

MEMORANDUM

DATE March 11, 2022

TO Jody London, Sustainability Coordinator, Contra Costa County Department of Conservation and Development
Demian Hardman, Senior Planner, Contra Costa County Department of Conservation and Development

FROM Tammy L. Seale, PlaceWorks, Climate Action and Resilience Principal
Eli Krispi, PlaceWorks, Climate Action and Resilience Senior Associate
Jessica Robbins, PlaceWorks, Climate Action and Resilience Planner

SUBJECT Attachment 1: Community-Wide GHG Inventories – Summary of Results

Introduction	1
Methods	2
Community-Wide GHG Inventory.....	5
Next Steps	19

Introduction

PlaceWorks is working with Contra Costa County (the County) to prepare an update to the County’s 2015 Climate Action Plan (CAP). The CAP is a plan to reduce greenhouse gas (GHG) emissions and improve community resilience to hazardous conditions associated with climate change. It is part of the overarching Envision Contra Costa 2040 project, the County’s ongoing General Plan update. Envision Contra Costa 2040 is the County’s document to guide future growth and development in the unincorporated area, as well as County operations and decisions through 2040. As part of this work, PlaceWorks has been preparing a set of new and revised GHG inventories, which are technical analyses to assess the total annual GHG emissions attributed to the unincorporated areas of Contra Costa County from various activities.

A GHG inventory is the first step in creating a strategy to reduce Contra Costa County’s annual emissions. Determining the annual level of GHG emissions will aid the County in establishing an attainable goal for continually reducing emissions. Furthermore, knowing which activities release GHG emissions allows the County to develop policies and programs that facilitate a decrease in emissions for each activity.

GHG emissions are generated by various activities that are largely commonplace in daily life. Some daily activities release GHG emissions in the location of the activity, such as gases released anytime an internal combustion engine is operated. Other activities cause GHG emissions to be released elsewhere, such as using non-renewable or non-carbon-free electricity to power a home, which generates GHG emissions in the location of the power plant that supplies the power, and not in the home itself. Therefore, Contra

CONTRA COSTA COUNTY
CLIMATE ACTION PLAN UPDATE
COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Costa County must consider the GHG emissions caused by activities attributed to the unincorporated community, including GHG emissions generated both inside and outside the County’s jurisdictional boundaries.

The County has two types of GHG inventories: (1) community-wide inventories and (2) County operations inventories.

- A **community-wide GHG inventory** identifies GHG emissions that result from activities of unincorporated Contra Costa County residents, employees, visitors, and other community members. Examples include residents driving cars, homes using water, and businesses using electricity.
- A **County operations GHG inventory** summarizes emissions that are a direct result of Contra Costa County’s government operations. Examples include electricity and water used in County buildings or the fuel used for County vehicles.

As part of the preparation of the 2015 CAP, Contra Costa County and its regional partners and technical consultants prepared community-wide and County operations GHG inventories for the calendar years 2005 and 2013. The 2015 CAP identified the year 2005 as the baseline year for emission reductions, as this was considered a year with good data availability at the time, consistent with State guidance, and without any unusual factors that might affect GHG emissions.

As part of the CAP update process, the project teams prepared inventories of community-wide emissions for the years 2017 and 2019 and of County operations for the 2019 calendar year. County staff made some updates to the 2005 and 2013 community-wide inventories in the 2015 CAP to ensure a consistent method and approach across all inventory years. County staff also prepared a 2017 County operations GHG emissions inventory, which staff have summarized in a separate memo available at https://envisioncontracosta2040.org/wp-content/uploads/2020/08/2006_2017-County-GHG-Emissions-Summary.pdf. This memo presents the results of the updated and new Contra Costa County community-wide GHG inventories and is the most up-to-date summary of Contra Costa County’s community-wide GHG emissions.

This memo contains a discussion of the methods used to prepare and update the GHG inventories (Section 2), selected results from the community-wide GHG inventory (Section 3), and next steps (Section 4). The new and revised draft inventory results show that between 2005 and 2019, unincorporated Contra Costa County saw an approximately 22-percent decline in total GHG emissions. The residential energy and transportation sources of GHG emissions are primarily responsible for this decrease.

Methods

PROTOCOLS

A series of guidance documents, called protocols, provide recommendations on how to adequately assess GHG emissions. The project team prepared the new GHG inventories and updates to past GHG inventories consistent with the guidance in widely adopted, standard protocol documents. These protocols provide guidance on what activities should be evaluated in the GHG inventories and how

CONTRA COSTA COUNTY
CLIMATE ACTION PLAN UPDATE
COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

emissions from those activities should be assessed. Using standard methods also allows for an easy comparison of GHG emission levels across multiple years and communities.

