions in 2019. Meat and dairy products contribute significantly to this sector, producing nearly half of all food-related emissions, with the remaining emissions generated from fruits, vegetables, cereals, and other food. The goods and services sectors were also substantial contributors, with each sector accounting for 18 percent of the county's CBEI. The goods sector consists of embedded emissions from small appliances and equipment, clothing, furnishings and large appliances, and other goods. The services sector includes GHG emissions embedded in the services consumed by residents in the unincorporated county, including health care, education, financial services, communications, and entertainment. The housing sector—which consists of emissions from household energy use,

[1] Consumption-based emissions estimates for composting are not shown in the chart, as these are emissions reductions (or avoided emissions) and cannot be represented in the chart type.

construction, water, and wastewater—contributed the smallest proportion of the unincorporated county's consumption-based emissions, accounting for 13 percent in 2019. Composting in the unincorporated county accounted for a net negative contribution to the unincorporated county's CBEI, reducing GHG emissions per household by 0.4 $MTCO_2e$ in 2019. Figure 4 below presents the county's CBEI by household.

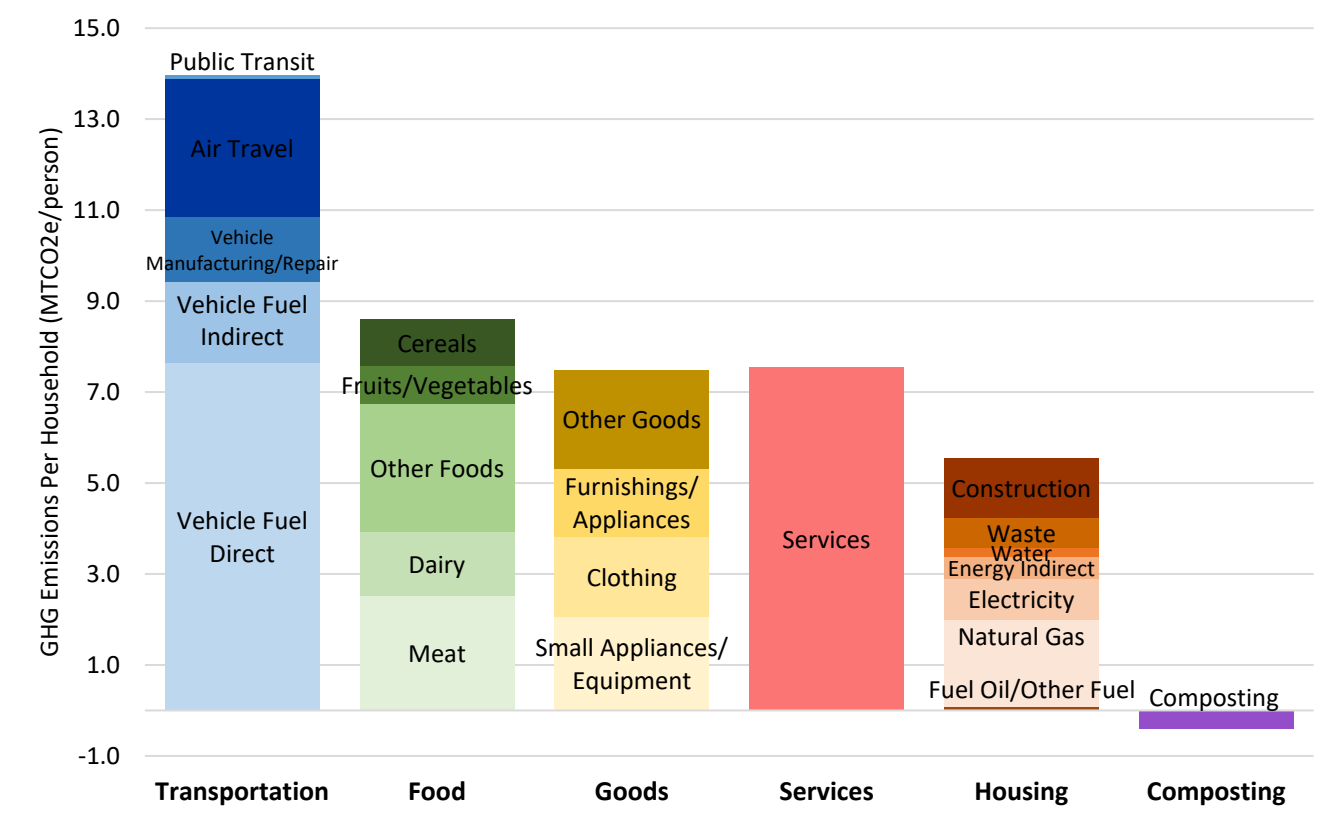


Figure 4 Unincorporated Alameda County 2019 Consumption-Based Emissions Inventory by Household

The unincorporated county's consumption-based emissions in 2019 are 154 percent higher than its production-based emissions in 2019. This is due to the inclusion of not only the emissions sources included in the production-based inventory, but also the upstream (i.e., lifecycle) emissions of those sources. Certain emissions sectors are accounted for in both inventories, including direct emissions from vehicle transportation fuels, household energy use, and waste disposal. Examples of direct emissions from these sources include the combustion of gasoline in personal vehicles, combustion of natural gas in cooking and heating buildings, and methane generated from the decomposition of waste at landfills. The CBEI captures emissions not included in the production-based inventory, such as embedded lifecycle emissions from the production of fuel, food, goods, services, and construction. These indirect emissions represent over two-thirds of the unincorporated county's CBEI. Table 16 presents a comparison of the county's 2019 production-based emissions and 2019 consumption-based emissions, and Figure 5 illustrates the two inventories by sector.

Table 16 Comparison of Unincorporated Alameda County Greenhouse Gas Emissions Inventories ($MTCO_2e$/year)

Emissions	Production-Based Emissions Inventory	Consumption-Based Emissions Inventory	Percent Difference
Total	950,235	2,417,015	+154

Notes: $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: Production-based emissions inventory prepared by Ascent in 2023. Consumption-based emissions inventory prepared by Jones and Kammen 2013 and UC Berkeley 2015; adapted by Ascent Environmental in 2023.

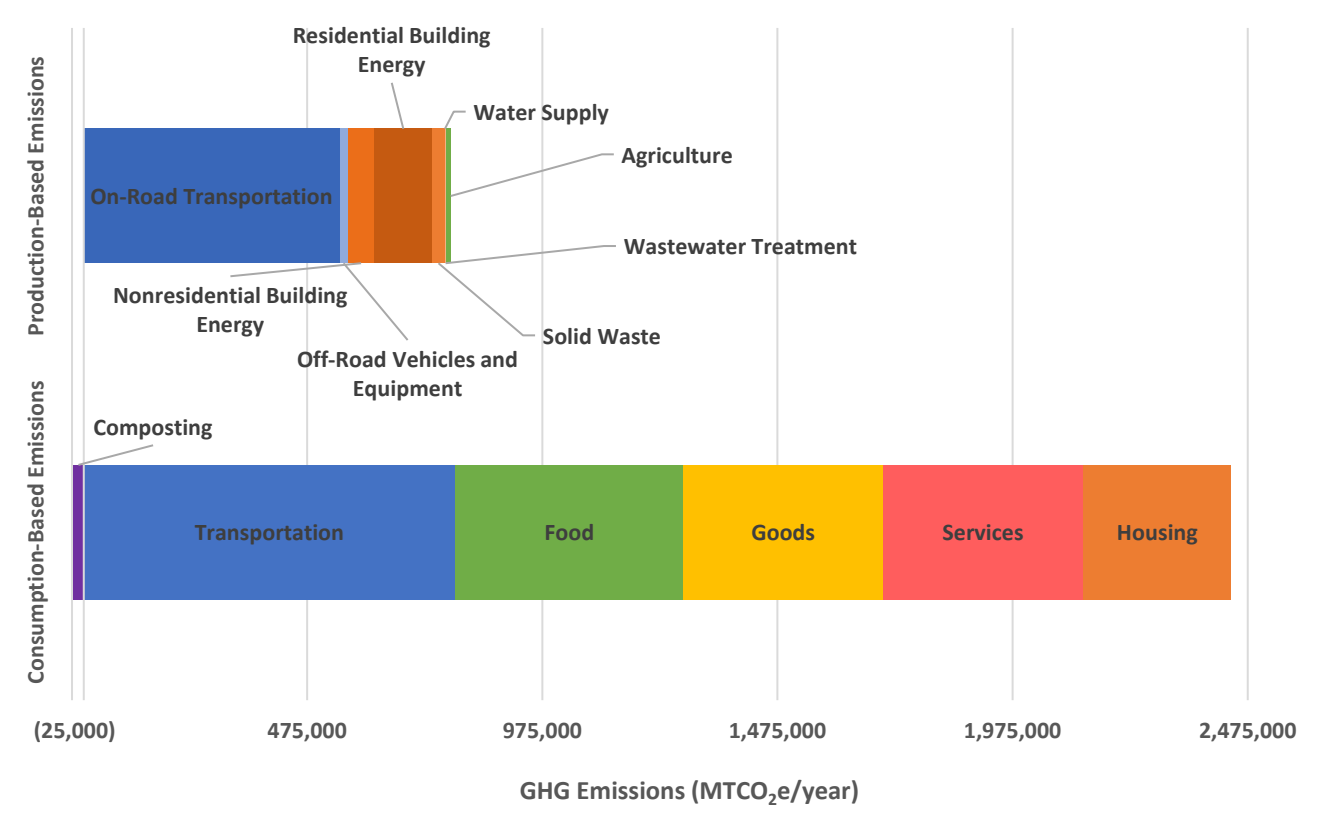


Figure 5 Comparison of Unincorporated Alameda County Production-Based and Consumption-Based Greenhouse Gas Emissions Inventories

3.3 DATA AND METHODS

3.3.1 STUDY BACKGROUND

To estimate consumption-based emissions in unincorporated Alameda County, the study used a methodology that is similar to the approach taken for the production-based inventory. Researchers obtained household activity data for each sector, usually in the form of annual consumption or annual expenditures and applied source-specific GHG emissions factors to calculate per household estimates of consumption-based emissions in the unincorporated county. To estimate the unincorporated county's total quantity of consumption-based emissions, the average countywide household carbon footprint was multiplied by the number of households in the unincorporated areas of Alameda County, which was 53,364 in 2019. The following sections describe the data and methods used for each sector. Additional information and references can be found in the study.

3.3.2 TRANSPORTATION

Transportation by residents in unincorporated Alameda County, including all travel within county boundaries as well as outside of county boundaries, resulted in 789,777 $MTCO_2e$ in 2019, accounting for approximately 33 percent of the unincorporated county's consumption-based emissions. Transportation represents the largest emissions sector in the CBEI and consists of direct vehicle fuel emissions from the combustion of gasoline, indirect emissions from the production of vehicle fuel, emissions from air travel and public transit, and lifecycle emissions from vehicle manufacturing and repair. Direct emissions and indirect emissions from vehicle fuel accounted for 55 and 13 percent of transportation emissions, respectively. Air travel generated 22 percent of emissions, vehicle manufacturing and repair accounted for 10 percent of emissions, and public transit accounted for 1 percent of emissions from this sector. Table 17 presents the unincorporated county's consumption-based transportation emissions by source.

Table 17 2019 Unincorporated Alameda County Consumption-Based Transportation Greenhouse Gas Emissions

Source	GHG Emissions ($MTCO_2e$/year)	Percent of Total
Vehicle Fuel Direct	432,870	55%
Vehicle Fuel Indirect	99,565	13%
Vehicle Manufacturing/Repair	80,891	10%
Air Travel	172,042	22%
Public Transit	4,408	1%
Total	**789,777**	**100%**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.

Consumption-based emissions in the transportation sector were estimated using a variety of data sources and methods. For vehicle fuel emissions, VMT data were approximated using responses from Bay Area residents in the National Household Travel Survey. VMT was estimated for all travel by all Alameda County residents, regardless of where that travel occurred, and average vehicle fuel economy was estimated using CARB's EMFAC 2014 model. The gasoline vehicles emissions factors reported by CARB and California's Low Carbon Fuel Standard—which includes all direct and indirect emissions of California reformulated gasoline—were used to estimate emissions[2]. Estimates for embedded emissions associated with the manufacturing of vehicles were obtained from previous lifecycle assessment studies. Emissions from vehicle repairs, including parts and services, were provided by the Comprehensive Environmental Data Archive (CEDA), an environmentally extended input-output lifecycle assessment model of consumption that considers all inputs to production resulting from supply chains.

Air travel emissions were estimated using the Consumer Expenditures Survey. Household income was the largest factor contributing to air travel expenditures because income is strongly correlated with expenditures on air travel, with higher incomes linked to more frequent air travel. Emissions factors for air travel were obtained from previous studies.

Emissions from Bay Area public transit systems were estimated using the National Transit Database, which reports fuel consumption of Bay Area transit systems. Jurisdiction-specific emissions were estimated by allocating emissions to households in counties served by each public transit system. San Francisco Bay Area Rapid Transit District, AC Transit, and San Francisco Bay Area Water Emergency Transportation Authority were considered for unincorporated Alameda County.

[2] The study assumed that all vehicles were gasoline-fueled vehicles.

3.3.3 FOOD

Food consumed by unincorporated Alameda County residents resulted in approximately 486,253 $MTCO_2e$ in 2019, accounting for approximately 20 percent of the unincorporated county's consumption-based emissions. Embedded GHG emissions from the food sector consist of those generated from the production, packaging, and distribution of food consumed by unincorporated Alameda County residents. This sector represents the county's second largest emissions-generating sector in the CBEI. Together, meat and dairy, which are carbon-intensive food groups, accounted for 46 percent of emissions from this sector. Produce and cereals accounted for 10 percent and 12 percent of food emissions, respectively, and other food, such as snacks and beverages, accounted for 33 percent. Consumption-based emissions from food are shown in Table 18.

Table 18 2019 Unincorporated Alameda County Consumption-Based Food Greenhouse Gas Emissions

Source	GHG Emissions ($MTCO_2e$/year)	Percent of Total
Meat	143,268	29%
Dairy	78,424	16%
Fruits/Vegetables	46,531	10%
Cereals	57,752	12%
Other Food	160,278	33%
Total	**486,253**	**100%**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.

Food consumption was approximated using data from USDA, the Centers for Disease Control and Prevention, and the Consumer Expenditures Survey. These sources led the study's researchers to conclude that while Bay Area residents spend more money on food than the US average, they spend roughly the same proportion of income on meat, dairy, fruits, vegetables, cereals, and other food as other U.S. cities. Accounting for above-average prices of food in the region, the researchers estimated that Bay Area residents consume 10 percent less food than the US average. Due to lack of available data at finer geospatial resolutions, the study assumed all diets in the region were the same on a per capita basis. Therefore, food-related emissions were estimated solely using average household size of each jurisdiction. GHG emission factors for food were obtained from CEDA, which considers all inputs to production resulting from supply chains and reports emissions per dollar of food sector output.

3.3.4 GOODS AND SERVICES

Goods consumed by residents of the unincorporated county resulted in approximately 423,002 $MTCO_2e$ in 2019, and the services purchased by the unincorporated county's residents generated approximately 427,145 $MTCO_2e$ in 2019. Each sector accounted for approximately 18 percent of the unincorporated county's consumption-based emissions (i.e., together, the goods and services sectors accounted for approximately 35 percent of the unincorporated county's CBEI). The goods sector consists of the GHG emissions embedded in the production of consumer products, including home appliances, furnishings, and clothing, as well as other goods, such as personal care products, electronics, toys, and books. Each source accounted for between 20 and 29 percent of emissions in the goods sector. The services sector consists of GHG emissions embedded in the full range of services consumed by households, including health care, education, financial services, communication, and entertainment. However, source-specific consumption-based emissions for the services sector were unavailable. Table 18 presents the county's consumption-based emissions of goods and the total consumption-based emissions associated with services consumed by the unincorporated county's residents.

The study used previously developed methods for estimating household emissions from the consumption of goods and services. The general steps involved included: developing econometric models of household consumption for categories of goods and services using the Consumer Expenditures Survey and data for household size and income; estimating household consumption profiles for each census block group; adjusting results based the Consumer Price Index and the Cost of Living Index for the Bay Area; and applying GHG emissions factors derived from CEDA. CEDA assumes that imported goods are produced with the same GHG emissions intensity as US products, and previous research has demonstrated that this assumption results in underestimating emissions of imported goods by between 10 and 15 percent. Therefore, the study increased the emissions factors obtained from CEDA by 10 percent.

Table 19 2019 Unincorporated Alameda County Consumption-Based Goods and Services Greenhouse Gas Emissions

Source	GHG Emissions ($MTCO_2e$/year)	Percent of Total
Small Appliances/Equipment	116,526	28%
Clothing	99,484	24%
Furnishings/Appliances	84,921	20%
Other Goods	122,092	29%
Goods Total	**423,022**	**100%**
Services Total	**427,145**	**100%**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; MTCO2e/year = metric tons of carbon dioxide equivalent per year.

Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.

3.3.5 HOUSING

Emissions from residents' housing resulted in approximately 313,521 $MTCO_2e$ in 2019, accounting for 13 percent of the unincorporated county's consumption-based emissions and representing the smallest emissions sector. The housing sector consists of direct emissions from the consumption of heating fuels (i.e., natural gas, fuel oil, and other fuels) and indirect emissions from the production and use of electricity, as well as from water use, waste generation, and residential building construction. The consumption of natural gas, electricity, and fuel oil and other fuels by residents accounted for approximately 35 percent, 16 percent, and 2 percent of emissions in this sector, respectively, while indirect (i.e., upstream) emissions from the production of energy (e.g., the emissions generated from the construction of a power plant) contributed 9 percent. Residential building construction generated 24 percent of housing-related emissions, and waste and water contributed 12 and 3 percent, respectively. Table 20 shows the unincorporated county's consumption-based emissions for the housing sector by source.

Table 20 2019 Unincorporated Alameda County Consumption-Based Housing Greenhouse Gas Emissions

Source	GHG Emissions ($MTCO_2e$/year)	Percent of Total
Natural Gas	108,281	35%
Electricity	50,054	16%
Fuel Oil/Other Fuel	4,942	2%
Energy Indirect	28,044	9%
Water	10,385	3%
Waste	37,971	12%
Construction	73,844	24%
Total	**313,521**	**100%**

Notes: Totals may not sum exactly due to independent rounding. GHG = greenhouse gas; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.

Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.

Household energy emissions were estimated using several data sources and methods. Utility electricity and natural gas consumption data at the zip code level were provided by PG&E. Utility emissions factors were also provided by PG&E. To estimate energy use at fine geospatial resolutions, researchers developed econometric models based on average home characteristics. Modeled results were used to estimate household energy consumption based on characteristics of homes in each census block group, obtained from the U.S. Census Bureau. Heating and cooling degree days, estimated from National Oceanic and Atmospheric Administration data, and square footage of homes were also used to adjust electricity and natural gas consumption estimates. Consumption-based emissions for fuel oil and other fuels were estimated using information obtained from the U.S. Energy Information Administration's Residential Energy Consumption Survey, the Office of Air Quality Planning and Standards, and Argonne National Laboratory.

Consumption-based emissions associated with household water consumption were estimated on a per capita basis. The study used the statewide average for residential water consumption and applied carbon intensities for water withdrawal provided by the GreenPoint Rated Calculator. The study assumed a conservative electricity carbon intensity based on the data reported for all electricity utilities in the region.

Household waste disposal and diversion rates were obtained from CalRecycle's 2008 Waste Characterization Study. EPA's average emissions factor for municipal solid waste sent to landfills was applied to waste disposal estimates to calculate per capita emissions. The results were scaled to the census block group level. It is important to note that while researchers initially estimated the impacts of recycling, the study does not include consumption-based emissions from recycling in overall emissions. This is due to the fact that recycling results in net negative emissions, theoretically as a result of a reduction of upstream manufacturing and land use emissions; therefore, the study assumed that these reductions are already accounted for in the goods and services sectors.

Emissions associated with the construction of homes, the production and transport of construction materials, and the maintenance of homes were estimated using methods developed in a study conducted for the Oregon Department of Environmental Quality. The study also used previously developed methods that estimated construction-related emissions for homes of different sizes and applied average home sizes specific to individual jurisdictions to calculate associated emissions.

3.3.6 COMPOSTING

Household composting by unincorporated Alameda County residents resulted in emissions reductions of approximately 22,703 $MTCO_2e$ in 2019. Composting decreases household consumption-based emissions by reducing the amount of organic waste sent to landfills, which generates larger quantities of methane emissions than composting. Further, composted materials are often used as fertilizers to grow produce. Using compost instead of fertilizers reduces emissions associated with traditional agricultural methods, reduces upstream emissions associated with producing fertilizer, and increases the carbon sequestration potential of the agriculture that is grown. Table 21 presents the consumption-based emissions reductions associated with composting by unincorporated Alameda County residents.

Table 21 2019 Unincorporated Alameda County Consumption-Based Composting Greenhouse Gas Emissions

Source	GHG Emissions ($MTCO_2e$/year)	Percent of Total
Composting Total	(22,703)	100

Notes: Parentheses indicate emissions reductions. GHG = greenhouse gas; $MTCO_2e$/year = metric tons of carbon dioxide equivalent per year.
Source: UC Berkeley 2015; adapted by Ascent Environmental in 2023.

Emissions reductions associated with composting were calculated using estimates for the disposal of organic material obtained from CalRecycle. The study quantified emissions reductions using methods and emissions factors provided by CARB and EPA.

3.4 DISCUSSION

The CBEI provides the County an additional lens through which it can view its GHG emissions and overall contribution to climate change. While the County's inventory of production-based emissions provides information that can be used to reduce GHG emissions from certain sectors, it does not accurately capture the total quantity of GHG emissions that are attributable to unincorporated Alameda County residents. As shown in Table 16 and Figure 5, the unincorporated county's consumption-based emissions are approximately 210 percent greater than those estimated in the production-based inventory. This increase is primarily due to the lifecycle emissions associated with food, goods, and services, as well as the inclusion of emissions generated from air travel. These findings offer useful insights and new opportunities for the County and unincorporated-area residents to reduce GHG emissions and mitigate impacts to climate change.

In general, strategies that will help the County reduce consumption-based emissions include:

- building and vehicle electrification,
- transitioning to low-carbon diets and sourcing food locally, and
- consuming local goods and services.

Reducing consumption-based emissions requires individuals to change their behavior towards more climate-friendly choices. The ability of local governments to change residents' behavior is somewhat limited and can be challenging to achieve. However, there are measures that the County could employ to induce, encourage, or compel residents to engage in more sustainable consumption practices. Further, the County can catalyze action through leading by example and making choices that residents can learn from and implement.

4 NATURAL AND WORKING LANDS INVENTORY

4.1 INTRODUCTION

Natural and working lands hold a prominent place in California's path toward carbon neutrality, and quantification of carbon storage is an evolving area. Understanding the magnitude and nature of existing carbon storage can help inform the potential future carbon sequestration opportunities from natural and working lands, which will be an important advancement in climate mitigation and resilience planning for unincorporated Alameda County.

Land use changes have direct impacts on the amount of carbon that is stored and sequestered within vegetation and soils in the unincorporated county. New development that converts grasslands, forests, shrublands, or other natural land covers to urban uses reduces the carbon sequestration potential of unincorporated county lands. Reforesting or afforesting barren, unproductive lands to preserve them from development will have the opposite effect, increasing the unincorporated county's carbon sequestration potential. This inextricable link between land use and carbon sequestration highlights the need for thoughtful land use planning that minimizes losses to current carbon storage and maximizes preservation/enhancements.

In April 2019, the State prepared the Draft California 2030 Natural and Working Lands Climate Change Implementation Plan (NWLIP), in response to CARB Resolution 17-46. The objectives of the NWLIP are to integrate climate goals into State-funded natural and working land conservation, restoration, and management programs; enhance natural and working lands' resilience to climate impacts, sequester carbon, and reduce GHG emissions; and identify next steps to address policy challenges facing natural and working lands (CalEPA, CNRA, CDFA, CARB, and SCG 2019). In October 2020, Governor Gavin Newsom highlighted the importance of California's natural and working lands for carbon sequestration through the signing of Executive Order N-82-20, which set a target of conserving 30 percent of the state's lands by 2030.

California's *2022 Scoping Plan for Achieving Carbon Neutrality* states that reducing GHG emissions from and increasing sequestration on natural and working lands is crucial to the State's long-term climate change strategy (CARB 2022). California has developed a Natural and Working Lands Climate Smart Strategy, which evaluates nature-based climate solutions, outlines regional opportunities for climate smart land management, and identifies opportunities to track nature-based climate action and measure progress (CNRA 2022). In addition, AB 1757 was signed into law in September 2022, which calls upon the California Natural Resources Agency to determine an ambitious range of targets for carbon sequestration and nature-based climate solutions.

Alameda County reaps the benefits of its natural and working lands through recreational amenities, wildlife habitat, and arable land that produces food that is distributed throughout the region. However, land use development resulting in the transition of carbon-sequestering land to other uses has reduced the overall potential of carbon held in vegetation and soil in the unincorporated county. The analysis presented below seeks to provide a baseline estimate for the carbon already stored in the unincorporated county's vast natural and working lands, inclusive of lands that have transition from natural lands to urbanized uses. This analysis lays the groundwork for future development of strategies to enhance carbon sequestration through land management activities such as riparian and wetland restoration, regenerative agricultural practices, carbon farming, living shorelines, native plant restoration, and green infrastructure, which were all identified in the Natural and Working Lands Climate Smart Strategy (CNRA 2022:76).

4.2 CARBON STOCK RESULTS

Based on estimates from Bay Area Greenprint, the unincorporated areas of Alameda County have 18,071,164 $MTCO_2e$ of carbon stored in its ecosystem—including carbon in aboveground biomass and belowground soil, as shown in Table 22. The following sections describe the data and methods used for each type of carbon stock. Additional information and references can be found on the Bay Area Greenprint website.

Table 22 2019 Unincorporated Alameda County Carbon Stock

Source	$MTCO_2e$	Percent of Total
Aboveground Live Carbon Storage	4,884,713	27
Soil Carbon Storage	12,486,405	69
Urban Forest Carbon Storage	700,046	4
Total	**18,071,164**	**100**

Notes: Totals may not sum exactly due to independent rounding. $MTCO_2e$ = metric tons of carbon dioxide equivalent per year.

Source: Bay Area Greenprint N.d.; adapted by Ascent Environmental in 2023.

4.3 DATA AND METHODS

4.3.1 OVERVIEW

Bay Area Greenprint is a tool that identifies, maps, and measures the values that natural resources contribute to the ecosystem, the economy, and the local community. Its goal is *"to provide a regional source of accessible conservation data and a framework for interpretation for planners, agencies, conservation practitioners, and other community stakeholders to facilitate the incorporation of natural and agricultural values information early into land use and infrastructure planning*" (Bay Area Greenprint, N.d.). The tool provides information on a variety of natural and agricultural values and benefits, including measurements of carbon stored in natural lands.

Bay Area Greenprint was used to report carbon storage in unincorporated Alameda County. The tool provides measurement for three types of carbon stock: aboveground live carbon storage, soil carbon storage, and urban forest carbon storage. A GIS shapefile of the unincorporated areas of Alameda County was uploaded to the reporting tool to assess carbon stock specific to the unincorporated Alameda County. The following sections describe the data and methods used for each metric.

4.3.2 ABOVEGROUND LIVE CARBON STORAGE

As shown in Table 22, the tool calculated aboveground live carbon storage to be 4,884,713 $MTCO_2e$, accounting for 27 percent of the total carbon stock in the unincorporated areas of the county. Aboveground live carbon storage refers to the carbon that is stored in live vegetation (i.e., trees, shrubs and grasses). Aboveground carbon storage was estimated by calculating biomass samples at the plot scale and transferring the values to remotely sensed data using metrics for vegetation type, size class, and canopy density. This process allows for wide-area estimation of carbon storage (i.e., the minimum threshold area is 100 acres) (Bay Area Greenprint 2019). Aboveground carbon was measured in megagrams per hectare at a 30-meter cell size. Carbon density was then converted to total carbon for each cell, measured in CO_2e. Figure 6 below shows where most aboveground live carbon storage is held in the unincorporated areas of the county.

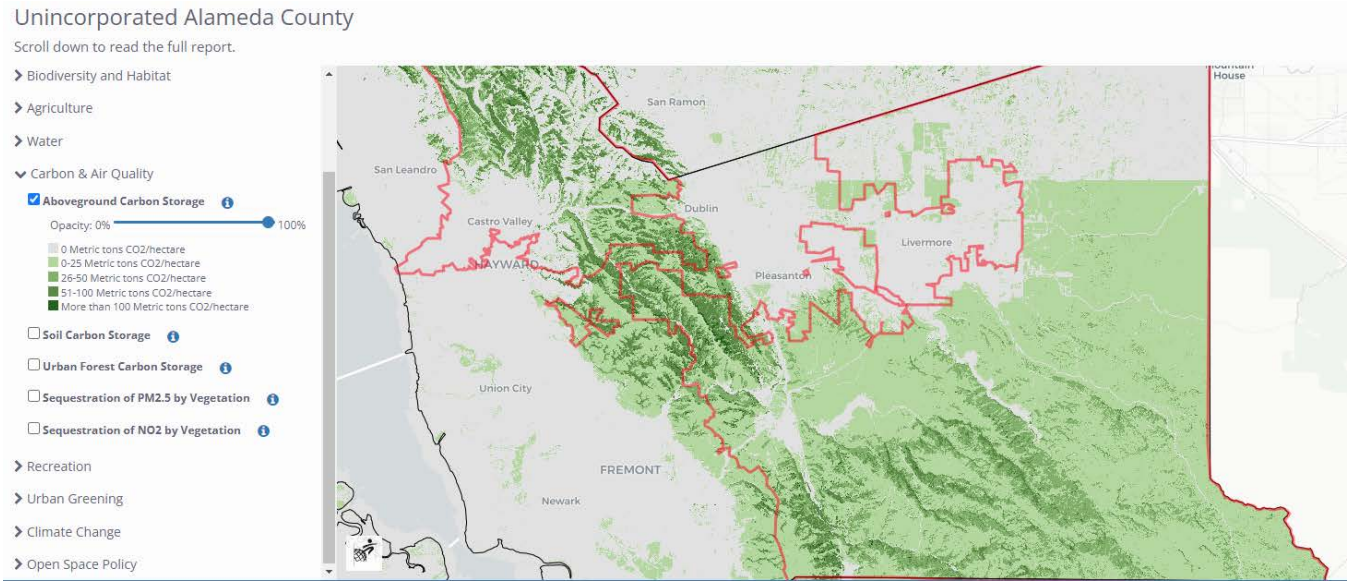


Figure 6 Aboveground Carbon Storage in Unincorporated Alameda County
Source: Bay Area Greenprint, N.d.

4.3.3 SOIL CARBON STORAGE

Soil carbon storage was calculated to be 12,486,405 $MTCO_2e$, accounting for 69 percent of the unincorporated county's total carbon stock. This refers to the carbon stored in soil organic matter from microorganisms, root exudates, decomposed organisms, and soil biota. Researchers used data from Gridded Soil Survey Geographic Database—the most detailed level of soil geographic data developed by the National Cooperative Soil Survey—to summarize soil carbon storage, measured in grams per square meter, to a depth of 30 centimeters. Carbon density was then converted to total carbon stock, measured in CO_2e. It is important to note that this calculation represents the carbon content of undisturbed soil but up to 30 percent of the carbon content may have already been lost through soil disturbances such as tillage from farming practices or land development (Bay Area Greenprint, N.d.). Figure 7 below shows where the highest concentrations of soil carbon storage is held in the unincorporated areas of the county.

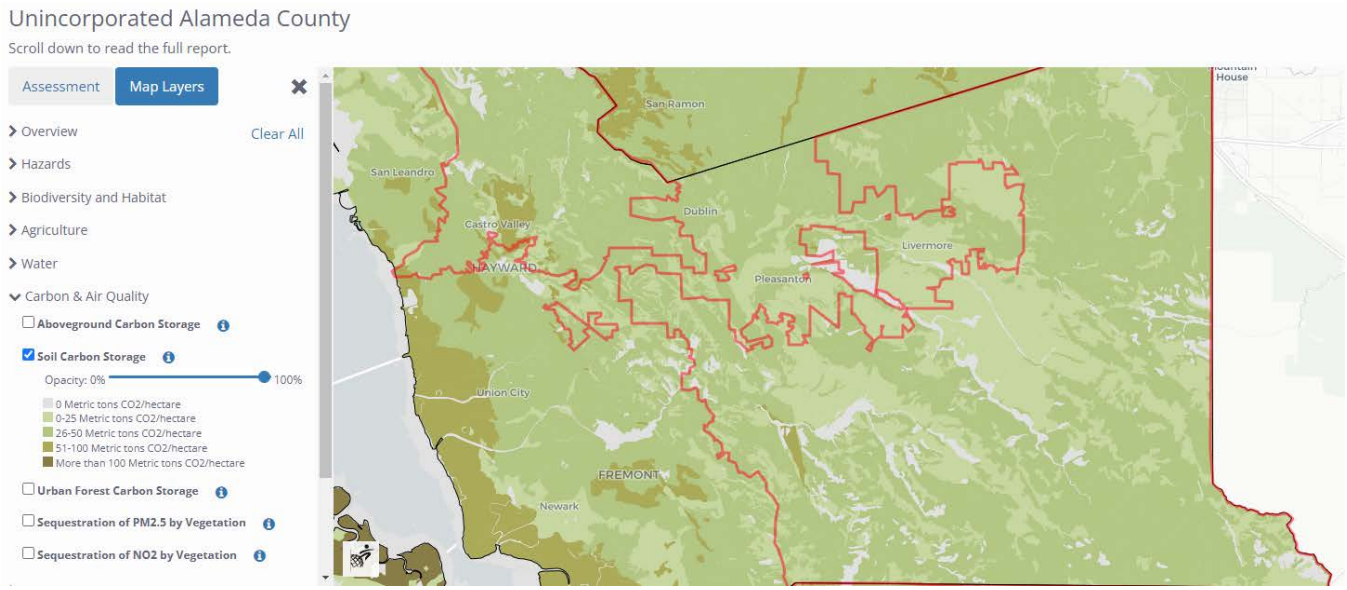


Figure 7 Soil Carbon Storage in Unincorporated Alameda County
Source: Bay Area Greenprint, N.d.

4.3.4 URBAN FOREST CARBON STORAGE

The urban forest carbon storage is estimated to be 700,046 $MTCO_2e$, accounting for just 4 percent of the unincorporated county's total carbon stock. This refers to the amount of carbon stored in street trees in urban areas (Bay Area Greenprint 2019). Figure 8 below shows where most urban forest carbon storage is held in the unincorporated areas of the county, while Figure 9 shows the concentration of the urban forest in the urban areas of the unincorporated county, which exists primarily in Castro Valley and Fairview.

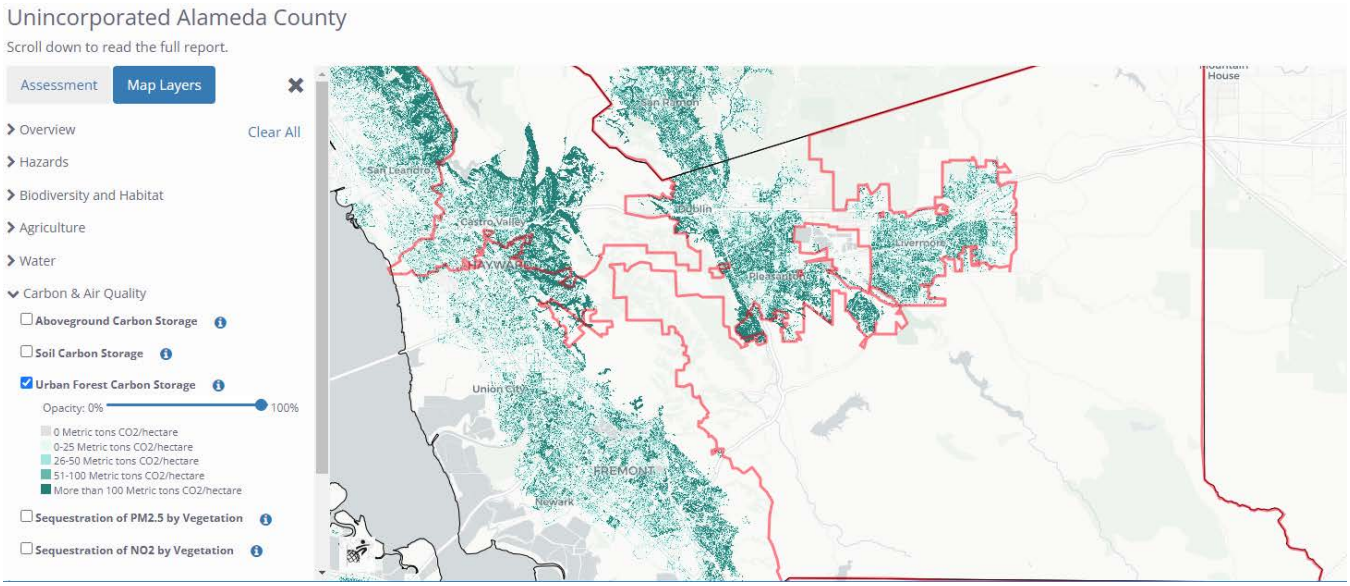


Figure 8 Urban Forest Carbon Storage in All Unincorporated Alameda County
Source: Bay Area Greenprint, N.d.

