APPENDIX H

GLOBAL CLIMATE CHANGE

This page intentionally
left blank.

Appendix H

2035 General Plan Draft PEIR
Global Climate Change Technical Appendix

INTRODUCTION

As part of the City of Folsom's General Plan Update (2035 General Plan), a climate action plan (CAP) was prepared that will be integrated with the General Plan Policy Document and analyzed in the Program EIR. The CAP consists of a baseline greenhouse gas (GHG) emissions inventory, a forecast of future GHG emissions, recommended CAP measures to reduce GHG emissions, and recommended general plan goals, policies, and implementation programs to both achieve estimated GHG reductions associated with the CAP measures and monitor the results of CAP implementation over time. The CAP integrated within the 2035 General Plan would serve as the City's "plan for the reduction of greenhouse gases", per Section 15183.5 of the CEQA Guidelines, once the 2035 General Plan is approved and the Program EIR is certified.

This appendix summarizes the methods, assumptions, and results of the GHG Inventory and the GHG reduction measures, and is organized into three primary sections, as follows:

1. Summary of 2014 Community and Municipal Operations GHG emissions inventory;
2. Summary of the GHG emissions projections for 2020, 2030, 2035, and 2050, including recommended GHG reduction targets;
3. Quantification of GHG emissions reductions associated with proposed GHG reduction measures incorporated into the 2035 General Plan.

Attachments:

Attachment 1: Greenhouse Gas Emission Reductions Calculations and Assumptions

This page intentionally
left blank.

1 GREENHOUSE GAS EMISSIONS INVENTORY

The initial phase in the preparation of the City of Folsom's CAP is to conduct a baseline GHG emissions inventory. In 2009, the County of Sacramento published an integrated, county-wide GHG emissions inventory, which included emissions from both communitywide sources and municipal operations for the unincorporated portions of Sacramento County as well as each of the incorporated cities, including the City of Folsom (City). The baseline year for emissions reporting in that inventory was 2005. Ascent Environmental, Inc. (Ascent) reviewed the reported emissions sectors, data sources, and methods used in the 2005 inventory as a basis for conducting an update to the City's GHG inventory. For this update of the City's GHG inventory, a baseline year of 2014 was used. In addition to quantifying communitywide emissions (Community Inventory), Ascent also included a separate inventory for the City's municipal operations (Municipal Inventory). This section summarizes the results, methods, and assumptions used in the 2014 City of Folsom GHG emissions inventory update.

Based on the modeling conducted, the community of Folsom generated approximately 657,892 metric tons of carbon dioxide equivalents ($MTCO_2e$) in 2014. Emissions attributable to the City's operations were approximately 7,469 $MTCO_2e$ in 2014. Major emissions sectors included building/facility energy use, on-road vehicles, off-road vehicles and equipment, water treatment and conveyance, wastewater management, solid waste, and high global warming potential (GWP) gases. Due to the low level of agriculture activity, agriculture-related emissions (e.g., agriculture off-road equipment, enteric fermentation from livestock, fertilizer-related) were not included in this inventory update. Emissions, data sources, and methods used for emission quantification are explained in further detail below. Table 1 presents a summary of the 2014 Community Inventory, and Table 2 presents a summary of the 2014 Municipal Inventory.

Table 1 2014 City of Folsom Community GHG Emissions Inventory

Sectors	2014 ($MTCO_2e$/yr)	Percent of Total (%)
Building Energy Use	235,955	36
On-Road Vehicles	342,865	52
Off-Road Vehicles	26,683	4
Solid Waste	13,073	2.0
Water-Related (water treatment and conveyance)	1,325	0.2
Wastewater (process and sewer/pumping emissions)	3,282	0.5
High GWP Gases	34,708	5
Total	657,892	100

Notes: GHG = greenhouse gas; GWP = global warming potential; $MTCO_2e$ = metric tons of carbon dioxide equivalent; yr = year.

Source: Data compiled by Ascent Environmental in 2016.

Table 2 2014 City of Folsom Municipal GHG Emissions Inventory

Sectors	2014 ($MTCO_2e$/yr)	Percent of Total (%)
Building Energy Use	2,137	29
Total On-Road (Includes Employee Commute and City Fleet)	4,247	57
Off-Road Mobile (Off Road Vehicles and Equipment)	138	2
Solid Waste Generation	71	1
Traffic Signals	101	1
Street Lights	727	10
Water-Related (water treatment and conveyance)	15	<1
Wastewater (wastewater pumping and process emissions)	32	<1
TOTAL	7,469	100

Notes: GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; yr = year

Source: Data compiled by Ascent Environmental in 2016.

1.1 DATA SOURCES AND METHODS

1.1.1 Inventory

The 2014 GHG emissions inventory update includes several changes to the data sources and emission factors used, along with changes in methods, compared to the 2005 baseline inventory. These differences were necessary in cases where the original data sources used in the 2009 inventory were no longer available or have not been updated. New methods that provide more accurate emissions estimates are available for sectors such as the on-road vehicles and solid waste sectors. For these reasons, an accurate comparison showing changes in emissions between the 2005 and 2014 inventories is not possible and was not included in the analysis.

The general approach used for both Community and Municipal GHG inventory emission calculations is consistent with International Council for Local Environmental Initiatives (ICLEI), California Air Resources Board (CARB), California Climate Action Registry and the Climate Registry guidance. The approach for the Community Inventory is consistent with the *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions,* Version 1.0 (ICLEI 2012) and the approach for the Municipal Inventory is consistent with the *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emission Inventorie*s, Version 1.1 (ICLEI 2010). The following section summarizes data sources and methods used in estimating the City's 2014 Community and Municipal Inventories.

1.1.2 Overall Assumptions Applied to Both Community and Municipal Operations

UTILITY EMISSION FACTORS

Emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) per megawatt hour (MWh) or therm of natural gas vary greatly by location and from year to year depending on numerous factors. Utility-specific factors for GHG emissions were obtained for the year 2014 and used throughout the inventory to estimate GHG emissions from electricity and natural gas consumption. Sources for electricity and natural gas emission factors are shown below.

- **Electricity:** Utility electricity emission factors for CO_2 were provided by the Sacramento Municipal Utility District (SMUD) directly (SMUD 2016). Electricity emission factors for CH_4 and N_2O were obtained from the U.S. Environmental Protection Agency's (EPA's) Emissions & Generation Resource Integrated Database (eGRID) 2012 GHG Annual Output Emission Rates (EPA 2012).

- **Natural Gas:** Utility natural gas emission factors for CO_2 were provided by Pacific Gas & Electric (PG&E) directly (PG&E 2015). Electricity emission factors for CH_4 and N_2O were obtained from The Climate Registry Emission Factors (2014).

GLOBAL WARMING POTENTIALS

GHG emissions other than CO_2 generally have a stronger insulating effect (e.g., ability to warm the earth's atmosphere or greenhouse effect) than CO_2. This effect is measured in terms of a pollutant's GWP. CO_2 has a GWP factor of one while all other GHGs have GWP's measured in multiples of one. CARB currently uses GWP factors published in the Fourth Assessment Report (FAR) from the Intergovernmental Panel on Climate Change (IPCC), where CH_4 and N_2O have GWP's of 25 and 298, respectively (IPCC 2007). This means that CH_4 and N_2O would be 25 and 298 times stronger than CO_2, respectively, in their potential to insulate solar radiation within the atmosphere. This inventory uses the same FAR GWP values.

POPULATION AND EMPLYOMENT

Population data, obtained from the U.S. Census Bureau, for the city was used to estimate wastewater process and high-GWP emissions for the Community Inventory. The total number of City employees was used for various sectors in the Municipal Inventory to scale the emissions from the Community Inventory. City employee data were provided by the City.

1.1.3 Sector-Specific Assumptions and Methods

BUILDING ENERGY

Community Inventory: This sector includes emissions associated with energy consumption (electricity and natural gas) for all buildings located within the city limits. This sector also includes electricity consumption from night/street lighting associated primarily with commercial/industrial buildings. Energy data and emissions were further categorized by residential and commercial/industrial land uses. Note that because City-specific energy use data were available for water treatment and conveyance facilities/buildings, electricity and natural gas use associated with these uses were subtracted from this sector and reported in the water-related and the wastewater sectors, respectively. See discussion of these sectors below.

Municipal Inventory: This sector includes emissions associated with energy consumption for all buildings owned and operated by the City. Emissions associated with energy consumption for City facility irrigation and outdoor lighting (such as at parks and street medians/shoulders) was also included in this sector, because in most cases electricity consumption data for lighting and irrigation was indistinguishable from building energy. Further, electricity consumption for onsite irrigation is associated with irrigation systems and meters which is considered building energy. Energy consumption associated with conveying water to buildings is captured in the water-related sector, described separately below.

Similar to the community inventory, energy consumption attributable to building energy and associated with water treatment, water conveyance, and wastewater pumping/conveyance was reported in the water-related and the wastewater sectors, respectively. See discussion of these sectors below.

- **Data and Method:** With regards to the Community Inventory, electricity consumption for the year 2014 was provided directly by SMUD for all accounts within the city. Natural gas consumption for the year 2014 was provided directly by PG&E for all accounts within the city.

- With regards to the Municipal Inventory, electricity, natural gas, and diesel (from back-up generators) consumption for the year 2014 was provided by the City. Emissions were calculated based on utility intensity factors described above. Emission factors were derived for gallons of diesel consumed based on data provided by the City for diesel generators used in 2014.

TRAFFIC SIGNALS AND STREET LIGHTS

Municipal Operations: This sector is included in the Municipal Inventory only. Emissions associated with electricity consumption for all City-owned and operated traffic signals and street lights were quantified.

- **Data and Method:** The City provided electricity consumption data for traffic signals and street lights. Emissions were calculated based on utility intensity factors described above.

SOLID WASTE

The City does not operate a solid waste facility and therefore all solid waste is sent to landfills outside city limits. Approximately 92 percent of solid waste generated by Folsom residents and businesses is sent to Sacramento County Kiefer Landfill. The remaining waste is sent to numerous other landfills in the surrounding area. Emissions associated with all landfills receiving waste generated by community-wide sources within the city were included in the inventory.