- The County operations GHG inventory relies on the Local Government Operations Protocol (LGOP), which was first developed in 2008 and was updated in 2010. The LGOP is a tool for accounting and reporting GHG emissions of local government (municipal) operations and is used throughout California and the United States. The LGOP includes guidance from several existing programs as well as the state’s mandatory GHG reporting regulations.
- The community-wide GHG inventory uses the United States Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (U.S. Community Protocol), which was first developed in 2012 and updated most recently in 2019. The California Governor’s Office of Planning and Research encourages cities and counties in California to follow the U.S. Community Protocol for community-wide GHG emissions.
- A third protocol, the Global Protocol for Community-Scale Greenhouse Gas Inventories (Global Protocol) was first developed in 2014 and is intended for use in preparing international community-scale GHG inventories. It is largely consistent with the U.S. Community Protocol, although it contains additional guidance and resources to support a wider range of activities that may be found in other countries. The project team has used the Global Protocol to assess GHG emissions from sources that are not covered in the U.S. Community Protocol.

GHG inventories are estimates of GHG emissions based on these standard methods and verified datasets. While they are not direct measurements of GHG emissions, the use of the standard methods identified in the protocols, in combination with accurate data from appropriate sources, allows GHG inventories to provide reliable estimates of local emission levels. Due to potential data limitations, some inconsistencies in methods may remain. Any concerns about inconsistent methods are noted in the appropriate sector discussion.

UNITS OF MEASUREMENT

GHG inventories assess emissions in a unit called carbon dioxide equivalent (CO₂e), which is a combined unit of all GHGs analyzed in the inventory. As different GHGs have different effects on the processes that drive climate change, CO₂e is a weighted unit that reflects the relative potency of the different GHGs. These inventories report amounts of GHGs in metric tons of CO₂e (MTCO₂e), equal to 1,000 kilograms or approximately 2,205 pounds.

EMISSION FACTORS

An emissions factor describes how many MTCO₂e are released per unit of an activity. For instance, an emissions factor for electricity describes the MTCO₂e produced per kilowatt hours (kWh) of electricity used, or an emission factor for on-road transportation describes the MTCO₂e produced per mile of driving. The project team calculated most of the GHG emissions using data on GHG-generating activities in combination with emission factors. Some sources of GHG emissions (known as sectors), including agriculture and off-road emissions, are calculated using formulae or models and do not have specific emission factors. **Table 1** shows the emissions factors for the inventory years for the unincorporated area.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Table 1: Inventory Emissions Factors, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE	SOURCE
PG&E electricity (MTCO ₂ e/kWh)	0.000226	0.000195	0.000096	0.000108	-52%	PG&E
Direct access electricity (MTCO ₂ e/kWh)	0.000388	0.000309	0.000208	0.000187	-52%	California Energy Commission
MCE electricity (MTCO ₂ e/kWh)	N/A	N/A	0.000059	0.000045	-24% *	MCE
Natural gas (MTCO ₂ e/therm)	0.005311	0.005311	0.005311	0.005311	0%	US Community Protocol
Propane (MTCO ₂ e/gallon)	0.005844	0.005844	0.005844	0.005844	0%	US Community Protocol
Kerosene (MTCO ₂ e/gallon)	0.010569	0.010569	0.010569	0.010569	0%	US Community Protocol
Wood (MTCO ₂ e/MMBTU)	0.095624	0.095624	0.095624	0.095624	0%	US Community Protocol
On-road vehicles (MTCO ₂ e/VMT)	0.000486	0.000483	0.000421	0.000408	-16%	California Air Resources Board
BART (MTCO ₂ e/passenger mile)	0.000093	0.000093	0.000093	0.000013	-86%	BART
Municipal solid waste (MTCO ₂ e/ton)	0.293179	0.293184	0.286047	0.261659	-11%	CalRecycle
Alternative daily cover (MTCO ₂ e/ton)	0.191850	0.245890	0.245694	0.245693	28%	CalRecycle

* MCE's percentage change is from 2017 to 2019.

Community-Wide GHG Inventory

SECTORS

The community-wide GHG inventory assessed GHG emissions from the following 11 categories of activities, known as sectors.

- **Transportation** includes GHG emissions created by driving on-road vehicles in the unincorporated county, including passenger and freight vehicles.
- **Residential energy** includes GHG emissions attributed to the use of electricity, natural gas, and other home heating fuels in residential buildings.
- **Solid waste** includes the GHG emissions released from trash collected in the unincorporated areas of Contra Costa County, as well as collective annual emissions from waste already in place at the Acme, Keller Canyon, and West Contra Costa Landfills.
- **Nonresidential energy** includes GHG emissions attributed to the use of electricity and natural gas in nonresidential buildings.
- **Agriculture** includes GHG emissions from various agricultural activities in the unincorporated county, including agricultural equipment, crop cultivation and harvesting, and livestock operations.
- **Off-road equipment** includes GHG emissions from equipment that does not provide on-road transportation (excluding agricultural equipment), such as tractors for construction or equipment used for landscape maintenance.
- **Water and wastewater** accounts for the electricity used to transport every gallon of water or wastewater to unincorporated county residents and businesses, as well as direct emissions resulting from the processing of waste material.
- **Bay Area Rapid Transit (BART)** includes GHG emissions associated with the operation of BART for unincorporated county residents.
- **Land Use and sequestration** includes GHG emissions absorbed and stored in trees and soils on locally controlled lands as part of healthy ecosystems and released into the atmosphere from development of previously undeveloped land.
- **Stationary sources** are emissions from fuel use at major industrial facilities, permitted by state and regional air quality authorities. These emissions are informational and are not counted as part of the community total.
- **Wildfire** includes emissions released as a result of wildfires. These emissions are informational and are not counted as part of the community total.