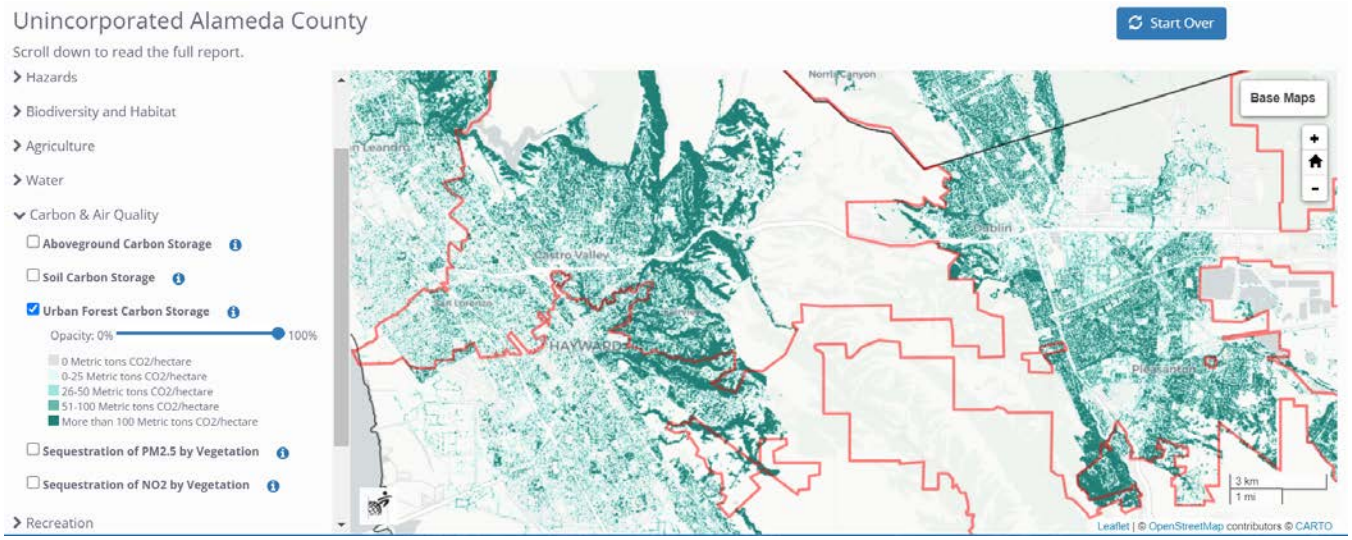


Figure 9 Urban Forest Carbon Storage in Urban Areas of Unincorporated Alameda County
Source: Bay Area Greenprint, N.d.

4.4 DISCUSSION

This analysis is a baseline assessment of carbon storage on natural and working lands in unincorporated Alameda County. This analysis does not account for land use changes associated with urbanization and development that may have resulted from carbon loss over the past several decades. Based on the availability and granularity of data, there is a margin of error in these estimates but it still provides an important consideration in climate action planning in the region: there are highly productive lands that store and continually sequester carbon and these lands should be conserved and enhanced to increase the potential for future sequestration. The results of this analysis will be incorporated into the CCAP and will lead to the development of strategies, measures, and actions to enhance carbon sequestration.

5 REFERENCES

Bay Area Greenprint. No date. Unincorporated Alameda County. Report generated using Greenprint fishnet version 7. Available: https://www.bayareagreenprint.org/. Report derived on September 29, 2022.

———. 2019. Glossary. Last updated June 10, 2019. Available: https://www.bayareagreenprint.org/glossary/#abovegroundlivecarbonstorage. Accessed January 27, 2023.

CalEPA, CNRA, CDFA, CARB, and SGC. See California Environmental Protection Agency, California Natural Resources Agency, California Department of Food & Agriculture, California Air Resources Board, and California Strategic Growth Council.

California Air Resources Board. 2017. *California's 2017 Climate Change Scoping Plan*. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf. Accessed September 20, 2021.

———. 2021. Greenhouse Gas Emission Inventory - Query Tool for years 2000 to 2019 (14th Edition). Available: https://www.arb.ca.gov/app/ghg/2000_2019/ghg_sector.php. Accessed November 2, 2021.

———. 2022 (November 16). *2022 Scoping Plan for Achieving Carbon Neutrality*. Available: https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf. Accessed January 25, 2023.

California Environmental Protection Agency, California Natural Resources Agency, California Department of Food & Agriculture, California Air Resources Board, and California Strategic Growth Council. 2019 (January). DRAFT California 2030 Natural and Working Lands Climate Change Implementation Plan. Available: https://ww2.arb.ca.gov/sites/default/files/2020-10/draft-nwl-ip-040419.pdf. Accessed June 6, 2022.

California Department of Food and Agriculture. 2019. *Fertilizing Materials Tonnage Report*. Available: http://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf. Accessed October 12, 2021.

California Department of Resources Recycling and Recovery. 2022. Jurisdiction Disposal and Alternative Daily Cover (ADC) Tons by Facility. Available: https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Destination/DisposalByFacility. Accessed October 7, 2022.

California Governor's Office of Planning and Research. 2017. *General Plan Guidelines, Chapter 8: Climate Change*. Available: https://opr.ca.gov/planning/general-plan/guidelines.html. Accessed August 28, 2021.

California Natural Resources Agency. 2022 (April). Natural and Working Lands Climate Smart Strategy. Available: https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf. Accessed June 6, 2022.

CalRecycle. *See* California Department of Resources Recycling and Recovery.

CARB. *See* California Air Resources Board.

CDFA. *See* California Department of Food and Agriculture.

CNRA. *See* California Natural Resources Agency.

County of Alameda. 2021 (February 24). *Alameda County 2019 Crop Report.* Available: https://www.acgov.org/cda/awm/resources/2019cropreport.pdf. Accessed January 23, 2023.

EPA. *See* U.S. Environmental Protection Agency.

ICLEI. *See* ICLEI – Local Governments for Sustainability.

IPCC. *See* Intergovernmental Panel on Climate Change.

ICLEI – Local Governments for Sustainability. 2019. *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*. Version 1.2.

Intergovernmental Panel on Climate Change. 2021 (August). *Climate Change 2021: The Physical Science Basis. Chapter 7: The Earth's energy budget, climate feedbacks, and climate sensitivity - Supplementary Material.* Available: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf. Accessed August 30, 2021.

Jones, C. and D. M. Kammen. 2013 (December 13). Spatial Distribution of U.S. Household Carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits of Urban Population Density. *Environ. Sci. Technol.* 2014, 48, 2, 895-902.

Metropolitan Planning Commission. 2017. Projections 2040. Available: http://projections.planbayarea.org/data. Accessed January 23, 2023.

MTC. *See* Metropolitan Planning Commission.

Navigant Consulting. 2015, April. Water/Energy Cost-Effectiveness Analysis. Available: https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/c/5360-cpucwaterenergycosteffectivenessanalysispublicreport10714.pdf. Accessed April 18, 2023.

OPR. *See* California Governor's Office of Planning and Research.

TCR. *See* The Climate Registry.

The Climate Registry. 2021. *2021 Default Emission Factor Document*. Available: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf. Accessed August 30, 2021.

UC Berkeley. *See* University of California, Berkeley.

University of California, Berkeley. 2015 (December). *A Consumption-Based Greenhouse Gas Inventory of San Francisco Bay Area Neighborhoods, Cities and Counties: Prioritizing Climate Action for Different Locations.* Available: https://escholarship.org/uc/item/2sn7m83z. Accessed January 25, 2021.

US Department of Agriculture. 2019 (April). 2017 Census of Agriculture: California – State and County Data. Available: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/California/cav1.pdf. Accessed August 20, 2021.

US Environmental Protection Agency. 2020. *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018, Annex 3.* Available: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2018. Accessed January 24, 2023.

———. 2021 (February). *Emissions & Generation Integrated Database (eGRID).* Available: https://www.epa.gov/egrid/download-data. Accessed November 29, 2021.

USDA. *See* US Department of Agriculture.

Column Labels	2019	2030			2040				2045				
	(blank)	BAU		Leg-Adjusted		BAU		Leg-Adjusted		BAU		Leg-Adjusted	
Row Labels	MTCO2e	MTCO2e	Percentage	MTCO2e	Percentage	MTCO2e	Percentage	MTCO2e	Percentage	MTCO2e	Percentage	MTCO2e	Percentage
Building Energy	**179,606**	**186,393**	**18.90%**	**176,474**	**17.24%**	**190,898**	**20.25%**	**164,455**	**16.15%**	**193,586**	**24.71%**	**160,760**	**15.80%**	**26.28%**
Non-Residential	56,013	56,561	5.89%	54,989	5.23%	57,266	6.31%	48,493	4.85%	57,564	7.29%	45,937	4.70%	7.51%
Residential	122,466	128,693	12.89%	120,347	11.90%	132,480	13.81%	114,810	11.21%	134,864	17.25%	113,664	11.01%	18.58%
Backup Generator	1,127	1,138	0.12%	1,138	0.11%	1,152	0.13%	1,152	0.10%	1,158	0.17%	1,158	0.09%	0.19%
On-Road	**692,138**	**811,857**	**72.84%**	**612,216**	**75.08%**	**906,648**	**70.24%**	**417,213**	**76.72%**	**946,777**	**62.69%**	**366,527**	**77.27%**	**59.91%**
Passenger	343,274	375,607	36.13%	255,967	34.74%	398,878	29.37%	99,907	33.75%	410,117	15.01%	52,590	33.47%	8.60%
Commercial	348,864	436,250	36.71%	356,249	40.35%	507,770	40.87%	317,306	42.97%	536,659	47.68%	313,937	43.80%	51.31%
Off-Road	**22,886**	**23,479**	**2.41%**	**23,479**	**2.17%**	**23,884**	**2.69%**	**23,884**	**2.02%**	**24,122**	**3.59%**	**24,127**	**1.97%**	**3.94%**
Construction and Mining	4,072	4,253	0.43%	4,253	0.39%	4,367	0.49%	4,367	0.37%	4,437	0.66%	4,438	0.36%	0.73%
Industrial	2,169	2,190	0.23%	2,190	0.20%	2,217	0.25%	2,217	0.19%	2,229	0.33%	2,228	0.18%	0.36%
Lawn and Garden Equipment	2,457	2,582	0.26%	2,582	0.24%	2,658	0.30%	2,658	0.22%	2,706	0.40%	2,706	0.22%	0.44%
Light Commercial Equipment	1,324	1,337	0.14%	1,337	0.12%	1,354	0.15%	1,354	0.11%	1,361	0.20%	1,366	0.11%	0.22%
Pleasure Craft	792	832	0.08%	832	0.08%	857	0.10%	857	0.07%	872	0.13%	872	0.07%	0.14%
Portable Equipment	2,063	2,083	0.22%	2,083	0.19%	2,109	0.24%	2,109	0.18%	2,120	0.32%	2,120	0.17%	0.35%
Recreational Equipment	624	655	0.07%	655	0.06%	675	0.08%	675	0.06%	687	0.10%	687	0.06%	0.11%
Transport Refrigeration Units	3,625	3,786	0.38%	3,786	0.35%	3,887	0.43%	3,887	0.33%	3,950	0.58%	3,950	0.32%	0.65%
Agricultural Offroad	5,761	5,761	0.61%	5,761	0.53%	5,761	0.66%	5,761	0.49%	5,761	0.87%	5,761	0.47%	0.94%
Solid Waste	**20,562**	**24,406**	**2.16%**	**24,406**	**2.26%**	**25,061**	**2.80%**	**25,061**	**2.12%**	**25,464**	**3.77%**	**25,464**	**2.08%**	**4.16%**
Waste Generation	20,562	24,406	2.16%	24,406	2.26%	25,061	2.80%	25,061	2.12%	25,464	3.77%	25,464	2.08%	4.16%
Wastewater	**2,404**	**2,511**	**0.25%**	**2,511**	**0.23%**	**2,579**	**0.29%**	**2,579**	**0.22%**	**2,620**	**0.39%**	**2,620**	**0.21%**	**0.43%**
Septic System	1,326	1,384	0.14%	1,384	0.13%	1,422	0.16%	1,422	0.12%	1,445	0.21%	1,445	0.12%	0.24%
WWTP	1,079	1,127	0.11%	1,127	0.10%	1,157	0.13%	1,157	0.10%	1,176	0.17%	1,176	0.10%	0.19%
Agriculture	**32,288**	**32,249**	**3.40%**	**32,288**	**2.98%**	**32,288**	**3.70%**	**32,288**	**2.73%**	**32,288**	**4.85%**	**32,288**	**2.64%**	**5.28%**
Fertilizer Application	3,887	3,848	0.41%	3,887	0.36%	3,887	0.45%	3,887	0.33%	3,887	0.58%	3,887	0.32%	0.64%
Livestock	28,401	28,401	2.99%	28,401	2.63%	28,401	3.26%	28,401	2.40%	28,401	4.27%	28,401	2.32%	4.64%
Water	**350**	**366**	**0.04%**	**202**	**0.03%**	**375**	**0.02%**	**47**	**0.03%**	**381**	**0.01%**	**-**	**0.03%**	**0.00%**
Water	350	366	0.04%	202	0.03%	375	0.02%	47	0.03%	381	0.01%	-	0.03%	0.00%
Grand Total	**950,235**	**1,081,260**	**100.00%**	**871,576**	**100.00%**	**1,181,732**	**100.00%**	**665,526**	**100.00%**	**1,225,238**	**100.00%**	**611,786**	**100.00%**	**100.00%**

Building Energy

Year	Emissions Sector	Calculation Sector	Fuel Type	Utility (if applicable)	Sub-Sector	Sub-Area (if a	Source Name	Fuel Use	Unit	Notes	Energy Use (kBTU)	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	19,290,201	kWh	*Source: PG&E; provided by Alameda County*	65,820,895	163	0	0	181
2019	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	83,258,490	kWh	*Source: PG&E; provided by Alameda County an*	284,089,747	705	1	0	781
2019	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	19,999,255	therm	*Source: PG&E; provided by Alameda County*	1,999,448,008	106,116	9	0	106,433
2019	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	8,424,227	therm	*Source: PG&E; provided by Alameda County*	842,221,567	44,699	4	0	44,832
2019	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	304,392	kWh	*Source: EBCE*	1,038,629	-	-	-	-
2019	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	168,947	kWh	*Source: EBCE*	576,471	-	-	-	-
2019	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	254,882,085	kWh	*Source: EBCE*	869,693,735	15,619	4	0	15,852
2019	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	43,015	kWh	*Source: EBCE*	146,773	-	-	-	-
2019	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	2,497,896	kWh	*Source: EBCE*	8,523,175	-	-	-	-
2019	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	167,225,923	kWh	*Source: EBCE*	570,598,508	10,248	3	0	10,400
2019	Building Energy	Building Energy	Diesel	NA	Backup Generator	NA	NA	3,954	gal	*Source: ICE Data; provided by BAAQMD*	546,050	40	0.000491	0.000218	40
2019	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	19,149,513	scf	*Source: ICE Data; provided by BAAQMD*	19,647,401	1,042	0.017683	0.017683	1,048
2019	Building Energy	Building Energy	LPG	NA	Backup Generator	NA	NA	6,724	gal	*Source: ICE Data; provided by BAAQMD*	614,103	38	0.003648	0.003779	39

Year	Emissions Sector	Calculation Sector	Fuel Type	Utility (if applicable)	Sub-Sector	Sub-Area (if a	Source Name	BAU or Leg-Adjusted	Activity Growth Meti	Activity Growth Factor	Legislative Adjustme	Fuel Use	Unit	Notes	Energy Use (kBTU)	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	BAU	Population	1.050848762	1	20,271,084	kWh	*Source: PG&E; provided by Alameda County*	69,167,806	172	0	0	190
2030	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	BAU	Employment	1.009782646	1	84,072,978	kWh	*Source: PG&E; provided by Alameda County and Ei*	286,868,897	712	1	0	788
2030	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	BAU	Population	1.050848762	1	21,016,192	therm	*Source: PG&E; provided by Alameda County*	2,101,117,464	111,512	10	0	111,845
2030	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	BAU	Employment	1.009782646	1	8,506,638	therm	*Source: PG&E; provided by Alameda County*	850,460,723	45,136	4	0	45,271
2030	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	BAU	Population	1.050848762	1	319,870	kWh	*Source: EBCE*	1,091,442	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	BAU	Population	1.050848762	1	177,538	kWh	*Source: EBCE*	605,784	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	BAU	Population	1.050848762	1	267,842,524	kWh	*Source: EBCE*	913,916,585	16,413	4	0	16,658
2030	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	BAU	Employment	1.009782646	1	43,436	kWh	*Source: EBCE*	148,209	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	BAU	Employment	1.009782646	1	2,522,332	kWh	*Source: EBCE*	8,606,554	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	BAU	Employment	1.009782646	1	168,861,835	kWh	*Source: EBCE*	576,180,472	10,348	3	0	10,502
2030	Building Energy	Building Energy	Diesel	NA	Backup Generator	NA	NA	BAU	Employment	1.009782646	1	3,993	gal	*Source: ICE Data; provided by BAAQMD*	551,392	41	0	0	41
2030	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	BAU	Employment	1.009782646	1	19,336,846	scf	*Source: ICE Data; provided by BAAQMD*	19,839,604	1,053	0	0	1,058
2030	Building Energy	Building Energy	LPG	NA	Backup Generator	NA	NA	BAU	Employment	1.009782646	1	6,790	gal	*Source: ICE Data; provided by BAAQMD*	620,111	38	0	0	39
2040	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	BAU	Population	1.081771174	1	20,867,583	kWh	*Source: PG&E; provided by Alameda County*	71,203,147	177	0	0	196
2040	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	BAU	Employment	1.022355413	1	85,119,768	kWh	*Source: PG&E; provided by Alameda County and Ei*	290,440,691	720	1	0	798
2040	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	BAU	Population	1.081771174	1	21,634,618	therm	*Source: PG&E; provided by Alameda County*	2,162,945,219	114,793	10	0	115,136
2040	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	BAU	Employment	1.022355413	1	8,612,554	therm	*Source: PG&E; provided by Alameda County*	861,049,778	45,698	4	0	45,835
2040	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	BAU	Population	1.081771174	1	329,282	kWh	*Source: EBCE*	1,123,558	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	BAU	Population	1.081771174	1	182,762	kWh	*Source: EBCE*	623,610	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	BAU	Population	1.081771174	1	275,724,092	kWh	*Source: EBCE*	940,809,613	16,896	4	1	17,148
2040	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	BAU	Employment	1.022355413	1	43,977	kWh	*Source: EBCE*	150,054	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	BAU	Employment	1.022355413	1	2,553,737	kWh	*Source: EBCE*	8,713,714	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	BAU	Employment	1.022355413	1	170,964,328	kWh	*Source: EBCE*	583,354,474	10,477	3	0	10,633
2040	Building Energy	Building Energy	Diesel	NA	Backup Generator	NA	NA	BAU	Employment	1.022355413	1	4,043	gal	*Source: ICE Data; provided by BAAQMD*	558,257	41	0	0	41
2040	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	BAU	Employment	1.022355413	1	19,577,609	scf	*Source: ICE Data; provided by BAAQMD*	20,086,627	1,066	0	0	1,071
2040	Building Energy	Building Energy	LPG	NA	Backup Generator	NA	NA	BAU	Employment	1.022355413	1	6,874	gal	*Source: ICE Data; provided by BAAQMD*	627,832	39	0	0	40
2045	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	BAU	Population	1.101240501	1	21,243,151	kWh	*Source: PG&E; provided by Alameda County*	72,484,635	180	0	0	199
2045	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	BAU	Employment	1.027678131	1	85,562,929	kWh	*Source: PG&E; provided by Alameda County and Ei*	291,952,820	724	1	0	802
2045	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	BAU	Population	1.101240501	1	22,023,990	therm	*Source: PG&E; provided by Alameda County*	2,201,873,126	116,859	10	0	117,208
2045	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	BAU	Employment	1.027678131	1	8,657,394	therm	*Source: PG&E; provided by Alameda County*	865,532,686	45,936	4	0	46,073
2045	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	BAU	Population	1.101240501	1	335,209	kWh	*Source: EBCE*	1,143,780	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	BAU	Population	1.101240501	1	186,051	kWh	*Source: EBCE*	634,833	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	BAU	Population	1.101240501	1	280,686,475	kWh	*Source: EBCE*	957,741,964	17,201	4	1	17,457
2045	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	BAU	Employment	1.027678131	1	44,206	kWh	*Source: EBCE*	150,836	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	BAU	Employment	1.027678131	1	2,567,033	kWh	*Source: EBCE*	8,759,080	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	BAU	Employment	1.027678131	1	171,854,424	kWh	*Source: EBCE*	586,391,608	10,531	3	0	10,688
2045	Building Energy	Building Energy	Diesel	NA	Backup Generator	NA	NA	BAU	Employment	1.027678131	1	4,064	gal	*Source: ICE Data; provided by BAAQMD*	561,164	41	0	0	42
2045	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	BAU	Employment	1.027678131	1	19,679,536	scf	*Source: ICE Data; provided by BAAQMD*	20,191,204	1,071	0	0	1,077
2045	Building Energy	Building Energy	LPG	NA	Backup Generator	NA	NA	BAU	Employment	1.027678131	1	6,910	gal	*Source: ICE Data; provided by BAAQMD*	631,100	39	0	0	40
2030	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.050848762	1.228197496	20,494,919	kWh	*Source: PG&E; provided by Alameda County*	69,931,563	955	0	0	967
2030	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.009782646	0.904602646	83,995,278	kWh	*Source: PG&E; provided by Alameda County and Ei*	286,603,773	3,915	1	0	3,963
2030	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.050848762	0.671114514	20,681,736	**therm**	*Source: PG&E; provided by Alameda County*	2,067,679,856	109,737	10	0	110,065
2030	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.009782646	0.890137394	8,497,584	**therm**	*Source: PG&E; provided by Alameda County*	849,555,548	45,088	4	0	45,223
2030	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	Leg-Adjusted	Population	1.050848762	1.228197496	323,402	kWh	*Source: EBCE*	1,103,493	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	Leg-Adjusted	Population	1.050848762	1.228197496	179,498	kWh	*Source: EBCE*	612,473	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	Leg-Adjusted	Population	1.050848762	1.228197496	270,800,063	kWh	*Source: EBCE*	924,008,128	9,178	2	0	9,315
2030	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.009782646	0.904602646	43,396	kWh	*Source: EBCE*	148,072	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.009782646	0.904602646	2,520,001	kWh	*Source: EBCE*	8,598,600	-	-	-	-
2030	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.009782646	0.904602646	168,705,773	kWh	*Source: EBCE*	575,647,967	5,718	1	0	5,803
2030	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	Leg-Adjusted	Employment	1.009782646	1	19,336,846	scf	*Source: ICE Data; provided by BAAQMD*	19,839,604	1,053	0	0	1,058
2040	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.081771174	1.228197496	21,227,538	kWh	*Source: PG&E; provided by Alameda County*	72,431,363	357	0	0	361
2040	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.022355413	0.904602646	84,942,207	kWh	*Source: PG&E; provided by Alameda County and Ei*	289,834,828	1,427	0	0	1,445
2040	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.081771174	0.671114514	21,096,771	**therm**	*Source: PG&E; provided by Alameda County*	2,109,173,359	111,939	10	0	112,274
2040	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.022355413	0.890137394	8,591,864	**therm**	*Source: PG&E; provided by Alameda County*	858,981,262	45,588	4	0	45,725
2040	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	Leg-Adjusted	Population	1.081771174	1.228197496	334,962	kWh	*Source: EBCE*	1,142,939	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	Leg-Adjusted	Population	1.081771174	1.228197496	185,915	kWh	*Source: EBCE*	634,367	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	Leg-Adjusted	Population	1.081771174	1.228197496	280,480,186	kWh	*Source: EBCE*	957,038,078	2,143	1	0	2,175
2040	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.022355413	0.904602646	43,885	kWh	*Source: EBCE*	149,741	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.022355413	0.904602646	2,548,410	kWh	*Source: EBCE*	8,695,537	-	-	-	-
2040	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.022355413	0.904602646	170,607,694	kWh	*Source: EBCE*	582,137,588	1,304	0	0	1,323
2040	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	Leg-Adjusted	Employment	1.022355413	1	19,577,609	scf	*Source: ICE Data; provided by BAAQMD*	20,086,627	1,066	0	0	1,071
2045	Building Energy	Building Energy	Electricity	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.101240501	1.228197496	21,688,809	kWh	*Source: PG&E; provided by Alameda County*	74,005,284	-	-	-	-
2045	Building Energy	Building Energy	Electricity	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.027678131	0.904602646	85,343,092	kWh	*Source: PG&E; provided by Alameda County and Ei*	291,202,704	-	-	-	-
2045	Building Energy	Building Energy	Natural Gas	PG&E	Residential	NA	NA	Leg-Adjusted	Population	1.101240501	0.671114514	21,358,084	**therm**	*Source: PG&E; provided by Alameda County*	2,135,298,443	113,326	10	0	113,664
2045	Building Energy	Building Energy	Natural Gas	PG&E	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.027678131	0.890137394	8,631,778	**therm**	*Source: PG&E; provided by Alameda County*	862,971,666	45,800	4	0	45,937
2045	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Residential	NA	NA	Leg-Adjusted	Population	1.101240501	1.228197496	342,241	kWh	*Source: EBCE*	1,167,775	-	-	-	-

2045	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Residential	NA	NA	Leg-Adjusted	Population	1.101240501	1.228197496	189,954	kWh	*Source: EBCE*	648,151	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Residential	NA	NA	Leg-Adjusted	Population	1.101240501	1.228197496	286,574,972	kWh	*Source: EBCE*	977,834,350	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Renewable 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.027678131	0.904602646	44,092	kWh	*Source: EBCE*	150,448	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Brilliant 100	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.027678131	0.904602646	2,560,438	kWh	*Source: EBCE*	8,736,575	-	-	-	-
2045	Building Energy	Building Energy	Electricity	EBCE Bright Choice	Non-Residential	NA	NA	Leg-Adjusted	Employment	1.027678131	0.904602646	171,412,877	kWh	*Source: EBCE*	584,884,988	-	-	-	-
2045	Building Energy	Building Energy	Natural Gas	NA	Backup Generator	NA	NA	Leg-Adjusted	Employment	1.027678131	1	19,679,536	scf	*Source: ICE Data; provided by BAAQMD*	20,191,204	1,071	0	0	1,077

Off-Road Vehicles and Equipment

Year	Emissions Sector	Calculation Sector	Sub-Sector	Jurisdiction Scaling Method	Jurisdiction Scaling Factor	Notes	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	MT CO2	MT CH4	MT N2O	MT CO2e	Uses OFFROAD 2007 for CO2?
2019	Off-Road	OffRoad Equipment	Agricultural Offroad	Agricultural Acres	1.00	Source: OFFROAD2021	17.35	0.00132		15.74	1.20E-03	0.00E+00	5,761	FALSE
2019	Off-Road	OffRoad Equipment	Construction and Mining	Service Population	0.07	Source: OFFROAD2021	12.27	0.00078		11.13	7.07E-04	0.00E+00	4,072	FALSE
2019	Off-Road	OffRoad Equipment	Industrial	Employment	0.03	Source: OFFROAD2021	6.49	0.00197		5.89	1.78E-03	0.00E+00	2,169	FALSE
2019	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	Population	0.09	Source: OFFROAD2021	7.13	0.01039		6.46	9.43E-03	0.00E+00	2,457	FALSE
2019	Off-Road	OffRoad Equipment	Light Commercial Equipment	Employment	0.034	Source: OFFROAD2021	3.97	0.00101		3.60	9.14E-04	0.00E+00	1,324	FALSE
2019	Off-Road	OffRoad Equipment	Pleasure Craft	Population	0.09	Source: OFFROAD2021	2.36	0.00113		2.14	1.02E-03	0.00E+00	792	FALSE
2019	Off-Road	OffRoad Equipment	Portable Equipment	Employment	0.03	Source: OFFROAD2021	6.20	0.00071		5.63	6.40E-04	0.00E+00	2,063	FALSE
2019	Off-Road	OffRoad Equipment	Recreational Equipment	Population	0.09	Source: OFFROAD2021	1.58	0.01078		1.43	9.78E-03	0.00E+00	624	FALSE
2019	Off-Road	OffRoad Equipment	Transport Refrigeration Units	Service Population	0.07	Source: OFFROAD2021	10.92	0.00080		9.90	7.21E-04	0.00E+00	3,625	FALSE
2019	Off-Road	OffRoad Equipment	Forestry		0.00	Source: OFFROAD2021 - None in Alameda County	0.00	0.00000		0.00	0.00E+00	0.00E+00	-	TRUE
2019	Off-Road	OffRoad Equipment	Airport Ground Support		0.00	Source: OFFROAD2021 - None in unincorporated county, so	0.00	0.00		0.00	0.00E+00	0.00E+00	-	FALSE
2019	Off-Road	OffRoad Equipment	Cargo Handling Equipment		0.00	Source: OFFROAD2021 - None in unincorporated county, so	0.00	0.00		0.00	0.00E+00	0.00E+00	-	FALSE
2019	Off-Road	OffRoad Equipment	Commercial Harbor Craft		0.00	Source: OFFROAD2021 - None in unincorporated county, so	0.00	0.00		0.00	0.00E+00	0.00E+00	-	FALSE
2019	Off-Road	OffRoad Equipment	Railyard Operations		0.00	Source: OFFROAD2021 - None in unincorporated county, so	0.00	0.00		0.00	0.00E+00	0.00E+00	-	FALSE
2019	Off-Road	OffRoad Equipment	Oil Drilling		0.00	Source: OFFROAD2021 - None in unincorporated county, so	0.00	0.00		0.00	0.00E+00	0.00E+00	-	FALSE

Year	Emissions Sector	Calculation Sector	Sub-Sector	BAU or Leg-Adjusted?	Jurisdiction Scaling Method	Activity Growth Method	Jurisdiction Scaling Factor	Activity Growth Factor	Legislative Adjustment	Notes	CO2 (tons/day)	CH4 (tons/day)	N2O (tons/day)	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Off-Road	OffRoad Equipment	Agricultural Offroad	BAU	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00		15.74	1.20E-03	0.00E+00	5,761
2030	Off-Road	OffRoad Equipment	Construction and Mining	BAU	Service Population	Service Population	0.07	1.04	1	Source: OFFROAD2021	12.81	0.00		11.62	7.39E-04	0.00E+00	4,253
2030	Off-Road	OffRoad Equipment	Industrial	BAU	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	6.55	0.00		5.95	1.80E-03	0.00E+00	2,190
2030	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	BAU	Population	Population	0.09	1.05	1	Source: OFFROAD2021	7.49	0.01		6.79	9.91E-03	0.00E+00	2,582
2030	Off-Road	OffRoad Equipment	Light Commercial Equipment	BAU	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	4.01	0.00		3.64	9.23E-04	0.00E+00	1,337
2030	Off-Road	OffRoad Equipment	Pleasure Craft	BAU	Population	Population	0.09	1.05	1	Source: OFFROAD2021	2.48	0.00		2.25	1.08E-03	0.00E+00	832
2030	Off-Road	OffRoad Equipment	Portable Equipment	BAU	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	6.27	0.00		5.68	6.47E-04	0.00E+00	2,083
2030	Off-Road	OffRoad Equipment	Recreational Equipment	BAU	Population	Population	0.09	1.05	1	Source: OFFROAD2021	1.66	0.01		1.51	1.03E-02	0.00E+00	655
2030	Off-Road	OffRoad Equipment	Transport Refrigeration Units	BAU	Service Population	Service Population	0.07	1.04	1	Source: OFFROAD2021	11.40	0.00		10.34	7.54E-04	0.00E+00	3,786
2030	Off-Road	OffRoad Equipment	Forestry	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Airport Ground Support	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Cargo Handling Equipment	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Commercial Harbor Craft	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Railyard Operations	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Oil Drilling	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Agricultural Offroad	BAU	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00		15.74	1.20E-03	0.00E+00	5,761
2040	Off-Road	OffRoad Equipment	Construction and Mining	BAU	Service Population	Service Population	0.07	1.07	1	Source: OFFROAD2021	13.16	0.00		11.94	7.58E-04	0.00E+00	4,367
2040	Off-Road	OffRoad Equipment	Industrial	BAU	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	6.63	0.00		6.02	1.82E-03	0.00E+00	2,217
2040	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	BAU	Population	Population	0.08	1.08	1	Source: OFFROAD2021	7.71	0.01		6.99	1.02E-02	0.00E+00	2,658
2040	Off-Road	OffRoad Equipment	Light Commercial Equipment	BAU	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	4.06	0.00		3.68	9.35E-04	0.00E+00	1,354
2040	Off-Road	OffRoad Equipment	Pleasure Craft	BAU	Population	Population	0.08	1.08	1	Source: OFFROAD2021	2.55	0.00		2.31	1.11E-03	0.00E+00	857
2040	Off-Road	OffRoad Equipment	Portable Equipment	BAU	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	6.34	0.00		5.75	6.55E-04	0.00E+00	2,109
2040	Off-Road	OffRoad Equipment	Recreational Equipment	BAU	Population	Population	0.08	1.08	1	Source: OFFROAD2021	1.71	0.01		1.55	1.06E-02	0.00E+00	675
2040	Off-Road	OffRoad Equipment	Transport Refrigeration Units	BAU	Service Population	Service Population	0.07	1.07	1	Source: OFFROAD2021	11.71	0.00		10.62	7.74E-04	0.00E+00	3,887
2040	Off-Road	OffRoad Equipment	Forestry	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Airport Ground Support	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Cargo Handling Equipment	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Commercial Harbor Craft	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Railyard Operations	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Oil Drilling	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Agricultural Offroad	BAU	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00		15.74	1.20E-03	0.00E+00	5,761
2045	Off-Road	OffRoad Equipment	Construction and Mining	BAU	Service Population	Service Population	0.06	1.09	1	Source: OFFROAD2021	13.37	0.00		12.13	7.71E-04	0.00E+00	4,437
2045	Off-Road	OffRoad Equipment	Industrial	BAU	Employment	Employment	0.03	1.03	1	Source: OFFROAD2021	6.67	0.00		6.05	1.83E-03	0.00E+00	2,229
2045	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	BAU	Population	Population	0.08	1.10	1	Source: OFFROAD2021	7.85	0.01		7.12	1.04E-02	0.00E+00	2,706
2045	Off-Road	OffRoad Equipment	Light Commercial Equipment	BAU	Employment	Employment	0.03	1.03	1	Source: OFFROAD2021	4.08	0.00		3.70	9.39E-04	0.00E+00	1,361
2045	Off-Road	OffRoad Equipment	Pleasure Craft	BAU	Population	Population	0.08	1.10	1	Source: OFFROAD2021	2.60	0.00		2.36	1.13E-03	0.00E+00	872
2045	Off-Road	OffRoad Equipment	Portable Equipment	BAU	Employment	Employment	0.03	1.03	1	Source: OFFROAD2021	6.38	0.00		5.78	6.58E-04	0.00E+00	2,120
2045	Off-Road	OffRoad Equipment	Recreational Equipment	BAU	Population	Population	0.08	1.10	1	Source: OFFROAD2021	1.74	0.01		1.58	1.08E-02	0.00E+00	687
2045	Off-Road	OffRoad Equipment	Transport Refrigeration Units	BAU	Service Population	Service Population	0.06	1.09	1	Source: OFFROAD2021	11.90	0.00		10.79	7.86E-04	0.00E+00	3,950
2045	Off-Road	OffRoad Equipment	Forestry	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Airport Ground Support	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Cargo Handling Equipment	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Commercial Harbor Craft	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Railyard Operations	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Oil Drilling	BAU			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00		0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Agricultural Offroad	Leg-Adjusted	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00		15.74	1.20E-03	0.00E+00	5,761
2030	Off-Road	OffRoad Equipment	Construction and Mining	Leg-Adjusted	Service Population	Service Population	0.07	1.04	1	Source: OFFROAD2021	12.81	0.00		11.62	7.39E-04	0.00E+00	4,253
2030	Off-Road	OffRoad Equipment	Industrial	Leg-Adjusted	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	6.55	0.00		5.95	1.80E-03	0.00E+00	2,190
2030	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	Leg-Adjusted	Population	Population	0.09	1.05	1	Source: OFFROAD2021	7.49	0.01		6.79	9.91E-03	0.00E+00	2,582
2030	Off-Road	OffRoad Equipment	Light Commercial Equipment	Leg-Adjusted	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	4.01	0.00		3.64	9.23E-04	0.00E+00	1,337
2030	Off-Road	OffRoad Equipment	Pleasure Craft	Leg-Adjusted	Population	Population	0.09	1.05	1	Source: OFFROAD2021	2.48	0.00		2.25	1.08E-03	0.00E+00	832
2030	Off-Road	OffRoad Equipment	Portable Equipment	Leg-Adjusted	Employment	Employment	0.03	1.01	1	Source: OFFROAD2021	6.27	0.00		5.68	6.47E-04	0.00E+00	2,083
2030	Off-Road	OffRoad Equipment	Recreational Equipment	Leg-Adjusted	Population	Population	0.09	1.05	1	Source: OFFROAD2021	1.66	0.01		1.51	1.03E-02	0.00E+00	655
2030	Off-Road	OffRoad Equipment	Transport Refrigeration Units	Leg-Adjusted	Service Population	Service Population	0.07	1.04	1	Source: OFFROAD2021	11.40	0.00		10.34	7.54E-04	0.00E+00	3,786
2030	Off-Road	OffRoad Equipment	Forestry	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00		0.00	0.00E+00	0.00E+00	-