Community Inventory: Community emissions include fugitive CH_4 emissions from the decomposition of waste that occurs at landfills. Community solid waste emissions were based on total solid waste generation for the year 2014.

Municipal Inventory: Although the City does not operate a landfill, solid waste generated by the City's municipal operations was estimated using community waste generated emissions and scaling by the total number of City employees. Waste-in-place emissions were not included as no landfills are operated by the City.

- **Data and Methods-** Community-wide emissions associated with solid waste generation were calculated using ICLEI Community Protocol Equation SW.4.1 which calculates community-generated waste sent to landfills. Total solid waste generation by amount, type, and disposal landfill was available from the California Department of Resources Recycling and Recovery (CalRecycle).

WASTEWATER

Wastewater from the city is treated by the Sacramento Regional County Sanitation District (Regional San) at the Sacramento Regional Wastewater Treatment Plant in Elk Grove. Therefore, no wastewater process emissions occur within the city limits.

Community Inventory: Wastewater process emissions and energy consumption associated with wastewater conveyance within the city is included in this sector. The Community Inventory includes wastewater treatment process emissions for the entire city. Process emissions at the Regional San treatment plant include electricity consumption for treatment, process N_2O, wastewater effluent containing N_2O, and emissions from biogas combustion.

In addition, the City operates wastewater conveyance/ sewer pumps that collect wastewater within the city until it reaches Regional San interceptors. Emissions associated with energy consumption from these facilities were also included in the Community Inventory.

Municipal Inventory: Although the City does not operate a wastewater treatment plant, process emissions associated with municipal operations were included for informational purposes and scaled down from the Community Inventory based on City of Folsom employment numbers.

Emissions associated with wastewater conveyance were estimated based on energy use for wastewater conveyance systems (e.g., pumps, sewer units). Wastewater conveyance and pumping-related emissions were also included in the Community Inventory. However, because these facilities are directly operated by the City, they were included in the Municipal Inventory as well.

- **Data and Methods-** Wastewater treatment process emissions for Regional San were calculated in accordance with Local Government Operations Protocol, Version 1.1. For the Community Inventory, process emissions were based on the city's 2014 population. For the Municipal Inventory process emissions were scaled to city's 2014 employment numbers.

- With regards to emissions associated with energy use for wastewater conveyance and pumping, total energy and wastewater managed for these facilities was provided by the City. For the Community Inventory, all energy consumed from these facilities was quantified based on utility intensity factors. For the Municipal Inventory, a wastewater electricity intensity factor was derived based on total wastewater managed by the City and total electricity consumed for wastewater conveyance facilities. This electricity intensity factor was applied to total water consumed by municipal facilities. Note that this approach is slightly conservative as not all water consumed would end up being processed through City conveyance systems, due to evaporation, ground water absorption, and other factors.

WATER-RELATED

The City operates the Folsom Water Treatment Plant (WTP) and obtains all potable water from the Folsom Reservoir, a surface water source. A portion of north-west Folsom is served by the San Juan Water District (SJWD). Part of the City's water supply system includes treatment facilities, pump stations, and conveyance pipes.

Community Inventory: Water-related emissions for the Community Inventory include energy consumption for potable water treatment, conveyance and pumping for all water consumption within the city. Energy consumption associated with treatment and distribution of potable water to buildings/facilities was not included in the building energy sector data to avoid double counting.

Municipal Inventory: The Municipal Inventory includes emissions from water treatment and water conveyance/pumping facilities apportioned to municipal water consumption.

- **Data and Methods:** Total energy use for the City's WTP and all associated water-related facilities was provided by the City. Water consumption data were provided by the City, excluding the portion served by SJWD. Based on the energy use and water consumption data provided for the City of Folsom's water service area, city-specific electricity intensity factors for treatment and conveyance were calculated.

- For the portion served by SJWD, water consumption for all SJWD water sent to the city (including the Ashland portion which is served by the City) was provided by SJWD (Tony Barela [SJWD], phone communication with Dimitri Antoniou [Ascent Environmental], 2016). The water total was apportioned to the part not served by the City, based on parcel data. Energy intensity factors for SJWD were available from the Assembly Bill (AB) 32 Water-Energy Assessment published by SMUD and the Regional Water Authority (SMUD 2014).

- For the municipal water-related emissions, the calculated water treatment and conveyance intensity factors were applied to municipal water consumption.

TRANSPORTATION: ON-ROAD VEHICLES

Community Inventory: The community inventory includes emissions from all on-road motor vehicles, using vehicle miles traveled (VMT) data for trips occurring within the city, along with a portion of regional VMT where trips originate or end within the city.

Municipal Inventory: On-road vehicle emissions for the Municipal Inventory includes emissions from both employee work commute trips and operations of City-owned vehicles in the City's vehicle fleets. City fleets included gasoline and diesel fuel vehicles.

- **Data and Methods:** On-road vehicle emission factors for both the community and municipal inventories were calculated from CARB's 2014 EMissions FACtor (EMFAC) model based on 2014 emissions data for Sacramento County.

- For the Community Inventory, annual on-road VMT, by speed bin (e.g., zero to five miles per hour, five to ten miles per hour) were obtained for baseline conditions from the project traffic consultants (DKS 2016) for the entire city. The baseline VMT data were adjusted using the Senate Bill (SB) 375 Regional Targets Advisory Committee's (RTAC's) origin-destination method, which includes:

  - 100 percent of VMT associated with trips that both begin and end within the city limits;

  - 50 percent of VMT associated with trips that either begin or end in the city limits but travel outside the city limits; and,

  - 0 percent of VMT associated with "pass-through" trips that have neither an origin nor a destination in the city limits.

  - Emission factors were derived by speed bin category and applied to the VMT provided by speed bin. It should be noted that VMT data was provided for year 2015, which is inconsistent with the baseline year of 2014. However, this was the best available VMT data and any differences would be minimal between 2014 and 2015; thus, 2015 data are adequate for characterizing baseline conditions for purposes of the GHG emissions inventory.

- For the municipal employee commute-related emissions, emission factors were calculated based on emissions associated with passenger auto- and light-duty vehicles. The City provided residential zip codes for all City employees, which were used to estimate round-trip commute distances. All employees were assumed to be full-time and travel to and from work each day of the week. Average City holiday and vacation time was calculated based on current City job posting data and used to discount annual worker commute trips.

- City-owned on-road vehicle fleet data (e.g., make, model, annual mileage and fuel consumption) was provided by the City. EMFAC vehicle classifications were assigned to individual vehicles and a fleet-specific emission factor was calculated based on the assigned classifications. Emission factors were derived for diesel and gasoline vehicles separately.

OFF-ROAD VEHICLES AND EQUIPMENT

Community Inventory: The Community Inventory includes emissions associated with all off-road and stationary equipment within the city.

Municipal Inventory: The municipal inventory includes emissions associated with off-road vehicles and stationary equipment owned and operated by the City.

- Data and Methods: for the Community Inventory, off-road vehicle emissions were estimated from CARB's OFFROAD 2007 model for Sacramento County and scaled to the City by population or work force (depending on the sector type). Off-road emissions associated with airport ground support and oil drilling were also removed as these activities do not occur within the city (DrillingMaps 2016).

-

- For the Municipal Inventory, off-road mobile and stationary equipment data owned by the City were provided by the City. Emissions were estimated using 2014 Climate Registry Emission Factors for diesel and gasoline off-road vehicles/equipment.

HIGH GWP GASSES

Community Inventory: The Community Inventory includes an estimate of high-GWP gas emissions, including sulfur hexafluoride (SF_6), sulfuryl fluoride (SO_2F_2), hydrofluorocarbons (HFCs), perfluorinated compounds (PFCs), and perfluoroethane (PFEs). These emissions were not scaled to the municipal level.

Data and Methods: Emissions associated with high-GWP gases were scaled on a per capita basis from the State's emission inventory (CARB 2016).

2 INVENTORY FORECASTS AND EMISSIONS TARGETS

2.1 SUMMARY OF BUSINESS AS USUAL AND LEGISLATIVE-ADJUSTED GHG EMISSIONS

Business-as-usual (BAU) emissions forecasts provide an assessment of how emissions would change over time without further action from federal, State, or local regulation. These forecasts provide the City with the information needed to focus efforts on certain emissions sectors and sources that have the most GHG reduction opportunities.

Legislative-adjusted forecasted emissions account for anticipated changes in future vehicle emissions factors and electricity emissions factors due to State and federal policies that would occur with or without City action, which can be referred to as "legislative adjustments" to the BAU forecasts. These actions are reflected in forecasted emissions factors either provided by SMUD or assumed in EMFAC 2014.

The selected future milestone years of 2020, 2030, and 2050 are based on the State's GHG reduction target years established in key State legislation and policies, including Assembly Bill (AB 32), Senate Bill 32 (SB 32), Executive Order B-30-15, and Executive Order S-3-05. GHG emissions were also forecasted to 2035, consistent with the 2035 General Plan buildout year. GHG reductions related to proposed policies and programs contained in the 2035 General Plan were also estimated for the year 2035; thus, forecasted emissions in 2035 for legislative-adjusted BAU conditions in 2035 are necessary to understand the scale of local reductions that would need to be achieved by the 2035 General Plan. See discussion in Section 3 for more details regarding general plan buildout and proposed policies and programs.

Table 3 and Table 4 show forecasted GHG emissions for BAU conditions with legislative adjustments applied, for community and municipal operations, respectively. Figure 1 and Figure 2 depict the legislative-adjusted forecasts and BAU forecasts, in comparison with the recommended GHG reduction targets (discussed in Section 2.3) for community and municipal operations, respectively.

Table 3 2014 City of Folsom Community GHG Emissions Inventory and Legislative-Adjusted BAU Forecasts ($MTCO_2e$/year)

Sectors	2014	2020	2030	2035	2050
Building Energy Use	235,955	238,335	221,661	234,787	281,736
On-Road Vehicles	342,865	317,361	279,019	279,867	325,871
Off-Road Vehicles	26,683	29,417	34,611	37,542	47,911
Solid Waste	13,073	14,410	16,949	18,382	23,447
Water-Related	1,325	1,381	1,212	1,277	1,628
Wastewater	3,282	3,529	3,708	4,576	5,877
High GWP Gases	34,708	31,956	37,586	40,762	51,996
Total	657,892	636,389	594,745	617,192	738,467
Percent Change from 2014 (%)	0	-3	-10	-6	12

Notes: GHG = greenhouse gas; GWP = global warming potential; $MTCO_2e$ = metric tons of carbon dioxide equivalent; yr = year.