INVENTORY RESULTS

Table 2 and **Figure 1** show the overall amount of community-wide GHG emissions for the unincorporated area associated with each sector for the four inventory years. Total community-wide emissions declined 22 percent from 2005 to 2019. **Table 3** shows the proportion of GHG emissions from each sector for the unincorporated area for the four inventory years.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Table 2: Absolute Annual GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Transportation	628,200	651,130	571,650	464,040	-26%
Residential energy	294,930	280,870	212,420	191,780	-35%
Nonresidential energy	118,740	125,350	48,700	109,370	-8%
Solid waste	243,940	224,570	223,100	220,760	-10%
Agriculture	33,350	39,300	44,880	36,130	8%
Off-road equipment	34,160	36,290	42,840	54,010	58%
Water and wastewater	8,080	7,400	4,400	4,870	-40%
BART	1,040	1,320	1,440	190	-82%
Land use and sequestration	-70,860	-70,860	-70,860	-70,860	0%
Total Annual MTCO_{2e}	1,291,580	1,295,370	1,078,570	1,010,590	-22%
Informational Items					
Stationary sources	13,983,030	11,956,000	11,232,290	10,867,670	-22%
Wildfire	14,270	66,080	0	10,100	N/A
All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.					

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Figure 1: Absolute Annual GHG Emissions by Sector, 2005 to 2019

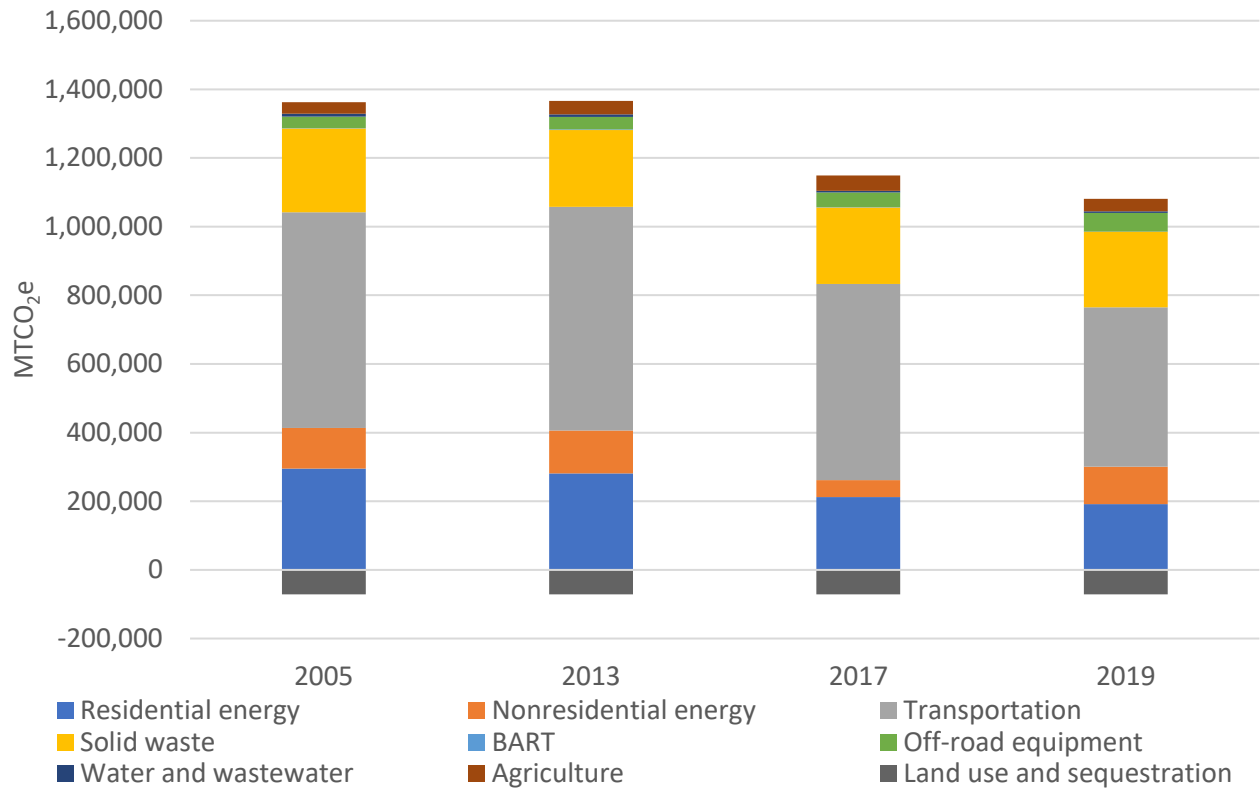


Table 3: Proportion of GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019
Transportation	49%	50%	53%	46%
Residential energy	23%	22%	20%	19%
Solid waste	19%	17%	21%	22%
Nonresidential energy	9%	10%	5%	11%
Agriculture	3%	3%	4%	4%
Off-road equipment	3%	3%	4%	5%
Water and wastewater	1%	1%	Less than 1%	Less than 1%
BART	Less than 1%	Less than 1%	Less than 1%	Less than 1%
Land use and sequestration	-5%	-5%	-7%	-7%
Total Annual MTCO₂e	100%	100%	100%	100%

Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

In all years, the transportation sector has remained the largest source of GHG emissions in unincorporated Contra Costa County, accounting for between 46 and 53 percent of total community-wide GHG emissions (excluding informational items). Residential energy and solid waste are the next-largest sources of GHG emissions, followed by nonresidential energy. Agriculture GHG emissions account for between 3 and 4 percent, while off-road equipment accounts for between 3 and 5 percent. GHG emissions from water and wastewater and BART are both 1 percent or less.

The sectors that experienced the largest decrease in annual GHG emissions between 2005 and 2019 were BART (82 percent decline), water and wastewater (40 percent decline), residential energy (35 percent), and transportation (26 percent). Emissions reductions also occurred in the solid waste sector (10 percent) and the nonresidential energy sector (8 percent). The reasons for these changes in emissions are discussed in more detail in the sector-specific sections below, but they are primarily due to an increase in renewable and carbon-free electricity and greater resource efficiency practices by community members. Two sectors, off-road equipment and agriculture, saw an increase in their emissions from 2005 to 2019.

SECTOR DETAILS

Transportation

Unincorporated Contra Costa County community members drove approximately 1.3 billion vehicle miles in 2005, decreasing 12 percent to approximately 1.1 billion vehicle miles in 2019. The VMT in 2005 resulted in GHG emissions of approximately 628,200 MTCO₂e, which dropped to approximately 464,040 in 2019, a 26-percent decrease. GHG emissions decreased due to this reduction in VMT, increasingly fuel-efficient vehicles, and a wider adoption of electric vehicles. The average vehicle on the road in unincorporated Contra Costa County generated 16 percent fewer GHG emissions in 2019 than in 2005, as reported by Caltrans and as shown in **Table 1**. **Table 4** provides a breakdown of the activity data and emissions for on-road transportation for the unincorporated area by each individual year included in the updated community inventory.

Table 4: Transportation Activity Data and GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data (VMT)					
On-road transportation	1,291,819,230	1,349,279,980	1,357,121,160	1,136,911,090	-16%
Emissions (MTCO₂e)					
On-road transportation	628,200	651,130	571,650	464,040	-19%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Residential Energy

Contra Costa County’s GHG emissions from residential energy totaled approximately 191,780 MTCO₂e in 2019, compared to 294,930 MTCO₂e in 2005, a decline of 35 percent. Residential electricity GHG emissions decreased due to a decrease in overall use and usage of cleaner sources of electricity. Residential electricity use fell 40 percent from 2005 to 2019, from 488,236,740 kWh to 293,561,300 kWh. Over this period, as seen in **Table 1**, electricity supplied by PG&E emitted 52 percent less GHGs in 2019 than in 2005. Electricity from MCE, which supplied electricity to community residents in 2017 and 2019, generated even fewer GHG emissions than PG&E-supplied electricity, which has also contributed to the decline in this sector. Natural gas use and GHG emissions saw a small decrease from 2005 to 2019 of 3 percent despite a growing population. Propane and wood use also declined, although GHG emissions from these fuels are only a small proportion of those from the residential energy sector. **Table 5** provides a breakdown of the activity data and GHG emissions for residential energy for the unincorporated area.

Table 5: Residential Energy Activity Data and GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data					
Residential PG&E electricity (kWh)	488,236,740	478,219,710	461,970,670	46,158,330	-91%
Residential MCE electricity (kWh)	-	-	307,820	247,402,970	80,273%*
Residential natural gas (therms)	30,919,160	31,007,110	28,634,420	30,100,640	-3%
Residential propane (gallons)	1,525,330	1,106,900	1,043,270	1,021,340	-33%
Residential kerosene (gallons)	13,160	10,960	8,030	16,320	24%
Residential wood (MMBTU)	117,000	165,830	100,960	101,710	-13%
Emissions (MTCO₂e)					
Residential PG&E electricity	110,120	93,380	44,510	5,000	-95%
Residential MCE electricity	0	0	20	11,060	55,200%*
Residential natural gas	164,570	165,040	152,060	159,850	-3%
Residential propane	8,910	6,470	6,100	5,970	-33%
Residential kerosene	140	120	80	170	21%
Residential wood	11,190	15,860	9,650	9,730	-13%
Total Annual MTCO₂e	294,930	280,870	212,420	191,780	-10%

* MCE did not operate in the unincorporated County until 2017, and 2017 operations were very limited. MCE percentage changes are for changes from 2017 to 2019.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Solid Waste

Contra Costa County’s community-wide GHG emissions associated with solid waste includes four subsectors.