2030	Off-Road	OffRoad Equipment	Airport Ground Support	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Cargo Handling Equipment	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Commercial Harbor Craft	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Railyard Operations	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2030	Off-Road	OffRoad Equipment	Oil Drilling	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Agricultural Offroad	Leg-Adjusted	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00	15.74	1.20E-03	0.00E+00	5,761
2040	Off-Road	OffRoad Equipment	Construction and Mining	Leg-Adjusted	Service Population	Service Population	0.07	1.07	1	Source: OFFROAD2021	13.16	0.00	11.94	7.58E-04	0.00E+00	4,367
2040	Off-Road	OffRoad Equipment	Industrial	Leg-Adjusted	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	6.63	0.00	6.02	1.82E-03	0.00E+00	2,217
2040	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	Leg-Adjusted	Population	Population	0.08	1.08	1	Source: OFFROAD2021	7.71	0.01	6.99	1.02E-02	0.00E+00	2,658
2040	Off-Road	OffRoad Equipment	Light Commercial Equipment	Leg-Adjusted	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	4.06	0.00	3.68	9.35E-04	0.00E+00	1,354
2040	Off-Road	OffRoad Equipment	Pleasure Craft	Leg-Adjusted	Population	Population	0.08	1.08	1	Source: OFFROAD2021	2.55	0.00	2.31	1.11E-03	0.00E+00	857
2040	Off-Road	OffRoad Equipment	Portable Equipment	Leg-Adjusted	Employment	Employment	0.03	1.02	1	Source: OFFROAD2021	6.34	0.00	5.75	6.55E-04	0.00E+00	2,109
2040	Off-Road	OffRoad Equipment	Recreational Equipment	Leg-Adjusted	Population	Population	0.08	1.08	1	Source: OFFROAD2021	1.71	0.01	1.55	1.06E-02	0.00E+00	675
2040	Off-Road	OffRoad Equipment	Transport Refrigeration Units	Leg-Adjusted	Service Population	Service Population	0.07	1.07	1	Source: OFFROAD2021	11.71	0.00	10.62	7.74E-04	0.00E+00	3,887
2040	Off-Road	OffRoad Equipment	Forestry	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Airport Ground Support	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Cargo Handling Equipment	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Commercial Harbor Craft	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Railyard Operations	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2040	Off-Road	OffRoad Equipment	Oil Drilling	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Agricultural Offroad	Leg-Adjusted	Agricultural Acres	Agricultural Acres	1.00	1.00	1	Source: OFFROAD2021	17.35	0.00	15.74	1.20E-03	0.00E+00	5,761
2045	Off-Road	OffRoad Equipment	Construction and Mining	Leg-Adjusted	Service Population	Service Population	0.06	1.09	1.000222331	Source: OFFROAD2021	13.37	0.00	12.13	7.71E-04	0.00E+00	4,438
2045	Off-Road	OffRoad Equipment	Industrial	Leg-Adjusted	Employment	Employment	0.03	1.03	0.999622799	Source: OFFROAD2021	6.67	0.00	6.05	1.83E-03	0.00E+00	2,228
2045	Off-Road	OffRoad Equipment	Lawn and Garden Equipment	Leg-Adjusted	Population	Population	0.08	1.10	1	Source: OFFROAD2021	7.85	0.01	7.12	1.04E-02	0.00E+00	2,706
2045	Off-Road	OffRoad Equipment	Light Commercial Equipment	Leg-Adjusted	Employment	Employment	0.03	1.03	1.003847998	Source: OFFROAD2021	4.09	0.00	3.71	9.43E-04	0.00E+00	1,366
2045	Off-Road	OffRoad Equipment	Pleasure Craft	Leg-Adjusted	Population	Population	0.08	1.10	1	Source: OFFROAD2021	2.60	0.00	2.36	1.13E-03	0.00E+00	872
2045	Off-Road	OffRoad Equipment	Portable Equipment	Leg-Adjusted	Employment	Employment	0.03	1.03	1	Source: OFFROAD2021	6.38	0.00	5.78	6.58E-04	0.00E+00	2,120
2045	Off-Road	OffRoad Equipment	Recreational Equipment	Leg-Adjusted	Population	Population	0.08	1.10	1	Source: OFFROAD2021	1.74	0.01	1.58	1.08E-02	0.00E+00	687
2045	Off-Road	OffRoad Equipment	Transport Refrigeration Units	Leg-Adjusted	Service Population	Service Population	0.06	1.09	1	Source: OFFROAD2021	11.90	0.00	10.79	7.86E-04	0.00E+00	3,950
2045	Off-Road	OffRoad Equipment	Forestry	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in Alameda County	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Airport Ground Support	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Cargo Handling Equipment	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Commercial Harbor Craft	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Railyard Operations	Leg-Adjusted			0.00	0.00	1	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-
2045	Off-Road	OffRoad Equipment	Oil Drilling	Leg-Adjusted			0.00	0.00	1.001250998	Source: OFFROAD2021 - None in unincorporated county	0.00	0.00	0.00	0.00E+00	0.00E+00	-

On-Road Transportation

Year	Emissions Sector	Calculation Sector	Sub-Sector	EMFAC Categories	Annual VMT
2019	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	990,400,637
2019	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	241,928,896

Year	Emissions Sector	Calculation Sector	Sub-Sector	EMFAC Categories	BAU or Leg-Adjust
2030	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	BAU
2030	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	BAU
2040	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	BAU
2040	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	BAU
2045	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	BAU
2045	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	BAU
2030	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	Leg-Adjusted
2030	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	Leg-Adjusted
2040	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	Leg-Adjusted
2040	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	Leg-Adjusted
2045	On-Road	On-Road	Passenger	LDA, LDT1, LDT2, MCY	Leg-Adjusted
2045	On-Road	On-Road	Commercial	All Other Buses, LHD1, LHD2, MDV, MH, Motor Coach, OBUS, PTO, SBUS, T6 CAIRP heavy, T6 CAIRP small, T6 instate he	Leg-Adjusted

Notes	g CO2e per mi	MT CO2e
Countywide VMT and emissions factor data for Alameda County, including incorporated areas, were obtained from CARB's EMFAC2021 model. Unincorporated county VMT was estimated using the proportion of households in the unincorporated county compared to the entire county. Households data were obtained from the Plan Bay Area 2040 data portal.	347	343,274
Countywide VMT and emissions factor data for Alameda County, including incorporated areas, were obtained from CARB's EMFAC2021 model. Unincorporated county VMT was estimated using the proportion of households in the unincorporated county compared to the entire county. Households data were obtained from the Plan Bay Area 2040 data portal.	1,442	348,864

Activity Growth Method	Activity Growth Factor	Annual VMT	Notes	g CO2e per mi	MT CO2e
Service Population	1.04	1,083,686,195	Countywide VMT and emissions factor	347	375,607
Employment	1.01	302,528,919	Countywide VMT and emissions factor	1,442	436,250
Service Population	1.07	1,150,824,834	Countywide VMT and emissions factor	347	398,878
Employment	1.02	352,126,533	Countywide VMT and emissions factor	1,442	507,770
Service Population	1.09	1,183,252,646	Countywide VMT and emissions factor	347	410,117
Employment	1.03	372,160,733	Countywide VMT and emissions factor	1,442	536,659
Service Population	1.04	1,083,686,195	Countywide VMT and emissions factor	236	255,967
Employment	1.01	302,528,919	Countywide VMT and emissions factor	1,178	356,249
Service Population	1.07	1,150,824,834	Countywide VMT and emissions factor	87	99,907
Employment	1.02	352,126,533	Countywide VMT and emissions factor	901	317,306
Service Population	1.09	1,183,252,646	Countywide VMT and emissions factor	44	52,590
Employment	1.03	372,160,733	Countywide VMT and emissions factor	844	313,937

Agriculture - Livestock

Year	Emissions Sector	Sub-Sector	Livestock Type	Heads	Enteric Fermentation Factor (kg CH4/head)	Manure Management (kg CH4/head)	Manure Management (kg N2O/head)	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Agriculture	Livestock	Cattle and Calves	13,624	69	2	0.0	2019 Alameda County Crop Report	-	955.58	-	26,660.67
2019	Agriculture	Livestock	Sheep and Lambs	737	8	0.7	0.4	USDA 2017 Census of Agriculture	-	6.42	0.29	259.52
2019	Agriculture	Livestock	Goats	1,414	5	0.4	0.4	USDA 2017 Census of Agriculture	-	7.60	0.53	356.18
2019	Agriculture	Livestock	Layers	1,366	0	0.2	0.02	USDA 2017 Census of Agriculture	-	0.21	0.02	12.65
2019	Agriculture	Livestock	Horses	1,158	18	3.3	1.3	USDA 2017 Census of Agriculture	-	24.65	1.55	1,111.71
									-	-	-	

Year	Emissions Sector	Sub-Sector	Livestock Type	BAU or Leg-Adjust	Activity Growth Factor	Heads	Enteric Fermentation Factor (kg CH4/head)	Manure Management (kg CH4/head)	Manure Management (kg N2O/head)	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Agriculture	Livestock	Cattle and Calves	BAU	1	13,624	69	2	0.0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2030	Agriculture	Livestock	Sheep and Lambs	BAU	1	737	8	0.7	0.4	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2030	Agriculture	Livestock	Goats	BAU	1	1,414	5	0.4	0.4	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2030	Agriculture	Livestock	Layers	BAU	1	1,366	0	0.2	0.02	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2030	Agriculture	Livestock	Horses	BAU	1	1,158	18	3.3	1.3	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71
2040	Agriculture	Livestock	Cattle and Calves	BAU	1	13,624	69	2	0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2040	Agriculture	Livestock	Sheep and Lambs	BAU	1	737	8	1	0	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2040	Agriculture	Livestock	Goats	BAU	1	1,414	5	0	0	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2040	Agriculture	Livestock	Layers	BAU	1	1,366	0	0	0	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2040	Agriculture	Livestock	Horses	BAU	1	1,158	18	3	1	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71
2045	Agriculture	Livestock	Cattle and Calves	BAU	1	13,624	69	2	0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2045	Agriculture	Livestock	Sheep and Lambs	BAU	1	737	8	1	0	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2045	Agriculture	Livestock	Goats	BAU	1	1,414	5	0	0	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2045	Agriculture	Livestock	Layers	BAU	1	1,366	0	0	0	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2045	Agriculture	Livestock	Horses	BAU	1	1,158	18	3	1	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71
2030	Agriculture	Livestock	Cattle and Calves	Leg-Adjusted	1	13,624	69	2	0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2030	Agriculture	Livestock	Sheep and Lambs	Leg-Adjusted	1	737	8	1	0	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2030	Agriculture	Livestock	Goats	Leg-Adjusted	1	1,414	5	0	0	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2030	Agriculture	Livestock	Layers	Leg-Adjusted	1	1,366	0	0	0	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2030	Agriculture	Livestock	Horses	Leg-Adjusted	1	1,158	18	3	1	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71
2040	Agriculture	Livestock	Cattle and Calves	Leg-Adjusted	1	13,624	69	2	0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2040	Agriculture	Livestock	Sheep and Lambs	Leg-Adjusted	1	737	8	1	0	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2040	Agriculture	Livestock	Goats	Leg-Adjusted	1	1,414	5	0	0	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2040	Agriculture	Livestock	Layers	Leg-Adjusted	1	1,366	0	0	0	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2040	Agriculture	Livestock	Horses	Leg-Adjusted	1	1,158	18	3	1	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71
2045	Agriculture	Livestock	Cattle and Calves	Leg-Adjusted	1	13,624	69	2	0	2019 Alameda County Crop Rep	-	955.58	-	26,660.67
2045	Agriculture	Livestock	Sheep and Lambs	Leg-Adjusted	1	737	8	1	0	USDA 2017 Census of Agricultur	-	6.42	0.29	259.52
2045	Agriculture	Livestock	Goats	Leg-Adjusted	1	1,414	5	0	0	USDA 2017 Census of Agricultur	-	7.60	0.53	356.18
2045	Agriculture	Livestock	Layers	Leg-Adjusted	1	1,366	0	0	0	USDA 2017 Census of Agricultur	-	0.21	0.02	12.65
2045	Agriculture	Livestock	Horses	Leg-Adjusted	1	1,158	18	3	1	USDA 2017 Census of Agricultur	-	24.65	1.55	1,111.71

Agriculture - Other

Year	Emissions Sector	Sub-Sector	Activity	Activity Level	Units	g CO2 per Unit	g CH4 per Unit	g N2O per Unit	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Agriculture	Fertilizer Application	Lime	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2019	Agriculture	Fertilizer Application	Nitrogen	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848

Year	Emissions Sector	Sub-Sector	Activity	BAU or Leg-Adjusted?	Activity Growth Method	Activity Growth Factor	Activity Level	Units	g CO2 per Unit	g CH4 per Unit	g N2O per Unit	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Agriculture	Fertilizer Application	Lime	BAU	Agricultural Acres	1.00	98	tons				*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	-	-	-	-
2030	Agriculture	Fertilizer Application	Nitrogen	BAU	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848
2040	Agriculture	Fertilizer Application	Lime	BAU	Agricultural Acres	1.00	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2040	Agriculture	Fertilizer Application	Nitrogen	BAU	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848
2045	Agriculture	Fertilizer Application	Lime	BAU	Agricultural Acres	1.00	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2045	Agriculture	Fertilizer Application	Nitrogen	BAU	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848
2030	Agriculture	Fertilizer Application	Lime	Leg-Adjusted	Agricultural Acres	1.00	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2030	Agriculture	Fertilizer Application	Nitrogen	Leg-Adjusted	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848
2040	Agriculture	Fertilizer Application	Lime	Leg-Adjusted	Agricultural Acres	1.00	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2040	Agriculture	Fertilizer Application	Nitrogen	Leg-Adjusted	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848
2045	Agriculture	Fertilizer Application	Lime	Leg-Adjusted	Agricultural Acres	1.00	98	tons	398,886			*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (Liming Materials)*	39.09	-	-	39
2045	Agriculture	Fertilizer Application	Nitrogen	Leg-Adjusted	Agricultural Acres	1.00	791	tons			17,820	*Source: CDFA 2019 Fertilizer Tonnage Report (https://www.cdfa.ca.gov/is/ffldrs/pdfs/2019_Tonnage.pdf) (All Nitrogen)*	-	-	14.10	3,848

Water

Year	Emissions Sector	Sub-Sector	Water District/Provider	Location	Extraction and Conveyance	Treatment	Water Use (AF/year)	Percent of Source Inside Jurisdiction	Utility (if applicable)	Notes	Fuel Use	Unit	Energy Use (kBTU)	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	11,155	0%	EBCE Bright Choice	*Source: EBMUD*	4,180,104	kWh	14,263,105	256	0.063	0	259.97
2019	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	3,896	0%	EBCE Bright Choice	*Source: Per capita estimate*	1,445,293	kWh	4,931,544	89	2.16E-02	2.62E-03	90
2019	Water	Water	ACPWA Wells	San Francisco	Groundwater		50	100%	EBCE Bright Choice	*Source: ACPWA*	17,600	kWh	60,054	-	-	-	-
2019	Water	Water	Zone 7 Wells	San Francisco	Groundwater		800	100%	EBCE Bright Choice	*Source: Zone 7*	281,600	kWh	960,859	-	0.00E+00	0.00E+00	-

Year	Emissions Sector	Sub-Sector	Water District/Provider	Location	Extraction and Conveyance	Treatment	Activity Growth Method	Activity Growth Factor	BAU or Leg-Adjusted?	Legislative Adjustment	Water Use (AF/year)	Percent of Source Inside Jurisdiction	Utility (if applicable)	Notes	Fuel Use	Unit	Energy Use (kBTU)	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.044401179	BAU	1	11,650	0%	EBCE Bright Choic	*Source: EBMUD*	4,365,705.12	kWh	14,896,404	268	0	0	272
2030	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.044401179	BAU	1	4,069	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,509,465.62	kWh	5,150,510	93	0	0	94
2030	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.044401179	BAU	1	52	100%	EBCE Bright Choic	*Source: ACPWA*	18,381.46	kWh	62,720	-	-	-	-
2030	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.044401179	BAU	1	836	100%	EBCE Bright Choic	*Source: Zone 7*	294,103.37	kWh	1,003,522	-	-	-	-
2040	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.072442606	BAU	1	11,963	0%	EBCE Bright Choic	*Source: EBMUD*	4,482,921.19	kWh	15,296,361	275	0	0	279
2040	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.072442606	BAU	1	4,178	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,549,993.70	kWh	5,288,798	95	0	0	96
2040	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.072442606	BAU	1	54	100%	EBCE Bright Choic	*Source: ACPWA*	18,874.99	kWh	64,404	-	-	-	-
2040	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.072442606	BAU	1	858	100%	EBCE Bright Choic	*Source: Zone 7*	301,999.84	kWh	1,030,466	-	-	-	-
2045	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.089690845	BAU	1	12,156	0%	EBCE Bright Choic	*Source: EBMUD*	4,555,020.62	kWh	15,542,375	279	0	0	283
2045	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.089690845	BAU	1	4,245	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,574,922.46	kWh	5,373,858	97	0	0	98
2045	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.089690845	BAU	1	54	100%	EBCE Bright Choic	*Source: ACPWA*	19,178.56	kWh	65,440	-	-	-	-
2045	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.089690845	BAU	1	872	100%	EBCE Bright Choic	*Source: Zone 7*	306,856.94	kWh	1,047,039	-	-	-	-
2030	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.044401179	Leg-Adjusted	1	11,650	0%	EBCE Bright Choic	*Source: EBMUD*	4,365,705.12	kWh	14,896,404	148	0	0	150
2030	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.044401179	Leg-Adjusted	1	4,069	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,509,465.62	kWh	5,150,510	51	0	0	52
2030	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.044401179	Leg-Adjusted	1	52	100%	EBCE Bright Choic	*Source: ACPWA*	18,381.46	kWh	62,720	-	-	-	-
2030	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.044401179	Leg-Adjusted	1	836	100%	EBCE Bright Choic	*Source: Zone 7*	294,103.37	kWh	1,003,522	-	-	-	-
2040	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.072442606	Leg-Adjusted	1	11,963	0%	EBCE Bright Choic	*Source: EBMUD*	4,482,921.19	kWh	15,296,361	34	0	0	35
2040	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.072442606	Leg-Adjusted	1	4,178	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,549,993.70	kWh	5,288,798	12	0	0	12
2040	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.072442606	Leg-Adjusted	1	54	100%	EBCE Bright Choic	*Source: ACPWA*	18,874.99	kWh	64,404	-	-	-	-
2040	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.072442606	Leg-Adjusted	1	858	100%	EBCE Bright Choic	*Source: Zone 7*	301,999.84	kWh	1,030,466	-	-	-	-
2045	Water	Water	EBMUD	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.089690845	Leg-Adjusted	1	12,156	0%	EBCE Bright Choic	*Source: EBMUD*	4,555,020.62	kWh	15,542,375	-	-	-	-
2045	Water	Water	Zone 7 and SFPUC	San Francisco	Local Imported	Conventional Potable Treatment	Service Population	1.089690845	Leg-Adjusted	1	4,245	0%	EBCE Bright Choic	*Source: Per capita estimate*	1,574,922.46	kWh	5,373,858	-	-	-	-
2045	Water	Water	ACPWA Wells	San Francisco	Groundwater		Service Population	1.089690845	Leg-Adjusted	1	54	100%	EBCE Bright Choic	*Source: ACPWA*	19,178.56	kWh	65,440	-	-	-	-
2045	Water	Water	Zone 7 Wells	San Francisco	Groundwater		Service Population	1.089690845	Leg-Adjusted	1	872	100%	EBCE Bright Choic	*Source: Zone 7*	306,856.94	kWh	1,047,039	-	-	-	-

Wastewater Treatment

Year	Emissions Sector	Sub-Sector	WWTP Name	WWTP Process	WW Equation	Digester Gas (ft3/day)	Fraction of CH4 in Biogas	Population Served	BTU Content of biogas	Mass of incinerated biosolids	FP	BOD5 Load (kg BOD5/day)	N Load (kg N/day)	Methanol Load (MT CH3OH/day)	Sludge Treatment Type	F_ind-com	EF_effluent	N uptake	Natural Gas (therms)	Electricity (kWh)	Utility (if applicable)	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7			144,924								1.25						*Source: Natasha Brown at Oro Loma (Popul*	-	-	1.268	346.2
2019	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12								62.28				0.0025					*Source: Natasha Brown at Oro Loma*	-	-	0.08937	24
2019	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6						0.985	9651.75										*Source: Natasha Brown at Oro Loma*	-	25.382	-	708.2
2019	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)			10,950														*Source: Alameda County (3750 septic tanks*	-	47.514	-	1,326

Year	Emissions Sector	Sub-Sector	WWTP Name	WWTP Process	WW Equation	Activity Growth Method	Activity Growth Factor	BAU or Leg-Adjusted?	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.04	BAU	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	362
2030	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.04	BAU	*Source: Natasha Brown at Oro Loma*	-	-	0	25
2030	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.04	BAU	*Source: Natasha Brown at Oro Loma*	-	27	-	740
2030	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.04	BAU	*Source: Alameda County (3750 septic tank*	-	50	-	1,384
2040	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.07	BAU	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	371
2040	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.07	BAU	*Source: Natasha Brown at Oro Loma*	-	-	0	26
2040	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.07	BAU	*Source: Natasha Brown at Oro Loma*	-	27	-	759
2040	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.07	BAU	*Source: Alameda County (3750 septic tank*	-	51	-	1,422
2045	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.09	BAU	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	377
2045	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.09	BAU	*Source: Natasha Brown at Oro Loma*	-	-	0	27
2045	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.09	BAU	*Source: Natasha Brown at Oro Loma*	-	28	-	772
2045	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.09	BAU	*Source: Alameda County (3750 septic tank*	-	52	-	1,445
2030	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.04	Leg-Adjusted	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	362
2030	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.04	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	-	0	25
2030	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.04	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	27	-	740
2030	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.04	Leg-Adjusted	*Source: Alameda County (3750 septic tank*	-	50	-	1,384
2040	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.07	Leg-Adjusted	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	371
2040	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.07	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	-	0	26
2040	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.07	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	27	-	759
2040	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.07	Leg-Adjusted	*Source: Alameda County (3750 septic tank*	-	51	-	1,422
2045	Wastewater	WWTP	Oro Loma Sanitar	Process Nitrous Oxide Emissions from Wastewater Treatment Plants with Nitrification or Denitrification	WW.7	Service Population	1.09	Leg-Adjusted	*Source: Natasha Brown at Oro Loma (Popu*	-	-	1	377
2045	Wastewater	WWTP	Oro Loma Sanitar	Fugitive Nitrous Oxide Emissions from Effluent Discharge	WW.12	Service Population	1.09	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	-	0	27
2045	Wastewater	WWTP	Oro Loma Sanitar	Process Methane Emissions from Wastewater Treatment Lagoons (BOD5 Load and Fraction BOD5 Removed in Primary '	WW.6	Service Population	1.09	Leg-Adjusted	*Source: Natasha Brown at Oro Loma*	-	28	-	772
2045	Wastewater	Septic System	Septic Tanks	Fugitive Methane Emissions from Septic Systems (population method)	WW.11(alt)	Service Population	1.09	Leg-Adjusted	*Source: Alameda County (3750 septic tank*	-	52	-	1,445

Waste Generation

Year	Emissions Sector	Sub-Sector	Landfill Name	Annual Waste Tonnage Delivered from Jurisdiction	Annual ADC Tonnage Delivered from Jurisdiction	Percent of year under LFG collection	LFG Collection Efficiency	Oxidation Rate	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2019	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	50,563	6	100%	75%	10%	Source: CalRecycle Disposal by Facility, ADDED: Our RDRS (CalRecycle reporting) records for 2019 show 6.25 tons of ADC. Our contact at Altamont Landfill says that the change from 17,506 tons of ADC to 6.25 tons of ADC was due to re-characterization of materials that were incorrectly reported from Green Material ADC to Non-Green Material ADC, so 6.25 should be correct.		682.7		19,047
2019	Solid Waste	Waste Generation	Avenal Regional Landfill	36	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.5		14
2019	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	1	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.0		1
2019	Solid Waste	Waste Generation	Billy Wright Disposal Site	19	0	0%	0%	10%	Source: CalRecycle Disposal by Facility		1.0		28
2019	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	15	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		6
2019	Solid Waste	Waste Generation	Fink Road Landfill	9	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		3
2019	Solid Waste	Waste Generation	Foothill Sanitary Landfill	49	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.7		19
2019	Solid Waste	Waste Generation	Forward Landfill, Inc.	11	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2019	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	6	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		2
2019	Solid Waste	Waste Generation	Highway 59 Landfill	3	0	0%	0%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2019	Solid Waste	Waste Generation	John Smith Road Landfill	3,054	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		41.2		1,150
2019	Solid Waste	Waste Generation	Keller Canyon Landfill	153	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		2.1		58
2019	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	13	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		5
2019	Solid Waste	Waste Generation	L and D Landfill	44	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.6		16
2019	Solid Waste	Waste Generation	Monterey Peninsula Landfill	88	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		1.2		33
2019	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	17	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		7
2019	Solid Waste	Waste Generation	North County Landfill & Recycling Center	9	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		0
2019	Solid Waste	Waste Generation	Potrero Hills Landfill	725	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		9.8		15
2019	Solid Waste	Waste Generation	Recology Hay Road	24	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.3		1
2019	Solid Waste	Waste Generation	Redwood Landfill	0	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		-		-
2019	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	832	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		11.2		17
2019	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	6,294	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		85.0		132
2019	Solid Waste	Waste Generation	Yolo County Central Landfill	1	0	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.0		0
2019	Solid Waste	Waste Generation	Zanker Material Processing Facility	1	0	0%	0%	10%	Source: CalRecycle Disposal by Facility		0.0		0

Year	Emissions Sector	Sub-Sector	Landfill Name	BAU or Leg-Adjusted?	Activity Growth Method	Activity Growth Factor	Legislative Adjustment	Annual Waste Tonnage Delivered from Jurisdiction	Annual ADC Tonnage Delivered from Jurisdiction	Percent of year under LFG collection	LFG Collection Efficiency	Oxidation Rate	Notes	MT CO2	MT CH4	MT N2O	MT CO2e
2030	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	BAU	Service Population	1.04	1	52808	7	100%	75%	10%	Source: CalRecycle Disposal by Facility		713.0		19,893
2030	Solid Waste	Waste Generation	Avenal Regional Landfill	BAU	Service Population	1.04	1	38	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.5		14
2030	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	BAU	Service Population	1.04	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.0		1
2030	Solid Waste	Waste Generation	Billy Wright Disposal Site	BAU	Service Population	1.04	1	20	-	0%	0%	10%	Source: CalRecycle Disposal by Facility		1.1		30
2030	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	BAU	Service Population	1.04	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		6
2030	Solid Waste	Waste Generation	Fink Road Landfill	BAU	Service Population	1.04	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2030	Solid Waste	Waste Generation	Foothill Sanitary Landfill	BAU	Service Population	1.04	1	52	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.7		19
2030	Solid Waste	Waste Generation	Forward Landfill, Inc.	BAU	Service Population	1.04	1	11	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		4
2030	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	BAU	Service Population	1.04	1	6	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		2
2030	Solid Waste	Waste Generation	Highway 59 Landfill	BAU	Service Population	1.04	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility		0.2		4
2030	Solid Waste	Waste Generation	John Smith Road Landfill	BAU	Service Population	1.04	1	3190	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		43.1		1,201
2030	Solid Waste	Waste Generation	Keller Canyon Landfill	BAU	Service Population	1.04	1	160	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		2.2		60
2030	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	BAU	Service Population	1.04	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		5
2030	Solid Waste	Waste Generation	L and D Landfill	BAU	Service Population	1.04	1	46	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.6		17
2030	Solid Waste	Waste Generation	Monterey Peninsula Landfill	BAU	Service Population	1.04	1	92	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		1.2		35
2030	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	BAU	Service Population	1.04	1	18	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		7
2030	Solid Waste	Waste Generation	North County Landfill & Recycling Center	BAU	Service Population	1.04	1	9	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2030	Solid Waste	Waste Generation	Potrero Hills Landfill	BAU	Service Population	1.04	1	757	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		10.2		285
2030	Solid Waste	Waste Generation	Recology Hay Road	BAU	Service Population	1.04	1	25	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.3		10
2030	Solid Waste	Waste Generation	Redwood Landfill	BAU	Service Population	1.04	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		-		-
2030	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	BAU	Service Population	1.04	1	869	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		11.7		327
2030	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	BAU	Service Population	1.04	1	6574	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		88.7		2,476
2030	Solid Waste	Waste Generation	Yolo County Central Landfill	BAU	Service Population	1.04	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.0		0
2030	Solid Waste	Waste Generation	Zanker Material Processing Facility	BAU	Service Population	1.04	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility		0.1		1
2040	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	BAU	Service Population	1.07	1	54226	7	100%	75%	10%	Source: CalRecycle Disposal by Facility		732.1		20,427
2040	Solid Waste	Waste Generation	Avenal Regional Landfill	BAU	Service Population	1.07	1	39	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.5		15
2040	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	BAU	Service Population	1.07	1	2	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.0		1
2040	Solid Waste	Waste Generation	Billy Wright Disposal Site	BAU	Service Population	1.07	1	20	-	0%	0%	10%	Source: CalRecycle Disposal by Facility		1.1		31
2040	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	BAU	Service Population	1.07	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		6
2040	Solid Waste	Waste Generation	Fink Road Landfill	BAU	Service Population	1.07	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2040	Solid Waste	Waste Generation	Foothill Sanitary Landfill	BAU	Service Population	1.07	1	53	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.7		20
2040	Solid Waste	Waste Generation	Forward Landfill, Inc.	BAU	Service Population	1.07	1	11	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		4
2040	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	BAU	Service Population	1.07	1	7	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		3
2040	Solid Waste	Waste Generation	Highway 59 Landfill	BAU	Service Population	1.07	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility		0.2		4
2040	Solid Waste	Waste Generation	John Smith Road Landfill	BAU	Service Population	1.07	1	3275	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		44.2		1,234
2040	Solid Waste	Waste Generation	Keller Canyon Landfill	BAU	Service Population	1.07	1	165	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		2.2		62
2040	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	BAU	Service Population	1.07	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.2		5
2040	Solid Waste	Waste Generation	L and D Landfill	BAU	Service Population	1.07	1	47	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.6		18
2040	Solid Waste	Waste Generation	Monterey Peninsula Landfill	BAU	Service Population	1.07	1	94	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		1.3		35
2040	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	BAU	Service Population	1.07	1	19	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.3		7
2040	Solid Waste	Waste Generation	North County Landfill & Recycling Center	BAU	Service Population	1.07	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.1		4
2040	Solid Waste	Waste Generation	Potrero Hills Landfill	BAU	Service Population	1.07	1	778	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		10.5		293
2040	Solid Waste	Waste Generation	Recology Hay Road	BAU	Service Population	1.07	1	26	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		0.4		10
2040	Solid Waste	Waste Generation	Redwood Landfill	BAU	Service Population	1.07	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		-		-
2040	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	BAU	Service Population	1.07	1	892	-	100%	75%	10%	Source: CalRecycle Disposal by Facility		12.0		336