Source: Data compiled by Ascent Environmental in 2016.

Table 4 2014 City of Folsom Municipal Operations GHG Emissions Inventory and Legislative-Adjusted Forecasts ($MTCO_2e$/year)

Sectors	2014	2020	2030	2035	2050
Building Energy Use	2,137	2,200	2,070	2,196	2,641
On-Road Vehicles	4,247	4,548	5,052	5,491	6,958
Off-Road Vehicles	138	152	179	194	247
Solid Waste	71	78	92	100	128
Traffic Signals	101	105	92	100	128
Street Lights	727	756	665	721	919
Water-Related	15	15	14	15	19
Wastewater	33	34	32	36	46
Total	7,469	7,889	8,196	8,852	11,086
Percent Change from 2014 (%)	0	6	10	19	48

Notes: GHG = greenhouse gas; GWP = global warming potential; $MTCO_2e$ = metric tons of carbon dioxide equivalent; yr = year.

Source: Data compiled by Ascent Environmental in 2016.

2.2 ASSUMPTIONS AND FORECAST METHODS

Estimated BAU and legislative-adjusted emissions forecasts were based on predicted growth in existing demographic units, including population, jobs, and household growth between 2014 and 2050 for Folsom, as shown in Table 5 below. To forecast GHG emissions in future years, different methods were used depending on the emissions sector. For example, residential building energy emissions were scaled using housing unit forecasts. Emissions from the mobile-sector were based on VMT growth projections and transportation modeling for the 2035 General Plan, based on Sacramento Area Council of Government (SACOG) land use and growth forecasts. Population, housing, and employment projections used to estimate future GHG emissions are shown below in Table 5.

Table 5 City of Folsom Demographic Forecasts

Input	2014	2020	2030	2035	2050	Change from 2014
Population	73,334	80,833	95,074	103,110	131,526	58,192 (79%)
Household Units	26,192	29,201	35,004	38,324	50,297	24,105 (92%)
Employment	34,800	38,368	45,145	48,970	62,502	27,702 (80%)
Municipal Employees	399	440	517	561	716	317 (79%)

Source: Mintier Harnish 2017

The forecast assumptions and methods used for each sector are described below in Table 6, including applicable legislative reductions applied.

Table 6 Scaling Factors and Legislative Reductions used to Forecast Emissions

Sector	Scaling Factor	Applied Legislative Reductions
Residential Electricity	Housing units	Accounts for 2016 Title 24 energy efficiency gains for new construction. Applies reductions in SMUD CO_2 emissions factors based on achieving 33 percent RPS by 2020 and 50 percent RPS by 2030.
Residential Natural Gas	Housing units	Accounts for 2016 Title 24 energy efficiency gains for new construction.
Commercial, Industrial, Municipal Electricity	Employment	Accounts for 2016 Title 24 energy efficiency gains for new construction. Applies reductions in SMUD CO_2 emissions factors based on achieving 33 percent RPS by 2020 and 50 percent RPS by 2030.
Commercial, Industrial, Municipal Natural Gas	Employment	Accounts for 2016 Title 24 energy efficiency gains for new construction.
On-Road Vehicles	Project-Specific VMT[1]	Applied EMFAC emission factors account for legislative reductions from Advanced Clean Cars, Pavley Clean Car Standards, Tractor-Trailer Greenhouse Gas Regulation, and adopted fuel efficiency standards for medium- and heavy-duty vehicles
Off-road vehicles	Population and Labor Force[2]	None
Solid waste	Population	No legislative reduction applied. See Solid Waste measures in Section 3 below.
Water-related	Population	Emissions associated with electricity use at the wastewater treatment plant were reduced based on SMUD achieving 33 percent RPS by 2020 and 50 percent by 2030. No legislative reductions were applied to process emissions.
Wastewater	Population	Emissions associated with electricity use at the water treatment plant were reduced based on SMUD achieving 33 percent RPS by 2020 and 50 percent by 2030.
High GWP Gases	Population	Assumes federal ban on refrigerants with GWP higher than 2,500. Assumes that refrigerants would have a GWP no higher than 2,500 starting from 2020.
City Traffic Signals	Municipal Employment	Emissions associated with electricity use were reduced based on SMUD achieving 33 percent RPS by 2020 and 50 percent by 2030.
City Street Lights	Municipal Employment	Emissions associated with electricity use were reduced based on SMUD achieving 33 percent RPS by 2020 and 50 percent by 2030.

Notes: SMUD= Sacramento Municipal Utility District; RPS= Renewable Portfolio Standard; VMT=Vehicle Miles Traveled.

1. **Project-specific VMT was provided by DKS (2017) for existing conditions (2015) and consistent with travel demand modeling and SACOG projections for 2036. Based on the 2036 VMT for Folsom, VMT was interpolated for al target years.**
2. **Different sub-sectors of the off-road sector were scaled based on population or labor force, depending on the sector. For example, construction equipment was scaled by labor force and lawn and garden household equipment was scaled by population. For more details refer to the Off-Road sector calculation sheet.**

2.3 GREENHOUSE GAS EMISSIONS REDUCTION TARGETS

GHG reduction targets were developed for 2020, 2030, 2035; and, a longer-term GHG reduction goal was identified for 2050. The targets were developed using different methods for the Community and Municipal inventories.

The community emissions targets and goal were based on per capita emission recommendations outlined in California's 2017 Climate Change Scoping Plan ([2017 Scoping Plan], CARB 2017). The 2017 Scoping Plan suggests that annual GHG emissions limits of no more than 6 metric tons of carbon dioxide equivalents per capita per year ($MTCO_{2e}$/capita/year) for 2030 and 2 $MTCO_2e$/capita/year for 2050 be used. The 2035 per capita emissions limit was interpolated from the 2030 and 2050 to 4.6 $MTCO_2e$ per capita. No per capita emissions limit is recommended for 2020. Thus, the target for 2020 was based on achieving a mass emissions level equivalent to the percent reduction in statewide emissions needed to meet State mass emission targets. For Folsom, this represents a 2.4 percent reduction from 2014 emissions. For all target years, mass emissions limits were calculated based on the target year per capita limit and associated forecasted Folsom population for that year.

The municipal emissions reduction targets were established using a percent reduction target below baseline 2014 emissions. These percent reduction targets (i.e., 2.4 percent by 2020, 40.2 percent by 2030, and 77.7 percent by 2050) are equivalent to the percent reduction in statewide emissions needed to meet State mass emission targets set by CARB in comparison to 1990 emission levels. Based on these established statewide targets, a 2035 emissions limit was interpolated to show the City's progress at General Plan buildout. The 2035 target equates to a 53 percent reduction in emissions from the 2014 baseline.

Targets for the community and municipal inventories are shown below in Table 7, and depicted graphically below in Figure 1 for the Community Inventory and Figure 2 for the Municipal Inventory as a bolded line.

Table 7 Greenhouse Gas Emissions Reduction Targets by Year

Applicable Inventory	Target Year			
	2020	2030	2035	2050
Community GHG Reduction Targets				
Per Capita Targets ($MTCO_2e$/capita/year)	NA	6	4.6	2
Mass Emissions Targets ($MTCO_2e$/year)	642,246	570,447	470,080	263,052
Municipal GHG Reduction Targets				
Mass Emissions Targets ($MTCO_2e$/year)	7,291	4,468	3,511	1,663

Notes: GHG= greenhouse gas; $MTCO_2e$= = metric tons of carbon dioxide equivalent; NA= not applicable

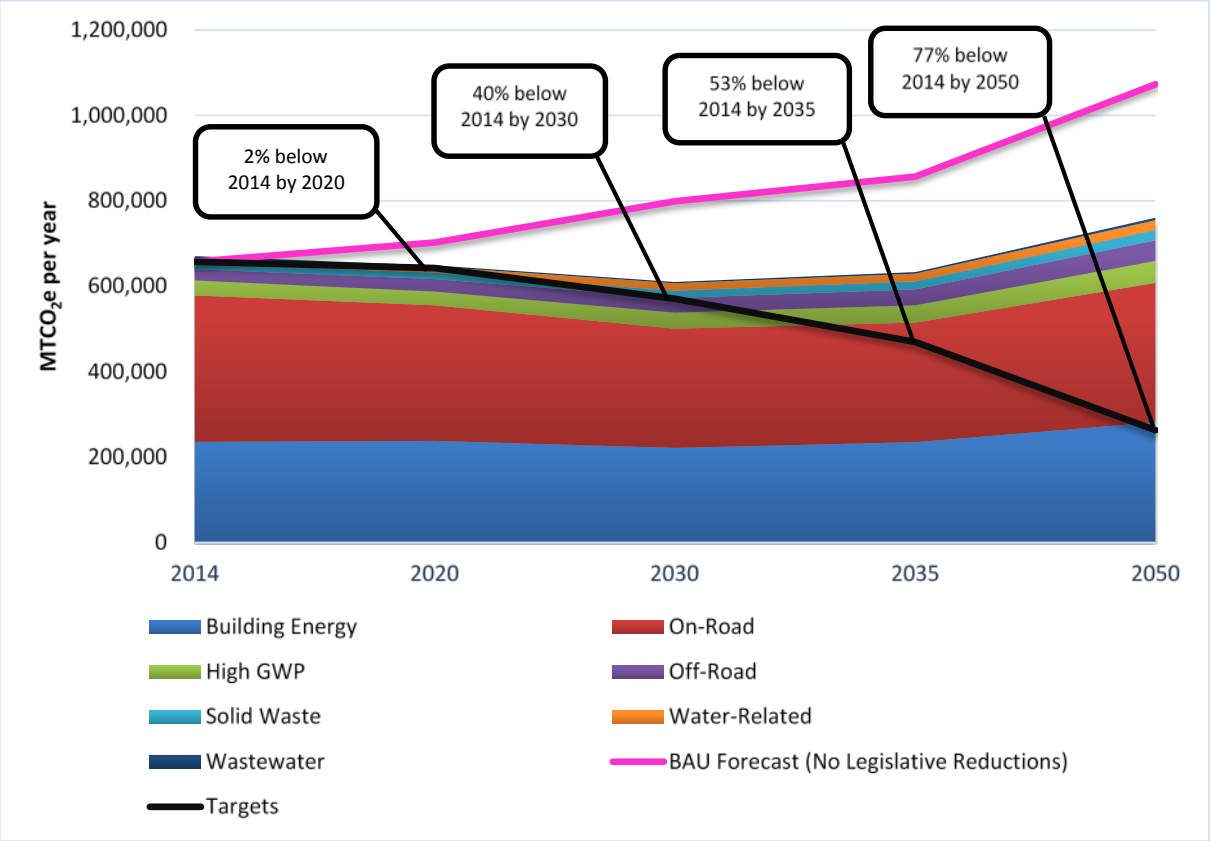


Figure 1: Community Inventory BAU Forecast, Legislative-Adjusted Forecast, and Targets