- Municipal solid waste (MSW) is the material that is discarded by community members and reflects the actual waste generated by the community.
- Alternative daily cover (ADC) is organic material applied at landfills by the landfill operator as a means of controlling debris and pests.
- Waste in place is the solid waste and associated GHG emissions deposited in the County’s landfills in previous years.
- The flaring subsector accounts for GHG emissions from the combustion of gases generated by the decomposing waste.

Between 2005 and 2019, emissions decreased by 10 percent due to decreases in solid waste generated and ADC applied, likely as a result of increased community awareness about recycling and composting and the availability of curbside recycling programs. Although annual waste generation decreased, waste in place at the landfills increased as waste is added to the landfills each year. **Table 6** presents solid waste emissions data for each year for the unincorporated area.

Table 6: Solid Waste Activity Data and GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 – 2019
Activity Data (Tons)					
Solid waste	154,820	78,790	79,520	79,340	-49%
ADC	15,950	13,990	11,470	7,580	-52%
Waste in place	34,455,010	41,785,650	45,776,140	47,618,290	38%
Landfill flaring	5,270	5,260	5,250	5,270	Less than 1%
Emissions (MTCO₂e)					
Solid waste	45,390	23,100	22,750	20,760	-54%
ADC	3,060	3,440	2,820	1,860	-39%
Waste in place	193,950	196,500	196,000	196,610	1%
Landfill flaring	1,540	1,530	13,550	13,590	-1%
Total Annual MTCO₂e	243,940	224,570	235,120	232,820	-10%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Nonresidential Energy

Contra Costa County’s GHG emissions from nonresidential energy totaled approximately 109,370 MTCO₂e in 2019, compared to 118,740 MTCO₂e in 2005, a decline of 8 percent. Electricity emissions from retail electricity suppliers (PG&E and MCE) have fallen significantly, driven by a small decrease in electricity use

CONTRA COSTA COUNTY
CLIMATE ACTION PLAN UPDATE
COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

and a large increase in the amount of electricity for renewable and carbon-free sources (see **Table 1**). Between 2005 and 2019, nonresidential electricity obtained from PG&E decreased by 90 percent and nonresidential electricity obtained from MCE increased from virtually nothing in 2017 to approximately 200 million kWh in 2019. Natural gas use and associated emissions have also reportedly declined, although this is less likely to be due to an actual decline and more likely the result of data being omitted by PG&E as a way of complying with state privacy regulations. Similarly, direct access electricity (electricity purchased from third parties instead of PG&E or MCE, usually by large customers such as major industrial facilities) was only reported for 2019, although this electricity use likely occurred in previous years but was not reported due to privacy regulations. **Table 7** provides a breakdown of the activity data and GHG emissions for nonresidential energy for the unincorporated area.

Table 7: Nonresidential Energy Activity Data and GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 – 2019
Activity Data					
Nonresidential PG&E Electricity (kWh) ¹	284,558,070	266,216,660	266,216,660	29,062,250	-90%
Nonresidential MCE electricity (kWh) ²	0	0	28,730	200,181,720	696,669%
Nonresidential Direct Access electricity (kWh) ³	0	0	0	396,805,940	N/A
Nonresidential natural gas (therms) ⁴	10,251,360	13,784,410	4,340,910	4,340,910	-58%
Emissions (MTCO₂e)					
Nonresidential PG&E electricity ¹	64,180	51,980	25,650	3,150	-95%
Nonresidential MCE electricity ²	0	0	Less than 10	9,040	451,900%
Nonresidential Direct Access electricity ³	0	0	0	74,130	N/A
Nonresidential natural gas ⁴	54,560	73,370	23,050	23,050	-58%
Total Annual MTCO₂e	118,740	125,350	48,710	109,370	-8%

1: Due to omissions in data reported by PG&E for the calendar year 2017, the project team assumed that electricity use remained constant from 2013 levels.

2: MCE did not operate in the unincorporated County until 2017, and 2017 operations were very limited. MCE percentage changes are for changes from 2017 to 2019.

3: Direct access electricity was only reported for 2019. As PG&E also reports MCE-supplied electricity as Direct Access, the numbers given in this table are the electricity use after MCE data are removed.

4: Due to omissions in data reported by PG&E for the calendar year 2019, the project team assumed that natural gas use remained constant from 2017 levels.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Agriculture

GHG emissions associated with the agriculture sector for the unincorporated area increased by approximately 8 percent between 2005 and 2019 (see **Table 8**). This increase is due primarily to a minor increase (5 percent) in the amount of cattle in the county. Although crop acreages declined from 2005 to 2019, more fertilizer was applied in 2019 than in 2005 due to a shift in the types of crops being grown that required slightly more fertilizer.