2040	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	BAU	Service Population	1.07	1	6750	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	91.1	2,542
2040	Solid Waste	Waste Generation	Yolo County Central Landfill	BAU	Service Population	1.07	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	0
2040	Solid Waste	Waste Generation	Zanker Material Processing Facility	BAU	Service Population	1.07	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.1	1
2045	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	BAU	Service Population	1.09	1	55098	7	100%	75%	10%	Source: CalRecycle Disposal by Facility	743.9	20,755
2045	Solid Waste	Waste Generation	Avenal Regional Landfill	BAU	Service Population	1.09	1	39	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.5	15
2045	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	BAU	Service Population	1.09	1	2	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	1
2045	Solid Waste	Waste Generation	Billy Wright Disposal Site	BAU	Service Population	1.09	1	21	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	1.1	31
2045	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	BAU	Service Population	1.09	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	6
2045	Solid Waste	Waste Generation	Fink Road Landfill	BAU	Service Population	1.09	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2045	Solid Waste	Waste Generation	Foothill Sanitary Landfill	BAU	Service Population	1.09	1	54	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.7	20
2045	Solid Waste	Waste Generation	Forward Landfill, Inc.	BAU	Service Population	1.09	1	12	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2045	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	BAU	Service Population	1.09	1	7	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	3
2045	Solid Waste	Waste Generation	Highway 59 Landfill	BAU	Service Population	1.09	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2045	Solid Waste	Waste Generation	John Smith Road Landfill	BAU	Service Population	1.09	1	3328	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	44.9	1,254
2045	Solid Waste	Waste Generation	Keller Canyon Landfill	BAU	Service Population	1.09	1	167	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	2.3	63
2045	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	BAU	Service Population	1.09	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2045	Solid Waste	Waste Generation	L and D Landfill	BAU	Service Population	1.09	1	48	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.6	18
2045	Solid Waste	Waste Generation	Monterey Peninsula Landfill	BAU	Service Population	1.09	1	96	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	1.3	36
2045	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	BAU	Service Population	1.09	1	19	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.3	7
2045	Solid Waste	Waste Generation	North County Landfill & Recycling Center	BAU	Service Population	1.09	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2045	Solid Waste	Waste Generation	Potrero Hills Landfill	BAU	Service Population	1.09	1	790	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	10.7	298
2045	Solid Waste	Waste Generation	Recology Hay Road	BAU	Service Population	1.09	1	27	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.4	10
2045	Solid Waste	Waste Generation	Redwood Landfill	BAU	Service Population	1.09	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	-	-
2045	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	BAU	Service Population	1.09	1	906	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	12.2	341
2045	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	BAU	Service Population	1.09	1	6859	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	92.6	2,583
2045	Solid Waste	Waste Generation	Yolo County Central Landfill	BAU	Service Population	1.09	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	0
2045	Solid Waste	Waste Generation	Zanker Material Processing Facility	BAU	Service Population	1.09	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.1	1
2030	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	Leg-Adjusted	Service Population	1.04	1	52808	7	100%	75%	10%	Source: CalRecycle Disposal by Facility	713.0	19,893
2030	Solid Waste	Waste Generation	Avenal Regional Landfill	Leg-Adjusted	Service Population	1.04	1	38	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.5	14
2030	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	Leg-Adjusted	Service Population	1.04	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	1
2030	Solid Waste	Waste Generation	Billy Wright Disposal Site	Leg-Adjusted	Service Population	1.04	1	20	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	1.1	30
2030	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	Leg-Adjusted	Service Population	1.04	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	6
2030	Solid Waste	Waste Generation	Fink Road Landfill	Leg-Adjusted	Service Population	1.04	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2030	Solid Waste	Waste Generation	Foothill Sanitary Landfill	Leg-Adjusted	Service Population	1.04	1	52	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.7	19
2030	Solid Waste	Waste Generation	Forward Landfill, Inc.	Leg-Adjusted	Service Population	1.04	1	11	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2030	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	Leg-Adjusted	Service Population	1.04	1	6	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	2
2030	Solid Waste	Waste Generation	Highway 59 Landfill	Leg-Adjusted	Service Population	1.04	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2030	Solid Waste	Waste Generation	John Smith Road Landfill	Leg-Adjusted	Service Population	1.04	1	3190	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	43.1	1,201
2030	Solid Waste	Waste Generation	Keller Canyon Landfill	Leg-Adjusted	Service Population	1.04	1	160	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	2.2	60
2030	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	Leg-Adjusted	Service Population	1.04	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2030	Solid Waste	Waste Generation	L and D Landfill	Leg-Adjusted	Service Population	1.04	1	46	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.6	17
2030	Solid Waste	Waste Generation	Monterey Peninsula Landfill	Leg-Adjusted	Service Population	1.04	1	92	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	1.2	35
2030	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	Leg-Adjusted	Service Population	1.04	1	18	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	7
2030	Solid Waste	Waste Generation	North County Landfill & Recycling Center	Leg-Adjusted	Service Population	1.04	1	9	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2030	Solid Waste	Waste Generation	Potrero Hills Landfill	Leg-Adjusted	Service Population	1.04	1	757	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	10.2	285
2030	Solid Waste	Waste Generation	Recology Hay Road	Leg-Adjusted	Service Population	1.04	1	25	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.3	10
2030	Solid Waste	Waste Generation	Redwood Landfill	Leg-Adjusted	Service Population	1.04	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	-	-
2030	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	Leg-Adjusted	Service Population	1.04	1	869	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	11.7	327
2030	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	Leg-Adjusted	Service Population	1.04	1	6574	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	88.7	2,476
2030	Solid Waste	Waste Generation	Yolo County Central Landfill	Leg-Adjusted	Service Population	1.04	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	0
2030	Solid Waste	Waste Generation	Zanker Material Processing Facility	Leg-Adjusted	Service Population	1.04	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.1	1
2040	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	Leg-Adjusted	Service Population	1.07	1	54226	7	100%	75%	10%	Source: CalRecycle Disposal by Facility	732.1	20,427
2040	Solid Waste	Waste Generation	Avenal Regional Landfill	Leg-Adjusted	Service Population	1.07	1	39	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.5	15
2040	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	Leg-Adjusted	Service Population	1.07	1	2	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	1
2040	Solid Waste	Waste Generation	Billy Wright Disposal Site	Leg-Adjusted	Service Population	1.07	1	20	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	1.1	31
2040	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	Leg-Adjusted	Service Population	1.07	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	6
2040	Solid Waste	Waste Generation	Fink Road Landfill	Leg-Adjusted	Service Population	1.07	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2040	Solid Waste	Waste Generation	Foothill Sanitary Landfill	Leg-Adjusted	Service Population	1.07	1	53	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.7	20
2040	Solid Waste	Waste Generation	Forward Landfill, Inc.	Leg-Adjusted	Service Population	1.07	1	11	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2040	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	Leg-Adjusted	Service Population	1.07	1	7	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	3
2040	Solid Waste	Waste Generation	Highway 59 Landfill	Leg-Adjusted	Service Population	1.07	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2040	Solid Waste	Waste Generation	John Smith Road Landfill	Leg-Adjusted	Service Population	1.07	1	3275	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	44.2	1,234
2040	Solid Waste	Waste Generation	Keller Canyon Landfill	Leg-Adjusted	Service Population	1.07	1	165	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	2.2	62
2040	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	Leg-Adjusted	Service Population	1.07	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2040	Solid Waste	Waste Generation	L and D Landfill	Leg-Adjusted	Service Population	1.07	1	47	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.6	18
2040	Solid Waste	Waste Generation	Monterey Peninsula Landfill	Leg-Adjusted	Service Population	1.07	1	94	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	1.3	35
2040	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	Leg-Adjusted	Service Population	1.07	1	19	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.3	7
2040	Solid Waste	Waste Generation	North County Landfill & Recycling Center	Leg-Adjusted	Service Population	1.07	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2040	Solid Waste	Waste Generation	Potrero Hills Landfill	Leg-Adjusted	Service Population	1.07	1	778	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	10.5	293
2040	Solid Waste	Waste Generation	Recology Hay Road	Leg-Adjusted	Service Population	1.07	1	26	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.4	10
2040	Solid Waste	Waste Generation	Redwood Landfill	Leg-Adjusted	Service Population	1.07	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	-	-
2040	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	Leg-Adjusted	Service Population	1.07	1	892	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	12.0	336
2040	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	Leg-Adjusted	Service Population	1.07	1	6750	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	91.1	2,542
2040	Solid Waste	Waste Generation	Yolo County Central Landfill	Leg-Adjusted	Service Population	1.07	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	0
2040	Solid Waste	Waste Generation	Zanker Material Processing Facility	Leg-Adjusted	Service Population	1.07	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.1	1
2045	Solid Waste	Waste Generation	Altamont Landfill & Resource Recovery	Leg-Adjusted	Service Population	1.09	1	55098	7	100%	75%	10%	Source: CalRecycle Disposal by Facility	743.9	20,755
2045	Solid Waste	Waste Generation	Avenal Regional Landfill	Leg-Adjusted	Service Population	1.09	1	39	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.5	15
2045	Solid Waste	Waste Generation	Azusa Land Reclamation Co. Landfill	Leg-Adjusted	Service Population	1.09	1	2	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	1
2045	Solid Waste	Waste Generation	Billy Wright Disposal Site	Leg-Adjusted	Service Population	1.09	1	21	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	1.1	31
2045	Solid Waste	Waste Generation	Corinda Los Trancos Landfill (Ox Mtn)	Leg-Adjusted	Service Population	1.09	1	16	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	6
2045	Solid Waste	Waste Generation	Fink Road Landfill	Leg-Adjusted	Service Population	1.09	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2045	Solid Waste	Waste Generation	Foothill Sanitary Landfill	Leg-Adjusted	Service Population	1.09	1	54	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.7	20
2045	Solid Waste	Waste Generation	Forward Landfill, Inc.	Leg-Adjusted	Service Population	1.09	1	12	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	4
2045	Solid Waste	Waste Generation	Guadalupe Sanitary Landfill	Leg-Adjusted	Service Population	1.09	1	7	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	3
2045	Solid Waste	Waste Generation	Highway 59 Landfill	Leg-Adjusted	Service Population	1.09	1	3	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2045	Solid Waste	Waste Generation	John Smith Road Landfill	Leg-Adjusted	Service Population	1.09	1	3328	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	44.9	1,254
2045	Solid Waste	Waste Generation	Keller Canyon Landfill	Leg-Adjusted	Service Population	1.09	1	167	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	2.3	63
2045	Solid Waste	Waste Generation	Kirby Canyon Recycl.& Disp. Facility	Leg-Adjusted	Service Population	1.09	1	14	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.2	5
2045	Solid Waste	Waste Generation	L and D Landfill	Leg-Adjusted	Service Population	1.09	1	48	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.6	18
2045	Solid Waste	Waste Generation	Monterey Peninsula Landfill	Leg-Adjusted	Service Population	1.09	1	96	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	1.3	36

2045	Solid Waste	Waste Generation	Newby Island Sanitary Landfill	Leg-Adjusted	Service Population	1.09	1	19	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.3	7
2045	Solid Waste	Waste Generation	North County Landfill & Recycling Center	Leg-Adjusted	Service Population	1.09	1	10	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.1	4
2045	Solid Waste	Waste Generation	Potrero Hills Landfill	Leg-Adjusted	Service Population	1.09	1	790	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	10.7	298
2045	Solid Waste	Waste Generation	Recology Hay Road	Leg-Adjusted	Service Population	1.09	1	27	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.4	10
2045	Solid Waste	Waste Generation	Redwood Landfill	Leg-Adjusted	Service Population	1.09	1	0	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	-	-
2045	Solid Waste	Waste Generation	Sacramento County Landfill (Kiefer)	Leg-Adjusted	Service Population	1.09	1	906	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	12.2	341
2045	Solid Waste	Waste Generation	Vasco Road Sanitary Landfill	Leg-Adjusted	Service Population	1.09	1	6859	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	92.6	2,583
2045	Solid Waste	Waste Generation	Yolo County Central Landfill	Leg-Adjusted	Service Population	1.09	1	1	-	100%	75%	10%	Source: CalRecycle Disposal by Facility	0.0	0
2045	Solid Waste	Waste Generation	Zanker Material Processing Facility	Leg-Adjusted	Service Population	1.09	1	1	-	0%	0%	10%	Source: CalRecycle Disposal by Facility	0.1	1

Assumptions and Emission Factors

Conversion Factors	Value	Source/notes
g/MT	1000000	
g/ton	907184.74	
g/lb	453.592	
lb/ton	2000	
lb/MT	2204.622622	
kg/MT	1000	
lb/kg	2.20462	
MT/ton	0.907185	
kWh/MWh	1000	
MWh/GWh	1000	
Btu/therm	100000	
kBTU/MMBTU	1000	
MMBtu/therm	0.1	
MMBtu/MWh	3.41214148	Onlineconversion.com
gal/cubic foot	7.480519481	Onlineconversion.com
gal/Liter	3.785411784	Onlineconversion.com
Liter/gal	0.264172052	
gallon/acrefoot	325851.429	Onlineconversion.com
million gal/acre-feet	0.325851429	Onlineconversion.com
gal/barrel	42	Onlineconversion.com
Btu/gal_diesel	137,381	https://www.eia.gov/energyexplained/units-and-calculators/
kBTU/MJ	0.947817078	Onlineconversion.com
days/year	365.25	
therm/scf	0.01037	

Energy Type	KBTU	per Unit	
Electricity	3.41	kWh	Onlineconversion.com
Electricity	3412.14	MWh	
Natural Gas	99.98	therm	Onlineconversion.com
Natural Gas	1.03	scf	https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
CNG	99.98	therm	Onlineconversion.com
LPG	91.33	gal	
LPG	2.52	scf	https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=5f138d1baa
Propane	91.00	gal	
Diesel	138.10	gal	Calculated from Table 13.1 in 2017 Climate Registry Default Emission Factors
Gasoline	125.00	gal	Calculated from Table 13.1 in 2017 Climate Registry Default Emission Factors
Hydrogen	113.74	kg	
Renewable Diesel	122.88	gal	CARB LCFS Quarterly Summary April 2018 (129.65 MJ/gal)
Heating Oil	139.00	gal	https://www.engineeringtoolbox.com/energy-content-d_868.html
Fuel Wood	1000.00	MMBTU	
B2	137.90	gal	Calculated from Diesel and B100 energy densities, assuming 2 percent biodiesel
B5	137.60	gal	Calculated from Diesel and B100 energy densities, assuming 5 percent biodiesel
B20	136.10	gal	Calculated from Diesel and B100 energy densities, assuming 20 percent biodiesel
B100	128.10	gal	Calculated from Table 13.1 in 2017 Climate Registry Default Emission Factors

GWP Factors	Value		Comment			
CO2	1	Carbon Dioxide				included in CARB Inventory
CH4	27.9	Methane	Short Lived Climate Pollutant			included in CARB Inventory
N2O	273	Nitrous Oxide				included in CARB Inventory
SF6	22800	Sulphur Hexafluoride				included in CARB Inventory
NF3	17200	Nitrogen Trifluoride				included in CARB Inventory
C2F6	12200	Hexafluoroethane (PFC-116)				included in CARB Inventory
C3F8	8830	Octafluoropropane (PFC-218)				included in CARB Inventory
C4F8	10300	Octafluorocyclobutane (PFC-318)				included in CARB Inventory
CF4	7390	Tetrafluoromethane (PFC-14)				included in CARB Inventory
HFC-125	3500	Hydrofluorocarbon 125	Short Lived Climate Pollutant			included in CARB Inventory
HFC-134a	1430	Hydrofluorocarbon 134a	Short Lived Climate Pollutant			included in CARB Inventory
HFC-143a	4470	Hydrofluorocarbon 143a	Short Lived Climate Pollutant			included in CARB Inventory
HFC-152a	124	Hydrofluorocarbon 152a	Short Lived Climate Pollutant			included in CARB Inventory
HFC-227ea	3220	Hydrofluorocarbon 227ea	Short Lived Climate Pollutant			included in CARB Inventory

Demographics

Alameda County Greenhouse Gas Inventory and Forecasts

	Population					Employment					Service Population				
Subarea	**2019**	**2020**	**2030**	**2040**	**2045**	**2019**	**2020**	**2030**	**2040**	**2045**	**2019**	**2020**	**2030**	**2040**	**2045**
Unincorporated Alameda County	155,874	156,865	163,800	168,620	171,655	29,031	29,010	29,315	29,680	29,835	184,905	185,875	193,115	198,300	201,489
Total County	1,694,324	1,711,460	1,868,635	2,092,370	2,187,143	853,794	858,685	901,080	952,940	976,546	2,548,118	2,570,145	2,769,715	3,045,310	3,163,689

Sources: MTC Plan Bay Area 2040. (http://projections.planbayarea.org/data). 2019 population interpolated using 2015 and 2020 data. 2045 population data extrapolated from 2019 and 2040 data.

	Population					Employment					Service Population				
Growth Rates	**2019**	**2020**	**2030**	**2040**	**2045**	**2019**	**2020**	**2030**	**2040**	**2045**	**2019**	**2020**	**2030**	**2040**	**2045**
Percent Growth from 2019	NA	0.64%	5.08%	8.18%	10.12%	NA	-0.07%	0.98%	2.24%	2.77%	NA	0.52%	4.44%	7.24%	8.97%
Percent of Total County	9.20%	9.17%	8.77%	8.06%	7.85%	3.40%	3.38%	3.25%	3.11%	3.06%	7.26%	7.23%	6.97%	6.51%	6.37%
Percent Growth from 2040					1.80%					0.52%					1.61%

Change in Agricultural Land

Ag Land Change	**2019**	**2030**	**2040**	**2045**	
Unincorporated Alameda Agricultural Acre	182,488	182,488	182,488	182,488	
Total County Agricultural Acres	182,488	182,488	182,488	182,488	
Percent of Total County	100.0%	100.00%	100.00%	100.00%	
Percent Change from 2019		0.00%	0.00%	0.00%	*Note: County has urban growth boundary so wouldn't expect loss of ag lands*

Sources: 2019 Alameda County Crop Report

Target Setting for County of Alameda

County of Alameda Target Emissions and Target Percent Reduction from 2019 Emissions Levels				
Year	**Target Emissions**	**Target Percent Reduction from 2019**	**Difference from Leg-Adj BAU**	*< amount needed to be reduced*
2019	950,235	--		
2030	723,139	24%	148,436	
2040	266,819	72%	398,707	
2045	138,283	85%	473,503	

CARB Scoping Plan Emissions Targets by Sector

	CARB's Statewide GHG Inventory	Scoping Plan Scenario		
Sectors	**2019 [1]**	**2030 [2]**	**2040 [3]**	**2045 [3]**
Agriculture	31	27	17	15
Residential and Commercial	41	32	10	4
Electric Power	60	39	28	9
High GWP	21	12	10	9
Industrial	80	68	19	12
Recycling and Waste	9	10	8	8
Transportation	162	116	27	8
CDR	0	-44	-63	-75
Total	**404.4**	**260**	**55**	**(10)**

Sources:
https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents
[1] CARB 2022. California Greenhouse Gas Inventory for 2000-2020 — by Category as Defined in the 2008 Scoping Plan. https://ww2.arb.ca.gov/sites/default/
[2] CARB 2017. 2017 Scoping Plan.
[3] https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx

Applicable Emission Sectors

Emission Sectors	**Applicable to County of Alameda?**
Agriculture	Yes
Residential and Commercial	Yes
Electric Power	Yes
High GWP	No
Industrial	Yes
Recycling and Waste	Yes
Transportation	Yes
CDR	No

GHG Reduction Targets

	All Sectors		Selected Sectors	
Milestone Year	**Statewide Existing and Target Emissions (MMTCO2e)**	**Target Percent Reduction from 2019**	**Statewide Existing and Target Emissions (MMTCO2e)**	**Target Percent Reduction from 2019**
2019	404	NA	384	NA
2030	260	36%	292	24%
2040	55	87%	108	72%
2045	(10)	103%	56	85%

Memo

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Date: August 7, 2023

To: Liz McElligott, Ali Abbors, and Rob Bennaton (County of Alameda)

From: Hannah Kornfeld, Lisa Fenton, John Steponick, and Honey Walters (Ascent)

Subject: County of Alameda Community Climate Action Plan and Safety Element: Gap Analysis and Climate Action Measures – Final Technical Memorandum

1 INTRODUCTION

This technical memorandum outlines climate action (i.e., greenhouse gas [GHG] reduction and climate adaptation) strategies, measures, and actions, and summarizes the results of the quantitative "gap analysis" process for the County of Alameda's (County's) Community Climate Action Plan (CCAP), which applies to the unincorporated areas of the county. The purpose of the gap analysis is to confirm and quantify the suite of GHG reduction measures that would set the County on course to meet its reduction targets for 2030, 2040, and 2045.

2 GREENHOUSE GAS EMISSIONS FORECASTS

As part of the CAP development process, GHG emissions forecasts were calculated to estimate future levels of community emissions for unincorporated Alameda County, absent County-specific reduction measures that may reduce community emissions. Emissions forecasts were prepared for legislative-adjusted "business-as-usual" (BAU) scenarios for 2030, 2040, and 2045. The legislative-adjusted BAU forecast scenario accounts for anticipated growth in community emissions associated with changes and growth in the county, along with legislative actions to reduce emissions because of State and federal regulations, programs, or other mandated actions.

The legislative-adjusted BAU forecasts for the unincorporated County's community GHG emissions are summarized in Table 1. Under the legislative-adjusted BAU forecast, the County's GHG emissions are projected to decrease by approximately 14 percent between 2019 and 2045.

Table 1 Unincorporated Alameda County 2019 Community GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$)

Sector	2019	2030	2040	2045
On-Road Transportation	692,138	612,216	417,213	336,527
Residential Building Energy	122,466	120,347	114,810	113,664
Nonresidential Building Energy	57,141	56,127	49,645	47,095
Agriculture[1]	32,288	32,288	32,288	32,288
Off-Road Vehicles and Equipment	22,886	23,479	23,884	24,127
Solid Waste	20,562	24,406	25,061	25,464
Wastewater Treatment	2,404	2,511	2,579	2,620

Water Supply	350	202	47	0
Legislative-Adjusted BAU Total	**950,235**	**871,576**	**665,526**	**611,786**
Legislative-Adjusted BAU Percent Change from 2019 Levels	—	*-8%*	*-30%*	*-36%*

Notes: Total may not sum exactly due to independent rounding. BAU = business-as-usual; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

[1] Agricultural emissions are not anticipated to change in the future because the acres in agricultural production in the unincorporated areas of the county are not anticipated to change over the coming decades.

Source: Ascent Environmental 2023.

3 GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

As directed in Senate Bill (SB) 32 and Assembly Bill (AB) 1279, the State has established the following GHG emissions reduction targets:

- 40 percent reduction below 1990 levels by 2030;
- 85 percent reduction in anthropogenic emissions below 1990 levels by 2045; and
- net zero GHG emissions by 2045.

The County aims to reduce unincorporated community GHG emissions in proportion to the State's targets and goals. Community emissions levels from 1990 are not available, which is the case for most local jurisdictions in California. Thus, community GHG reduction targets for the County's CCAP were developed relative to the 2019 unincorporated Alameda County community emissions inventory, consistent with guidance provided by the California Air Resources Board (CARB) (CARB 2017).

Consistent with the State's goal under AB 1279, the County has chosen to adopt a target to achieve net zero emissions no later than 2045. A 2040 target was also established based on interpolation between the 2030 and 2045 targets to provide an interim point between the State targets. Therefore, consistent with State targets and goals and considering relevant emissions sectors, the County's unincorporated-area community GHG reduction targets are as follows:

- 2030 target: 24 percent below 2019 levels (723,139 metric tons of carbon dioxide equivalent [$MTCO_2e$]);
- 2040 target: 72 percent below 2019 levels (266,819 $MTCO_2e$); and
- 2045 target: 85 percent below 2019 levels (138,283 $MTCO_2e$).

4 CLIMATE ACTION MEASURES AND ACTIONS

Additional GHG reductions are needed to achieve the unincorporated Alameda County community emissions reduction targets for 2030, 2040, and 2045 beyond those realized from State and federal legislative actions. Ascent worked with County staff to develop a draft list of recommended GHG reduction measures based on measures identified in existing County and regional plans, as well as new measures informed by community outreach and current best practices.

The measures presented below are organized into seven categories that include the emissions sectors included in Table 1. The categories do not align exactly with emissions sectors, as they encompass both GHG reduction and climate adaptation. Categories include buildings, infrastructure, land use and mobility, waste, health and resiliency, agriculture and vegetation, and green economy. Each category includes one or more broad strategies to reduce

emissions, such as building decarbonization, clean and renewable energy, and energy efficiency and reliability. The measures are organized under each strategy, which are more specific expressions of the strategies. Metrics are provided for measures that are quantified to help the County meet its unincorporated-area reduction targets. These include performance indicators by which progress can be tracked and monitored for implementation. The proposed measures are further organized into one or more actions that the County can implement to reduce GHG emissions.

GHG reductions associated with these recommended measures were calculated in a stepwise manner for the future years of 2030, 2040, and 2045. In other words, GHG reductions (in $MTCO_2e$) are assessed during a snapshot in time in years 2030, 2040, and 2045. Measures are quantified for a single year rather than adding cumulative reductions from prior years, which aligns with the methodology used to derive the County's unincorporated-area GHG reduction targets. Importantly, GHG emissions reductions were quantified for measures wherever substantial evidence and reasonable assumptions were available to support calculations. County staff and Ascent also identified measures that were not quantifiable because of lack of available data or quantification methods but would still be expected to reduce GHG emissions. These measures are listed in this technical memorandum and will be discussed qualitatively in the CCAP. They can be monitored for potential quantification opportunities in the future if data and/or quantification methods become available.

Estimates of GHG emissions reductions, along with an estimated emissions "gap" (i.e., the difference between GHG reductions required to meet the targets and total estimated GHG reductions), are summarized in Table 2 below. Descriptions of the measures are provided in the following sections. Detailed measure calculations and assumptions supporting the GHG reduction estimates are provided in Attachment A.

Table 2 Unincorporated Alameda County Community Climate Action Measures

Measure Number	Strategy	Measure	GHG Reductions ($MTCO_2e$)		
			2030	2040	2045
Buildings					
BE-1.1	Building Decarbonization	Encourage decarbonization of existing residential and nonresidential buildings (i.e., replace gas infrastructure and appliances with electric alternatives).	17,237	68,604	100,370
BE-1.2		Require new buildings, and significant remodels or additions, to be all-electric.	997	3,682	5,487
BE-1.3		Encourage and support the use of electricity and alternative fuels in construction equipment.	367	846	1,110
BE-2.1	Clean and Renewable Energy	Install additional renewable energy-generating technologies (e.g., solar panels) in existing residential and nonresidential buildings.	NA	NA	NA
BE-2.2		Install renewable energy-generating technologies (e.g., solar panels) beyond minimum State requirements in new residential and nonresidential development.	NA	NA	NA
BE-3.1	Energy Efficiency and Reliability	Connect owners/occupants of existing residential and nonresidential buildings to energy audit and weatherization programs and resources.	NA	NA	NA
BE-3.2		Retrofit existing residential and nonresidential buildings to improve energy efficiency.	NA	NA	NA
BE-3.3		Reduce plug loads (i.e., energy used by equipment that is plugged into an outlet) in existing residential and nonresidential buildings.	NA	NA	NA
BE-4.1	Resilient and Sustainable Buildings	Improve resilience of existing residential and nonresidential buildings to climate hazards.	NA	NA	NA

Measure Number	Strategy	Measure	GHG Reductions ($MTCO_2e$)		
			2030	2040	2045
BE-4.2		Enhance resilience of new residential and nonresidential buildings to climate hazards.	NA	NA	NA
BE-4.3		Increase the use of low-carbon concrete and other types of sustainable materials in new construction and renovations.	NA	NA	NA
		Buildings Subtotal	*18,601*	*73,132*	*106,967*
Infrastructure					
IN-1.1	Clean and Reliable Energy	Transition the community to 100 percent clean energy.	27,795	11,139	0
IN-1.2		Increase the use of battery storage technologies (i.e., decentralized clean energy resources).	NA	NA	NA
IN-1.3		Support the development of innovative approaches to energy generation, distribution, and storage. For example: energy recapture (in-conduit hydro, co-generation), developing clean microgrids for schools, hospitals, or neighborhoods.	NA	NA	NA
IN-1.4		Encourage the increase of smart grid integration throughout the county.	NA	NA	NA
IN-1.5		Evaluate the potential for and develop district energy systems (multi-building heating and cooling systems) in urban areas of the county, and develop an implementation plan for cost-effective systems.	NA	NA	NA
IN-2.1	Low- and Zero-Emission Vehicles	Increase electric vehicle (EV) charging infrastructure.	33,179	18,483	36,128
IN-2.2		Encourage public EV and low-carbon vehicle adoption.	NA	NA	NA
IN-3.1	Low- and Zero-Emission Equipment	Transition to electric landscaping equipment.	311	803	1,082
IN-3.2		Encourage the use of electric or alternatively fueled agricultural equipment.	NA	NA	NA
IN-4.1	Water Conservation	Reduce water consumption in buildings.	11	5	0
IN-4.2		Reduce water consumption for irrigation and landscaping.	NA	NA	NA
IN-4.3		Increase the capture and use of recycled water.	NA	NA	NA
IN-5.1	Wastewater	Foster best management practices and innovative strategies for Onsite Wastewater Treatment System management for the protection of groundwater and surface water bodies.	NA	NA	NA
IN-6.1	Resilient Infrastructure	Improve energy sector resilience.	NA	NA	NA
IN-6.2		Improve resilience of water and wastewater systems.	NA	NA	NA
IN-6.3		Protect vulnerable transportation infrastructure, services, and systems from climate hazards.	NA	NA	NA
		Infrastructure Subtotal	*60,709*	*28,997*	*37,211*
Land Use and Mobility					
LU-1.1	Safe, Accessible, and Reliable Active Transportation	Develop and maintain a safe, connected, and continuous bicycle and pedestrian network.	18,199	7,103	3,737
LU-1.2		Increase and improve access to walking and bicycling throughout the unincorporated county.	NA	NA	NA
LU-2.1	Safe, Accessible, and Reliable Public Transportation	Continue to partner with transit agencies to improve reliability, affordability, and convenience of existing transit services through increased frequency, expanded service areas,	34,362	14,216	7,696

Measure Number	Strategy	Measure	GHG Reductions ($MTCO_2e$)		
			2030	2040	2045
		extended service hours, and better facilities. Prioritize improvements in frontline communities.			
LU-3.1	Equitable Shared Mobility	Develop programs and incentives that promote shared mobility (e.g., car sharing, bike sharing, and scooter sharing) in frontline communities and that increase access to health services, food, education, and employment.	NA	NA	NA
LU-4.1	Sustainable Land Use Planning	Increase residential and commercial density in urban areas located near transit.	3,305	2,089	1,286
LU-4.2		Promote and ensure land uses that support walking and bicycling.	NA	NA	NA
LU-5.1	Parking	Reduce minimum parking requirements and strategically evaluate the parking needs of the community.	NA	NA	NA
		Land Use and Mobility Subtotal	*55,867*	*23,409*	*12,721*
Waste					
WR-1.1	Inorganic Waste Management and Reduction	Increase recycling in the unincorporated areas of the county.	NA	NA	NA
WR-1.2		Reduce solid waste generation.	NA	NA	NA
WR-2.1	Organic Waste Management and Reduction	Educate the community and food generating businesses about reducing wasted food by preventing surplus edible food generation, storing food correctly, and donating surplus edible food before composting what is left.	15,531	18,226	20,834
		Waste Subtotal	*15,531*	*18,226*	*20,834*
Health and Resiliency					
HR-1.1	Resilient Communities, Equity, and Environmental Justice	Support the creation of resilience hubs and other place-based resilience resources to provide community members with essential services before, during, and after climate-related hazard events.	NA	NA	NA
HR-1.2		Embed climate resiliency and adaptation across planning efforts.	NA	NA	NA
HR-1.3		Ensure essential services are available for community members most at risk.	NA	NA	NA
HR-1.4		Support local food production and improve food security.	NA	NA	NA
HR-1.5		Prioritize measures and investments in that protect frontline communities and small businesses from displacement.	NA	NA	NA
HR-2.1	Emergency Preparedness and Disaster Response	Ensure that emergency services have adequate capacity to address increased demand due to potential impacts of climate hazards.	NA	NA	NA
HR-2.2		Prioritize making emergency services more accessible and equitable, especially for community members most at risk.	NA	NA	NA
HR-3.1	Hazard-Specific Resilience	Build resilience to flooding across the county, along with sea level rise in San Lorenzo.	NA	NA	NA
HR-3.2		Build resilience to wildfires across the unincorporated county.	NA	NA	NA
HR-3.3		Build resilience to extreme heat across the county.	NA	NA	NA
HR-4.1		Improve the quality of green jobs, ensuring jobs have fair labor practices, living wages, benefits and worker protection.	NA	NA	NA

Measure Number	Strategy	Measure	GHG Reductions ($MTCO_2e$)		
			2030	2040	2045
HR-4.2	High Road, Green Workforce and Business Development	Incentivize and promote green business practices, such as work-from-home policies.	NA	NA	NA
		Health and Resiliency Subtotal	*NA*	*NA*	*NA*
Agriculture and Vegetation					
AG-1.1	Climate-Resilient Agricultural and Working Lands	Encourage agricultural best practices in agricultural and working lands that improve resilience to climate impacts.	NA	NA	NA
AG-1.2		Increase soil organic matter and soil carbon content in working lands.	NA	NA	NA
AG-2.1	Nature-Based Solutions	Increase and improve urban tree canopy and green space consistent with the goals of the County's Environmental Justice Element.	458	1,222	1,604
AG-2.2		Utilize nature-based solutions to reduce the impacts of climate hazards and improve community resilience.	NA	NA	NA
		Agriculture and Vegetation Subtotal	*458*	*1,222*	*1,604*
Community Engagement and Monitoring					
CE-1.1	Ongoing Equitable Community Engagement	Foster ongoing and deep community engagement with frontline communities.	NA	NA	NA
CE-1.2		Develop an array of accessible outreach programs with multilingual capacity for widely spoken languages that emphasize preparedness to climate hazards.	NA	NA	NA
CE-1.3		Prioritize community-based solutions to improve climate resilience.	NA	NA	NA
CE-2.1	Climate Action Monitoring	Monitor implementation of CCAP actions to reduce GHG emissions and enhance adaptation and resilience in unincorporated Alameda County.	NA	NA	NA
		Community Engagement and Monitoring Subtotal	*NA*	*NA*	*NA*
Total Reductions from Measures			**151,166**	**144,987**	**179,337**
Reduction Needed to Meet Target			148,436	398,707	473,503
Target Met?			Yes	No	No
Remaining Gap to Target			(2,729)	253,720	294,166

Notes: Total may not sum exactly due to independent rounding. EV = electric vehicle; GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not applicable.

Parentheses indicate target was met with a surplus of reductions.

Source: Calculations conducted by Ascent in 2023.

4.1.1 Buildings

BUILDING DECARBONIZATION

Measure BE-1.1: Encourage decarbonization of existing residential and nonresidential buildings (i.e., replace gas infrastructure and appliances with electric alternatives).

Quantification assumptions: This measure assumes that 18 percent of existing single family and multifamily residential buildings are retrofitted to all-electric buildings by 2030, 54 percent are retrofitted by 2040, and 72 percent are retrofitted by 2045. This measure assumes that 7 percent of existing commercial buildings are retrofitted to all-electric buildings by 2030, 26 percent are retrofitted by 2040, and 40 percent are retrofitted by 2045.

Action BE-1.1.1: Consider developing a comprehensive energy retrofit plan to encourage transition of mixed-fuel residential and nonresidential buildings to all-electric, prioritizing the needs of frontline communities. The plan should address end-of-life recycling and disposal of gas appliances.

Action BE-1.1.2: Consider establishing electrification retrofit requirements for commercial buildings at the time of building retrofit/renovation or equipment replacement. Where electrification is infeasible, encourage renewable gas.

Action BE-1.1.3: Work with Renew Alameda County to expand the services eligible for home improvements and repair to include energy efficiency and electric appliance changeouts, and to reduce barriers to accessing the services for low-income property owners.

Action BE-1.1.4: Consider eliminating the provision of fossil fuel-powered backup generator permits for existing nonresidential development (except for emergency facilities such as hospitals and building types not subject to the California Building Energy Efficiency Standards that provide essential services) by 2030.

Action BE-1.1.5: Evaluate the feasibility of requiring electric service upgrades during major retrofits, including solar-ready panels.

Measure BE-1.2: Encourage a transition away from reliance on natural gas infrastructure in new buildings and significant remodels.

Quantification assumptions: This measure assumes that all residential and commercial development built in 2026 or later is all-electric. This measure assumes some buildings may be exempt from all-electric requirements and therefore includes a target electrification rate for new construction of 90 percent by 2030, 93 percent by 2040, and 95 percent by 2045.

Action BE-1.2.1: Consider adopting a reach code that reduces reliance on natural gas infrastructure in new development (residential and nonresidential).

Action BE-1.2.2: Consider adopting a reach code that requires electric-ready design in new industrial construction and that requires non-core industrial operations (e.g., space heating and cooling, domestic hot water) to be all electric.

Measure BE-1.3: Encourage and support the use of electricity and alternative fuels in construction equipment.

Quantification assumptions: This measure assumes that 50 percent of diesel-powered construction equipment used in the unincorporated county is powered by renewable diesel or other alternative fuels that meet EPA's Renewable Fuel Standards by 2030. This measure increases the percentage of alternative fuels used in diesel-powered construction equipment to 75 percent by 2040 and 80 percent by 2045. This measure also assumes that 7 percent of construction equipment used in the unincorporated county is electrified by 2030, 15 percent is electrified by 2040, and 19 percent by 2045.

Action BE-1.3.1: Encourage construction projects to use renewable diesel in diesel-powered construction equipment.

Action BE-1.3.2: Encourage the use of electric-powered construction equipment in all discretionary projects.

Action BE-1.3.3: Discourage the use of fossil fuel-powered generators at construction sites in all discretionary projects.

CLEAN AND RENEWABLE ENERGY

Measure BE-2.1: Install additional renewable energy-generating technologies (e.g., solar panels) in existing residential and nonresidential buildings.

Quantification assumptions: Not quantified to avoid double-counting reductions with Measure IN-1.1.

Action BE-2.1.1: Identify commercial and industrial areas with optimal solar orientation, building structure, and land ownership/management conditions.

Action BE-2.1.2: Adopt ordinance that establishes Solar EmPowerment Districts in high potential areas.

Action BE-2.1.3: Minimize barriers and streamline permitting for solar PV installation in Solar EmPowerment Districts.

Action BE-2.1.4: Promote the availability of incentive programs to support the installation of renewable energy-generating technologies.