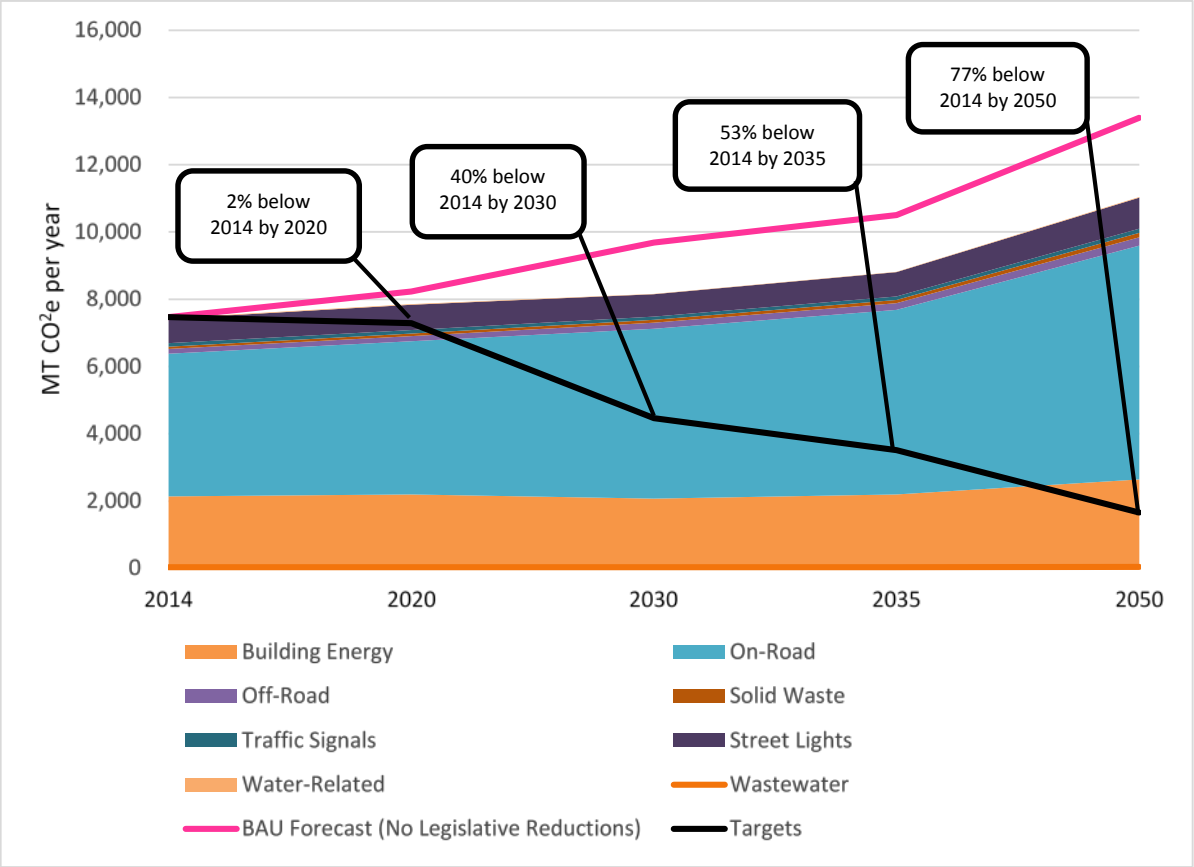


Figure 2: Municipal Operations Inventory BAU Forecast, Legislative-Adjusted Forecast, and Targets

As shown above, with legislative adjustments alone, 2020 emissions targets would be met for both the community and municipal operations. In contrast, while legislative reductions would help to reduce emissions beyond 2020, neither the recommend targets for 2030 or 2035 nor the longer-term 2050 goal would be met for both the community and municipal operations. Additional GHG reductions from locally-based actions would be needed. Proposed GHG reduction measures to meet the targets are presented below in Section 3.

3 GHG REDUCTION MEASURES

As shown above, forecasted emissions do not meet emissions limits for future years. To reduce emissions and meet future targets, the City of Folsom can take action through the proposed 2035 General Plan to adopt or update land use plans, enforce or update City ordinances, adjust municipal operations, encourage or incentivize residents and business by partnering with local organizations, and work with local and regional transportation planning or other agencies that provide services or maintain infrastructure that is not directly in the City's control. The City can effectively reduce emissions in some sectors where they have jurisdictional control (e.g., municipal operations, land use change), but in some cases the City has limited ability to influence reductions because the City has limited jurisdictional control (e.g., on-road transportation).

To determine the GHG reductions required to achieve the community and municipal operations targets in the future, the mass emissions limits (based on per capita targets) were subtracted from the legislative-adjusted forecasts. The local GHG reductions required to achieve the target (beyond what is already included in the legislative-adjustments to the emissions forecasts) is referred to as the "gap", shown below in Table 8 by year. The effective "gap" needs to be closed in each target year, in order for the City to meet the GHG reduction targets.

Table 8 GHG Emissions Reduction Targets by Year

Applicable Inventory	GHG Emissions ($MTCO_2e$/year)			
	2020	2030	2035	2050
Community Emissions				
Mass Emissions (legislative-adjusted BAU)	636,389	594,745	617,192	738,467
Mass Emissions Reduction Targets	642,246	570,447	470,080	263,052
Gap (surplus)	(5,857)	24,299	147,112	475,415
Municipal Emissions				
Mass Emissions (legislative-adjusted BAU)	7,889	8,196	8,852	11,086
Mass Emissions Targets	7,291	4,468	3,511	1,663
Gap (surplus)	(598)	3,728	5,342	9,423

Notes: GHG= greenhouse gas; MT= metric tons; CO_2e= carbon dioxide equivalent; NA= not applicable

As shown above, both the Community and the City's Municipal Operations are expected to meet the 2020 targets with a surplus of GHG emissions due to legislative reductions, with no further local action needed. All future years beyond 2020 would require additional local GHG reductions from local measures to meet the targets. Based on the proposed land use designations, and proposed policies and programs contained in the 2035 General Plan policy document, GHG reductions were quantified, where appropriate. Revisions and additions to policies and programs were made, where necessary, to ensure that the proposed General Plan will put the City on a path to achieve GHG reductions to meet 2030 statewide emissions limits. These reductions were applied to the legislative adjusted forecasts to meet 2030 targets. Note that in some cases, several policies would be implemented by an implementation program with specific performance targets related to achieving the GHG reductions. In this case GHG reductions were quantified based on the implementation program and policies were grouped accordingly. In other cases, an individual policy was revised or recommended with specific performance standards for which GHG reductions were quantified. All policies and programs were further grouped into categories by GHG emissions sector.

GHG reductions associated with all recommended measures were calculated in a step-wise manner for the future years of 2020, 2030, 2035, and 2050. In other words, GHG reductions (in $MTCO_2e$/year) are assessed during a snapshot in time in years 2020, 2030, 2035, and 2050. This is a simplified method of characterizing GHG reductions, which would more realistically occur on a continuous basis. However, a step-wise method is appropriate for a planning-level document because the City's GHG reduction targets and monitoring of CAP implementation progress would be tied to these future years.

Importantly, GHG emissions reductions were quantified for measures wherever substantial evidence and reasonable assumptions were available to support calculations. Numerous programs and policies were not quantifiable for various reasons, such as the need to avoid double-counting VMT reductions already accounted for in future VMT projections, lack of substantial data on effectiveness of a measure, or infeasible assumptions that would be required to apply a measure. For example, VMT-reducing measures such as improvements to transit or new transit services have been accounted for in the future VMT projections based on transportation modeling for the 2035 General Plan; therefore, no additional transit-related GHG reduction measures were quantified. It was determined that relying further on additional new transit services (beyond what is already included in the adopted SACOG MTP/SCS and planned for the City of Folsom) to provide additional GHG reductions could not be substantiated because new transit services require adequate funding and demand which could not be determined or relied upon at this time.

Estimates of GHG emissions reductions associated with all local GHG reduction measures and legislative-adjusted emissions, along with an estimated emissions reduction "gap", are summarized below in Table 9. Detailed measure descriptions, calculations, and assumptions supporting the GHG reduction estimates are provided in Attachment 1. A summary of how each CAP measure would be implemented by 2035 General Plan policies and programs is shown in Attachment 1.