Table 8: Agriculture Activity Data and GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data					
Crops (acreage)	200,980	204,031	197,360	183,730	-9%
Nitrogen applied (pounds)	3,261,620	3,560,480	3,698,500	3,608,340	11%
Livestock (effective annual population)	16,500	19,110	22,060	17,340	5%
Emissions (MTCO₂e)					
Crops	3,920	4,280	4,450	4,340	11%
Enteric fermentation	28,510	33,920	39,160	30,790	-8%
Manure management	920	1,100	1,270	1,000	9%
Total Annual MTCO₂e	33,350	39,300	44,880	36,130	8%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Off-Road Equipment

According to data shown in **Table 9**, emissions from off-road equipment in unincorporated Contra Costa County increased approximately 73 percent between 2005 and 2019, although the sector overall remains a small proportion of the total community-wide emissions. This increase is primarily the result of a significant rise in diesel tractor and other agricultural equipment use over this period, along with increases in commercial and industrial/warehouse equipment use. Since this is modeling directly reported by State agencies, it is possible that changes in modeling methods may be affecting the results. Note that the State provides these GHG emission levels directly, so there is no activity data to display.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Table 9: Off-Road Equipment GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Total Annual MTCO₂e					
Agricultural equipment	1,200	1,190	1,180	10,170	748%
Cargo handling equipment	900	380	330	310	-66%
Commercial harbor equipment *	0	0	0	2,600	N/A
Construction and mining equipment	6,780	7,170	8,880	7,200	6%
Industrial equipment	8,320	8,840	9,470	9,780	18%
Lawn and garden equipment	3,580	3,280	3,760	3,880	8%
Light commercial equipment	2,230	2,780	3,060	3,270	47%
Locomotives	3,170	3,260	3,540	3,620	14%
Oil drilling equipment	20	20	20	20	0%
Pleasure craft	1,890	1,810	1,800	1,830	-3%
Portable equipment	4,830	6,240	6,700	6,970	44%
Recreational equipment	650	670	610	630	-3%
Transport Refrigeration Units	590	650	3,490	3,730	532%
Total Annual MTCO₂e	34,160	36,290	42,840	54,010	58%

* State modeling only provided emissions for commercial harbor equipment for 2019.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

According to records maintained by the California Department of Conservation’s Geologic Energy Management Division, there are no active oil or gas extraction wells in the unincorporated area. There are 16 natural gas storage wells in the hills between Clyde and Bay Point, along with an observation well. As these sites are not being used for active extraction, there are no further emissions associated with fossil fuel production at well sites in this inventory.

Water and Wastewater

Emissions associated with the water and wastewater sector are counted as indirect or direct emissions. Indirect water emissions refer to emissions created by the electricity required to treat and move water to where it is used. Indirect wastewater emissions refer to electricity needed to move wastewater to water treatment facilities, and to process and discharge it. Direct wastewater emissions refer to emissions produced directly by decomposing materials in wastewater.

GHG emissions from Contra Costa County’s water and wastewater consumption decreased 40 percent between 2005 and 2019. Indirect water GHG emissions declined by 62 percent between 2005 and 2019 while indirect wastewater GHG emissions decreased by 66 percent. Community members used substantially less water (31 percent less) and generated less wastewater (30 percent less) in 2019 than in

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

2005 despite population growth. This is likely a result of increased water efficiency by community residents and businesses. Additionally, the electricity used in water and wastewater pumping and treatment has been increasingly supplied by renewable and carbon-free sources, decreasing GHG emissions. Direct wastewater emissions did rise by approximately 199 percent from 2005 to 2019, but given that the amount of wastewater generated declined by this period, this is likely due to changes in modeling approaches and available data. The emissions data for the unincorporated area in **Table 10** shows that overall emissions increased slightly within the water and wastewater sector.

Table 10: Water and Wastewater Activity Data and GHG Emissions by Subsector, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data					
Water use (million gallons)	11,530	11,650	7,380	8,010	-31%
Water electricity use (kWh)	26,443,770	28,004,290	19,137,620	20,783,930	-21%
Wastewater generation (million gallons)	4,560	4,610	3,150	3,170	-30%
Wastewater electricity use (kWh)	6,199,120	6,198,590	4,268,050	4,295,780	-31%
Emissions (MTCO₂e)					
Indirect water	5,960	5,470	1,840	2,250	-62%
Indirect wastewater	1,400	1,210	410	470	-66%
Direct wastewater	720	720	2,150	2,150	199%
Total Annual MTCO₂e	8,080	7,400	4,400	4,870	-40%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

BART

Emissions associated with BART ridership decreased 82 percent between 2005 and 2019. This decline is attributable to changes in BART’s electricity portfolio, which in recent years have shifted to favor more renewable and carbon-free sources of energy. BART ridership from community members in unincorporated Contra Costa County increased 29 percent between 2005 and 2019, as shown in **Table 11**. Ridership at all stations serving the unincorporated area increased by 10 to 35 percent over this period except for Pittsburg/Bay Point, which saw some of its ridership shift to Pittsburg Center and Antioch with the opening of the BART to Antioch extension in 2018.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Table 11: BART Activity Data and GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 – 2019
Activity Data					
BART Ridership (passenger miles)	11,231,870	14,228,420	15,528,840	14,444,740	29%
Emissions (MTCO_{2e})					
Total Annual MTCO_{2e}	1,040	1,320	1,440	190	-82%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Land Use and Sequestration

GHG emissions from land use and sequestration can be either positive (a source of emissions) or negative (removing emissions from the atmosphere, creating what is known as an emissions “sink”). Natural lands and street trees absorb carbon, storing it in wood, plants, and soil. As a result, when natural land is preserved or when more street trees are planted, emissions from this sector are negative because GHGs are being removed from the atmosphere. However, developing natural lands or converting them to a different form (for example, replacing forests with crop land) or removing street trees causes carbon to be released, creating GHG emissions.