Measure BE-2.2: Install renewable energy-generating technologies (e.g., solar panels) beyond minimum State requirements in new residential and nonresidential development.

Quantification assumptions: Not quantified to avoid double-counting reductions with Measure IN-1.1.

Action BE-2.2.1: Adopt a reach code with the 2025 code cycle that requires all new residential and nonresidential buildings to generate on-site, renewable energy to meet anticipated energy consumption of the building, as feasible.

Action BE-2.2.2: Eliminate local regulatory barriers to installation of distributed renewable energy systems, such as wind and solar, through revisions to the zoning code and other relevant County policies.

Action BE-2.2.3: Provide guidelines for the permit application process for renewable energy generation installation (e.g., solar photovoltaics) in residential and nonresidential development.

Action BE-2.2.4: Collaborate with PG&E to make key upgrades to transmission and distribution systems, substations, and other equipment to enable electrification and renewable energy integration into the electricity grid.

ENERGY EFFICIENCY AND RELIABILITY

Measure BE-3.1: Connect owners/occupants of existing residential and nonresidential buildings to energy audit and weatherization programs and resources.

Quantification assumptions: Not quantified.

Action BE-3.1.1: Work with regional organizations such as BayREN to support and expand access to rental property energy efficiency and electrification outreach and incentive programs.

Action BE-3.1.2: Connect to external programs that provide low-cost financing and encourage energy efficiency investments for existing residential buildings, focused on owner-occupants.

Measure BE-3.2: Retrofit existing residential and nonresidential buildings to improve energy efficiency.

Quantification assumptions: Not quantified to avoid double-counting reductions with Measure BE-1.1.

Action BE-3.2.1: Work with PG&E, EBCE, and community-based organizations (e.g., Rising Sun Center for Opportunity) to provide free energy audits of existing buildings, prioritizing implementation in frontline communities.

Action BE-3.2.2: Encourage developers to utilize state and federal funding programs, such as Community Development Block Grant programs, to achieve energy efficiency improvements in existing and new buildings, with a particular focus on affordable housing.

Action BE-3.2.3: Promote existing community education programs around energy efficiency best practices and cost savings opportunities, prioritizing outreach to frontline communities.

Action BE-3.2.4: Explore options to lower costs associated with residential energy efficiency improvements, such as lowering permit fees.

Measure BE-3.3: Reduce plug loads (i.e., energy used by equipment that is plugged into an outlet) in existing residential and nonresidential buildings.

Quantification assumptions: Not quantified to avoid double-counting reductions with Measure BE-1.1.

Action BE-3.3.1: Promote appliance upgrades to energy-efficient technologies and products through campaigns targeted at residents and local businesses (e.g., ENERGY STAR® appliance change-out programs, and incentives).

Action BE-3.3.2: Facilitate the adoption of smart grid and other peak load reduction technologies such as building energy management systems and smart appliances.

RESILIENT AND SUSTAINABLE BUILDINGS

Measure BE-4.1: Improve resilience of existing residential and nonresidential buildings to climate hazards.

Quantification assumptions: Not quantified.

Action BE-4.1.1: Increase the use of indoor air purification systems capable of enhancing and protecting public health from wildfire smoke and poor air quality in the existing building stock in the unincorporated county, as well as from toxic air contaminants associated with vehicle travel (consistent with the County's proposed Air Pollution Exposure Zone Ordinance).

Action BE-4.1.2: Through focused outreach, encourage all residential and nonresidential building owners located in wildland-urban interface (WUI) areas or "High" or "Very High" fire hazard severity zones (FHSZs) to conduct hardening retrofits, which may include installing fire-resistant roofs and building materials, covering vents or using ember- and flame-resistant vents, and installing dual-paned windows with one pane of tempered glass, among other actions.

Action BE-4.1.3: Encourage residential and nonresidential building owners that lack air conditioning, or that are located in areas vulnerable to extreme heat, to install reflective "cool roofs" to mitigate the impacts of increased temperatures and extreme heat through public education campaigns and incentive programs.

Action BE-4.1.4: Encourage residential and nonresidential building owners located in the 100- or 500-year floodplain to floodproof their building to a point at, or above, the base flood elevation, and to raise mechanical equipment through public education campaigns and incentive programs.

Action BE-4.1.5: Decrease vulnerability of renters to extreme heat by assisting rental housing owners with implementing measures to improve interior cooling in rental units.

Measure BE-4.2: Enhance resilience of new residential and nonresidential buildings to climate hazards.

Quantification assumptions: Not quantified.

Action BE-4.2.1: Require new buildings located within or in the vicinity of the 100- or 500-year floodplain, or in areas that are historically prone to flooding, to be designed and located to allow unrestricted flow of flood waters or be able to withstand flood forces.

Action BE-4.2.2: Require new development to comply with the requirements and criteria for stormwater quantity controls established in the Alameda County Hydrology and Hydraulics Criteria Summary and the Alameda County Clean Water Program to control surface runoff from new development.

Action BE-4.2.3: Require new buildings located within "High" or "Very High" fire hazard severity zones (FHSZs) to use fire-resistant building materials, fire-resistant landscaping, and adequate clearance around structures.

Action BE-4.2.4: Encourage new development to use high-albedo (i.e., reflective) materials for features such as roofs and driveways to help mitigate the impacts of increased temperatures and extreme heat through public education campaigns and incentives.

Measure BE-4.3: Increase the use of low-carbon concrete and other types of sustainable materials in new construction and renovations.

Quantification assumptions: Not quantified.

Action BE-4.3.1: Adopt a reach code with the 2025 code cycle that requires new residential and nonresidential construction to use low-carbon concrete, steel, and other key impact materials.

4.1.2 Infrastructure

CLEAN AND RELIABLE ENERGY

Measure IN-1.1: Transition the community to 100 percent clean energy.

Quantification assumptions: This measure assumes that all EBCE and PG&E electricity emissions are reduced by 2030 by switching all customers to 100 percent carbon-free electricity sources through opting into EBCE's Renewable Choice option.

Action IN-1.1.1: Work with EBCE on a transition plan to automatically enroll all unincorporated-area accounts in the Renewable Choice tier, with an option for residents and businesses to opt-out.

Action IN-1.1.2: Promote enrollment in EBCE for current PG&E customers through a multilingual outreach campaign.

Action IN-1.1.3: Require all newly built parking lots and structures to have solar-ready generation capabilities.

Action IN-1.1.4: Require the installation of solar heaters for all new swimming pools which propose the use of heating systems.

Action IN-1.1.5: Work with EBCE to provide incentives for replacing existing swimming pool heaters with solar versions.

Action IN-1.1.6: Encourage the installation of solar canopies on surface parking lots.

Action IN-1.1.7: Partner with advocacy organizations, such as The Utility Reform Network (TURN), to ensure consideration of energy use-reduction barriers faced by low-income utility users.

Measure IN-1.2: Increase the use of battery storage technologies (i.e., decentralized clean energy resources).

Quantification assumptions: Not quantified.

Action IN-1.2.1: Encourage the installation of battery storage in conjunction with renewable energy generation projects within new and existing buildings through engagement campaigns and state incentives. Ensure that battery storage systems are responsibly handled during operation and are properly disposed of at end of useful life.

Action IN-1.2.2: Require battery storage readiness design in new nonresidential construction.

Action IN-1.2.3: Seek funding opportunities for additional backup power capabilities at critical facilities.

Action IN-1.2.4: Evaluate opportunities to remove barriers to battery storage installation throughout the unincorporated county. Opportunities could include development-related incentives, streamlined permitting, or incentives for medical uses.

Measure IN-1.3: Support the development of innovative approaches to energy generation, distribution, and storage. For example: energy recapture (in-conduit hydro, co-generation), developing clean microgrids for schools, hospitals, or neighborhoods.

Quantification assumptions: Not quantified.

Action IN-1.3.1: Develop renewable microgrids at County libraries, fire and police stations and other emergency facilities and community hubs.

Action IN-1.3.2: Encourage non-municipal public service facilities (e.g., hospitals) to develop renewable microgrids.

Action IN-1.3.3: Evaluate opportunities and incentives for integrating battery storage readiness in existing homes and businesses at the time of retrofit and/or in conjunction with renewable energy generation installations.

Measure IN-1.4: Encourage the increase of smart grid integration throughout the county.

Quantification assumptions: Not quantified.

Action IN-1.4.1: Partner with PG&E and develop a community smart grid integration plan.

Action IN-1.4.2: Develop an outreach program that informs property owners and businesses about benefits of smart grid and smart appliances.

Action IN-1.4.3: Consider adopting an ordinance that requires smart grid energy management system and compatible heating, ventilation, air conditioning and lighting in new construction.

Measure IN-1.5: Evaluate the potential for and develop district energy systems (multi-building heating and cooling systems) in urban areas of the county and develop an implementation plan for cost-effective systems.

Quantification assumptions: Not quantified.

Action IN-1.5.1: Conduct an analysis of district heating potential in the Castro Valley Central Business District Specific Plan area, the Ashland and Cherryland Business District Specific Plan area, the San Lorenzo Village Center Specific Plan area, and other neighborhood commercial centers.

LOW- AND ZERO-EMISSION VEHICLES

Measure IN-2.1: Increase electric vehicle (EV) charging infrastructure.

Quantification assumptions: This measure assumes that the percentage of passenger EVs will be 28 percent of total passenger vehicles in the unincorporated county in 2030, 69 percent in 2040, and 90 percent in 2045. This measure also assumes that the percentage of medium- and heavy-duty EVs in the unincorporated county will be 10 percent by 2030, 40 percent by 2040, and 50 percent by 2045.

Action IN-2.1.1: Consider adopting an EV charging reach code to increase levels of EV readiness in new residential and nonresidential development.

Action IN-2.1.2: Ensure EV charging stations are encouraged and allowed through land use designations that currently permit gas fueling stations.

Action IN-2.1.3: Work with EBCE, BAAQMD, and regional agencies to provide incentives for existing gas stations and retail centers to add EV charging stations.

Action IN-2.1.4: Work with regional agencies and EV charging companies to incentivize, install, and maintain in good working order EV charging stations and preferred parking for EVs at public facilities, parks, retail centers, multifamily residential properties, and other high-use parking areas throughout the unincorporated county.

Action IN-2.1.5: Collaborate with EBCE to establish EV charging mobility hubs at publicly accessible sites that support tenants of multifamily properties and rideshare drivers.

Action IN-2.1.6: Provide guidelines for the permit application process for EV charging infrastructure installation in residential and nonresidential development.

Action IN-2.1.7: Promote the Alameda County Incentive Project to increase EV charging infrastructure in frontline communities, at workplaces, in multifamily residential properties, and in affordable housing developments.

Action IN-2.1.8: Promote EBCE's EV charging rates for residents, which provides a cost-effective way to charge EVs at residences by charging during off-peak hours.

Action IN-2.1.9: Require all nonresidential development with loading docks to supply sufficient electrical power for delivery trucks and associated equipment to reduce idling when making deliveries.

Action IN-2.1.10: Seek funding to support improved access to EV charging stations.

Measure IN-2.2: Encourage public EV and low-carbon vehicle adoption.

Quantification assumptions: Not quantified to avoid double-counting with reductions from Measure IN-2.1.

Action IN-2.2.1: Implement the recommendations for local governments provided in the Bay Area Electric Vehicle Acceleration Plan to support outreach and education for EV adoption.

Action IN-2.2.2: Promote Electric For All, which provides information and an incentive database for EVs and associated charging equipment.

Action IN-2.2.3: Collaborate with EBCE to develop and implement a Medium- and Heavy-Duty Goods Movement Electrification Blueprint.

Action IN-2.2.4: Promote the California Clean Vehicle Rebate Project and the Clean Vehicle Assistance Program, which provide rebates and financial incentives that prioritize accessibility and affordability for low- to moderate-income consumers to switch to EVs.

LOW- AND ZERO-EMISSION EQUIPMENT

Measure IN-3.1: Transition to electric landscaping equipment.

Quantification assumptions: This measure assumes that 12 percent of existing landscaping equipment will be replaced with zero-emission alternatives by 2030, 30 percent by 2040, and 39 percent by 2040.

Action IN-3.1.1: Encourage business owners (including landscaping businesses) to convert or replace their gasoline-powered gardening equipment, such as lawn mowers, leaf blowers, and hedge trimmers, with electric or other zero-emission alternative equipment.

Action IN-3.1.2: Promote California's Clean Off-Road Equipment Voucher Program for professional landscape services, which provides vouchers to purchase zero-emission landscaping equipment.

Measure IN-3.2: Encourage the use of electric or alternatively fueled agricultural equipment.

Quantification assumptions: Not quantified.

Action IN-3.2.1: Encourage the use of electric-powered agricultural equipment where feasible and promote CARB's Carl Moyer Program, which provides grants to replace diesel-powered agricultural equipment. Encourage the use of renewable diesel in diesel-powered agricultural equipment where electrification is infeasible.

Action IN-3.2.2: Encourage the replacement of diesel- and natural gas-powered irrigation pumps with electric-powered alternatives where feasible. Encourage the use of renewable diesel or renewable natural gas where electrification is infeasible.

WATER CONSERVATION

Measure IN-4.1: Reduce water consumption in buildings.

Quantification assumptions: This measure assumes a reduction in water consumption per capita of 5 percent by 2030, 10 percent by 2040, and 15 percent by 2045.

Action IN-4.1.1: Continue to promote water conservation incentives such as appliance and plumbing rebates and water conservation kits in partnership with California Water Services.

Action IN-4.1.2: Require ultra-low-flow fixtures in new development to reduce water consumption.

Action IN-4.1.3: Consider requiring ultra-low-flow water fixture retrofit-upon-sale requirements for residential and commercial buildings.

Measure IN-4.2: Reduce water consumption for irrigation and landscaping.

Quantification assumptions: Not quantified to avoid double-counting emissions reductions with Measure IN-4.1.

Action IN-4.2.1: Continue to promote landscape water conservation incentives in partnership with EBMUD and Zone 7.

Measure IN-4.3: Increase the capture and use of recycled water.

Quantification assumptions: Not quantified to avoid double-counting emissions reductions with Measure IN-4.1.

Action IN-4.3.1: Adopt a drought-ready ordinance to require greywater readiness in new residential construction and major remodels.

Action IN-4.3.2: Encourage the use of onsite rainwater harvesting and recycled water systems, consistent with all applicable environmental, health, and safety regulations and requirements.

Action IN-4.3.3: Encourage the use of rainwater capture and onsite recycled water for landscaping use.

Action IN-4.3.4: Support residents and businesses interested in installing onsite recycled water systems (i.e., greywater), consistent with all State and County health codes and standards and in compliance with regional water agency requirements through providing guidance, incentives, and/or streamlining permitting processes.

WASTEWATER

Measure IN-5.1: Foster best management practices and innovative strategies for Onsite Wastewater Treatment System (OWTS) management for the protection of groundwater and surface water bodies.

Quantification assumptions: Not quantified.

Action IN-5.1.1: Explore the feasibility of reducing wastewater through a variety of methods, including the use of dry/composting toilets in new development and encourage these systems, repairing leaks in plumbing, using water-saving devices (e.g., low-flow fixtures), reducing water usage in daily activities, and avoiding the plumbing of greywater systems into the OWTS.

Action IN-5.1.2: Promote best management practices of septic system OWTSs by properly sizing and maintaining wastewater dispersal fields (avoiding plants with invasive roots and parking of vehicles/heavy equipment on dispersal fields), using supplemental treatment units, pumping and maintaining all tanks and other components of the OWTS every 3 to 5 years (or as needed by a licensed professional), and avoiding chemical additive to maintain the OWTS or using harsh chemicals for cleaning.

RESILIENT INFRASTRUCTURE

Measure IN-6.1: Improve energy sector resilience.

Quantification assumptions: Not quantified.

Action IN-6.1.1: Coordinate with PG&E and other utility providers/suppliers to identify and protect critical energy infrastructure in the unincorporated county from climate hazards.

Action IN-6.1.2: Integrate energy assurance actions into countywide planning processes to decrease vulnerability to grid outages during hazard events.

Action IN-6.1.3: Ensure adequate utility redundancy and backup power is available to maintain critical facilities where not already installed, prioritizing clean backup power sources where feasible.

Action IN-6.1.4: Encourage the inclusion of broadband infrastructure in new development proposals to enable adequate connectivity for building and utility controls and operating system networks.

Action IN-6.1.5: Encourage residents to use the California Interactive Broadband Map developed by the California Public Utilities Commission, which reports internet speeds and helps to document and identify unserved and underserved areas.

Measure IN-6.2: Improve resilience of water and wastewater systems.

Quantification assumptions: Not quantified.

Action IN-6.2.1: Collaborate with relevant local and regional agencies to identify and protect vulnerable water and wastewater facilities to ensure an adequate clean water supply during emergencies and disaster recovery.

Action IN-6.2.2: Upgrade water and wastewater systems to accommodate projected changes in water quality and availability such as intake systems that are too shallow, higher levels of water contaminants, and potential need for greater water storage capacity.

Action IN-6.2.3: Reduce reliance on external water supplies by shifting towards local sources of water such as grey water, rainwater, air conditioning condensate, and foundation drainage.

Action IN-6.2.4: Inventory all sewer pump stations in the 100- and 500-year floodplain and identify priority facilities to upgrade to become more flood-resilient.

Measure IN-6.3: Protect vulnerable transportation infrastructure, services, and systems from climate hazards.

Quantification assumptions: Not quantified.

Action IN-6.3.1: Coordinate with AC Transit, community-based organizations, and other relevant partners to identify and protect local and regional transportation, transit, and active transportation corridors that are at risk from climate change impacts. Use the best available science and resilient design features to improve resiliency in transportation infrastructure.

Action IN-6.3.2: Update County transportation system maintenance protocols, for which the Public Works Agency is responsible, to incorporate climate vulnerabilities.

Action IN-6.3.3: Pilot cool pavement initiatives and evaluate effectiveness post-implementation.

4.1.3 Land Use and Mobility

SAFE, ACCESSIBLE, AND RELIABLE ACTIVE TRANSPORTATION

Measure LU-1.1: Develop and maintain a safe, connected, and continuous bicycle and pedestrian network.

Quantification assumptions: This measure assumes a 7.1 percent reduction in existing passenger VMT by 2030, holding constant through 2045. The 7.1 percent reduction is derived from a combination of neighborhood design-related GHG reduction measures presented in the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity, referred to hereafter as "CAPCOA Handbook" (CAPCOA 2021).

Action LU-1.1.1: Implement specific recommendations for improving bicycle and pedestrian infrastructure (e.g., bike paths, sidewalks) included in the 2019 Alameda County Bicycle & Pedestrian Master Plan for Unincorporated Areas and its future updates.

Action LU-1.1.2: Continue to eliminate gaps in the existing network and improve bicycle and pedestrian connections to transit, schools, parks/trails, retail and employment centers, community/senior centers, and libraries as identified in the 2019 Alameda County Bicycle & Pedestrian Master Plan for Unincorporated Areas.

Action LU-1.1.3: Work with Alameda CTC, local cities, school districts, and community-based organizations to launch a Vision Zero program for the unincorporated county.

Action LU-1.1.4: Consider establishing temporary and permanent car-free areas.

Action LU-1.1.5: Partner with neighboring counties, special districts, and other relevant partners to close gaps in long-distance trail networks.

Measure LU-1.2: Increase and improve access to walking and bicycling throughout the unincorporated county.

Quantification assumptions: Not quantified to avoid double-counting emissions reductions with Measure LU-1.1.

Action LU-1.2.1: Promote BAAQMD's rebate program for e-bikes.

Action LU-1.2.2: Work with school districts and park districts that serve unincorporated areas of the county to install secure bike bicycle parking at all elementary, middle and high schools and parks.

Action LU-1.2.3: Promote partnerships with transit providers (e.g., AC Transit, BART, Wheels, ACE, Amtrak) to increase bicycle access on board transit vehicles to bicycle users, especially during peak commute hours.

Action LU-1.2.4: Work with the Alameda County Transportation Commission to build community awareness, through multilingual outreach efforts, of walking and biking as an alternative to driving, road safety responsibilities, and existing programs such as Safe Routes to Schools.

SAFE, ACCESSIBLE, AND RELIABLE PUBLIC TRANSPORATION

Measure LU-2.1: Continue to partner with transit agencies to improve reliability, affordability, and convenience of existing transit services through increased frequency, expanded service areas, extended service hours, and better facilities. Prioritize improvements in frontline communities.

Quantification assumptions: This measure assumes a 13.6 percent reduction in existing passenger VMT by 2030, 14.5 percent reduction by 2040, and 15 percent reduction by 2045. The percent reductions are derived from a combination of transit-related GHG reduction measures presented in the CAPCOA Handbook (CAPCOA 2021).

Action LU-2.1.1: Request that AC Transit evaluate the potential for increasing service frequency on key routes.

Action LU-2.1.2: Prepare formal request for AC Transit to extend BRT bus service to the unincorporated county and determine the conditions necessary for BRT route expansion.

Action LU-2.1.3: Ensure that bus stops provide shade, weather protection, seating, lighting, route information, and are frequently cleaned and maintained.

Action LU-2.1.4: Explore and support innovative public transit options, such as deploying low-emissions buses in neighborhoods with disproportionately poor air quality, or developing a "first and last mile" plan to connect riders to public transit.

Action LU-2.1.5: Work with regional transit providers (e.g., BART, AC Transit) to make public transit safer for all riders.

Action LU-2.1.6: Promote discounted transit passes such as the Clipper START program and the Student Transit Pass Program.

EQUITABLE SHARED MOBILITY

Measure LU-3.1: Develop programs and incentives that promote shared mobility (e.g., car sharing, bike sharing, and scooter sharing) in frontline communities and that increase access to health services, food, education, and employment.

Quantification assumptions: Not quantified.

Action LU-3.1.1: Explore programs and funding to provide an EV car share program for underserved areas of the city that are not well served by transit.

Action LU-3.1.2: Promote the establishment of affordable bikeshare programs in the urban unincorporated areas of Alameda County (e.g., expanding the geography of Bay Wheels' Bike Share for All program, which offers affordable membership options for low-income residents).

Action LU-3.1.3: Develop community awareness and education programs around shared mobility (e.g., car sharing, bike sharing, and scooter sharing), prioritizing outreach to frontline communities.

SUSTAINABLE LAND USE PLANNING

Measure LU-4.1: Increase residential and commercial density in urban areas located near transit.

Quantification assumptions: This measure assumes new passenger VMT is reduced 15 percent by 2030 in compliance with SB 743 VMT targets. This measure assumes the 15 percent reduction is held constant for new development through 2045.

Action LU-4.1.1: Facilitate construction of missing middle housing, including ADUs and duplexes by connecting unincorporated area residents to the Alameda County ADU Resource Center. Develop an ADU incentive program that will offer grants and loans for the construction of ADUs and adopt an ordinance to allow up to four housing units in single-family zones.

Action LU-4.1.2: Streamline the permitting process and reduce parking requirement for affordable housing as an incentive.

Action LU-4.1.3: Encourage transit-oriented development and promote co-location of childcare centers and family childcare homes with affordable housing, employment centers, and health and social services.

Action LU-4.1.4: Focus commercial and residential development in the County's Specific Plan areas to encourage efficient land use and minimize daily trips.

Action LU-4.1.5: Promote jobs-housing balance in the urban unincorporated area through zoning and general plan policy.

Measure LU-4.2: Promote and ensure land uses that support walking and bicycling.

Quantification assumptions: Not quantified to avoid double-counting emissions reductions with Measure LU-4.1.

Action LU-4.2.1: Develop incentive zoning for the inclusion of shared mobility and other transportation demand management measures. Incentive zoning could include parking reduction or substitution, greater floor-to-area ratios, increased dwelling units, and greater height allowances.

Action LU-4.2.2: Partner with regional agencies to promote vanpools by creating community vanpool programs, including farmworker vanpools including employer-sponsored shuttles and rural vanpool programs.

Action LU-4.2.3: Collaborate with regional transportation agencies and business networks to provide information about, and access to, incentives and services that increase the use of alternatives to single-occupant vehicle commuting, including the Bay Area Commuter Benefits Program, the Alameda County Guaranteed Ride Home Program, and the 511 SF Bay traffic information program.

PARKING

Measure LU-5.1: Reduce minimum parking requirements and strategically evaluate the parking needs of the community.

Quantification assumptions: Not quantified.

Action LU-5.1.1: Modify the zoning code in accordance with California Assembly Bill (AB) 2097 to remove parking minimums for new developments within half a mile of public transit and consider establishing parking maximums in new developments.

Action LU-5.1.2: Evaluate current and future parking needs and consider repurposing underutilized and vacant lots.

Action LU-5.1.3: Implement the recommendations of the Ashland Cherryland Business District Specific Plan Area Parking Demand and Management Strategy Study.

4.1.4 Waste

INORGANIC WASTE MANAGEMENT AND REDUCTION

Measure WR-1.1: Increase recycling in the unincorporated areas of the county.

Quantification assumptions: Not quantified.

Action WR-1.1.1: Partner with waste haulers, Sanitary Districts, and StopWaste to expand the diversion of recyclable inorganic solid waste from landfills.

Action WR-1.1.2: Continue to increase participation in, while simultaneously reducing contamination of, curbside and drop-off recycling programs for all residential, commercial, industrial and institutional uses. Identify new drop-off and pick-up opportunities and additional items that can be recycled curbside.

Action WR-1.1.3: Provide education, audits, and other technical assistance in multiple languages to increase waste diversion rates in coordination with StopWaste. Develop waste reduction and diversion behavior campaigns in partnership with StopWaste and local organizations for residential, multifamily property managers, and commercial sectors.

Action WR-1.1.4: For events that require a County-issued permit, adopt an ordinance that requires recycling and composting services, the use of only recyclable and compostable materials by vendors, and adequate staff to ensure proper disposal and recycling.

Measure WR-1.2: Reduce solid waste generation.

Quantification assumptions: Not quantified.

Action WR-1.2.1: Adopt a comprehensive construction and demolition ordinance to reach a 75 percent diversion rate, which could include deconstruction.

Action WR-1.2.2: Work with restaurants in the unincorporated areas of the county to reduce single-use plastics.

Action WR-1.2.3: Create and support "fix-it clinics" at County facilities that can build skills among local businesses and residents in innovation, repair, and reuse.

Action WR-1.2.4: Support Extended Producer Responsibility initiatives that drive end of product life management.

Action WR-1.2.5: Explore establishment of a tool lending library in unincorporated Alameda County to reduce unnecessary waste associated with purchasing home improvement tools and equipment, increase access to electric

tools, hand-powered tools, and home energy assessment tools like plug load meters, and decrease cost-related barriers to home improvements.

ORGANIC WASTE MANAGEMENT AND REDUCTION

Measure WR-2.1: Educate the community and food generating businesses about reducing wasted food by preventing surplus edible food generation, storing food correctly, and donating surplus edible food before composting what is left.

Quantification assumptions: This measure assumes an estimated waste diversion rate of 45 percent for the unincorporated county in 2019. This measure assumes that the unincorporated county's diversion rate increases to 80 percent by 2030, 85 percent by 2040, and 90 percent by 2045.

Action WR-2.1.1: Implement and enforce the requirements of SB 1383 to divert compostable organic materials from landfills, ensuring that outreach and education materials are provided in appropriate languages and at appropriate literacy levels to meet the unique needs of residents and small businesses.

Action WR-2.1.2: Expand existing organic waste collection routes and drop-off sites to improve composting services for interested residents and businesses.

Action WR-2.1.3: Seek partnerships with schools to develop school composting programs and education.

Action WR-2.1.4: Seek partnerships with nonprofits and local community-based organizations to establish new food recovery programs, but also to maintain existing ones, such as the Alameda County Food Recovery Project led by the Alameda County Deputy Sheriffs' Activities League.

Action WR-2.1.5: Develop and launch outreach campaigns intended to educate the community and food generating businesses on reducing food waste, properly storing food, and composting.

4.1.5 Health and Resiliency

RESILIENT COMMUNITIES, EQUITY, AND ENVIRONMENTAL JUSTICE

Measure HR-1.1: Support the creation of resilience hubs and other place-based resilience resources to provide community members with essential services before, during, and after climate-related hazard events.

Quantification assumptions: Not quantified.

Action HR-1.1.1: Pursue funding to establish resilience hubs in frontline communities. Resilience hubs should be community-accessible centers that serve to deliver disaster preparedness messaging, facilitate stronger community ties, provide an accessible point of distribution for basic needs (such as food, masks, and emergency supplies), and to play a critical role in post-disruption recovery and ongoing communications needs.

Action HR-1.1.2: Partner with AC Transit, BART, and other public and private transportation providers to transport community members most at risk to inclement weather centers and resilience hubs during hazard events.

Action HR-1.1.3: Develop a broad, accessible, and multilingual communication strategy for hazard events.

Measure HR-1.2: Embed climate resiliency and adaptation across planning efforts.

Quantification assumptions: Not quantified.

Action HR-1.2.1: Integrate climate resilience throughout long-term planning and current development projects.

Action HR-1.2.2: Work with surrounding jurisdictions to accelerate, expand, and build new climate adaptation collaborative efforts with communities, governments, community and faith-based organizations, and businesses, such as the partnerships and efforts produced by the Bay Area Climate Adaptation Network (BayCAN) and the Coastal Hazards Adaptation Resiliency Group (CHARG).

Measure HR-1.3: Ensure essential services are available for community members most at risk.

Quantification assumptions: Not quantified.

Action HR-1.3.1: Improve broadband connectivity through targeted efforts resulting from a comprehensive Broadband Needs Assessment and through the promotion of existing programs, such as the Federal Communications Commission's (FCC's) Affordable Connectivity Program.

Action HR-1.3.2: Promote the services of nearby health, wellness, and social service providers that serve under-resourced and community members most at risk, and support the expansion of such facilities and services throughout the unincorporated county.

Action HR-1.3.3: Pursue grant funding to provide water refill stations at community gathering spots (e.g., schools, parks) throughout the unincorporated county.

Action HR-1.3.4: During extreme weather and climate hazard events, expand support services to people experiencing homelessness.

Measure HR-1.4: Support local food production and improve food security.

Quantification assumptions: Not quantified.

Action HR-1.4.1: Promote the Microenterprise Home Kitchen Operation (MEHKO) program and ensure that there are educational materials available in multiple languages.

Action HR-1.4.2: Encourage the development of, and facilitate access to, healthy food retail outlets throughout the unincorporated county, such as grocery stores, healthy corner stores, and farmers' markets.

Action HR-1.4.3: Establish new partnerships to increase healthy food access for youth. These partnerships may optimize school-based emergency food distribution, expand youth agricultural opportunities at local schools, and enhance school garden curricula.

Action HR-1.4.4: Promote, incentivize, and remove barriers to urban agriculture across the unincorporated county. This may include establishing partnerships to identify and active urban agriculture sites, reviewing existing ordinances and regulations to explore removing barriers, and encouraging the inclusion of food-growing spaces in new or remodeled multifamily residential sites.

Action HR-1.4.5: Promote food as medicine pathways to direct locally produced and sourced food to community health centers and clinics.

Action HR-1.4.6: Map local food recovery organizations currently addressing food insecurity and mobilize a network of food providers to strengthen coordination and shared resources between these organizations.

Measure HR-1.5: Prioritize measures and investments that protect frontline community residents and small businesses from displacement.

Quantification assumptions: Not quantified.

Action HR-1.5.1: Establish a Displacement Avoidance Task Force comprising of local government officials, community representatives, and other members to develop policies for preventing the displacement of frontline community

residents and small businesses due to climate impacts or unintended consequences of other policies meant to address climate change.

Action HR-1.5.2: Develop and implement assistance programs to provide financial and technical support to under-resourced communities and small businesses, helping them to adapt to climate change and transition to more sustainable practices without being displaced.

EMERGENCY PREPAREDNESS AND DISASTER RESPONSE

Measure HR-2.1: Ensure that emergency services have adequate capacity to address increased demand due to potential impacts of climate hazards.

Quantification assumptions: Not quantified.

Action HR-2.1.1: Consult with local jurisdictions, water providers, and fire departments to ensure the adequacy of emergency water flow, emergency vehicle access, and evacuation routes prior to approving any new development.

Action HR-2.1.2: Maintain up-to-date emergency preparedness and evacuation plans and procedures in coordination with appropriate State, regional, and local agencies and departments.

Action HR-2.1.3: Revise and coordinate cross-jurisdictional emergency management plans, programs, and activities to account for changing hazard profiles and their associated impacts.

Action HR-2.1.4: Promote the Community Emergency Response Team (CERT) training program through the Alameda County Fire Department to improve disaster preparedness and disaster response skills among residents.

Action HR-2.1.5: Develop disaster documentation program to include tracking disasters affecting the unincorporated county via photos of damage incurred during and after disaster events. This data can be used for tracking and trending, and ultimately mitigation planning.

Action HR-2.1.6: Host regular disaster preparedness trainings at convenient locations, in widely spoken languages to provide basic training to community members who are unable to commit to the CERT training program.

Action HR-2.1.7: Conduct outreach in multiple languages to ensure that all residents are aware of the County's evacuation and emergency notification systems (e.g. AC Alert, Genasys Connect).

Measure HR-2.2: Prioritize making emergency services more accessible and equitable, especially for community members most at risk.

Quantification assumptions: Not quantified.

Action HR-2.2.1: Encourage residents to register with the AC Alert emergency notification system for those who have access to mobile communication devices or devices with internet accessibility. Promote the availability of emergency notifications through KCBS radio 740 for those who do not have internet access or who are at risk of losing internet access in an emergency scenario.

Action HR-2.2.2: Partner with local healthcare providers, community-based organizations, and Medical Reserve Corps programs to establish emergency response networks and train volunteers to assist in emergencies.

Action HR-2.2.3: Coordinate to deploy "pop-up" mobile emergency units to areas that may be geographically isolated or have limited access to traditional healthcare facilities. In addition to rapid response to medical emergencies, these units can help build capacity and connectedness through health education and raising awareness about emergency services.

Action HR-2.2.4: Ensure that emergency service providers are prepared to serve the community with disability accessibility and language access capabilities, such as multilingual staff and/or interpretation and translation services.

Action HR-2.2.5: Establish an equity officer in the Alameda County Emergency Operations Center to connect disaggregated data and equity metrics, consider diverse needs, and engage trusted messengers in outreach efforts.

HAZARD-SPECIFIC RESILIENCE

Measure HR-3.1: Build resilience to flooding across the county, along with sea level rise in San Lorenzo.

Quantification assumptions: Not quantified.

Action HR-3.1.1: Work with ACFCWCD and other partner agencies and jurisdictions to conduct community engagement and feasibility studies and implement further flood control improvement projects, including those related to creek restoration, regional detention facilities, and dredging existing facilities for increased capacity.

Action HR-3.1.2: Continue to improve County's rating under the National Flood Insurance Program (NFIP) so that flood insurance premiums for residents in flood-prone areas may be reduced.

Action HR-3.1.3: Where it is not already required, encourage property owners to purchase flood insurance to reduce the financial risk from flooding.

Action HR-3.1.4: Dedicate adequate resources to ensure effective and timely monitoring and maintenance of public drainage facilities, including storm drains, to maintain adequate capacity for peak flows in the area.

Action HR-3.1.5: Ensure that any sea level- or flood-related barriers do not result in the diversion of flood waters or otherwise increase flooding potential near development and critical facilities.

Action 3.1.6: Incorporate future sea level rise, permanent and temporary inundation, and precipitation projections into long-term infrastructure planning processes, influencing decisions on expansion, relocation, elevation, or retrofitting of assets.

Action HR-3.1.7: Collaborate with neighboring jurisdictions, partner agencies, and organizations throughout the San Francisco Bay Area to encourage and expedite projects and initiatives aimed at addressing sea level rise (e.g., shoreline protection and restoration).

Measure HR-3.2: Build resilience to wildfires across the unincorporated county.

Quantification assumptions: Not quantified.

Action HR-3.2.1: Develop a structure ignition zone assessment program (and grant funding, if feasible) that connects homeowners and businesses to mitigation specialists to develop a comprehensive report with recommended mitigation actions to increase building resilience to wildfire.

Action HR-3.2.2: Partner with landowners, State agencies, and others to implement fuels reduction projects that are beyond defensible space requirements, but within two miles of homes and other structures, such as pruning, utility management, removal of understory, and biomass removal. Consider developing incentives to encourage brush removal around structures in fire-prone areas.