Table 9 Summary of Greenhouse Gas Emissions Reduction Measures Performance

General Plan Location	GHG Reduction Measure	GHG Reductions ($MTCO_2e$/year)			
		2020	2030	2035	2050
Building Energy Sector					
NCR 3.2.3, LU 9.1.10, LU 1.1.13, LU 1.1.17, Program PFS-25, Program LU-6	**E-1:** Improve Building Energy Efficiency in New Development	262	1,501	2,171	4,048
PFS 8.1.9, Program PFS-23	**E-2:** Water Heater Replacement in Existing Residential Development	0	1,326	1,856	1,856
PFS 8.1.5, PFS 8.1.4, Program PFS-24	**E-3:** Improve Building Energy Efficiency in Existing Development	48	574	623	623
PFS 8.1.3, Program PFS-24	**E-4:** Increase Use of Renewable Energy in Existing Development	1,844	3,328	3,325	3,324
PFS 8.1.7	**E-5:** Improve Energy Efficiency in City-Owned Facilities	388	876	1,180	1,847
PFS 8.1.3, Program PFS-22	**E-6:** Increase use of Renewable Energy in City-Operated Facilities	79	264	310	310
Building Energy Sector: Community Subtotal		2,622	7,868	9,466	12,008
Building Energy Sector: Municipal Subtotal		467	1,140	1,490	2,157
Transportation Sector					
LU 3.1.1, LU 3.1.5, LU 3.1.6, LU 4.1.2, LU 4.1.3, NCR 3.1.3	**T-1:** Reduce VMT Through Mixed and High-Density Land Use	2,038	3,722	4,373	3,869
M 2.1.15, M 1.1.4, M 1.1.6, M 1.1.5, M 2.1.2, M 2.1.3, M 2.1.4, Program M-8	**T-2:** Improve Streets and Intersections for Multi-Modal Use and Access	0	268	431	486
M 1.1.9, NCR 3.1.3, Program M-1	**T-3:** Adopt Citywide TDM	0	575	877	900
M 1.1.9, NCR 3.1.3, Program M-1	**T-4:** Adopt TDM For City Employees	0	167	263	424
M 4.2.1, M 4.2.2, M 4.2.3, Program M-11	**T-5:** Reduce Minimum Parking Standards	0	82	125	699
NCR 3.2.7, Program PFS-26	**T-6:** Require the Use of High-Performance Renewable Diesel in Construction Equipment	0	5,116	22,196	28,330
PFS 8.1.8, Program PFS-14	**T-7:** Alternative Fuel in City Fleet	0	2,874	4,824	6,148
M 1.1.10, M 4.2.4, M 6.1.3, Program M-3, Program M-4	**T-8:** Install Electric Vehicle Charging Stations	0	4,243	5,949	5,949
Transportation Sector: Community Subtotal		2,038	17,048	39,038	46,805
Transportation Sector: Municipal Subtotal		0	3,109	5,314	6,852
Solid Waste					
PFS 9.1.3, Program PFS-18, Program PFS-19, Program PFS-20, Program PFS-21	**SW-1:** Increase Solid Waste Diversion	4,674	7,787	10,930	13,942
PFS 9.1.3, Program PFS-18, Program PFS-19, Program PFS-20, Program PFS-21	**SW-2:** Divert Organic Waste from Landfills	1,606	4,005	4,471	5,541

Table 9 Summary of Greenhouse Gas Emissions Reduction Measures Performance

General Plan Location	GHG Reduction Measure	GHG Reductions ($MTCO_2e$/year)			
		2020	2030	2035	2050
Solid Waste Sector: Community Subtotal		6,279	11,793	15,400	19,482
Solid Waste Sector: Municipal Subtotal		25	42	59	76
Water and Wastewater					
PFS 3.1.3, PFS 3.1.9, Program PFS-27	**W-1:** Increase Water Efficiency in New Residential Development	0	1	1	3
PFS 3.1.3, PFS 3.1.9, Program PFS-27	**W-2:** Reduce Outdoor Water Use	0	293	309	394
PFS 3.1.3, PFS 3.1.9, Program PFS-27	**W-3:** Reduce Potable Water Consumption at City Facilities	416	357	360	487
Water and Wastewater: Community Subtotal		416	652	671	884
Water and Wastewater: Municipal Subtotal		416	357	360	487
Total GHG Emissions Reductions					
Community Total		11,355	37,360	64,575	79,179
Municipal Total		908	4,649	7,224	9,572
Community GHG Reduction Target and Gap					
GHG Emissions Reduction Target		5,857	24,299	147,112	475,415
Gap (Surplus)		(17,212)	(13,061)	82,537	396,236
Municipal GHG Reduction Target and Gap					
GHG Emissions Reduction Target		598	3,728	5,342	9,423
Gap (Surplus)		(310)	(921)	(1,882)	(149)

Notes: MT= metric tons; CO_2e= carbon dioxide equivalents; GHG= greenhouse gas; VMT=vehicle miles traveled; TDM= traffic demand management; ZNE = zero net energy

Source: Modeled by Ascent Environmental, Inc. 2017.

3.1 STREAMLINING GHG ANALYSIS FOR SUBSEQUENT PROJECTS

As shown above in Table 9, GHG reduction measures have been incorporated into the 2035 GPU as policies and implementation programs. Some of the measures would result in GHG reductions associated with land use development patterns and others from actions taken by the City and/or other local agencies. Further, some GHG reduction measures could apply to future development projects subject to CEQA review that could choose to incorporate the measures into project designs or conditions of approval, consistent with the 2035 GPU policies and programs and the CAP identified in this Technical Appendix. As such, some projects would be eligible for CEQA streamlining and tiering for project-level GHG analysis, pursuant to criteria identified in CEQA Guidelines Section 15183.5.

The specific GHG reduction measures identified in Table 9 that would typically apply to projects seeking streamlining of GHG analysis are summarized below.

- E-1: Improve Building Energy Efficiency in New Development
- T-2: Improve Streets and Intersection for Multi-Modal Use and Access
- T-5: Reduce Minimum Parking Standards
- T-8: Install Electric Vehicle Charging Stations
- W-1: Increase Water Efficiency in New Residential Development
- W-2: Reduce Outdoor Water Use

In addition to the above-referenced GHG reduction measures, General Plan Policy NCR 3.2.8 describes the general process and criteria by which the City will administer review of subsequent projects for consistency with the CAP and associated GHG measures incorporated into the General Plan and EIR, pursuant to CEQA Guidelines Section 15183.5.

General Plan Policy NCR 3.2.8: Streamlined GHG Analysis for Projects Consistent with the General Plan Projects subject to environmental review under CEQA may be eligible for tiering and streamlining the analysis of GHG emissions, provided they are consistent with the GHG reduction measures included in the General Plan and EIR. The City may review such projects to determine whether the following criteria are met:

- Proposed project is consistent with the current general plan land use designation for the project site;
- Proposed project incorporates all applicable GHG reduction measures (as documented in the Climate Change Technical Appendix to the General Plan EIR) as mitigation measures in the CEQA document prepared for the project; and,
- Proposed project clearly demonstrates the method, timing and process for which the project will comply with applicable GHG reduction measures and/or conditions of approval, (e.g., using a CAP/GHG reduction measures consistency checklist, mitigation monitoring and reporting plan, or other mechanism for monitoring and enforcement as appropriate).

4 REFERENCES

California Air Resources Board. 2016. *California Greenhouse Gas Emissions Inventory – 2016 Edition*. Available: http://www.arb.ca.gov/cc/inventory/data/data.htm. Accessed April 10, 2016.

_____. 2017 (January). *The 2017 Climate Change Scoping Plan Update*. Available: https://www.arb.ca.gov/cc/scopingplan/2030sp_pp_final.pdf. Accessed June 27, 2017.

CARB. *See* California Air Resources Board.

Climate Registry. 2014 (April). *2014 Climate Registry Default Emission Factors.* Available: http://www.theclimateregistry.org/wp-content/uploads/2014/11/2014-Climate-Registry-Default-Emissions-Factors.pdf. Accessed: March 10, 2015.

DKS. 2016. Folsom Baseline (2015) Community VMT. Provided by David Tokarski (DKS) to Dimitri Antoniou (Ascent Environmental). Email communication June 21, 2016.

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

ICLEI. *See* International Council for Local Environmental Initiatives.

International Council for Local Environmental Initiatives. 2010. Local government operations protocol for the quantification and reporting of greenhouse gas emission inventories. Version 1.1

_____.2012 (October). U.S. Community protocol for accounting and reporting of GHG emissions. Version 1.0.

Intergovernmental Panel on Climate Change. 2007 (February). *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the IPCC. Geneva, Switzerland.

IPCC. *See* Intergovernmental Panel on Climate Change.

Mintier Harnish. 2017. Folsom GPU Population Forecasts. Email correspondence on August 14, 2017 between Chelsey Payne (Mintier Harnish) and Dimitri Antoniou (Ascent Environmental).

Pacific Gas & Electric (PGE). 2015. Community Wide GHG Inventory Report for Folsom 2005 to 2015.

Sacramento Municipal Utility District (SMUD). 2014. 2014 AB 32 Water-Energy assessment and savings demonstration project. Prepared by GEI Consultants.

_____. 2016. SMUD CY2014 Greenhouse gas emissions reported to the Climate Registry. Personal communication from Martha Helek (SMUD) to Dimitri Antoniou (Ascent Environmental). Email June 28th, 2016.

U.S. Environmental Protection Agency. 2012 (October). eGRID 2012 Summary Tables. Available: https://www.epa.gov/energy/egrid-2012-summary-tables. Accessed June 27th, 2016.

San Juan Water District. 2016. Water consumption for the City of Folsom. Tony Barela (SJWD) to Dimitri Antoniou (Ascent Environmental). Phone conversation .

This page intentionally
left blank.

Attachment 1

Greenhouse Gas Emission Reductions Calculations and Assumptions

This page intentionally
left blank.