This sector includes emission sources and sinks from three types of activities: sequestration of GHG emissions in locally controlled forested lands, sequestration of GHG emissions in street trees in urbanized unincorporated areas, and emissions caused by permanently removing vegetation from natural lands or farmlands as a part of development.

Emissions and sequestered amounts remained constant in both years for all three activities. Locally-controlled forests and street trees have not had their sequestration capabilities changed by human activities during the inventory period. While there was some development activity that caused a loss of sequestered GHG emissions, records of when the development specifically occurred are not available, and so the GHG emissions have been assigned equally to both inventory years, hence the lack of changes. Forests sequestered 58,110 MTCO_{2e} annually, while street trees sequestered 12,750 MTCO_{2e}, for a total carbon sink of 70,860 MTCO_{2e} for the unincorporated area, as shown in **Table 12**.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Table 12: Land Use and Sequestration Activity Data and GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data					
Acres of forested land	60,050	60,050	60,050	60,050	0%
Acres of urban trees	32,780	32,780	32,780	32,780	0%
Acres of land use changes	0	0	0	0	0%
Emissions (MTCO₂e)					
Forest sequestration	-58,110	-58,110	-58,110	-58,110	0%
Street tree sequestration	-12,750	-12,750	-12,750	-12,750	0%
Land use changes	0	0	0	0	0%
Total Annual MTCO₂e	-70,860	-70,860	-70,860	-70,860	0%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

Wildfire

Wildfires create GHG emissions by burning organic materials such as trees and plants, releasing the carbon sequestered in these materials. Larger fires and those that burn through forested areas, as opposed to less densely vegetated ecosystems, release more GHG emissions. The County reported wildfires in 2005, 2013, and 2019, but not in 2017. The acreages and emissions of these fires for the unincorporated area are reported in **Table 13**. Although wildfire emissions and acreages were lower in 2019 than in 2005, wildfire activity varies widely from year to year, and is generally expected to increase in future years due to climate change. Wildfire emissions are not calculated in the totals presented in this memorandum and are for informational purposes only.

Table 13: Wildfire Activity Data and GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Activity Data					
Acres burned	2,070	6,320	0	1,830	-31%
Emissions (MTCO₂e)					
Total Annual MTCO₂e	14,270	66,080	0	10,100	-29%

2005 wildfires: Bragdon Fire, BNSF Fire, Byron Fire, Vasco Airport Fire, and an unnamed fire south of Antioch.

2013 wildfires: Kirker Fire and Morgan Fire.

2019 wildfires: Marsh 3 Fire, Marsh 5 Fire, Marsh 6 Fire.

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Stationary Sources

Stationary source emissions result from fuel use, such as natural gas or propane, at large industrial facilities. These facilities include refineries, power plants, factors, and similar installations. Natural gas use at these facilities may be included as part of the nonresidential natural gas use reported by PG&E. **Table 14** shows the emissions from stationary sources for the unincorporated area. This information is directly reported by the California Air Resources Board as total emissions. The Board does not report activity data for stationary sources, which would include amounts of fuel burned at these facilities. These emissions are not included in the totals presented in this memorandum and are for informational purposes only.

Table 14: Stationary Source GHG Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Emissions (MTCO_{2e})					
Total Annual MTCO_{2e}	13,983,030	11,956,000	11,232,290	10,867,670	-22%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

PER-CAPITA EMISSIONS

Along with the “absolute” GHG emission levels discussed previously, the project team also assessed the per-capita, or per-person, GHG emissions from the unincorporated area of Contra Costa County. The team calculates the per-capita GHG emissions by taking the absolute GHG emissions presented in **Table 2** and dividing these GHG emissions by the number of residents in the unincorporated county for that inventory year. **Table 15** and **Figure 2** show the per-capita emissions for the inventory years for the unincorporated area.

Overall, per-capita emissions declined 31 percent from 2005 to 2019. Because the population of unincorporated Contra Costa County grew during this time, most sectors saw their per-capita emissions decline. Even for sectors that saw increases in their absolute emissions, such as agriculture, the population growth resulted in a decline in per-capita emissions. The one sector that saw an increase in per-capita emissions was off-road equipment, although the per-capita emissions grew by 53 percent from 2005 to 2019 compared to a 73-percent increase when measured at the absolute level.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