Action HR-3.2.3: Require private property owners to maintain the vegetation on their property in a condition that will not contribute to the spread of wildfire. Requirements may include, but are not limited to, removing all portions of trees within 10 feet of chimneys and stovepipe outlets, maintaining a 30-foot defensible space around all buildings and structures, and removing materials that may act as a fuel or conveyance of fire.

Action HR-3.2.4: Consider establishing and funding an enforcement district for residents within wildland-urban interface (WUI) areas and establish an inspection period to be conducted annually to ensure compliance with vegetation management standards.

Action HR-3.2.5: Promote programs from Diablo Firesafe Council and other partner organizations to further support wildfire preparedness and the implementation of wildfire risk reduction measures throughout the unincorporated county.

Action HR-3.2.6: Utilize goat grazing as a cost-effective and environmentally friendly alternative to controlled burns that reduce wildfire risk, where feasible.

Action HR-3.2.7: Promote and expand free to low-cost fire fuel reduction programs such as ACFD's Chipper Program.

Action HR-3.2.8: Research actions available to the County to support reduction of fire insurance rates for property owners in fire-prone areas.

Measure HR-3.3: Build resilience to extreme heat across the county.

Quantification assumptions: Not quantified.

Action HR-3.3.1: Seek funding to expand upon the work piloted by "Cooling Our Communities" to provide heat preparedness materials and resources to all areas of the unincorporated county.

Action HR-3.3.2: Update, revise, and promote the guidance of and ensure that residents have access to the "Pocket Guide to Emergency Preparedness & Heat Events" developed by the Alameda County Health Care Services Agency and Community Development Agency through the "Cooling Our Communities" heat preparedness program. This will include ensuring language and ADA accessibility, making physical and digital copies readily available, and partnering with communities to disseminate.

Action HR-3.3.3: Partner with community-based organizations, faith-based organizations, businesses, and other public agencies to develop a "Community Cool Zone Network" comprised of air-conditioned spaces that are made available and accessible to community members most at risk during extreme heat events.

Action HR-3.3.4: Develop a "Cool Buddy" program where local volunteers are trained to build neighborhood networks, identify heat-vulnerable neighbors, and set up systems to check in on each other during extreme heat events.

Action HR-3.3.5: Encourage the installation or use of cool roof technologies, green roofs, and rooftop gardens in new and existing private and public development.

Action HR-3.3.6: Reduce heat gain from surface parking lots in new development for a minimum of 50 percent of the site's hardscape. Develop standards to provide shade from the existing tree canopy or from appropriately selected new trees that complement site characteristics and maximize drought tolerance. Where feasible, use open-grid pavement systems (at least 50 percent pervious).

Action HR-3.3.7: Increase resilience of existing cooling centers by increasing guidance, providing low-tech information sources, and seeking funding for additional resources, such as backup power capabilities.

HIGH-ROAD, GREEN WORKFORCE AND BUSINESS DEVELOPMENT

Measure HR-4.1: Improve the quality and availability of green jobs, ensuring jobs have fair labor practices, living wages, benefits, and worker protection.

Quantification assumptions: Not quantified.

Action HR-4.1.1: Partner with the Alameda County Workforce Development Board, labor organizations, local CBOs, and community colleges to promote and connect local residents to high quality and family-sustaining local job opportunities.

Action HR-4.1.2: Promote BayREN programs to support contractor training and resident education in the unincorporated areas on electric appliances and their installation, operation, and maintenance.

Action HR-4.1.3: Develop a robust scoring and reporting system (e.g., health and wellness scorecard) to evaluate employer practices at workplaces in the unincorporated areas of the county. Develop incentives for workplaces to meet defined scorecard standards to improve physical and mental health, wages, job security, advancement opportunities, and meaningful voices in the workplace.

Action HR-4.1.4: Work with regional partners to convene a multistakeholder regional board that brings together residents, small businesses, labor organizations, and workers to identify, launch, and evaluate economic investment pilot programs that align small business goals with people-focused and place-based community priorities through shared decision-making power and aligned objectives.

Measure HR-4.2: Incentivize and promote green business practices, such as work-from-home policies.

Quantification assumptions: Not quantified.

Action HR-4.2.1: Promote business creation, retention, and entrepreneurship by providing technical assistance and financial incentives to local businesses.

Action HR-4.2.2: Continue to promote and encourage participation in the Alameda County Green Business Program through the California Green Business Network.

Action HR-4.2.3: Work with local employers to provide subsidies to employees for using transit or active transportation to commute to work, and encourage flexible work schedules (e.g., 9/80s and 4/10s) as well as telecommuting.

4.1.6 Agriculture and Vegetation

CLIMATE-RESILIENT AGRICULTURAL AND WORKING LANDS

Measure AG-1.1: Encourage agricultural best practices in agricultural and working lands that improve resilience to climate impacts.

Quantification assumptions: Not quantified.

Action AG-1.1.1: Promote the use of agroforestry in agricultural systems, which may improve soil fertility, water retention, and overall agricultural resilience.

Action AG-1.1.2: Coordinate with California Department of Food and Agriculture (CDFA), United States Department of Agriculture (USDA), and other relevant partners to improve and integrate projected climate impacts into pest detection and management, while minimizing the use of potentially harmful pesticides.

Action AG-1.1.3: Promote crop diversification and tailored crop breeding and selection to minimize the risk of crop failure and enhance resistance and resilience to potential climate impacts.

Action AG-1.1.4: Work with the State and other relevant partners to advocate for the subsidization and/or incentivization of obtaining crop insurance. Advocate for the inclusion of diverse crops in crop insurance offerings (such as culturally relevant crops).

Action AG-1.1.5: Work with ranchers to manage grazing to support oak woodland regeneration.

Action AG-1.1.6: Promote the use of livestock grazing near development, especially on steep hillsides and vacant lots, to support fire fuel management and provide discounted or free water supplies to ranchers whose livestock are serving this purpose.

Action AG-1.1.7: Promote the use of efficient irrigation systems to reduce crop water needs.

Action AG-1.1.8: Review County tax policies affecting land and infrastructure improvements for agriculture to avoid taxing landowners at home site improvement rates (e.g., water wells for agriculture that may be on a home site parcel).

Action AG-1.1.9: Promote and expand enrollment and participation in Williamson Act contracts.

Action AG-1.1.10: Increase awareness of BAAQMD's Agricultural Equipment assistance programs to help replace mobile, stationary, and portable agricultural equipment, and help unincorporated-area agricultural producers utilize this assistance.

Measure AG-1.2: Increase soil organic matter and soil carbon content in working lands.

Quantification assumptions: Not quantified.

Action AG-1.2.1: Promote the Alameda County Resource Conservation District's carbon farming program and technical assistance programs to develop and implement site-specific carbon farm plans and soil-beneficial conservation practices in unincorporated Alameda County.

Action AG-1.2.2: Assess and work to eliminate barriers to permitting carbon farm plans and allow for streamlining of permits related to carbon farm practices.

Action AG-1.2.3: In partnership with Alameda County Resource Conservation District, develop a healthy soil strategy for the county to support agriculture, address carbon sequestration, and increase water capture, building on the work of Alameda County Resource Conservation District's Healthy Soils Demonstration project.

Action AG-1.2.4: Promote the use of cover crops, hedgerows, mulch, and windbreaks and support farmers' and ranchers' pursuits of State and federal funding, in part through ACRCD's technical assistance.

Action AG-1.2.5: Work with ranchers, Alameda County Resource Conservation District, StopWaste, and other agency partners to increase compost application on rangelands.

Action AG-1.2.6: Work with horse-keepers, ACRCD, StopWaste, and other agency partners to improve on-farm composting and commercial composting acceptance of manure.

Action AG-1.2.7: Support partner-led (e.g., ACRCD, University of California Agriculture and Natural Resources, StopWaste, US Department of Agriculture's Natural Resources Conservation Science) educational and workshop events tailored to both the public and farmers and ranchers on topics of soil-beneficial practices and management techniques.

Action AG-1.2.8: Explore creation of ecosystem services payments for agricultural land management practices that promote carbon storage in soils and aboveground woody biomass.

Action AG-1.2.9: Undertake a study to evaluate threats to carbon sequestration and carbon storage on agricultural and working lands (e.g., incorporation, development, agricultural practices, erosion, etc.).

NATURE-BASED SOLUTIONS

Measure AG-2.1: Increase and improve urban tree canopy and green space consistent with the goals of the County's Environmental Justice Element.

Quantification assumptions: This measure assumes that 10 acres of urban trees are planted annually from 2030 through 2045.

Action AG-2.1.1: Partner with local park districts to ensure sustainable park maintenance and to make parks more accessible, safe, and comfortable for all. This can include providing more benches and shade in local parks, revitalizing

and investing in parks that serve vulnerable communities, increasing the number of local parks throughout the unincorporated county, and improving transition points between parks and communities.

Action AG-2.1.2: Compile and manage a street tree inventory to help in effectively managing and maintaining urban trees, monitoring the health and condition of urban trees, guiding evidence-based decision making (e.g., tree species selection, planting strategies, maintenance priorities), and raising public awareness of the value of urban and native trees.

Action AG-2.1.3: Develop a residential tree planting and replacement program that assists single-family homeowners and provides free trees to homes in under-resourced communities.

Action AG-2.1.4: Pursue funding to evaluate and expand the Alameda County Tree Program.

Action AG-2.1.5: Develop an Urban Greening Master Plan.

Action AG-2.1.6: Explore strategies to increase tree protections on private property that consider both the benefits of a healthy urban tree canopy and concerns about preserving private property rights. Strategies may include private property tree protection ordinances, Heritage, Protected, or Native tree designations, or tree stewardship incentives.

Measure AG-2.2: Utilize nature-based solutions to reduce the impacts of climate hazards and improve community resilience.

Quantification assumptions: Not quantified.

Action AG-2.2.1: Continue to implement and expand stormwater management best practices pursuant to Chapter 17.64 of the Alameda County Ordinance Code by using natural infrastructure to recharge groundwater, improve water quality, and minimize runoff. This can include rain gardens, infiltration beds, bioswales and basins, and constructed wetlands and retention ponds.

Action AG-2.2.2: Scale the use of innovative natural infrastructure features, such as green roofs and walls, permeable pavements, vegetated corridors, and multi-functional open spaces, where appropriate.

Action AG-2.2.3: Use tools, such as CalEnviroScreen, to determine priority pollution-burdened communities across the unincorporated county that may benefit most from vegetative barriers and plant hazard-resistant barriers in these areas, aligning with the objectives of the Air Pollution Exposure Zone Ordinance.

4.1.7 Community Engagement and Monitoring

ONGOING EQUITABLE COMMUNITY ENGAGEMENT

Measure CE-1.1: Foster ongoing and deep community engagement with frontline communities.

Action CE-1.1.1: Develop a community climate action engagement strategy that facilitates and inspires broad community participation in community- and individual-level climate actions. To encourage frontline community participation, engagement should be offered in commonly-spoken languages and should consider providing incentives for participation time, offering childcare, adjusting meeting times to accommodate work schedules, and/or combining planning meetings with workshops or trainings related to disaster preparedness or other topics of interest to the community.

Measure CE-1.2: Develop an array of accessible outreach programs with multilingual capacity for widely spoken languages that emphasize preparedness to climate hazards.

Quantification assumptions: Not quantified.

Action CE-1.2.1: Create an online and offline public outreach campaign for climate hazards (e.g., Red Flag warnings, Public Safety Power Shutoff events, Air Quality Index alerts), including information about what the warning is, what areas may be closed, what individuals should do to be prepared, and what activities should be avoided.

Action CE-1.2.2: Review and revise (as needed) the County's wildfire smoke and air quality communications protocols to ensure that related messaging is coordinated with other jurisdictions and can be disseminated to all populations, including those that may be difficult to reach.

Action CE-1.2.3: Promote the array of extreme heat-related resources already produced or hosted by the County to bolster extreme heat preparedness and prevent heat-related illnesses through targeted outreach and awareness campaigns.

Action CE-1.2.4: Develop neighborhood readiness plans and promote flood/sea level rise/ storm preparedness education.

Action CE-1.2.5: As a minimum standard, ensure that any outreach efforts that are developed are accessible, easy to understand, and available in multiple languages.

Action CE-1.2.6: Connect unincorporated area residents to air quality messaging by amplifying Spare the Air Alerts and other air quality communications released by BAAQMD.

Measure CE-1.3: Prioritize community-based solutions to improve climate resilience.

Quantification assumptions: Not quantified.

Action CE-1.3.1: Form community-based committees consisting of local stakeholders, residents, and experts to actively engage in climate resilience and response planning and decision-making processes and provide micro-grants to support community-led planning and projects.

Action CE-1.3.2: Establish partnerships with local businesses, institutions, and community-based organizations to leverage resources, expertise, and community networks for implementing climate resilience initiatives effectively.

CLIMATE ACTION MONITORING

Measure CE-2.1: Monitor implementation of CCAP actions to reduce GHG emissions and enhance adaptation and resilience in unincorporated Alameda County.

Quantification assumptions: Not quantified.

Action CE-2.1.1: Conduct updates of the unincorporated county GHG emissions inventory every five years to monitor the progress of GHG-reducing actions.

Action CE-2.1.2: Provide annual monitoring reports to the Alameda County Board of Supervisors on the implementation of CCAP actions.

Action CE-2.1.3: Conduct comprehensive updates of the CCAP every eight years, aligning with updates to the County's Housing Element and Safety Element.

Action CE-2.1.4: Proactively seek additional cost-effective implementation and strategic funding opportunities.

REFERENCES

California Air Pollution Control Officers Association. 2021 (December). Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. Available: https://www.airquality.org/ClimateChange/Documents/Final%20Handbook_AB434.pdf. Accessed April 6, 2023.

California Air Resources Board. 2017. California's 2017 Climate Change Scoping Plan. Available: https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf. Accessed June 29, 2021.

CAPCOA. *See* California Air Pollution Control Officers Association.

CARB. *See* California Air Resources Board.

Attachment A

Greenhouse Gas Emissions Reduction Measures

County of Alameda Community Measures
Quantification Summary

Emissions Sector	Strategy	Measure Code	Measure	Quantification Approach	2030	2040	2045
Buildings	Building Decarbonization	BE-1.1	Decarbonize existing residential and nonresidential buildings (i.e., replace gas infrastructure and appliances with electric alternatives).	Assumes 18% of existing residential development will be all-electric by 2030, 54% by 2040, and 72% by 2045. Assumes 7% of existing nonresidential development will be all-electric by 2030, 26% by 2040, and 40% by 2045.(Mozingo 2021)	17,237	68,604	100,370
		BE-1.2	Require new buildings, and significant remodels or additions, to be all-electric.	No natural gas in new construction, effective January 2026.	997	3,682	5,487
		BE-1.3	Encourage and support the use of electricity and alternative fuels in construction equipment.	Assumes 10% of construction equipment are converted to zero-emission alternatives by 2030, 20% by 2040, and 25% by 2045.	367	846	1,110
	Clean and Renewable Energy	BE-2.1	Install additional renewable energy-generating technologies (e.g., solar panels) in existing residential and nonresidential buildings.	Quantification combined with IN-1.1.	-	-	-
		BE-2.2	Install renewable energy-generating technologies (e.g., solar panels) beyond minimum State requirements in new residential and nonresidential development.	Quantification combined with IN-1.1.	-	-	-
	Energy Efficiency and Reliability	BE-3.1	Connect owners/occupants of existing residential and nonresidential buildings to energy audit and weatherization programs and resources.	Not quantified	-	-	-
		BE-3.2	Retrofit existing residential and nonresidential buildings to improve energy efficiency.	Quantification combined with BE-1.1.	-	-	-
		BE-3.3	Reduce plug loads (i.e., energy used by equipment that is plugged into an outlet) in existing residential and nonresidential buildings.	Quantification combined with BE-1.1.	-	-	-
	Resilient and Sustainable Buildings	BE-4.1	Improve resilience of existing residential and nonresidential buildings to climate hazards.	Not quantified	-	-	-
		BE-4.2	Enhance resilience of new residential and nonresidential buildings to climate hazards.	Not quantified	-	-	-
		BE-4.3	Increase the use of low-carbon concrete and other types of sustainable materials in new construction and renovations.	Not quantified	-	-	-
Infrastructure	Clean and Reliable Energy	IN-1.1	Transition the community to 100 percent clean energy.	Assumes 100% of communitywide accounts are enrolled in 100% Renewable Choice option from EBCE.	27,209	9,706	-
		IN-1.2	Increase the use of battery storage technologies (i.e., decentralized clean energy resources).	Not quantified	-	-	-
		IN-1.3	Support the development of innovative approaches to energy generation, distribution, and storage. For example: energy recapture (in-conduit hydro, co-generation), developing clean microgrids for schools, hospitals, or neighborhoods.	Not quantified	-	-	-
		IN-1.4	Encourage the increase of smart grid integration throughout the county.	Not quantified	-	-	-
		IN-1.5	Evaluate the potential for and develop district energy systems (multi-building heating and cooling systems) in urban areas of the county, and develop an implementation plan for cost-effective systems.	Not quantified	-	-	-
	Low- and Zero-Emission Vehicles	IN-2.1	Increase electric vehicle (EV) charging infrastructure.	Based on state targets and existing conditions	33,179	18,483	36,128
		IN-2.2	Encourage public EV and low-carbon vehicle adoption.	Quantification combined with IN-2.1.	-	-	-
	Low- and Zero-Emission Equipment	IN-3.1	Transition to electric landscaping equipment.	Assumes new lawn and garden equipment are zero-emission starting in 2024. Assumes 12%, 30%, and 39% replacement of existing fossil-fuel powered lawn and garden equipment by 2030, 2040, and 2045, respectively.	311	803	1,082

		IN-3.2	Encourage the use of electric or alternatively fueled agricultural equipment.	Not quantified	-	-	-
	Water Conservation	IN-4.1	Reduce water consumption in buildings.	Assume a reduction in per capita water consumption for indoor and outdoor use by 5% by 2030, 10% by 2040, and 15% by 2045.	11	5	-
		IN-4.2	Reduce water consumption for irrigation and landscaping.	Quantification combined with IN-4.1.	-	-	-
		IN-4.3	Increase the capture and use of recycled water.	Quantification combined with IN-4.1.	-	-	-
	Wastewater	IN-5.1	Foster best management practices and innovative strategies for Onsite Wastewater Treatment System management for the protection of groundwater and surface water bodies.	Not quantified	-	-	-
	Resilient Infrastructure	IN-6.1	Improve energy sector resilience.	Not quantified	-	-	-
		IN-6.2	Improve resilience of water and wastewater systems.	Not quantified	-	-	-
		IN-6.3	Protect vulnerable transportation infrastructure, services, and systems from climate hazards.	Not quantified	-	-	-
Land Use and Mobility	Safe, Accessible, and Reliable Active Transportation	LU-1.1	Develop and maintain a safe, connected, and continuous bicycle and pedestrian network.	Assumes 7.1% reduction in passenger VMT per CAPCOA 2021.	18,199	7,103	3,739
		LU-1.2	Increase and improve access to walking and bicycling throughout the unincorporated county.	Quantification combined with LU-1.1.	-	-	-
	Safe, Accessible, and Reliable Public Transportation	LU-2.1	Continue to partner with transit agencies to improve reliability, affordability, and convenience of existing transit services through increased frequency, expanded service areas, extended service hours, and better facilities. Prioritize improvements in under-resourced communities.	Assumes 13.6% reduction in existing passenger VMT by 2030, 14.5% by 2040, and 15% by 2045 per CAPCOA 2021.	34,362	14,216	7,696
	Equitable Shared Mobility	LU-3.1	Develop programs and incentives that promote shared mobility (e.g., car sharing, bike sharing, and scooter sharing) in under-resourced communities and that increase access to health services, food, education, and employment.	Not quantified	-	-	-
	Sustainable Land Use Planning	LU-4.1	Increase residential and commercial density in urban areas located near transit.	Assumes a 15% reduction in new passenger VMT due to increased density and SB 743 compliance.	3,305	2,089	1,286
		LU-4.2	Promote and ensure land uses that support walking and bicycling.	Quantification combined with LU-4.1.	-	-	-
	Parking	LU-5.1	Reduce minimum parking requirements for mixed use, pedestrian and transit-oriented development.	Not quantified	-	-	-
Waste	Inorganic Waste Management and Reduction	WR-1.1	Increase recycling in the unincorporated areas of the county.	Quantification combined with WR-1.2.	-	-	-
		WR-1.2	Reduce solid waste generation.	Not quantified	-	-	-
	Organic Waste Management and Reduction	WR-2.1	Continue to educate the community on composting best practices and increase onsite/home composting and use of curbside green organic recycling bins.	Assumes increase of diversion rate from 45% to 80% by 2030, increasing to 90% by 2045.	15,531	18,226	20,834
Health and Resiliency	Resilient Communities, Equity, and Environmental Justice	HR-1.1	Support the creation of resilience hubs and other place-based resilience resources to provide community members with essential services before, during, and after climate-related hazard events.	Not quantified	-	-	-
		HR-1.2	Embed climate resiliency and adaptation across planning efforts.	Not quantified	-	-	-
		HR-1.3	Ensure essential services are available for community members most at risk.	Not quantified	-	-	-
		HR-1.4	Support local food production and improve food security.	Not quantified	-	-	-
		HR-1.5	Prioritize measures and investments in under-resourced communities and small businesses and protect them from displacement.	Not quantified	-	-	-
	Education, Outreach, and Coordination	HR-2.1	Develop an array of accessible outreach programs with multilingual capacity for widely spoken languages that emphasize preparedness to climate hazards.	Not quantified	-	-	-
		HR-2.2	Prioritize community-based solutions to improve climate resilience.	Not quantified	-	-	-
	Emergency Preparedness and Disaster Response	HR-3.1	Ensure that emergency services have adequate capacity to address increased demand due to potential impacts of climate hazards.	Not quantified	-	-	-
		HR-3.2	Prioritize making emergency services more accessible and equitable, especially for community members most at risk.	Not quantified	-	-	-
	Hazard-Specific Resilience	HR-4.1	Build resilience to flooding across the county, along with sea level rise in San Lorenzo.	Not quantified	-	-	-
		HR-4.2	Build resilience to wildfires across the county.	Not quantified	-	-	-
		HR-4.3	Build resilience to extreme heat across the county.	Not quantified	-	-	-

Agriculture and Vegetation	Climate-Resilient Agriculture	AG-1.1	Encourage agricultural best practices that improve resilience to climate impacts.	Not quantified	-	-	-
		AG-1.2	Encourage increases in soil organic matter and soil carbon content.	Not quantified	-	-	-
	Nature-Based Solutions	AG-2.1	Increase and improve urban tree canopy and green spaces.	Assumes 10 acres of urban tree canopy is planted annually starting in 2025.	458	1,222	1,604
		AG-2.2	Utilize nature-based solutions to reduce the impacts of climate hazards and improve community resilience.	Not quantified	-	-	-
	Livestock Management	AG-3.1	Encourage best practices for livestock management.	Not quantified	-	-	-
Green Economy	High Road, Green Workforce and Business Development	GE-1.1	Improve the quality of green jobs, ensuring jobs have fair labor practices, living wages, benefi	Not quantified	-	-	-
		GE-1.2	Incentivize and promote green business practices.	Not quantified	-	-	-
Total emissions reductions with measures					**151,166**	**144,987**	**179,337**
Legislative-Adjusted Business-As-Usual Emissions					**871,576**	**665,526**	**611,786**
Target Emissions					**723,139**	**266,819**	**138,283**
Reductions Needed to Meet Targets					**148,436**	**398,707**	**473,503**
Emissions with Measures					**720,410**	**520,540**	**432,449**
Emissions Gap					**(2,729)**	**253,720**	**294,166**
Target Met?					**Yes**	**No**	**No**

BE-1.1a
Buildings Measures

Retrofit existing residential buildings (single family and multi-family) to improve energy efficiency and facilitate fuel switching.	**2030**	**2040**	**2045**
Gas Usage (therms)	20,681,736	21,096,771	21,358,084
REDUCTIONS			
Target Electrification Rate [1]	18%	54%	72%
Reduced natural gas usage (therms)	3,724,752	11,398,498	15,388,353
Natural gas emissions factor (MTCO2e/therm)	0.00532	0.00532	0.00532
GHG reductions from existing development natural gas savings (MTCO2e)	19,823	60,661	81,894
INCREASES			
Total therms offset from natural gas heating use (therms)	4,775,324	14,613,460	19,728,658
Total electricity needed to offset natural gas heating (MWh)	139,917	428,176	578,052
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)	0.0344	0.0078	-
Additional GHG emissions from electricity use (MTCO2e)	4,813	3,320	-
Net GHG Reductions (MTCO2e)	**15,010**	**57,341**	**81,894**

Sources:

[1] Mozingo. 2021. Zero-Carbon Buildings in California: A Feasibility Study

BE-1.1b
Buildings Measures

Retrofit existing nonresidential buildings to improve energy efficiency and facilitate fuel switching.	**2030**	**2040**	**2045**
Gas Usage (therms)	8,497,584	8,631,778	8,631,778
REDUCTIONS			
Target Electrification Rate	7%	26%	40%
Reduced natural gas usage (therms)	552,646	2,238,959	3,471,620
Natural gas emissions factor (MTCO2e/therm)	0.00532	0.00532	0.00532
GHG reductions from existing development natural gas savings (MTCO2e)	2,941	11,915	18,475
INCREASES			
Total therms offset from natural gas heating use (therms)	708,520	2,870,460	4,450,795
Total electricity needed to offset natural gas heating (MWh)	20,760	84,105	130,409
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)	0.0344	0.0078	-
Additional GHG emissions from electricity use (MTCO2e)	714	652	-
Net GHG Reductions (MTCO2e)	**2,227**	**11,263**	**18,475**

Sources:

[1] Mozingo. 2021. Zero-Carbon Buildings in California: A Feasibility Study

BE-1.2
Buildings Measures

Eliminate the use of natural gas in new development by January 2026.	**2019**	**2026**	**2030**	**2040**	**2045**
(therms)	28,423,482	28,904,470	29,179,321	29,688,635	29,989,861
Gas usage from residential and nonresidential starting 2026 (new only) (therms)			274,850	784,164	1,085,391
REDUCTIONS					
Target Electrification Rate			90%	93%	95%
Reduced natural gas usage (therms)			247,365	731,887	1,031,121
Natural gas emissions factor (MTCO2e/therm)			0.00532	0.00532	0.00532
GHG reductions from existing development natural gas savings (MTCO2e)			1,316	3,895	5,487
INCREASES					
Total therms offset from natural gas heating use (therms)			317,135	938,316	1,321,951
Total electricity needed to offset natural gas heating (MWh)			9,292	27,493	38,733
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)			0.0344	0.0078	-
Additional GHG emissions from electricity use (MTCO2e)			320	213	-
Net GHG Reductions (MTCO2e)			**997**	**3,682**	**5,487**

BE-1.3
Buildings Measures

Reduce emissions from construction equipment by supporting a transition to zero-emission equipment.	**2019**	**2030**	**2040**	**2045**
Construction equipment emissions (MTCO2e)	4,072	4,253	4,367	4,438
Target zero-emission rate for construction equipment [1]		10%	20%	25%
GHG reductions from zero-emission construction equipment (MTCO2e)		425	873	1,110
Additional emissions from electricity use				
Diesel Emission Factors (MTCO2e per gal)		1.02E-02	1.02E-02	1.02E-02
Reduced Diesel usage due to transition (gal)		41,579	85,392	108,480
Gal/kWh factor for diesel [2]		40.7	40.7	40.7
Electricity required to charge transitioned construction equipment (kwh)		1,692,281	3,475,434	4,415,144
Charged amount (MWh)		1,692.28	3,475.43	4,415.14
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)		3.44E-02	7.75E-03	0.00E+00
Additional GHG emissions from transitioned construction equipment (MTCO2e)		58	27	-
Reduced GHG Emissions (MTCO2e)		**367**	**846**	**1,110**

Sources:
[1] Assuming same proportions as Statewide GHG reduction included in CARB 2020 Mobile Source Strategy; extrapolated for 2045
[2] Convertunits.com

IN-1.1
Infrastructure Measures

Enroll 100% of communitywide accounts in 100% Renewable Choice option from EBCE.	**2030**	**2040**	**2045**
Total electricity emissions (MTCO2e)	20,048	5,304	0
Additional electricity emissions from other measures (MTCO2e)			
BE-1.1a	*4,813*	*3,320*	*0*
BE-1.1b	*714*	*652*	*0*
BE-1.2	*320*	*213*	*0*
IN-2.1	*1,203*	*162*	*0*
IN-3.1	*52*	*27*	*0*
BE-1.3	*58*	*27*	*0*
Adjusted electricity emissions reductions from 100% carbon-free electricity (MTCO2e)	27,209	9,706	0
GHG Reductions (MTCO2e)	**27,209**	**9,706**	**-**

IN-2.1
Infrastructure Measures

Transition to low- and zero-emission vehicles.	**2019**	**2030**	**2040**	**2045**
Unincorporated Alameda County population	155,874	163,800	168,620	171,655
Alameda County population	1,694,324	1,868,635	2,092,370	2,187,143
Population ratio (City vs County)	0.09	0.09	0.08	0.08
Install EV charging stations for LDVs				
EV Forecasts and Targets				
EMFAC2021 ACC II Light Duty Pop - Countywide [1]		1,132,742	1,220,547	1,267,408
EMFAC2021 ACC II Light Duty Pop - Unincorporated Alameda County		99,293	98,361	99,471
EMFAC2021 ACC II Light Duty EV/PHEV Pop - Countywide [1]		226,520	799,903	1,035,812
EMFAC2021 ACC II Light Duty EV/PHEV Pop - Unincorporated Alameda County		19,856	64,463	81,294
Calculated EMFAC2021 ACC II Light Duty EV/PHEV percentage		20%	66%	82%
Targeted EV/PHEV Pop percentage under IN-2.1		28%	69%	90%
Increased EV/PHEV Pop percentage under IN-2.1		8%	4%	8%
Targeted EV/PHEV Pop under IN-2.1		27,802	68,197	89,524
Additional EV/PHEV Pop under IN-2.1		7,946	3,735	8,229
EMFAC2021 EV:PHEV Ratio with ACC II adjustments		4.7	7.8	8.8
Additional EV Pop under IN-2.1		6,553	3,312	7,387
Additional PHEV Pop under IN-2.1		1,393	423	843
Additional GHG emissions from EVs				
Average annual miles per EV (mi/vehicle) [1]		15,244	13,719	12,894
New EV VMT under measure		99,891,810	45,435,675	95,244,983
Average Efficiency of EV LDV (kWh/100-mi) [2]		34.60	34.60	34.60
Charged amount (kWh)		34,562,566	15,720,744	32,954,764
Charged amount (MWh)		34,563	15,721	32,955
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)		3.44E-02	7.75E-03	0.00E+00
Additional GHG emissions from EVs (MTCO2e)		1,189	122	-
Additional GHG emissions from PHEVs				
Average annual miles per PHEV (mi/vehicle) [1]		15,956	14,218	13,481
New PHEV VMT under measure		22,227,465	6,010,560	11,361,728
Average emissions factor from PHEV (gCO2e/mi) [1]		129	121	120
Additional PHEV emissions under measure (MTCO2e)		2,863	727	1,360
Emissions avoided from Equivalent Gasoline/Diesel Vehicles				
Average emissions factor from Gasoline/Diesel mix (gCO2e/mi) [1]		301	294	298
Average annual miles per Gasoline/Diesel (mi/vehicle) [1]		11,885	8,848	7,252
Reduced Gasoline/Diesel VMT (mi)		122,119,274	51,446,235	106,606,711
Reduced Gasoline/Diesel emissions under IN-2.1 (MTCO2e)		36,814	15,134	31,724

Total Emission Reductions from Increased LDV EV/PHEV Mix (MTCO2e)		**32,762**	**14,285**	**30,364**
Install EV charging stations for Medium and Heavy-duty vehicles				
State-level EV Forecasts and Targets	**2019**	**2030**	**2040**	**2045**
EMFAC2021 Medium/Heavy Duty Pop - Countywide [1]		77,635	89,762	96,047
EMFAC2021 Medium/Heavy Duty Pop - Unincorporated Alameda County		6,805	7,234	7,538
EMFAC2021 Medium/Heavy Duty EV/PHEV Pop - Countywide [1]		4,437	23,830	33,042
EMFAC2021 Medium/Heavy Duty EV/PHEV Pop - Unincorporated Alameda County		389	1,920	2,593
Calculated EMFAC2021 Medium/Heavy Duty EV/PHEV percentage		6%	27%	34%
Targeted EV/PHEV Pop percentage under IN-2.1		10%	40%	50%
Increased EV/PHEV Pop percentage under IN-2.1		4%	13%	16%
Targeted EV/PHEV Pop under IN-2.1		406	2,179	2,998
Additional EV/PHEV Pop under IN-2.1		17	258	405
Additional GHG emissions from EVs				
Average annual miles per EV (mi/vehicle) [1]		21,976	18,205	16,895
New EVMT under measure		366,229	4,703,182	6,834,130
Average Efficiency of EV medium/heavy duty (kWh/100-mi) [1]		115	110	110
Charged amount (kWh)		420,305	5,179,281	7,513,597
Charged amount (MWh)		420	5,179	7,514
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)		3.44E-02	7.75E-03	0.00E+00
Additional GHG emissions from EVs (MTCO2e)		14	40	-
Emissions from Equivalent Gasoline/Diesel Vehicles				
Average emissions factor from Gasoline/Diesel mix (gCO2e/mi) [1]		1,177.57	901.11	843.55
Average annual miles per Gasoline/Diesel (mi/vehicle) [1]		17,995	18,937	20,065
Reduced Gasoline/Diesel VMT under IN-2.1 (mi)		-	-	-
Reduced Gasoline/Diesel VMT (mi)		366,229	4,703,182	6,834,130
Reduced Gasoline/Diesel emissions under IN-2.1 (MTCO2e)		431	4,238	5,765
Net GHG emissions avoided from increased MHDV EV chargers (MTCO2e)		**417**	**4,198**	**5,765**
Net GHG emissions avoided from increased EV chargers (MTCO2e)		**33,179**	**18,483**	**36,128**

Sources:

[1] EMFAC 2021 results for Alameda County adjusted for ACC II ZEV requirements for new vehicles. Requirements pertain to both PHEVs and ZEVs.

[2] https://ecocostsavings.com/average-electric-car-kwh-per-mile/

IN-3.1
Infrastructure Measures

Reduce emissions from landscaping equipment such as leaf blowers by supporting a transition to zero-emission equipment.	**2019**	**2024**	**2030**	**2040**	**2045**
Landscaping equipment emissions (MTCO2e)	2,457	2,514	2,582	2,658	2,706
Target electrification rate for existing landscaping equipment [1]			12%	30%	39%
Reduction in landscaping equipment emissions from SORE regulations (MTCO2e)			68	76	124
GHG reductions from zero-emission landscaping equipment (MTCO2e)			363	830	1,082
Additional emissions from electricity use					
Gasoline Emission Factors (MTCO2e per gal) [2]			0.00878	0.00878	0.00878
Reduced Gasoline usage due to transition (gal)			41,343	94,547	123,241
Gal/kWh factor for gasoline [3]			36.6	36.6	36.6
Electricity required to charge transitioned construction equipment (kwh)			1,513,156	3,460,433	4,510,634
Charged amount (MWh)			1,513.16	3,460.43	4,510.63
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)			0.03440	0.00775	0.00000
Additional GHG emissions from zero-emission construction equipment (MTCO2e)			52	27	-
Reduced GHG Emissions (MTCO2e)			**311**	**803**	**1,082**

Sources:
[1] Assuming same proportions as Statewide GHG reduction included in CARB 2020 Mobile Source Strategy; extrapolated for 2045
[2] The Climate Registry 2022 Default Emissions Factors
[3] Convertunits.com

IN-4.1
Infrastructure Measures

Reduce water consumption in buildings through conservation campaigns and water efficiency measures. Reduce water consumption for irrigation and landscaping by encouraging drought tolerant landscaping practices.