GHG Measure Reduction Summary

GHG Emission Reductions by Category				
	Annual GHG Reduction (MT CO_2e)			
Category	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	2,038	17,048	39,038	46,805
Energy	2,622	7,868	9,466	12,008
Solid Waste	6,279	11,793	15,400	19,482
Water and Wastewater	416	652	671	884
TOTAL Reductions from Proposed Measures	**11,355**	**37,360**	**64,575**	**79,179**
Emissions Gap: Needed reductions to meet CAP Targets after GHG Reduction Measures have been applied (MT CO_2e) (Surplus)	-17,212	-13,061	82,537	396,236

Projections with Legislative Reductions					
Category	Annual GHG Emissions (MT CO_2e)				
	2014	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	404,256	378,734	351,216	358,172	425,778
Energy	235,955	238,335	221,661	234,787	281,736
Solid Waste	13,073	14,410	16,949	18,382	23,447
Water and Wastewater	4,607	4,910	4,920	5,852	7,506
TOTAL Emissions with Legislative Reductions	**657,892**	**636,389**	**594,745**	**617,192**	**738,467**
Projected Percent Reduction from 2014		-3.3%	-9.6%	-6.2%	12.2%
Per Capita Target (MT CO2e/capita)		NA	6	4.6	2
CAP Targets (MT CO_2e)		642,246	570,447	470,080	263,052
Needed reductions to meet CAP Targets from 2014 levels (MT CO_2e)		15,646	87,445	187,812	394,840
Needed reductions to meet CAP Targets from Legislative reductions (MT CO_2e) (Surplus)		-5,857	24,299	147,112	475,415
TOTAL BAU Emissions	**657,892**	**702,774**	**799,201**	**856,813**	**1,073,197**

Projections with Legislative Reductions and City CAP Measures					
Category	Annual GHG Emissions (MT CO_2e)				
	2014	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	404,256	376,696	334,168	319,133	378,974
Energy	235,955	235,713	213,793	225,321	269,728
Solid Waste	13,073	8,131	5,156	2,981	3,965
Water and Wastewater	4,607	4,494	4,268	5,182	6,621
TOTAL	**657,892**	**625,034**	**557,385**	**552,617**	**659,288**
Percent below 2014		-5%	-15%	-16%	0%
Additional Reductions Needed to meet CAP Targets (MT CO_2e) (Surplus)		-17,212	-13,061	82,537	396,236

GHG Measure Reduction Summary

GHG Emission Reductions by Category				
	Annual GHG Reduction (MT CO_2e)			
Category	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	0	3,109	5,314	6,852
Energy	467	1,140	1,490	2,157
Solid Waste	25	42	59	76
Water and Wastewater	416	357	360	487
TOTAL Reductions from Proposed Measures	**908**	**4,649**	**7,224**	**9,572**
Emissions Gap: Needed reductions to meet CAP Targets after GHG Reduction Measures have been applied (MT CO_2e) (Surplus)	-310	-921	-1,882	-149

Projections with Legislative Reductions					
Category	Annual GHG Emissions (MT CO_2e)				
	2014	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	5,213	5,561	5,988	6,506	8,252
Energy	2,137	2,200	2,070	2,196	2,641
Solid Waste	71	78	92	100	128
Water and Wastewater	47	50	46	51	65
TOTAL Emissions with Legislative Reductions	**7,469**	**7,889**	**8,196**	**8,852**	**11,086**
Projected Percent Reduction from 2014		6%	10%	19%	48%
CAP Targets (adjusted for percent reduction from 2014)		2%	40%	53%	78%
CAP Targets (MT CO_2e)		7,291	4,468	3,511	1,663
Needed reductions to meet CAP Targets from 2014 levels (MT CO_2e)		178	3,001	3,958	5,805
Needed reductions to meet CAP Targets from Legislative reductions (MT CO_2e) (Surplus)		598	3,728	5,342	9,423
TOTAL BAU Emissions	**7,469**	**8,232**	**9,683**	**10,501**	**13,395**

Projections with Legislative Reductions and City CAP Measures					
Category	Annual GHG Emissions (MT CO_2e)				
	2014	**2020**	**2030**	**2035**	**2050**
Built Environment and Transportation	5,213	5,561	2,879	1,192	1,401
Energy	2,137	1,733	930	706	484
Solid Waste	71	53	50	41	52
Water and Wastewater	47	-366	-311	-309	-422
TOTAL	**7,469**	**6,981**	**3,547**	**1,629**	**1,515**
Percent below 2014		-7%	-53%	-78%	-80%
Additional Reductions Needed to meet CAP Targets (MT CO_2e) (Surplus)		-310	-921	-1,882	-149

Built Environment and Transportation Measures								
CAP Measure	GP Policy/Program	Category	Measure Title	Description	Annual GHG Reduction (MT CO_2e)			
					2020	2030	2035	2050
T-1	LU 3.1.1, LU 3.1.5, LU 3.1.6, LU 4.1.2, LU 4.1.3, NCR 3.1.3	Built Environment and Transportation	Reduce VMT Through Mixed and High Density Land Use	**Brief Description:** Applies GHG reductions associated with reduction in vehicle miles traveled (VMT) from development in mixed use nodes and near transit. **Detailed Assumptions:** Focus growth in the TOD/Mixed Use Area. This measure applies reductions in VMT associated with high-density housing development in mixed-use and TOD areas of the City. Applies CAPCOA LUT-9 to population associated with land use designations: MLD, MMD, MHD, MU, EBC, HF.	2,038	3,722	4,373	3,869
T-2	M 2.1.15, M 1.1.4, M 1.1.6, M 1.1.5, M 2.1.2, M 2.1.3, M2.1.4, Program M-8	Built Environment and Transportation	Improve Streets and Intersections for Multi-Modal Use and Access	**Brief Description:** Sets goal for City to improve existing intersections/streets and requires future development to include pedestrian and bicycle amenities in streets and intersections. **Detailed Assumptions:** Improve intersections/streets to provide multi modal transportation/access: Amended Program M-8 to set a goal for the City to improve ~~75%~~ 30 percent of all roadways/intersections in existing and new development by 2035. Applies CAPCOA SDT-2 for rural context. Reduces VMT and short trips due to increases in pedestrian/bicycle amenities and connections. Measure applies Citywide and assumed ~~75~~ 30 percent of intersections/streets have pedestrian/bicycle improvements.	0	268	431	486
T-3	M 1.1.9, NCR 3.1.3, M-1	Built Environment and Transportation	Adopt Citywide TDM	**Brief Description:** Implement citywide TDM **Detailed Assumptions:** Reduce commute VMT in new residential and non-residential development by 15 percent by 2035. Applies CAPCOA TRT-1, TRT-2, TRT-3 to all new VMT in City (excluding city employees)	0	575	877	900
T-4	M 1.1.9, NCR 3.1.3, Program M-1	Built Environment and Transportation	Adopt TDM For City Employees	**Brief Description:** Implement TDM for city employees **Detailed Assumptions:** Reduce City employee commute Vehicle Miles Traveled (VMT) by 20 percent by 2035. Applies CAPCOA TRT-1, TRT-2, TRT-3 to all VMT associated with City employees.	0	167	263	424
T-5	M 4.2.1, M4.2.2, M 4.2.3, Program M-11	Built Environment and Transportation	Reduce Minimum Parking Standards	**Brief Description:** Reduces minimum parking requirements. **Detailed Assumptions:** Requires that the City reduce parking minimums by ~~20~~ 5 percent in new land use development, especially in commercial districts, mixed-use, TOD zones, and high density areas. Applied CAPCOA PDT-1 to new VMT citywide.	0	82	125	699
T-6	NCR 3.2.7, Program PFS-26	Built Environment and Transportation/ Off-road	Require the Use of High-Performance Renewable Diesel in Construction Equipment	**Brief Description:** Phases in requirements for use of high-performance renewable diesel in construction equipment. **Detailed Assumptions:** Requires new residential and non-residential construction projects in the City to use alternative diesel: 100 percent by 2035. High Performance Renewable Diesel, results in no net increase in anthropogenic GHG emissions as diesel is produced from 100 percent biogenic sources.	0	5,116	22,196	28,330
T-7	PFS 8.1.8, Program PFS-14	Built Environment and Transportation	Alternative Fuel in City Fleet	**Brief Description:** Requires City on-road fleet conversion to alternative fuel and use of high-performance renewable diesel. **Detailed Assumptions:** Assumes 100 percent of City-owned onroad diesel fleet would be using High Performance Renewable Diesel by 2035. The use of High Performance Diesel does not require any modifications to existing engines. Measure also requires that 100 percent of city-owned onroad gasoline vehicles would be replaced with electric vehicles by 2035.	0	2,874	4,824	6,148
T-8	M 1.1.10, M 4.2.4, M 6.1.3, Program M-3 and M-4	Built Environment and Transportation	Install Electric Vehicle Charging Stations	**Brief Description:** Installation of electric vehicle charging stations throughout city in commercial, office, and City facilities **Detailed Assumptions:** Sets a target for the City to install 10 percent increase over the current population of EV's in Folsom by 2035. This results in the needed installation of 560 charging stations. A portion of the GHG reductions associated with this measure were attributed to the Municipal Operations inventory, assuming the City would install one percent of the 560 stations (i.e., 6) on City-owned facilities	0	4,243	5,949	5,949
					2,038	**17,048**	**39,038**	**46,805**

Community Total	2,038	17,048	39,038	46,805
Muni Total	0	3,109	5,314	6,852
TDM Totals	0	742	1,140	1,324

Solid Waste Measures								
CAP Measure	GP Policy/Program	Category	Measure Title	Description	Annual GHG Reduction (MT CO_2e)			
					2020	2030	2035	2050
SW-1	PFS 9.1.3, Program PFS-18, Program PFS-19, Program PFS-20, Program PFS-21	Solid Waste	Increase Solid Waste Diversion	**Brief Description:** Sets reduced per person diversiosn rate target **Detailed Assumptions:** Reduce existing disposal rate to 1.5 pounds/person/day. Because Folsom currently is on track to meet State diversion targets, it is assumed that continuation of existing programs will result in further reductions in waste disposal by 2035.	4,674	7,787	10,930	13,942
SW-2	PFS 9.1.3, Program PFS-18, Program PFS-19, Program PFS-20, Program PFS-21	Solid Waste	Divert organic waste from landfills	**Brief Description:** Implement composting program to divert food and green waste from landfills. **Detailed Assumptions:** Implementation of PFS -18, PFS-19, PFS-20, and PFS-21 would result in composting programs and waste-reduction efforts. The measure assumes that Folsom will reach ~~100~~ 75 percent diversion of green and 50 percent of food waste for residential and commercial land uses by 2035.	1,606	4,005	4,471	5,541
				TOTAL ANNUAL SAVINGS (MTCO2e)	**6,279**	**11,793**	**15,400**	**19,482**