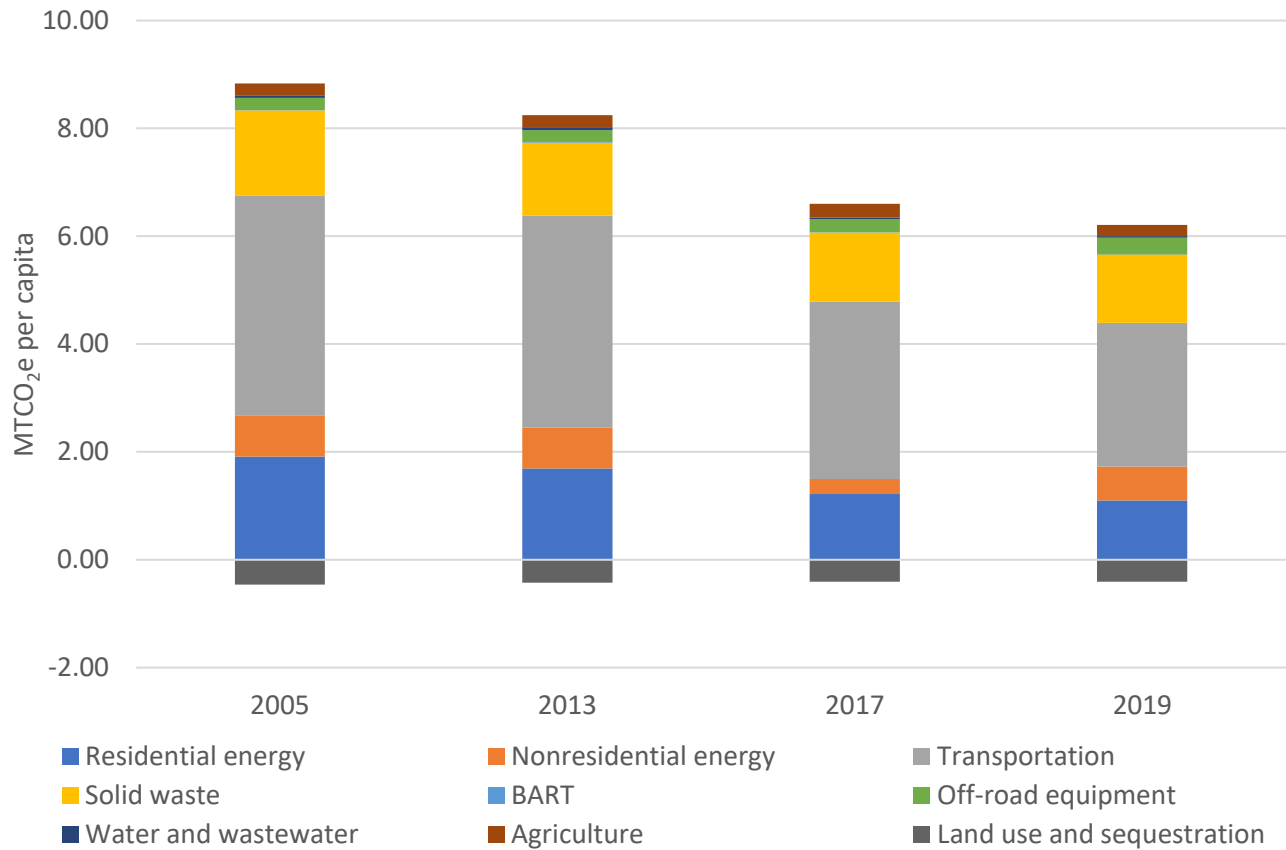
Table 15: Per-Capita Emissions, 2005 to 2019

SECTOR	2005	2013	2017	2019	PERCENTAGE CHANGE, 2005 - 2019
Population					
Residents	154,270	165,700	174,110	174,150	13%
Emissions (MTCO₂e per-capita)					
Transportation	4.07	3.93	3.28	2.66	-35%
Residential energy	1.91	1.70	1.22	1.10	-42%
Solid waste	1.58	1.36	1.28	1.27	-20%
Nonresidential energy	0.77	0.76	0.28	0.63	-18%
Agriculture	0.22	0.24	0.26	0.21	-4%
Off-road equipment	0.22	0.22	0.25	0.31	53%
Water and wastewater	0.05	0.04	0.03	0.03	-47%
BART	0.01	0.01	0.01	Less than 0.01	-84%
Land use and sequestration	-0.46	-0.43	-0.41	-0.41	-11%
Total Annual Per-Capita MTCO₂e	8.37	7.82	6.19	5.80	-31%
Informational Items					
Stationary sources	90.64	72.15	64.51	62.40	-31%
Wildfire	0.09	0.40	0.00	0.06	-37%

All numbers are rounded to the nearest 10. Totals may not equal the sum of individual rows.

CONTRA COSTA COUNTY
 CLIMATE ACTION PLAN UPDATE
 COMMUNITY-WIDE GHG INVENTORIES – SUMMARY OF RESULTS

Figure 2: Per-Capita Annual GHG Emissions by Sector, 2005 to 2019



Next Steps

PlaceWorks will prepare 2030, 2040, and 2050 forecasts of community-wide and County operations GHG emissions and will assess the GHG reduction benefits from existing and planned state, regional, and local activities GHG emissions. The results of the GHG inventory, forecast, and benefits of existing and planned activities will help inform new policies to reduce both community-wide and County operations GHG emissions.