	2030	2040	2045
Total Potable Water-related Fuel Use (kWh)	6,187,656	6,353,790	6,455,979
Annual potable water consumption (AF/year)	16,607	17,053	17,327
Rate of Fuel Use (kWh/AF/year)	373	373	373
Water consumption reduction target	5%	10%	15%
Reduced water related consumption (AF/year)	830	1,705	2,599
Reduced Fuel Use (kWh)	309,383	635,379	968,397
kWh / MWH factor	1,000	1,000	1,000
Reduced Fuel Use (MWh)	309	635	968
Electricity emissions factor (MTCO2e/MWh) (EBCE Bright Choice)	0.0344	0.0078	0.0000
Reduced GHG Emissions (MTCO2e)	**11**	**5**	**-**

LU-1.1 Land Use and Mobility Measures **Develop more protected bikeways.** **Expand bicycling and walking options through infrastructure improvements.** **Develop more accessible and safer pedestrian infrastructure.** **Implement a community bikeshare program.**			**2030**	**2040**	**2045**
Emissions from on-road transportation (passenger vehicles)			255,967	99,907	52,590
Annual VMT from passenger vehicles after LU-4.1 and LU-2.1			924,214,211	963,004,943	981,176,118
Percent reduction in GHG emissions by providing Pedestrian Network Improvement (T-18, ND) [1]	6.40%				
Percent reduction in GHG emissions from displaced vehicles on roadway with bicycle boulevard (T-19-B, ND) [1]	0.20%		**7.1%**	**7.1%**	**7.1%**
Percent reduction in GHG emissions by expanding bikeway network (T-20, ND) [1]	0.50%				
Percent reduction in GHG emissions by Implementing Electric Bikeshare Program (T-22-B, ND) [1]	0.06%				
Reduction in VMT with LU measures (miles)			**65,711,921**	**68,469,954**	**69,761,930**
GHG Reductions from LU-1.1 (MTCO2e)			**18,199**	**7,103**	**3,739**

Notes:

Multiple measures are quantified in this sheet together as these measures are lumped together under the "Neighborhood subsector" in CAPCOA, 2021. CAPCOA, 2021 defines one single number (% reduction) for the whole sector.

Combined impact of CAPCOA measures:

7.110%

Sources:

[1] CAPCOA, 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity-Final Draft.

LU-2.1 Land Use and Mobility Measures **Enhance and expand transit facilities and infrastructure to access a broader ridership.** **Increase transit ridership through incentives and more frequent, connected transit lines.** **Implement an on-demand microtransit system, transporting residents from curb to curb.**	**2030**	**2040**	**2045**
Annual passenger vehicle miles traveled (VMT) after LU-4.1	1,069,693,361	1,126,761,204	1,154,324,844
Percent reduction in unincorporated county passenger VMT from extended transit coverage or hours (T-25, T) [1]	2.3%	3.8%	4.6%
Percent reduction in unincorporated county passenger VMT from increased transit service frequency (T-26, T) [1]	11.3%	11.3%	11.3%
Percent reduction in unincorporated county passenger VMT from transit-supportive roadway treatments (T-27, T) [1]	0.3%	0.5%	0.6%
Total percent reduction	13.6%	14.5%	15.0%
Passenger VMT reduction	145,479,150	163,756,261	173,148,727
Passenger vehicle emissions factor (MTCO2e/mi)	0.0002362	0.0000868	0.0000444
GHG reductions from passenger vehicles (MTCO2e)	34,362	14,216	7,696
GHG Reductions from LU-2.1 (MTCO2e)	34,362	14,216	7,696

Notes:

Maximum reduction taken for Transit subcategory per CAPCOA 2021 in 2045

Sources:

[1] CAPCOA, 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity-Final Draft.

LU-4.1
Land Use and Mobility Measures

Increase high-density, transit-oriented development along primary corridors to reduce time spent traveling.	**2019**	**2030**	**2040**	**2045**
Annual passenger vehicle miles traveled (VMT)	990,400,637	1,083,686,195	1,150,824,834	1,183,252,646
New passenger VMT		93,285,558	160,424,197	192,852,009
Percent VMT reduction from SB 743 and increased density [1]		15%	15%	15%
Reduced passenger VMT from SB 743 and increased density [1]		13,992,834	24,063,630	28,927,801
Passenger vehicle emissions factor (MTCO2e/mile)		0.00023620	0.00008681	0.0000444
GHG reductions from passenger vehicles (MTCO2e)		3,305	2,089	1,286
GHG Reductions (MTCO2e)		**3,305**	**2,089**	**1,286**

Notes:
[1] Increased density is relative to General Plan growth assumptions used in the GHG emissions projections.

WR-2.1
Waste Measures

Eliminate the disposal of organic solid waste in landfills to reduce methane emissions.	**2019**	**2030**	**2040**	**2045**
Solid waste emissions (MTCO2e)	20,562	24,406	25,061	25,464
Waste Diversion Targets [1]	45%	80%	85%	90%
Increased waste diversion		35%	40%	45%
Adjusted forecasted emissions from solid waste (MTCO2e)		8,875	6,835	4,630
Reduced GHG Emissions (MTCO2e)		**15,531**	**18,226**	**20,834**

Notes:

From CalRecycle 2021: Of the total materials generated in 2019, 55 percent were sent to landfill, 19 percent were exported as recyclables, 12 percent were composted, anaerobically digested or mulched, and another 6 percent were recycled or source reduced. The remainder of the material, less than 10 percent, went to alternative daily cover (ADC), beneficial reuse, transformation, alternative intermediate cover (AIC), waste-tire derived fuel, and engineered municipal solid waste (EMSW).

Sources:

[1] State of Disposal and Recycling for Calendar Year 2019. CalRecycle 2021. Available: **https://www2.calrecycle.ca.gov/Publications/Details/1697**

AG-2.1 Agriculture and Vegetation Measures			
Increase and improve urban tree canopy and green spaces.	**2030**	**2040**	**2045**
Annual sequestration rate per acre (MTCO2) [1]	7.6	7.6	7.6
Target: Increased acreage of canopy cover per year	10	10	10
Number of years (planting begins in 2025)	6	16	21
Number of acres planted over period in active growing stage in inventory year	60	160	210
Reduced GHG Emissions (MTCO2e)	**458**	**1,222**	**1,604**

Bay Area Greenprint

Acres Covered	476,548
Carbon Sequestered Annually by Urban Trees (MTCO2)	3640865
Carbon Sequestered Per Acre Per Year (MTCO2/tree)	7.6

Sources:

[1] Bay Area Greenprint, Alameda County report. Accessed June 2023. www.bayareagreenprint.org

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MEASURE NUMBER	MEASURE	Action Number	ACTION	PRIORITIZATION SCORE	GHG Reduction Potential	County Cost Effectiveness	Residential and Businesses Cost Effectiveness	Technological Feasibility	Current Policies or Ordinances	Jurisdictional Control / Ease of Implementation	Implementation Timeframe	Benefits to Renters	Equity	Air Pollution Prevention	Health and Well-Being	Reliability	Prioritized by Community	Job Development	Resource Preservation
BUILDINGS																			
STRATEGY 1. BUILDING DECARBONIZATION																			
BE-1.1	Encourage decarbonization of existing residential and nonresidential buildings (i.e., replace gas infrastructure and appliances with electric alternatives).	BE-1.1.1	Consider developing a comprehensive energy retrofit plan to encourage transition of mixed-fuel residential and nonresidential buildings to all-electric, prioritizing the needs of frontline communities. The plan should address end-of-life recycling and disposal of gas appliances.	21	8	0	2	2	0	2	1	1	2	1	1	0	0	1	0
		BE-1.1.2	Consider establishing electrification retrofit requirements for commercial buildings at the time of building retrofit/renovation or equipment replacement. Where electrification is infeasible, encourage renewable gas.	19	8	0	2	2	0	2	2	0	0	1	1	0	0	1	0
		BE-1.1.3	Work with Renew Alameda County to expand the services eligible for home improvements and repair to include energy efficiency and electric appliance changeouts, and to reduce barriers to accessing the services for low-income property owners.	20	8	0	2	2	0	0	2	1	2	1	1	0	0	1	0
		BE-1.1.4	Consider eliminating the provision of fossil fuel-powered backup generator permits for existing nonresidential development (except for emergency facilities such as hospitals and building types not subject to the California Building Energy Efficiency Standards that provide essential services) by 2030.	14	8	0	0	2	0	2	0	0	0	1	1	0	0	0	0
		BE-1.1.5	Evaluate the feasibility of requiring electric service upgrades during major retrofits, including solar-ready panels.	13	8	0	0	2	0	2	1	0	0	0	0	0	0	0	0
BE-1.2	Encourage a transition away from reliance on natural gas infrastructure in new buildings and significant remodels.	BE-1.2.1	Consider adopting a reach code that reduces reliance on natural gas infrastructure in new development (residential and nonresidential).	17	4	0	2	2	0	2	2	1	2	1	1	0	0	0	0
		BE-1.2.2	Consider adopting a reach code that requires electric-ready design in new industrial construction and that requires non-core industrial operations (e.g., space heating and cooling, domestic hot water) to be all electric.	17	4	0	2	2	0	2	2	1	2	1	1	0	0	0	0
BE-1.3	Encourage and support the use of electricity and alternative fuels in construction equipment.	BE-1.3.1	Encourage all construction projects to use renewable diesel in diesel-powered construction equipment.	15	4	0	0	2	0	2	2	1	0	1	1	0	2	0	0
		BE-1.3.2	Encourage the use of electric-powered construction equipment in all discretionary projects.	11	4	0	2	2	0	-2	1	0	0	1	1	0	2	0	0
		BE-1.3.3	Discourage the use of fossil fuel-powered generators at construction sites in all discretionary projects.	13	4	0	0	2	0	2	1	0	0	1	1	0	2	0	0
STRATEGY 2. CLEAN AND RENEWABLE ENERGY																			
BE-2.1	Install additional renewable energy-generating technologies (e.g., solar panels) in existing residential and nonresidential buildings.	BE-2.1.1	Identify commercial and industrial areas with optimal solar orientation, building structure, and land ownership/management conditions.	11	4	1	2	2	0	-2	1	0	0	0	1	0	2	0	0
		BE-2.1.2	Adopt ordinance that establishes Solar EmPowerment Districts in high potential areas.	18	4	1	2	2	0	2	2	0	2	0	1	0	2	0	0
		BE-2.1.3	Minimize barriers and streamline permitting for solar PV installation in Solar EmPowerment Districts.	18	4	0	2	2	0	2	2	0	2	1	1	0	2	0	0
		BE-2.1.4	Promote the availability of incentive programs to support the installation of renewable energy-generating technologies.	15	4	0	2	2	0	-2	2	0	2	1	1	1	2	0	0
BE-2.2	Install renewable energy-generating technologies (e.g., solar panels) beyond minimum State requirements in new residential and nonresidential development.	BE-2.2.1	Promote appliance upgrades to energy-efficient technologies and products through campaigns targeted at residents and local businesses (e.g., ENERGY STAR® appliance change-out programs, and incentives).	15	4	0	2	2	0	-2	2	1	2	1	1	0	2	0	0
		BE-2.2.2	Eliminate local regulatory barriers to installation of distributed renewable energy systems, such as wind and solar, through revisions to the zoning code and other relevant County policies.	18	4	1	2	2	0	2	2	1	0	1	1	0	2	0	0
		BE-2.2.3	Provide guidelines for the permit application process for renewable energy generation installation (e.g., solar photovoltaics) in residential and nonresidential development.	17	4	1	2	2	0	2	2	1	0	0	1	0	2	0	
		BE-2.2.4	Collaborate with PG&E to make key upgrades to transmission and distribution systems, substations, and other equipment to enable electrification and renewable energy integration into the electricity grid.	16	4	1	2	2	0	0	2	0	0	1	1	0	2	1	
STRATEGY 3. ENERGY EFFICIENCY AND RELIABILITY																			
BE-3.1	Connect owners/occupants of existing residential and nonresidential buildings to energy audit and weatherization programs and resources.	BE-3.1.1	Work with regional organizations such as BayREN to support and expand access to rental property energy efficiency and electrification outreach and incentive programs.	15	4	-1	2	2	0	0	1	1	2	0	1	0	2	1	0
		BE-3.1.2	Connect to external programs that provide low-cost financing and encourage energy efficiency investments for existing residential buildings, focused on owner-occupants.	17	4	1	2	2	0	0	1	1	2	1	1	0	2	0	0

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BE-3.2	Retrofit existing residential and nonresidential buildings to improve energy efficiency.	BE-3.2.1	Work with PG&E, Ava Community Energy (Ava), and community-based organizations (e.g., Rising Sun Center for Opportunity) to provide free energy audits of existing buildings, prioritizing implementation in frontline neighborhoods.	18	4	0	2	2	0	0	2	1	2	1	1	0	2	1	0
		BE-3.2.2	Encourage developers to utilize state and federal funding programs, such as Community Development Block Grant programs, to achieve energy efficiency improvements in existing and new buildings, with a particular focus on affordable housing.	20	4	1	2	2	0	2	1	1	2	1	1	0	2	1	0
		BE-3.2.3	Promote existing community education programs around energy efficiency best practices and cost savings opportunities, prioritizing outreach to frontline communities.	15	4	0	2	2	0	-2	2	1	2	1	1	0	2	0	0
		BE-3.2.4	Explore options to lower costs associated with residential energy efficiency improvements, such as lowering permit fees.	18	4	0	2	2	0	2	2	0	2	1	1	0	2	0	0
BE-3.3	Reduce plug loads (i.e., energy used by equipment that is plugged into an outlet) in existing residential and nonresidential buildings.	BE-3.3.1	Promote appliance upgrades to energy-efficient technologies and products through campaigns focused on residents and local businesses (e.g., ENERGY STAR® appliance change-out programs, and incentives).	16	4	0	2	2	0	0	2	1	2	1	1	1	0	0	0
		BE-3.3.2	Facilitate the adoption of smart grid and other peak load reduction technologies such as building energy management systems and smart appliances.	13	4	0	2	2	0	0	0	1	0	1	1	1	0	1	0
STRATEGY 4. RESILIENT AND SUSTAINABLE BUILDINGS																			
BE-4.1	Improve resilience of existing residential and nonresidential buildings to climate hazards.	BE-4.1.1	Increase the use of indoor air purification systems capable of enhancing and protecting public health from wildfire smoke and poor air quality in the existing building stock in the unincorporated county, as well as from toxic air contaminants associated with freeway traffic and vehicle travel (consistent with the County's proposed Air Pollution Exposure Zone Ordinance).	19	4	0	2	2	0	2	1	1	2	1	1	0	2	1	0
		BE-4.1.2	Through focused outreach, encourage all residential and nonresidential building owners located in wildland-urban interface (WUI) areas or "High" or "Very High" fire hazard severity zones (FHSZs) to conduct hardening retrofits, which may include installing fire-resistant roofs and building materials, covering vents or using ember- and flame-resistant vents, and installing dual-paned windows with one pane of tempered glass, among other actions.	17	4	0	0	2	0	2	2	1	2	0	1	0	2	1	0
		BE-4.1.3	Encourage residential and nonresidential building owners that lack air conditioning, or that are located in areas vulnerable to extreme heat, to install reflective "cool roofs" to mitigate the impacts of increased temperatures and extreme heat through public education campaigns and incentive programs.	19	4	0	2	2	0	2	2	1	2	0	1	0	2	1	0
		BE-4.1.4	Encourage residential and nonresidential building owners located in the 100- or 500-year floodplain to floodproof their building to a point at, or above, the base flood elevation, and to raise mechanical equipment through public education campaigns and incentive programs.	19	4	2	0	2	0	2	2	1	2	0	1	0	2	1	0
		BE-4.1.5	Decrease vulnerability of renters to extreme heat by assisting rental housing owners with implementing measures to improve interior cooling in rental units.	13	4	0	0	2	0	-2	2	1	2	0	1	1	2	0	0
BE-4.2	Enhance resilience of new residential and nonresidential buildings to climate hazards.	BE-4.2.1	Require new buildings located within or in the vicinity of the 100- or 500-year floodplain, or in areas that are historically prone to flooding, to be designed and located to allow unrestricted flow of flood waters or be able to withstand flood forces.	18	4	2	0	2	0	2	2	1	2	0	1	0	2	0	0
		BE-4.2.2	Require new development to comply with the requirements and criteria for stormwater quantity controls established in the Alameda County Hydrology and Hydraulics Criteria Summary and the Alameda County Clean Water Program to control surface runoff from new development.	14	4	0	0	2	0	2	2	1	0	0	1	0	2	0	0
		BE-4.2.3	Require new buildings located within "High" or "Very High" fire hazard severity zones (FHSZs) to use fire-resistant building materials, fire-resistant landscaping, and adequate clearance around structures.	18	4	2	0	2	0	2	2	1	2	0	1	0	2	0	0
		BE-4.2.4	Encourage new development to use high-albedo (i.e., reflective) materials for features such as roofs and driveways to help mitigate the impacts of increased temperatures and extreme heat through public education campaigns and incentives.	16	4	0	0	2	0	2	2	1	2	0	1	0	2	0	0
BE-4.3	Increase the use of low-carbon concrete and other types of sustainable materials in new construction and renovations.	BE-4.3.1	Adopt a reach code with the 2025 code cycle that requires new residential and nonresidential construction to use low-carbon concrete, steel, and other key impact materials.	17	4	1	2	2	0	2	1	1	2	1	1	0	0	0	0

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INFRASTRUCTURE																			
STRATEGY 1. CLEAN AND RELIABLE ENERGY																			
IN-1.1	Transition to 100 percent clean electricity.	IN-1.1.1	Work with Ava Community Energy (Ava) on a transition plan to automatically enroll all unincorporated-area accounts in the Renewable Choice tier, with an option for residents and businesses to opt-out.	18	8	0	-2	2	0	0	2	1	2	1	1	1	2	0	0
		IN-1.1.2	Promote enrollment in Ava for current PG&E customers through a multilingual outreach campaign.	17	8	0	0	2	0	-2	2	1	2	1	1	0	2	0	0
		IN-1.1.3	Require all newly built parking lots and structures to have solar-ready generation capabilities.	20	8	0	0	2	0	2	2	0	0	1	1	1	2	1	0
		IN-1.1.4	Require the installation of solar heaters for all new swimming pools which propose the use of heating systems.	18	8	0	0	2	0	2	2	0	0	1	1	0	2	0	0
		IN-1.1.5	Work with Ava to provide incentives for replacing existing swimming pool heaters with solar versions.	19	8	0	2	2	0	0	1	0	2	1	1	0	2	0	0
		IN-1.1.6	Encourage the installation of solar canopies on surface parking lots.	15	8	0	0	2	0	-2	2	0	0	1	1	1	2	0	0
		IN-1.1.7	Partner with advocacy organizations, such as The Utility Reform Network (TURN), to ensure consideration of energy use-reduction barriers faced by low-income utility users.	17	4	0	0	2	0	2	2	0	2	1	1	1	2	0	0
IN-1.2	Increase the use of battery storage technologies (i.e., decentralized clean energy resources).	IN-1.2.1	Encourage the installation of battery storage in conjunction with renewable energy generation projects within new and existing buildings through engagement campaigns and state incentives. Ensure that battery storage systems are responsibly handled during operation and are properly disposed of at end of useful life.	12	4	0	2	0	0	-2	2	0	2	1	0	1	2	0	0
		IN-1.2.2	Require battery storage readiness design in new nonresidential construction.	14	4	0	2	0	0	2	2	0	0	1	0	1	2	0	0
		IN-1.2.3	Seek funding opportunities for additional backup power capabilities at critical facilities.	14	4	0	2	2	0	0	2	0	0	1	0	1	2	0	0
		IN-1.2.4	Evaluate opportunities to remove barriers to battery storage installation throughout the unincorporated county. Opportunities could include development-related incentives, streamlined permitting, or incentives for medical uses.	16	4	0	2	2	0	2	2	0	0	1	0	1	2	0	0
IN-1.3	Support the development of innovative approaches to energy generation, distribution, and storage. For example: energy recapture (in-conduit hydro, co-generation), developing clean microgrids for schools, hospitals, or neighborhoods.	IN-1.3.1	Develop renewable microgrids at County libraries, fire and police stations and other emergency facilities and community hubs.	15	4	2	0	0	0	2	1	0	0	1	1	1	2	1	0
		IN-1.3.2	Encourage non-municipal public service facilities (e.g., hospitals) to develop renewable microgrids.	12	4	0	2	0	0	-2	0	0	2	1	1	1	2	1	0
		IN-1.3.3	Evaluate opportunities and incentives for integrating battery storage readiness in existing homes and businesses at the time of retrofit and/or in conjunction with renewable energy generation installations.	15	4	0	2	0	0	0	1	1	2	1	1	1	2	0	0
IN-1.4	Encourage the increase of smart grid integration throughout the unincorporated county.	IN-1.4.1	Partner with PG&E and develop a community smart grid integration plan.	14	4	0	2	2	0	0	1	0	0	1	1	1	2	0	0
		IN-1.4.2	Develop an outreach program that informs property owners and businesses about benefits of smart grid and smart appliances.	19	4	0	2	2	0	2	1	1	2	1	1	1	2	0	0
		IN-1.4.3	Consider adopting an ordinance that requires smart grid energy management system and compatible heating, ventilation, air conditioning and lighting in new construction.	20	4	0	2	2	0	2	2	1	2	1	1	1	2	0	0
IN-1.5	Evaluate the potential for and develop district energy systems (multi-building heating and cooling systems) in urban areas of the county, and develop an implementation plan for cost-effective systems.	IN-1.5.1	Conduct an analysis of district heating potential in the Castro Valley Central Business District Specific Plan area, the Ashland and Cherryland Business District Specific Plan area, the San Lorenzo Village Center Specific Plan area, and other neighborhood commercial centers.	19	4	1	2	2	2	2	1	0	2	0	1	0	2	0	0

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STRATEGY 2. LOW- AND ZERO-EMISSION VEHICLES																			
IN-2.1	Increase electric vehicle (EV) charging infrastructure.	IN-2.1.1	Consider adopting an EV charging reach code to increase levels of EV readiness in new residential and nonresidential development.	23	8	0	2	2	0	2	2	1	2	1	1	0	2	0	0
		IN-2.1.2	Ensure EV charging stations are encouraged and allowed through land use designations that currently permit gas fueling stations.	20	8	0	2	2	0	0	2	0	2	1	1	0	2	0	0
		IN-2.1.3	Work with Ava, BAAQMD, and regional agencies to provide incentives for existing gas stations and retail centers to add EV charging stations.	18	8	0	2	2	0	0	2	0	0	1	1	0	2	0	0
		IN-2.1.4	Work with regional agencies and EV charging companies to incentivize, install, and maintain in good working order EV charging stations and preferred parking for EVs at public facilities, parks, retail centers, multifamily residential properties, and other high-use parking areas throughout the unincorporated county.	21	8	0	2	2	0	0	2	0	2	1	1	0	2	1	0
		IN-2.1.5	Collaborate with Ava to establish EV charging mobility hubs at publicly accessible sites that support tenants of multifamily properties and rideshare drivers.	21	8	0	2	2	0	0	2	1	2	1	1	0	2	0	0
		IN-2.1.6	Provide guidelines in multiple languages for the permit application process for EV charging infrastructure installation in residential and nonresidential development.	23	8	0	2	2	0	2	2	1	2	1	1	0	2	0	0
		IN-2.1.7	Promote the Alameda County Incentive Project to increase EV charging infrastructure at workplaces, multifamily residential properties, identified disadvantaged or low-income communities, and affordable housing.	19	8	0	2	2	0	-2	2	1	2	1	1	0	2	0	0
		IN-2.1.8	Promote Ava's EV charging rates for residents, which provides a cost-effective way to charge EVs at residences by charging during off-peak hours.	20	8	0	2	2	0	-2	2	1	2	1	1	1	2	0	0
		IN-2.1.9	Require all nonresidential development with loading docks to supply sufficient electrical power for delivery trucks and associated equipment to reduce idling when making deliveries.	15	8	0	0	0	0	2	2	0	0	1	0	0	2	0	0
		IN-2.1.10	Seek funding to support improved access to EV charging stations.	21	8	0	2	2	0	0	2	1	2	1	1	0	2	0	0
IN-2.2	Encourage public EV and low-carbon vehicle adoption.	IN-2.2.1	Implement the recommendations for local governments provided in the Bay Area Electric Vehicle Acceleration Plan to support outreach and education for EV adoption.	24	8	0	2	2	2	2	1	0	2	1	1	0	2	1	0
		IN-2.2.2	Promote Electric For All, which provides information and an incentive database for EVs and associated charging equipment.	18	8	0	2	2	0	-2	2	0	2	1	1	0	2	0	0
		IN-2.2.3	Collaborate with Ava to develop and implement a Medium- and Heavy-Duty Goods Movement Electrification Blueprint.	14	8	0	0	2	0	0	1	0	0	1	0	0	2	0	0
		IN-2.2.4	Promote the California Clean Vehicle Rebate Project and the Clean Vehicle Assistance Program, which provide rebates and financial incentives that prioritize accessibility and affordability for low- to moderate-income consumers to switch to EVs.	17	8	0	2	2	0	-2	1	0	2	1	1	0	2	0	0
STRATEGY 3. LOW- AND ZERO-EMISSION EQUIPMENT																			
IN-3.1	Transition to electric landscaping equipment.	IN-3.1.1	Encourage business owners (including landscaping businesses) to convert or replace their gasoline-powered gardening equipment, such as lawn mowers, leaf blowers, and hedge trimmers, with electric or other zero-emission alternative equipment.	12	4	0	2	2	0	-2	2	0	0	1	1	0	2	0	0
		IN-3.1.2	Promote California's Clean Off-Road Equipment Voucher Program for professional landscape services, which provides vouchers to purchase zero-emission landscaping equipment.	12	4	0	2	2	0	-2	2	0	0	1	1	0	2	0	0
IN-3.2	Encourage the use of electric or alternatively fueled agricultural equipment.	IN-3.2.1	Encourage the use of electric-powered agricultural equipment where feasible and promote CARB's Carl Moyer Program, which provides grants to replace diesel-powered agricultural equipment. Encourage the use of renewable diesel in diesel-powered agricultural equipment where electrification is infeasible.	10	4	0	2	2	0	-2	2	0	0	1	1	0	0	0	0
		IN-3.2.2	Encourage the replacement of diesel- and natural gas-powered irrigation pumps with electric-powered alternatives where feasible. Encourage the use of renewable diesel or renewable natural gas where electrification is infeasible.	8	4	0	2	0	0	-2	2	0	0	1	1	0	0	0	0
STRATEGY 4. WATER CONSERVATION																			
IN-4.1	Reduce water consumption in buildings.	IN-4.1.1	Continue to promote water conservation incentives such as appliance and plumbing rebates and water conservation kits in partnership with California Water Services.	18	4	0	2	2	2	0	2	1	2	0	0	0	2	0	1
		IN-4.1.2	Require ultra-low-flow fixtures in new development to reduce water consumption.	16	4	0	2	2	0	2	2	1	0	0	0	0	2	0	1
		IN-4.1.3	Consider requiring ultra-low-flow water fixture retrofit-upon-sale requirements for residential and commercial buildings.	16	4	0	2	2	0	2	2	1	0	0	0	0	2	0	1
IN-4.2	Reduce water consumption for irrigation and landscaping.	IN-4.2.1	Continue to promote landscape water conservation incentives in partnership with EBMUD and Zone 7.	18	4	0	2	2	2	0	2	1	2	0	0	0	2	0	1

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IN-4.3	Increase the capture and use of recycled water.	IN-4.3.1	Adopt a drought-ready ordinance to require greywater readiness in new residential construction and alterations.	16	4	0	2	2	0	2	2	1	0	0	0	0	2	0	1
		IN-4.3.2	Encourage the use of onsite rainwater harvesting and recycled water systems, consistent with all applicable environmental, health, and safety regulations and requirements.	12	4	0	2	2	0	-2	2	1	0	0	0	0	2	0	1
		IN-4.3.3	Encourage the use of rainwater capture and onsite recycled water for landscaping use.	12	4	0	2	2	0	-2	2	1	0	0	0	0	2	0	1
		IN-4.3.4	Support residents and businesses interested in installing onsite recycled water systems (i.e., greywater), consistent with all State and County health codes and standards and in compliance with regional water agency requirements through providing guidance, incentives, and/or streamlining permitting processes.	13	4	0	2	2	0	0	2	0	0	0	0	0	2	0	1
STRATEGY 5. WASTE WATER																			
IN-5.1	Foster best management practices and innovative strategies for Onsite Wastewater Treatment System (OWTS) management for the protection of groundwater and surface water bodies.	IN-5.1.1	Explore the feasibility of reducing wastewater through a variety of methods, including the use of dry/composting toilets in new development and encourage these systems, repairing leaks in plumbing, using water-saving devices (e.g., low-flow fixtures), reducing water usage in daily activities, and avoiding the plumbing of greywater systems into the OWTS.	10	4	0	0	2	0	0	1	0	0	1	0	0	2	0	0
		IN-5.1.2	Promote best management practices of septic system OWTSs by properly sizing and maintaining wastewater dispersal fields (avoiding plants with invasive roots and parking of vehicles/heavy equipment on dispersal fields), using supplemental treatment units, pumping and maintaining all tanks and other components of the OWTS every 3 to 5 years (or as needed by a licensed professional), and avoiding chemical additive to maintain the OWTS or using harsh chemicals for cleaning.	11	4	0	2	2	0	-2	2	0	0	1	0	0	2	0	0
STRATEGY 6. RESILIENT INFRASTRUCTURE																			
IN-6.1	Improve energy sector resilience.	IN-6.1.1	Coordinate with PG&E and other utility providers/suppliers to identify and protect critical energy infrastructure in the unincorporated county from climate hazards.	16	4	0	2	2	0	0	1	0	2	0	1	1	2	1	0
		IN-6.1.2	Integrate energy assurance actions into countywide planning processes to decrease vulnerability to grid outages during hazard events.	16	4	0	2	0	0	2	2	0	2	0	1	1	2	0	0
		IN-6.1.3	Ensure adequate utility redundancy and backup power is available to maintain critical facilities where not already installed, prioritizing clean backup power sources where feasible.	12	4	0	2	0	0	0	2	0	0	0	1	1	2	0	0
		IN-6.1.4	Encourage the inclusion of broadband infrastructure in new development proposals to enable adequate connectivity for building and utility controls and operating system networks.	14	4	0	2	2	0	-2	2	0	2	0	1	1	2	0	0
		IN-6.1.5	Encourage residents to use the California Interactive Broadband Map developed by the California Public Utilities Commission, which reports internet speeds and helps to document and identify unserved and underserved areas.	12	4	0	0	2	0	-2	2	0	2	0	1	1	2	0	0
IN-6.2	Improve resilience of water and wastewater systems.	IN-6.2.1	Collaborate with relevant local and regional agencies to protect vulnerable water and wastewater facilities to ensure an adequate clean water supply during emergencies and disaster recovery.	14	4	2	0	2	0	0	2	0	0	0	1	1	2	0	0
		IN-6.2.2	Upgrade water and wastewater systems to accommodate projected changes in water quality and availability such as intake systems that are too shallow, higher levels of water contaminants, and potential need for greater water storage capacity.	18	4	2	0	2	0	2	1	0	2	0	1	1	2	1	0
		IN-6.2.3	Reduce reliance on external water supplies by shifting towards local sources of water such as greywater, rainwater, air conditioning condensate, and foundation drainage.	14	4	0	0	2	0	2	1	0	0	0	1	1	2	0	1
		IN-6.2.4	Inventory all sewer pump stations in the 100- and 500-year floodplain and identify priority facilities to upgrade to become more flood-resilient.	15	4	2	0	2	0	2	1	0	0	0	1	1	2	0	0
IN-6.3	Protect vulnerable transportation infrastructure, services, and systems from hazards exacerbated by climate change.	IN-6.3.1	Coordinate with AC Transit, community-based organizations, and other relevant partners to identify and protect local and regional transportation, transit, and active transportation corridors that are at risk from climate change impacts. Use the best available science and resilient design features to improve resiliency in transportation infrastructure.	18	4	0	2	2	0	0	2	0	2	1	1	1	2	1	0
		IN-6.3.2	Update County transportation system maintenance protocols, for which the Public Works Agency is responsible, to incorporate climate vulnerabilities.	20	4	0	2	2	2	2	2	0	2	0	1	1	2	0	0
		IN-6.3.3	Pilot cool pavement initiatives and evaluate effectiveness post-implementation.	19	4	1	2	2	0	2	2	0	2	0	1	0	2	1	0
Land Use and Mobility																			
STRATEGY 1. SAFE, ACCESSIBLE, AND RELIABLE ACTIVE TRANSPORTATION																			
LU-1.1	Develop and maintain a safe, connected, and continuous bicycle and pedestrian network.	LU-1.1.1	Implement specific recommendations for improving bicycle and pedestrian infrastructure (e.g., bike paths, sidewalks) included in the 2019 Alameda County Bicycle & Pedestrian Master Plan for Unincorporated Areas and its future updates.	25	8	2	0	2	2	2	1	0	2	1	1	1	2	1	0
		LU-1.1.2	Continue to eliminate gaps in the existing network and improve bicycle and pedestrian connections to transit, schools, parks/trails, retail and employment centers, community/senior centers, and libraries as identified in the 2019 Alameda County Bicycle & Pedestrian Master Plan for Unincorporated Areas.	27	8	2	2	2	2	2	2	0	2	1	1	1	2	0	0
		LU-1.1.3	Work with Alameda County Transportation Commission, local cities, school districts, and community-based organizations to launch a Vision Zero program for the unincorporated county.	19	8	1	0	2	0	0	2	0	2	0	1	1	2	0	0
		LU-1.1.4	Consider establishing temporary and permanent car-free areas.	21	8	0	2	2	0	0	2	0	2	1	1	1	2	0	0
		LU-1.1.5	Partner with neighboring counties, special districts, and other relevant partners to close gaps in long-distance trail networks.	20	8	0	0	2	2	0	1	0	2	1	1	1	2	0	0
		LU-1.2.1	Promote BAAQMD's rebate program for e-bikes.	13	4	0	0	2	0	-2	2	0	2	1	1	1	2	0	0