community	6,279	11,793	15,400	19,482
municipal	25	42	59	76

Energy Measures								
CAP Measure	GP Policy/Program	Category	Measure Title	Description	Annual GHG Reduction (MT CO_2e)			
					2020	2030	2035	2050
E-1	NCR 3.2.3, LU 9.1.10, LU 1.1.17, Revised Policy and Programs PFS-25, Program LU-6	Energy	Improve Building Energy Efficiency in New Development	**Brief Description:** Applies GHG reductions associated with building energy efficiency and renewable energy generation in new development through CALGreen Tier 1 and ZNE. **Detailed Assumptions:** ~~Requires all new residential development to meet the State's Zero Net Energy (ZNE) standards by 2020; and requires all new non-residential development to meet the State's ZNE standards by 2030~~ Assumes that 35 percent of new development (17.5 percent residential/commercial split) would be consistent with CAP measures and thus incorporate Tier 1 into project designs or conditions of approval in new construction. Of the 35 percent of new development that would be Tier 1 compliant, 10 percent would also achieve ZNE.	262	1,501	2,171	4,048
E-2	PFS 8.1.9, Program PFS-23	Energy	Water Heater Replacement in Existing Residential Development	**Brief Description:** Applies GHG reductions associated with voluntary replacement of existing water heaters with high-efficiency and alternatively-powered water heaters. **Detailed Assumptions:** Assumes that up to 25 percent of existing development would install more efficient or alternatively-powered water heaters by 2035, for the purpose of reducing or eliminating natural gas usage in water heating. High-efficiency and alternatively powered water heaters could include solar water heating, electric heat pump, or tankless electric or tankless natural gas. ~~Require all new and replacement water heaters in residential development to be either solar, electrically powered or tankless natural gas by 2035~~	0	1,326	1,856	1,856
E-3	PFS 8.1.5, PFS 8.1.4, Program PFS-24	Energy	Improve Building Energy Efficiency in Existing Development	**Brief Description:** Assumes continued participation in existing energy efficiency upgrade programs and an increased participation rate into the future. **Detailed Assumptions**: Assumes that participation in existing SMUD energy efficiency upgrade programs will increase to ~~38~~ 10 percent for all residential uses by 2035 and ~~62~~ 15 percent of all commercial/industrial buildings by 2035. Participation would increase due to continuation of SMUD programs and coordination efforts with the City to promote such programs. The City may consider providing additional incentives and educational material through new programs identified by new Implementation Policy associated with PFS 8.1.3, PFS 8.1.5, and PFS 8.1.4.	48	574	623	623
E-4	PFS 8.1.3, Program PFS-24	Energy	Increase Use of Renewable Energy in Existing Development	**Brief Description:** Assumes continued participation in existing renewable energy retrofit programs and an increased participation rate into the future. **Detailed Assumptions:** This measure assumes that ~~75~~ 10 percent of all existing residential buildings and 15 percent of all existing commercial buildings in the City ~~(residential, commercial, industrial)~~ would either participate in ~~100 percent offset~~ SMUD's Greenergy of Solar Shares programs, or install on-site solar PV to offset ~~100 of~~ electricity use. The City may consider providing additional incentives and educational material through new programs identified by new Implementation Policy associated with PFS 8.1.3, PFS 8.1.5, and PFS 8.1.4.	1,844	3,328	3,325	3,324
E-5	PFS 8.1.7	Energy	Improve Energy Efficiency in City-Owned Facilities	**Brief Description/Detailed Assumptions:** Reduces energy use at City facilities by ~~45~~ 20 percent below 2014 levels by 2035.	388	876	1,180	1,847
E-6	PFS 8.1.3, Program PFS-22	Energy	Increase use of Renewable Energy in City-Operated Facilities	**Brief Description/Detailed Assumptions:** Sets city goal to suppplement ~~100%~~ 25 percent of the City's operational electricity with renewable energy sources by 2035. Renewable energy includes on-site generation or off-site purchase agreements.	79	264	310	310
				TOTAL ANNUAL SAVINGS (MTCO2e)	**2,622**	**7,868**	**9,466**	**12,008**
Community					2,622	7,868	9,466	12,008
Municipal					467	1,140	1,490	2,157
Existing Building Improvements Total					1,893	3,901	3,949	3,947

Water and Wastewater Measures								
Measure Number	GOP Policy/Program	Category	Measure Title	Measure Name	Annual GHG Reduction (MT CO_2e)			
					2020	2030	2035	2050
W-1	PFS 3.1.3, PFS 3.1.9, Program PFS-27	Water and Wastewater	Increase Water Efficiency in New Residential Development	**Brief Description:** Increases water efficiency **Detailed Assumptions:** Require installation of water-efficient appliances and plumbing fixtures in ~~all new~~ 17.5 percent of new residential construction (based on an assumed capture rate of 35 percent of all new development that would be consistent with CAP measures and a 50/50 split between residential and commercial development) pursuant to Tier 1 of the California Green Building Standards Code (CALGreen) by 202~~0~~35	0	1	1	3
W-2	PFS 3.1.3, PFS 3.1.9, Program PFS-27	Water and Wastewater	Reduce Outdoor Water Use	**Brief Summary:** Reduces outdoor water use **Detailed Assumptions:** Require a 40 percent reduction below BAU levels in outdoor water use for landscaping in new and existing residential and nonresidential development by 2035	0	293	309	394
W-3	PFS 3.1.3, PFS 3.1.9, PFS-27	Water and Wastewater	Reduce Potable Water Consumption at City Facilities	**Brief Summary:** Reduces water consumption at City facilities. **Detailed Assumptions:** Reduce potable water consumption at City facilities by 30 percent below 2014 levels by 2035	416	357	360	487
~~W-4~~	~~PFS 3.1.3, PFS 3.1.9, New Program~~	~~Water and Wastewater~~	~~Increase Rain Barrel Installations~~	~~Capture, store, and re-use rainwater in existing and new developments by installing 3,000 by 2035~~	~~0~~	~~0~~	~~0~~	~~0~~
				Community Total	416	652	671	884
				Municipal Total	416	357	360	487

Energy Reduction Measure Quantification

Assumptions

	2020	2030	2035	2050
SMUD Emissions Factor (MTCO2e/MWh)	0.240	0.179	0.179	0.179
Natural Gas Emissions Factor (MTCO2e/therm)		0.00685		

E-1 Improve Building Energy Efficiency in New Development

This calculates the GHG reductions associated with adoption of CalGreen Tier 1 energy improvements and assumes that 10 percent of new projects adopting this measure would also achieve ZNE. The measure only applies to new construction of residential and non-residential projects. The capture rate was assumed to be 35 percent of all new development based on an inventory of existing vacant land and projects likely to undergo CEQA review through coordination with the City.

	2014	2020	2030	2035	2050
City of Folsom Population	73,334	80,833	95,074	103,110	131,526
City of Folsom Job Force	34,800	38,368	45,145	48,970	62,502
Residential					
Forecast energy usage (w/o 2016 code, scaled by population)					
Electricity (MWh)	244,521	269,526	317,011	343,804	438,553
Natural Gas (therms)	9,582,028	10,561,895	12,422,696	13,472,644	17,185,567
New Energy Use Only (w/o 2016 code, difference between future and existing)					
Electricity (MWh)		25,005	72,490	99,283	194,032
Natural Gas (therms)		979,867	2,840,668	3,890,616	7,603,539
New Energy Use Only (w/ 2016 code)					
Electricity (MWh)		13,503	39,145	53,613	104,777
Natural Gas (therms)		529,128	1,533,961	2,100,933	4,105,911
New Energy Use Only (w/ 2016 code and Tier 1)					
Electricity (MWh)		12,833	37,204	50,955	99,582
Natural Gas (therms)		502,892	1,457,902	1,996,762	3,902,326
Percent of new building energy applied to measure		17.5%	17.5%	17.5%	17.5%
Tier 1 reduction above 2016 Title 24		15%	15%	15%	15%
Percent of new building energy Tier 1 compliant also meeting ZNE		10%	10%	10%	10%
New Energy measure applied to					
Electricity (MWh)		2,363	6,850	9,382	18,336
Natural Gas (therms)		92,597	268,443	367,663	718,534
Reduction in energy from Tier 1					
Electricity (MWh)		670	1,941	2,658	5,195
Natural Gas (therms)		26,236	76,059	104,171	203,585
Adjusted Energy Use from buildings built through years:	2014-2018	2018-2019	2020-2029	2030-2034	2035-2050
Electricity (MWh)	11,252	2,139	24,371	13,751	48,628
Natural Gas (therms)	440,940	83,815	955,009	538,860	1,905,565
Cumulative Energy use from New Buildings					
Electricity (MWh)		13,391	37,762	51,513	100,140
Natural Gas (therms)		524,755	1,479,765	2,018,625	3,924,189
Energy Reductions from Baseline for Tier 1					
Electricity (MWh)		112	1,383	2,100	4,637
Natural Gas (therms)		4,373	54,196	82,308	181,721
Energy Reductions from Baseline for ZNE					
Electricity (MWh)		236	685	938	1,834
Natural Gas (therms)		9,260	26,844	36,766	71,853
Emissions Reductions (MTCO2e)					
Electricity		**83**	**370**	**544**	**1,158**
Natural Gas		**93**	**555**	**816**	**1,245**

Energy Reduction Measure Quantification (Continued)