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LU-1.2	Increase and improve access to walking and bicycling throughout the unincorporated county.	LU-1.2.2	Work with school districts and park districts that serve unincorporated areas of the county to install secure bike bicycle parking at all elementary, middle and high schools and parks.	14	4	0	0	2	0	0	2	0	2	1	1	0	2	0	0
		LU-1.2.3	Promote partnerships with transit providers (e.g., AC Transit, BART, Wheels, ACE, Amtrak) to increase bicycle access on board transit vehicles to bicycle users, especially during peak commute hours.	12	4	0	0	2	0	-2	2	0	2	1	1	0	2	0	0
		LU-1.2.4	Work with the Alameda County Transportation Commission to build community awareness of walking and biking as an alternative to driving, as well as an understanding of the safety responsibilities of all users, as well as existing programs such as Safe Routes to Schools.	18	4	0	0	2	2	2	2	0	2	1	1	0	2	0	0
STRATEGY 2. SAFE, ACCESSIBLE, AND RELIABLE PUBLIC TRANSPORTATION																			
LU-2.1	Continue to partner with transit agencies to improve reliability, affordability, and convenience of existing transit services through increased frequency, expanded service areas, extended service hours, and better facilities. Prioritize improvements in under-resourced communities.	LU-2.1.1	Request that AC Transit evaluate the potential for increasing service frequency on key routes.	16	8	0	0	2	0	-2	2	0	2	0	1	1	2	0	0
		LU-2.1.2	Prepare formal request for AC Transit to extend BRT bus service to the unincorporated county and determine the conditions necessary for BRT route expansion.	18	8	0	0	2	2	-2	2	0	2	0	1	1	2	0	0
		LU-2.1.3	Ensure that bus stops provide shade, weather protection, seating, lighting, route information, and are frequently cleaned and maintained.	18	8	0	0	2	2	-2	2	0	2	0	1	1	2	0	0
		LU-2.1.4	Explore and support innovative public transit options, such as deploying low-emissions buses in neighborhoods with disproportionately poor air quality, or developing a “first and last mile” plan to connect riders to public transit.	18	8	0	0	2	0	0	1	0	2	1	1	1	2	0	0
		LU-2.1.5	Work with regional transit providers (e.g., BART, AC Transit) to make public transit safer for all riders.	17	8	0	0	2	0	0	2	0	0	1	1	1	2	0	0
		LU-2.1.6	Promote discounted transit passes such as the Clipper START program and the Student Transit Pass Program.	17	8	0	0	2	0	-2	2	0	2	1	1	1	2	0	0
STRATEGY 3. EQUITABLE SHARED MOBILITY																			
LU-3.1	Develop programs and incentives that promote shared mobility (e.g., car sharing, bike sharing, and scooter sharing) in under-resourced communities and that increase access to health services, food, education, and employment.	LU-3.1.1	Explore programs and funding to provide an EV car share program for underserved areas of the city that are not well served by transit.	14	4	0	0	2	0	0	2	0	2	1	1	1	0	1	0
		LU-3.1.2	Promote the establishment of affordable bikeshare programs in the urban unincorporated areas of Alameda County (e.g., expanding the geography of Bay Wheels’ Bike Share for All program, which offers affordable membership options for low-income residents).	11	4	0	0	2	0	-2	2	0	2	1	1	1	0	0	0
		LU-3.1.3	Develop community awareness and education programs around shared mobility (e.g., car sharing, bike sharing, and scooter sharing), prioritizing outreach to under-resourced communities.	15	4	0	0	2	0	2	2	0	2	1	1	1	0	0	0
STRATEGY 4. SUSTAINABLE LAND USE PLANNING																			
LU-4.1	Increase residential and commercial density in urban areas located near transit.	LU-4.1.1	Facilitate construction of missing middle housing, including Accessory Dwelling Units (ADUs) and duplexes by connecting unincorporated area residents to the Alameda County ADU Resource Center. Develop an accessory dwelling unit (ADU) incentive program that will offer grants and loans for the construction of ADUs and adopt an ordinance to allow up to four housing units in single-family zones.	19	6	1	2	2	0	2	1	1	2	0	1	0	0	0	1
		LU-4.1.2	Streamline the permitting process and reduce parking requirement for affordable housing as an incentive.	18	6	1	0	2	0	2	2	1	2	0	1	0	0	0	1
		LU-4.1.3	Encourage transit-oriented development and promote co-location of childcare centers and family childcare homes with affordable housing, employment centers, and health and social services.	16	6	0	2	2	0	-2	2	1	2	1	1	0	0	0	1
		LU-4.1.4	Focus commercial and residential development in the County’s Specific Plan areas to encourage efficient land use and minimize daily trips.	21	6	1	2	2	2	2	0	1	2	1	1	0	0	0	1
		LU-4.1.5	Promote jobs-housing balance in the urban unincorporated area through zoning and general plan policy.	20	6	0	2	2	2	2	0	1	2	1	1	0	0	0	1
LU-4.2	Promote and ensure land uses that support walking and bicycling.	LU-4.2.1	Develop incentive zoning for the inclusion of shared mobility and other transportation demand management measures. Incentive zoning could include parking reduction or substitution, greater floor-to-area ratios, increased dwelling units, and greater height allowances.	20	6	2	0	2	0	2	1	1	2	1	1	0	2	0	0
		LU-4.2.2	Partner with regional agencies to promote vanpools by creating community vanpool programs, including farmworker vanpools including employer-sponsored shuttles and rural vanpool programs.	16	6	0	0	2	0	0	2	0	2	1	1	0	2	0	0
		LU-4.2.3	Collaborate with regional transportation agencies and business networks to provide information about, and access to, incentives and services that increase the use of alternatives to single-occupant vehicle commuting, including the Bay Area Commuter Benefits Program, the Alameda County Guaranteed Ride Home Program, and the 511 SF Bay traffic information program.	20	6	0	2	2	2	0	2	0	2	1	1	0	2	0	0

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STRATEGY 6. PARKING																			
LU-5.1	Reduce minimum parking requirements and strategically evaluate the parking needs of the community.	LU-5.1.1	Modify the zoning code in accordance with California Assembly Bill (AB) 2097 to remove parking minimums for new developments within half a mile of public transit and consider establishing parking maximums in new developments.	15	4	0	0	2	2	2	2	0	0	1	1	0	0	0	1
		LU-5.1.2	Evaluate current and future parking needs and consider repurposing underutilized and vacant lots.	12	4	1	0	2	0	2	1	0	0	0	1	0	0	0	1
		LU-5.1.3	Implement the recommendations of the Ashland Cherryland Business District Specific Plan Area Parking Demand and Management Strategy Study.	14	4	2	0	2	2	2	1	0	0	0	1	0	0	0	0
WASTE																			
STRATEGY 1. INORGANIC WASTE MANAGEMENT AND REDUCTION																			
WR-1.1	Increase recycling in the unincorporated areas of the county.	WR-1.1.1	Partner with waste haulers, Sanitary Districts, and StopWaste to expand the diversion of recyclable inorganic solid waste from landfills.	18	4	0	0	2	2	2	2	0	0	1	0	1	2	1	1
		WR-1.1.2	Continue to increase participation in, while simultaneously reducing contamination of, curbside and drop-off and pick-up recycling programs for all residential, commercial, industrial and institutional uses. Identify new drop-off opportunities and additional items that can be recycled curbside.	16	4	0	0	2	2	0	2	1	0	0	0	1	2	1	1
		WR-1.1.3	Provide education, audits, and other technical assistance to increase waste diversion rates in coordination with StopWaste. Develop waste reduction and diversion behavior campaigns in partnership with StopWaste and local organizations for residential, multifamily property managers, and commercial sectors.	20	4	1	0	2	2	2	2	1	2	0	0	0	2	1	1
		WR-1.1.4	For events that require a County-issued permit, adopt an ordinance that requires recycling and composting services, the use of only recyclable and compostable materials by vendors, and adequate staff to ensure proper disposal and recycling.	13	4	0	0	2	0	2	2	0	0	0	0	0	2	0	1
WR-1.2	Reduce solid waste generation.	WR-1.2.1	Adopt a comprehensive construction and demolition ordinance to reach a 75 percent diversion rate, which could include deconstruction.	14	4	0	0	2	0	2	2	0	0	0	1	0	2	0	1
		WR-1.2.2	Work with restaurants in the unincorporated areas of the county to reduce single-use plastics.	13	4	0	0	2	0	0	2	0	0	0	1	0	2	1	1
		WR-1.2.3	Create and support “fix-it clinics” at County facilities that can build skills among local businesses and residents in innovation, repair, and reuse.	16	4	0	0	2	0	2	2	0	2	0	1	0	2	1	0
		WR-1.2.4	Support Extended Producer Responsibility initiatives that drive end of product life management.	12	4	0	0	2	0	0	1	0	2	0	0	0	2	0	1
		WR-1.2.5	Explore establishment of a tool lending library in unincorporated Alameda County to reduce unnecessary waste associated with purchasing home improvement tools and equipment, increase access to electric tools, hand-powered tools, and home energy assessment tools like plug load meters, and decrease cost-related barriers to home improvements.	20	4	2	2	2	0	2	2	1	2	0	1	0	2	0	0
STRATEGY 2. ORGANIC WASTE MANAGEMENT AND REDUCTION																			
WR-2.1	Educate the community and food generating businesses about reducing wasted food by preventing surplus edible food generation, storing food correctly, and donating surplus edible food before composting what is left.	WR-2.1.1	Implement and enforce the requirements of SB 1383 to divert compostable organic materials from landfills, ensuring that outreach and education materials are provided in appropriate languages and at appropriate literacy levels to meet the unique needs of residents and small businesses.	24	8	2	2	2	2	2	2	0	0	1	1	0	2	0	1
		WR-2.1.2	Expand existing organic waste collection routes and drop-off sites to improve composting services for interested residents and businesses.	27	8	2	2	2	0	2	2	1	2	1	1	0	2	1	1
		WR-2.1.3	Seek partnerships with schools to develop school composting programs and education.	19	8	0	0	2	0	0	2	0	2	1	1	0	2	0	1
		WR-2.1.4	Seek partnerships with nonprofits and local community-based organizations to establish new food recovery programs, but also to maintain existing ones, such as the Alameda County Food Recovery Project led by the Alameda County Deputy Sheriffs’ Activities League.	17	8	0	0	2	0	-2	2	0	2	1	1	0	2	0	1
		WR-2.1.5	Develop and launch multilingual outreach campaigns intended to educate the community and food generating businesses on reducing food waste, properly storing food, and composting.	17	8	0	0	2	0	0	2	0	0	1	1	0	2	0	1
HEALTH AND RESILIENCY																			
STRATEGY 1. RESILIENT COMMUNITIES, EQUITY, AND ENVIRONMENTAL JUSTICE																			
HR-1.1	Support the creation of resilience hubs and other place-based resilience resources to provide community members with essential services before, during, and after climate-related hazard events.	HR-1.1.1	Pursue funding to establish resilience hubs in frontline communities. Resilience hubs should be community-accessible centers that serve to deliver disaster preparedness messaging, facilitate stronger community ties and ongoing community capacity building, provide an accessible point of distribution for basic needs (such as food, masks, and emergency supplies), and to play a critical role in post-disruption recovery and ongoing communications needs.	14	4	1	0	2	0	0	1	0	2	0	1	0	2	1	0
		HR-1.1.2	Partner with AC Transit, BART, and other public and private transportation providers to transport community members most at risk to inclement weather centers and resilience hubs during hazard events.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-1.1.3	Develop a broad, accessible, and multilingual communication strategy for hazard events.	17	4	1	0	2	0	2	2	0	2	0	1	1	2	0	0
		HR-1.2.1	Integrate climate resilience throughout long-term planning and current development projects.	19	4	2	0	2	0	2	2	0	2	0	1	1	2	0	1

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HR-1.2	Embed climate resiliency and adaptation across planning efforts.	HR-1.2.2	Work with surrounding jurisdictions to accelerate, expand, and build new climate adaptation collaborative efforts with communities, governments, community and faith-based organizations, and businesses, such as the partnerships and efforts produced by the Bay Area Climate Adaptation Network (BayCAN) and the Coastal Hazards Adaptation Resiliency Group (CHARG).	18	4	2	0	2	2	0	2	0	2	0	1	0	2	1	0
HR-1.3	Ensure essential services are available for community members most at risk.	HR-1.3.1	Improve broadband connectivity through targeted efforts resulting from a comprehensive Broadband Needs Assessment and through the promotion of existing programs, such as the Federal Communications Commission's (FCC's) Affordable Connectivity Program.	14	4	1	0	2	0	0	1	0	2	0	1	1	2	0	0
		HR-1.3.2	Promote the services of nearby health, wellness, and social service providers that serve frontline communities and support the expansion of such facilities and services throughout the unincorporated county.	16	4	1	0	2	2	-2	2	0	2	0	1	1	2	1	0
		HR-1.3.3	Pursue grant funding to provide water refill stations at community gathering spots (e.g., schools, parks) throughout the unincorporated county.	13	4	0	0	2	0	0	2	0	2	0	1	0	2	0	0
		HR-1.3.4	During extreme weather and climate hazard events, expand support services to people experiencing homelessness.	16	4	2	0	2	0	0	2	0	2	0	1	0	2	1	0
HR-1.4	Support local food production and improve food security.	HR-1.4.1	Promote the Microenterprise Home Kitchen Operation (MEHKO) program, and ensure that there are educational materials available in multiple languages.	11	4	0	0	2	0	-2	2	0	2	0	1	0	2	0	0
		HR-1.4.2	Encourage the development of, and facilitate access to, healthy food retail outlets throughout the unincorporated county, such as grocery stores, healthy corner stores, and farmers' markets.	14	4	2	0	2	0	-2	2	0	2	0	1	0	2	0	1
		HR-1.4.3	Establish new partnerships to increase healthy food access for youth. These partnerships may optimize school-based emergency food distribution, expand youth agricultural opportunities at local schools, and enhance school garden curricula.	15	4	0	0	2	0	0	2	0	2	0	1	0	2	1	1
		HR-1.4.4	Promote, incentivize, and remove barriers to urban agriculture across the unincorporated county. This may include establishing partnerships to identify and active urban agriculture sites, reviewing existing ordinances and regulations to explore removing barriers, and encouraging the inclusion of food-growing spaces in new or remodeled multifamily residential sites.	15	4	1	0	2	0	0	1	0	2	0	1	0	2	1	1
		HR-1.4.5	Promote food as medicine pathways to direct locally produced and sourced food to community health centers and clinics.	16	4	0	2	2	0	0	1	0	2	0	1	0	2	1	1
		HR-1.4.6	Map local food recovery organizations currently addressing food insecurity and mobilize a network of food providers to strengthen coordination and shared resources between these organizations.	15	4	0	2	2	0	0	1	0	2	0	1	0	2	1	0
HR-1.5	Prioritize measures and investments in under-resourced communities and small businesses and protect them from displacement.	HR-1.5.1	Establish a Displacement Avoidance Task Force comprising local government staff, community leaders, and others to develop policies for preventing the displacement of frontline community residents and small businesses as a result of climate impacts or as an unintended consequence of policies meant to address climate change.	13	4	0	0	2	0	0	1	0	2	0	1	0	2	1	0
		HR-1.5.2	Develop and implement assistance programs to provide financial and technical support to under-resourced communities and small businesses, helping them to adapt to climate change and transition to more sustainable practices without being displaced.	16	4	2	0	2	0	2	1	0	2	0	1	0	2	0	0
STRATEGY 2. EMERGENCY PREPAREDNESS AND DISASTER RESPONSE																			
HR-2.1	Ensure that emergency and critical service providers have adequate capacity to address increased demand due to potential impacts of climate hazards.	HR-2.1.1	Consult with local jurisdictions, water providers, and fire departments to ensure the adequacy of emergency water flow, emergency vehicle access, and evacuation routes prior to approving any new development.	14	4	2	0	2	0	0	2	0	0	0	1	1	2	0	0
		HR-2.1.2	Maintain up-to-date emergency preparedness and evacuation plans and procedures in coordination with appropriate State, regional, and local agencies and departments.	16	4	2	0	2	0	2	2	0	0	0	1	1	2	0	0
		HR-2.1.3	Revise and coordinate cross-jurisdictional emergency management plans, programs, and activities to account for changing hazard profiles and their associated impacts.	14	4	2	0	2	0	0	2	0	0	0	1	1	2	0	0
		HR-2.1.4	Promote the Community Emergency Response Team (CERT) training program through the Alameda County Fire Department to improve disaster preparedness and disaster response skills among residents.	14	4	0	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-2.1.5	Develop disaster documentation program to include tracking disasters affecting the unincorporated county via photos of damage incurred during and after disaster events. This data can be used for tracking and trending, and ultimately mitigation planning.	18	4	2	0	2	0	2	1	0	2	0	1	1	2	1	0
		HR-2.1.6	Host regular disaster preparedness trainings at convenient locations, in widely spoken languages to provide basic training to community members who are unable to commit to the CERT training program.	19	4	2	2	2	0	2	2	0	2	0	1	0	2	0	0
		HR-2.1.7	Conduct outreach in multiple languages to ensure that all residents are aware of the County's evacuation and emergency notification systems (e.g. AC Alert, Genasys Connect).	20	4	2	2	2	0	2	2	1	2	0	1	0	2	0	0

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HR-2.2	Prioritize making emergency services more accessible and equitable, especially for community members most at risk.	HR-2.2.1	Encourage residents to register with the AC Alert emergency notification system for those who have access to mobile communication devices or devices with internet accessibility. Promote the availability of emergency notifications through KCBS radio 740 for those who do not have internet access.	12	4	0	0	2	0	-2	2	0	2	0	1	1	2	0	0
		HR-2.2.2	Partner with local healthcare providers, community-based organizations, and Medical Reserve Corps programs to establish emergency response networks and train volunteers to assist in emergencies.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-2.2.3	Coordinate to deploy “pop-up” mobile emergency units to areas that may be geographically isolated or have limited access to traditional healthcare facilities. In addition to rapid response to medical emergencies, these units can help build capacity and connectedness through health education and raising awareness about emergency services.	17	4	2	0	2	0	0	2	0	2	0	1	1	2	1	0
		HR-2.2.4	Ensure that emergency service providers are prepared to serve the community with disability accessibility and language access capabilities, such as multilingual staff and/or interpretation and translation services.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-2.2.5	Establish an equity officer in the Alameda County Emergency Operations Center to bring disaggregated data and equity metrics to help the County consider diverse needs and use community members for trusted messengers and dissemination partners.	17	4	0	0	2	0	2	2	0	2	0	1	1	2	1	0
STRATEGY 3. HAZARD-SPECIFIC RESILIENCE																			
HR-3.1	Build resilience to flooding across the county, along with sea level rise in San Lorenzo.	HR-3.1.1	Work with Alameda County Flood Control & Water Conservation District and other partner agencies and jurisdictions to conduct community engagement and feasibility studies and implement further flood control improvement projects, including those related to creek restoration, sea level rise in San Lorenzo, regional detention facilities, and dredging existing facilities for increased capacity.	14	4	2	0	2	0	0	1	0	0	0	1	1	2	1	0
		HR-3.1.2	Continue to improve County’s rating under the National Flood Insurance Program (NFIP) so that flood insurance premiums for residents in flood-prone areas may be reduced.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-3.1.3	Where it is not already required, encourage property owners to purchase flood insurance to reduce the financial risk from flooding.	10	4	0	0	2	0	-2	2	0	0	0	1	1	2	0	0
		HR-3.1.4	Dedicate adequate resources to ensure effective and timely monitoring and maintenance of public drainage facilities, including storm drains, to maintain adequate capacity for peak flows in the area.	17	4	2	0	2	0	2	2	0	0	0	1	1	2	1	0
		HR-3.1.5	Ensure that any sea level- or flood-related barriers do not result in the diversion of flood waters or otherwise increase flooding potential near development and critical facilities.	16	4	2	0	2	0	2	2	0	0	0	1	1	2	0	0
		HR-3.1.6	Incorporate future sea-level rise, permanent and temporary inundation, and precipitation projections into long-term infrastructure planning processes, influencing decisions on expansion, relocation, elevation, or retrofitting of assets.	19	4	2	2	2	0	2	2	0	2	0	1	0	2	0	0
		HR-3.1.7	Collaborate with neighboring jurisdictions, partner agencies, and organizations throughout the San Francisco Bay Area to encourage and expedite projects and initiatives aimed at addressing sea level rise (e.g., shoreline protection and restoration).	20	4	2	2	2	0	2	1	0	2	0	1	0	2	1	1
HR-3.2	Build resilience to wildfires across the county.	HR-3.2.1	Develop a structure ignition zone assessment program (and grant funding, if feasible) that connects homeowners and businesses to mitigation specialists to develop a comprehensive report with recommended mitigation actions to increase building resilience to wildfire.	14	4	-1	0	2	0	2	1	0	2	0	1	1	2	0	0
		HR-3.2.2	Partner with landowners, State agencies, and others to implement fuels reduction projects that are beyond defensible space requirements, but within two miles of homes and other structures, such as pruning, utility management, removal of understory, and biomass removal. Consider developing incentives to encourage brush removal around structures in fire-prone areas.	14	4	2	0	2	0	0	1	0	0	0	1	1	2	1	0
		HR-3.2.3	Require private property owners to maintain the vegetation on their property in a condition that will not contribute to the spread of wildfire. Requirements may include, but are not limited to, removing all portions of trees within 10 feet of chimneys and stovepipe outlets, maintaining a 30-foot defensible space around all buildings and structures, and removing materials that may act as a fuel or conveyance of fire.	16	4	2	0	2	0	2	2	0	0	0	1	1	2	0	0
		HR-3.2.4	Consider establishing and funding an enforcement district for residents within wildland-urban interface (WUI) areas and establish an inspection period to be conducted annually to ensure compliance with vegetation management standards.	13	4	2	0	2	0	0	0	0	0	0	1	1	2	1	0
		HR-3.2.5	Promote programs from Diablo Firesafe Council and other partner organizations to further support wildfire preparedness and the implementation of wildfire risk reduction measures throughout the unincorporated county.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-3.2.6	Utilize goat grazing as a cost-effective and environmentally friendly alternative to controlled burns that reduce wildfire risk, where feasible.	14	4	1	0	2	0	0	2	0	0	1	1	0	2	0	1
		HR-3.2.7	Promote and expand free or low-cost fire fuel reduction programs such as ACFD’s Chipper Program.	18	4	1	2	2	0	2	2	0	0	1	1	0	2	0	1
		HR-3.2.8	Research actions available to the County to support reduction of fire insurance rates for property owners in fire-prone areas.	9	4	0	2	0	0	-2	2	0	0	0	1	0	2	0	0
		HR-3.3.1	Seek funding to expand upon the work piloted by “Cooling Our Communities” to provide heat preparedness materials and resources to all areas of the unincorporated county.	15	4	1	0	2	0	0	2	0	2	0	1	1	2	0	0

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HR-3.3	Build resilience to extreme heat across the county.	HR-3.3.2	Update, revise, and promote the guidance of and ensure that residents have access to the “Pocket Guide to Emergency Preparedness & Heat Events” developed by the Alameda County Health Care Services Agency and the Community Development Agency through the "Cooling Our Communities" heat preparedness program. This will include ensuring language and ADA accessibility, making physical and digital copies readily available, and partnering with communities to disseminate.	16	4	0	0	2	0	2	2	0	2	0	1	1	2	0	0
		HR-3.3.3	Partner with community-based organizations, faith-based organizations, businesses, and other public agencies to develop a “Community Cool Zone Network” comprised of air-conditioned spaces that are made available and accessible to community members most at risk during extreme heat events.	14	4	0	0	2	0	0	2	0	2	0	1	1	2	0	0
		HR-3.3.4	Develop a “Cool Buddy” program where local volunteers are trained to build neighborhood networks, identify heat-vulnerable neighbors, and set up systems to check in on each other during extreme heat	16	4	0	0	2	0	2	2	0	2	0	1	1	2	0	0
		HR-3.3.5	Encourage the installation or use of cool roof technologies, green roofs, and rooftop gardens in new and existing private and public development.	12	4	0	2	2	0	-2	2	0	0	1	1	0	2	0	0
		HR-3.3.6	Reduce heat gain from surface parking lots in new development for a minimum of 50 percent of the site’s hardscape. Develop standards to provide shade from the existing tree canopy or from appropriately selected new trees that complement site characteristics and maximize drought tolerance. Where feasible, use open-grid pavement systems (at least 50 percent pervious).	15	4	0	0	2	0	2	2	0	2	0	1	0	2	0	0
		HR-3.3.7	Increase resilience of existing cooling centers by increasing guidance, providing low-tech information sources, and seeking funding for additional resources, such as backup power capabilities.	18	4	2	0	2	0	2	2	0	2	0	1	1	2	0	0
STRATEGY 4. HIGH-ROAD, GREEN WORKFORCE BUSINESS DEVELOPMENT																			
HR-4.1	Improve the quality of green jobs, ensuring jobs have fair labor practices, living wages, benefits and worker protection.	HR-4.1.1	Partner with the Alameda County Workforce Development Board, labor organizations, local CBOs, and community colleges to promote and connect local residents to high quality and family-sustaining local job opportunities.	20	4	2	2	2	2	0	2	0	2	0	1	0	2	1	0
		HR-4.1.2	Promote BayREN programs to support contractor training and resident education in the unincorporated areas on electric appliances and systems and their installation, operation, and maintenance.	14	4	2	0	2	0	-2	2	0	2	0	1	0	2	1	0
		HR-4.1.3	Develop a robust scoring and reporting system (e.g., health and wellness scorecard) to evaluate employer practices at workplaces in the unincorporated areas of the county. Develop incentives for workplaces to meet defined scorecard standards to improve physical and mental health, wages, job security, advancement opportunities, and meaningful voices in the workplace.	13	4	0	0	2	0	0	2	0	2	0	1	0	2	0	0
		HR-4.1.4	Work with regional partners to convene a multistakeholder regional board that brings together residents, small businesses, labor organizations, and workers to identify, launch, and evaluate economic investment pilot programs that align small business goals with people-focused and place-based community priorities through shared decision-making power and aligned objectives.	18	4	2	2	2	0	0	2	0	2	0	1	0	2	1	0
HR-4.2	Incentivize and promote green business practices, such as work-from-home policies.	HR-4.2.1	Promote business creation, retention, and entrepreneurship by providing technical assistance and financial incentives to local businesses.	16	4	2	2	2	0	-2	2	0	2	0	1	0	2	1	0
		HR-4.2.2	Continue to promote and encourage participation in the Alameda County Green Business Program through the California Green Business Network.	22	4	2	2	2	2	2	2	0	2	0	1	0	2	1	0
		HR-4.2.3	Work with local employers to provide subsidies to employees for using transit or active transportation to commute to work, and encourage flexible work schedules (e.g., 9/80s and 4/10s) as well as telecommuting.	16	4	2	2	2	0	-2	2	0	2	1	1	0	2	0	0

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AGRICULTURE AND VEGETATION																			
STRATEGY 1. CLIMATE-RESILIENT AGRICULTURAL AND WORKING LANDS																			
AG-1.1	Encourage best practices in agricultural and working lands that improve resilience to climate impacts.	AG-1.1.1	Promote the use of agroforestry in agricultural systems, which may improve soil fertility, water retention, and overall agricultural resilience.	11	4	0	0	2	0	-2	2	0	0	1	1	0	2	0	1
		AG-1.1.2	Coordinate with California Department of Food and Agriculture, United States Department of Agriculture, and other relevant partners to improve and integrate projected climate impacts into pest detection and management, while minimizing the use of potentially harmful pesticides.	15	4	2	0	2	0	0	2	0	0	1	1	0	2	0	1
		AG-1.1.3	Promote crop diversification to minimize the risk of crop failure and enhance resilience to climate impacts.	13	4	2	0	2	0	-2	2	0	0	1	1	0	2	0	1
		AG-1.1.4	Work with the State and other relevant partners to advocate for the subsidization and/or incentivization of obtaining crop insurance. Advocate for the inclusion of diverse crops in crop insurance offerings (such as culturally relevant crops).	14	4	0	0	2	0	0	1	0	2	1	1	0	2	0	1
		AG-1.1.5	Work with ranchers to manage grazing to support oak woodland regeneration.	13	4	0	0	2	0	0	2	0	2	1	1	0	0	0	1
		AG-1.1.6	Promote the use of livestock grazing near development, especially on steep hillsides and vacant lots, to support fire fuel management and provide discounted or free water supplies to ranchers whose livestock are serving this purpose.	9	4	0	0	2	0	-2	2	0	0	1	1	0	0	0	1
		AG-1.1.7	Promote the use of efficient irrigation systems to reduce crop water needs.	12	4	0	2	2	0	-2	2	0	0	1	1	1	0	0	1
		AG-1.1.8	Review County tax policies affecting land and infrastructure improvements for agriculture to avoid taxing landowners at home site improvement rates (e.g., water wells for agriculture that may be on a home site parcel).	13	4	0	2	2	0	2	2	0	0	0	1	0	0	0	0
		AG-1.1.9	Promote and expand enrollment and participation in Williamson Act contracts.	11	4	0	0	2	2	-2	2	0	0	1	1	0	0	0	1
		AG-1.1.10	Increase awareness of BAAQMD's Agricultural Equipment assistance programs to help replace mobile, stationary, and portable agricultural equipment, and help unincorporated-area agricultural producers utilize this assistance.	10	4	0	2	2	0	-2	2	0	0	1	1	0	0	0	0
AG-1.2	Increase soil organic matter and soil carbon content in working lands.	AG-1.2.1	Promote the Alameda County Resource Conservation District's (ACRCD's) carbon farming program and technical assistance programs to develop and implement site-specific carbon farm plans and soil-beneficial conservation practices in unincorporated Alameda County.	13	4	1	0	2	0	-2	1	0	2	1	1	0	2	0	1
		AG-1.2.2	Assess and work to eliminate barriers to permitting carbon farm plans and allow for streamlining of permits related to carbon farm practices.	13	4	0	0	0	0	0	2	0	2	1	1	0	2	0	1
		AG-1.2.3	In partnership with Alameda County Resource Conservation District, develop a healthy soil strategy for the county to support agriculture, address carbon sequestration, and increase water capture, building on the work of Alameda County Resource Conservation District's Healthy Soils Demonstration project.	12	4	0	0	2	0	0	1	0	0	1	1	0	2	0	1
		AG-1.2.4	Promote the use of cover crops, hedgerows, mulch, and windbreaks and support farmers' and ranchers' pursuits of State and federal funding, in part through ACRCD's technical assistance.	11	4	0	0	2	0	-2	2	0	0	1	1	0	2	0	1
		AG-1.2.5	Work with ranchers, Alameda County Resource Conservation District, StopWaste, and other agency partners to increase compost application on rangelands.	12	4	0	0	2	0	0	1	0	0	1	1	0	2	0	1
		AG-1.2.6	Work with horse-keepers, ACRCD, StopWaste, and other agency partners to improve on-farm composting and commercial composting acceptance of manure.	8	4	0	0	0	0	-2	1	0	0	1	1	0	2	0	1
		AG-1.2.7	Support partner-led (e.g., ACRCD, University of California Agriculture and Natural Resources, StopWaste, US Department of Agriculture's Natural Resources Conservation Science) educational and workshop events tailored to both the public and farmers and ranchers on topics of soil-beneficial practices and management techniques.	10	4	0	0	2	0	-2	1	0	0	1	1	0	2	0	1
		AG-1.2.8	Explore creation of ecosystem services payments for agricultural land management practices that promote carbon storage in soils and aboveground woody biomass.	12	4	0	2	2	0	-2	1	0	0	1	1	0	2	0	1
		AG-1.2.9	Undertake a study to evaluate threats to carbon sequestration and carbon storage on agricultural and working lands (e.g, incorporaton, development, agricultural practices, erosion, etc.).	15	4	1	0	2	2	2	1	0	0	0	0	0	2	0	1

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STRATEGY 2. NATURE-BASED SOLUTIONS																			
AG-2.1	Increase and improve urban tree canopy and green space consistent with the goals of the County's Environmental Justice Element.	AG-2.1.1	Partner with local Park Districts to ensure sustainable park maintenance and to make parks more accessible, safe, and comfortable for all. This can include providing more benches and shade in local parks, revitalizing and investing in parks near under-resourced communities, increasing the number of local parks throughout the unincorporated county, and improving transition points between parks and communities.	17	4	2	0	2	0	0	1	0	2	1	1	0	2	1	1
		AG-2.1.2	Compile and manage a street tree inventory to help in effectively managing and maintaining urban trees, monitoring the health and condition of urban trees, guiding evidence-based decision making (e.g., tree species selection, planting strategies, maintenance priorities), and raising public awareness of the value of urban and native trees.	18	4	2	0	2	0	2	1	0	2	1	1	0	2	0	1
		AG-2.1.3	Develop a residential tree planting, care, and replacement program that assists single-family homeowners and provides free trees and maintenance services to low-income residents	20	4	2	0	2	0	2	1	1	2	1	1	0	2	1	1
		AG-2.1.4	Pursue funding to evaluate and expand the Alameda County Tree Program.	23	4	2	0	2	2	2	2	0	2	1	1	1	2	1	1
		AG-2.1.5	Develop an Urban Greening Master Plan.	20	4	2	0	2	0	2	1	0	2	1	1	1	2	1	1
		AG-2.1.6	Explore strategies to increase tree protections on private property that consider both the benefits of a healthy urban tree canopy and concerns about preserving private property rights. Strategies may include private property tree protection ordinances, Heritage, Protected, or Native tree designations, or tree stewardship incentives.	16	4	1	0	2	0	2	1	0	2	1	1	0	2	0	1
AG-2.2	Utilize nature-based solutions to reduce the impacts of climate hazards and improve community resilience.	AG-2.2.1	Continue to implement and expand stormwater management best practices pursuant to Chapter 17.64 of the Alameda County Ordinance Code (Water Efficient Landscape Ordinance) by using natural infrastructure to recharge groundwater, improve water quality, and minimize runoff. This can include rain gardens, infiltration beds, bioswales and basins, and constructed wetlands and retention ponds.	20	4	2	0	2	2	2	2	0	0	1	1	0	2	1	1
		AG-2.2.2	Scale and incentivize the use of innovative natural infrastructure features, such as green roofs and walls, permeable pavements, vegetated corridors, and multi-functional open spaces, where appropriate.	17	4	2	0	2	0	0	2	0	2	0	1	0	2	1	1
		AG-2.2.3	Use tools, such as CalEnviroScreen, to determine priority pollution-burdened communities across the unincorporated county that may benefit most from vegetative barriers and plant hazard-resistant barriers in these areas, aligning with the objectives of the Environmental Justice Element and the proposed Air Pollution Exposure Zone Ordinance.	17	4	0	0	2	0	2	2	0	2	1	1	0	2	0	1
COMMUNITY ENGAGEMENT AND MONITORING																			
STRATEGY 1: ONGOING EQUITABLE COMMUNITY ENGAGEMENT																			
CE-1.1	Foster ongoing and deep community engagement with frontline communities.	CE-1.1.1	Develop a community climate action engagement strategy that facilitates and inspires broad community participation in community- and individual-level climate actions. To encourage frontline community participation, engagement should be offered in commonly-spoken languages and should consider providing incentives for participation time, offering childcare, adjusting meeting times to accommodate work schedules, and/or combining planning meetings with workshops or trainings related to disaster preparedness or other topics of interest to the community.	20	4	2	2	2	2	0	2	0	2	0	1	0	2	1	0
CE-1.2	Develop an array of accessible outreach programs with multilingual capacity for widely spoken languages that emphasize preparedness to climate hazards.	CE-1.2.1	Create an online and offline public outreach campaign for climate hazards (e.g., Red Flag warnings, Public Safety Power Shutoff events, Air Quality Index alerts), including information about what the warning is, what areas may be closed, what individuals should do to be prepared, and what activities should be avoided.	14	4	2	0	2	0	-2	2	0	2	0	1	0	2	1	0
		CE-1.2.2	Review and revise (as needed) the County's wildfire smoke and air quality communications protocols to ensure that related messaging is coordinated with other jurisdictions and can be disseminated to all populations, including those that may be difficult to reach.	17	4	0	0	2	2	2	2	0	2	0	1	0	2	0	0
		CE-1.2.3	Promote the array of extreme heat-related resources already produced or hosted by the County to bolster extreme heat preparedness and prevent heat-related illnesses through targeted outreach and awareness campaigns.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		CE-1.2.4	Develop neighborhood readiness plans and promote flood/sea level rise/storm preparedness education.	19	4	2	0	2	2	2	1	0	2	0	1	0	2	0	1
		CE-1.2.5	As a minimum standard, ensure that any outreach efforts that are developed are accessible, easy to understand, and available in multiple languages.	18	4	2	0	2	0	2	2	0	2	0	1	1	2	0	0
		CE-1.2.6	Connect unincorporated area residents to air quality messaging by amplifying Spare the Air Alerts and other air quality communications released by BAAQMD.	14	4	2	0	2	0	-2	2	0	2	1	1	0	2	0	0
CE-1.3	Prioritize community-based solutions to improve climate resilience.	CE-1.3.1	Form community-based committees consisting of local stakeholders, residents, and experts to actively engage in climate resilience and response planning and decision-making processes and provide micro-grants to support community-led planning and projects.	16	4	2	0	2	0	0	2	0	2	0	1	1	2	0	0
		CE-1.3.2	Establish partnerships with local businesses, institutions, and community-based organizations to leverage resources, expertise, and community networks for implementing climate resilience initiatives effectively.	15	4	2	0	2	0	0	2	0	2	0	1	0	2	0	0

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STRATEGY 2: CLIMATE ACTION MONITORING																			
CE-2.1	Monitor implementation of CCAP actions to reduce GHG emissions and enhance adaptation and resilience in unincorporated Alameda County.	CE-2.1.1	Conduct updates of the unincorporated county GHG emissions inventory every five years to monitor the progress of GHG-reducing actions.	13	4	2	0	2	2	2	1	0	0	0	0	0	0	0	0
		CE-2.1.2	Provide annual monitoring reports to the Alameda County Board of Supervisors on the implementation of CCAP actions.	14	4	2	0	2	2	2	2	0	0	0	0	0	0	0	0
		CE-2.1.3	Conduct comprehensive updates of the CCAP every eight years, aligning with updates to the County's Housing Element and Safety Element.	13	4	2	0	2	2	2	0	0	0	0	1	0	0	0	0
		CE-2.1.4	Proactively seek additional cost-effective implementation and strategic funding opportunities.	15	4	2	0	2	0	2	2	0	2	0	1	0	0	0	0