E-1 Improve Building Energy Efficiency in New Development (Continued)	2014	2020	2030	2035	2050
Commercial					
Forecast energy usage (w/o 2016 code, scaled by jobs)					
Electricity (MWh)	411,904	454,132	534,350	579,625	739,796
Natural Gas (therms)	360,957	397,962	468,257	507,933	648,293
New Energy Use Only (w/o 2016 code, difference between future and existing)					
Electricity (MWh)		42,228	122,445	167,721	327,892
Natural Gas (therms)		37,005	107,300	146,976	287,336
New Energy Use Only (w/ 2016 code)					
Electricity (MWh)		28,082	81,426	111,534	218,048
Natural Gas (therms)		24,608	71,355	97,739	191,078
New Energy Use Only (w/ 2016 code and Tier 1)					
Electricity (MWh)		27,684	79,408	108,769	212,642
Natural Gas (therms)		24,260	69,586	95,316	186,341
Percent of new building energy applied to measure		*10.0%*	17.5%	17.5%	17.5%
Tier 1 reduction above 2016 Title 24		*15%*	*15%*	*15%*	*15%*
Percent of new building energy Tier 1 compliant also meeting ZNE		10%	10%	10%	10%
New Energy measure applied to					
Electricity (MWh)		2,808	14,250	19,519	38,158
Natural Gas (therms)		2,461	12,487	17,104	33,439
Reduction in energy from Tier 1					
Electricity (MWh)		398	2,019	2,765	5,406
Natural Gas (therms)		349	1,769	2,423	4,737
Adjusted Energy Use from buildings built through years:	2014-2018	2019	2020-2029	2030-2034	2035-2050
Electricity (MWh)	23,401	4,614	51,724	29,362	103,873
Natural Gas (therms)	20,507	4,043	45,326	25,730	91,025
		2020	2030	2035	2050
Cumulative Energy use from New Buildings					
Electricity (MWh)		28,015	79,739	109,101	212,974
Natural Gas (therms)		24,550	69,876	95,606	186,632
Energy Reductions from Baseline Tier 1 Compliant					
Electricity (MWh)		66	1,687	2,434	5,074
Natural Gas (therms)		58	1,478	2,133	4,447
Energy Reductions from Baseline for ZNE					
Electricity (MWh)		281	1,425	1,952	3,816
Natural Gas (therms)		246	1,249	1,710	3,344
Emissions Reductions (MTCO2e)					
Electricity		**83**	**557**	**785**	**1,591**
Natural Gas		**2**	**19**	**26**	**53**
Commercial and Residential					
Emissions Reductions (MTCO2e)					
Electricity		**167**	**927**	**1,329**	**2,750**
Natural Gas		**95**	**574**	**842**	**1,298**

Note: ZNE aims for a net zero usage in energy, which does not necessarily translate to net zero emissions because natural gas and electricity have different emission factors. If roof-top solar is being used to offset overall energy usage, the reductions in emissions would be greater because there are more emissions reductions per unit of energy for electricity than for natural gas, based on estimated SMUD emission factors.

GHG Reductions from E-1 Improve Building Energy Efficiency in New Development (MTCO2e)	262	1,501	2,171	4,048

E-3 Improve Building Energy Efficiency in Existing Development

	2014	2020	2030	2035	2050
This calculation is based on SMUD-provided participation rates data for the City of Folsom in SMUD programs including energy efficiency upgrades. 2015 participation rates were assumed to be the same for 2020 and slight increases by 2035 due to policies related to continuation of Folsom participating and collaborating with SMUD. This measure does not include natural gas savings as those savings were not available from PGE, thus emissions reductions may be higher. Average participation rates reflect average participation rates across all programs.					
Background Data					
Number of Housing Units	26,192				
Number of commercial customers	485	485	485	485	485
SMUD 2015 Energy Efficiency Program Summary					
Residential					
Number of Participants	1119				
Average Savings per Participant (Assumes residences applied no more than one measure) (kWh)	958				
Commercial					
Number of Participants	57				
Average Savings per Participant (Assumes businesses applied for no more than one measure) (kWh)	36,779				
Participation Rates and Energy Reductions					
Participation rate and energy savings of existing buildings participating in SMUD rebates programs based on 2015 data from SMUD.					
Residential					
Number of Participating Households	1,119	1,200	2,500	2,500	2,500
Number of New Participating Households starting from 2014		81	1,381	1,381	1,381
Participation rate (2014: average, 2020-2050: target average)	4.27%	9%	10%	10%	10%
Average Saving per Participant (kWh/hh)	958	1,000	1,800	2,000	2,000
Electricity reductions (kWh)		81,000	2,485,800	2,762,000	2,762,000
Electricity reductions (MWh)		81	2,486	2,762	2,762
Emissions Reductions (MTCO2e)		19	445	494	494
Commercial					
Number of Participating Businesses	57	60	73	73	73
Number of New Participating Businesses starting from 2014		3	16	16	16
Participation rate (2014: average, 2020-2050: target average)	11.75%	12.4%	15.1%	15.1%	15.1%
Average Saving per Participant (kWh/business)	36,779	40,000	45,000	45,000	45,000
Electricity reductions (kWh)		120,000	720,000	720,000	720,000
Electricity reductions (MWh)		120	720	720	720
Emissions Reductions (MTCO2e)		29	129	129	129
GHG Reductions from E-3 Improve Building Energy Efficiency in Existing Development (MTCO2e)		48	574	623	623

E-4 Increase Use of Renewable Energy in Existing Development

	2014	2020	2030	2035	2050
This calculation is based on SMUD-provided participation rates data for the City of Folsom in SMUD programs including PV retrofits and Greenergy. 2015 participation rates were assumed to be the same for 2020 and slight increases by 2035 due to policies related to continuation of Folsom participating and collaborating with SMUD. Municipal facilities are excluded from this measure and excluded from the participation rates in this measure.					
Background Data					
Number of Housing Units	26,192				
Number of commercial customers	485	485	485	485	485
Participation Rates and Emissions Savings					
Participation rate of existing buildings participating in SMUD rebates/solar/greenergy programs based on 2015 data from SMUD. Assumes that participating HH and businesses use an average amount of energy.					
Residential					
Participation Rates of Existing Residences (2014: current, 2020-2050: target)					
Greenergy-50% offset	1.2%	2%	3%	3%	3%
Greenergy- 100% offset	2.9%	3%	3%	3%	3%
PV retrofits/Solar Shares	0.7%	2%	5%	5%	5%
Total participation of residential		6%	10%	10%	10%
Energy usage from existing residential (MWh)		244,521	244,521	244,521	244,521
Electricity reductions from other measures (MWh)					
E-3 Improve Building Energy Efficiency in Existing Development		81	2,486	2,762	2,762
W-2 Reduce Outdoor Water Use		-	1,181	1,281	1,633
W-3 Reduce Potable Water Consumption at City Facilities		41	73	164	164
W-4		-	-	-	-
Adjusted electricity demand from existing residential (MWh)		244,399	240,782	240,315	239,962
Emissions reductions relative to 2014 from... (MTCO2e)					
Greenergy-50% offset		84	277	276	276
Greenergy- 100% offset		21	(92)	(92)	(92)
PV retrofits/Solar Shares		231	924	922	921
Total Emissions Reductions from Residential (MTCO2e)		336	1,109	1,106	1,105

Commercial/Industrial					
Participation Rates of Existing Business including municipal (2014: current, 2020-2050: target) (Total participation rate cannot exceed 98% in order to exclude municipal)					
Greenergy-50% offset	1.0%	3%	5%	5%	5%
Greenergy- 100% offset	1.0%	5%	5%	5%	5%
PV retrofits	0.6%	3%	5%	5%	5%
Total participation of commercial and industrial		10%	15%	15%	15%
Energy usage from existing commercial/industrial (MWh)		411,904	411,904	411,904	411,904
Electricity reductions from PFS 8.1.4. (MWh)		120	720	720	720
Adjusted electricity demand from existing residential (MWh)		411,784	411,184	411,184	411,184
Emissions reductions relative to 2014 from... (MTCO2e)					
Greenergy-50% offset		377	828	828	828
Greenergy- 100% offset		608	453	453	453
PV retrofits/Solar Shares		524	938	938	938
Total Emissions Reductions from Commercial/Industrial (MTCO2e)		1,509	2,219	2,219	2,219
GHG Reductions from E-4 Increase Use of Renewable Energy in Existing Development (MTCO2e)		1,844	3,328	3,325	3,324

E-5 Improve Energy Efficiency in City-Owned Facilities					
	2014	**2020**	**2030**	**2035**	**2050**
Diesel use is not included in these calculations.					
Electricity Use at City Facilities (MWh)					
Facility Type					
traffic lights	395	435	512	555	708
street lights	2,842	3,133	3,685	3,996	5,098
buildings	4,377	4,674	5,239	5,558	6,686
Parks (irrigation/lights)	1,056	1,127	1,264	1,341	1,613
Total Electricity	8,669	9,370	10,700	11,451	14,105
Natural Gas Use at City Facilities (therms)					
Buildings & Other Facilities	108,927	116,334	130,401	138,339	166,407
Total Natural Gas	108,927	116,334	130,401	138,339	166,407
Percent reduction in energy use **below 2014 levels**		5%	15%	20%	20%
Target Annual Electricity Use (MWh)		8,236	7,369	6,936	6,936
Target Annual Natural Gas Use (Therms)		103,481	92,588	87,142	87,142
Annual Electricity Reductions (MWh)		1,134	3,331	4,515	7,169
Annual Natural Gas (therms)		12,854	37,813	51,197	79,265
Electricity savings associated with 75 KW solar on sports complex (mwh/yr)		116	116	116	116
Emissions savings from reduced electricity (MTCO2e)		300	617	829	1,304
Emissions savings from reduced natural gas (MTCO2e)		88	259	351	543
GHG Reductions from E-5 Improve Energy Efficiency in City-Owned Facilities (MTCO2e)		388	876	1,180	1,847

E-6 Increase use of Renewable Energy in City-Operated Facilities				
	2020	2030	2035	2050
City electricity use after the implementation of E-5 Improve Energy Efficiency in	8,236	7,369	6,936	6,936
Percent of renewable electricity generated on-site or through Power Purchase Agreements	4%	20%	25%	25%
Electricity offset (MWh)	329	1,474	1,734	1,734
GHG Reductions from E-6 Increase use of Renewable Energy in City-Operated Facilities (MTCO2e)	79	264	310	310

E-2 Water Heater Replacement in Existing Residential Development

	2020	2030	2035	2050

Note: Only homes not connected to natural gas utilities are allowed to install electric water heaters (See 2016 California Energy Code, Title 24 Part 6). Measure is conservative in that it assumes no water heaters are converted to solar, which would result in more GHG reductions.

Percent of natural gas use in homes by end use in California (assumed to apply to propane -only homes also)	***2009***
Space Heating	25%
Water Heating	34%
Cooking	25%
Other	16%

Water heating usage by fuel type	***2009***
Natural Gas	85%
Electric	11%
Propane	4%

Source: EIA 2009. http://www.eia.gov/consumption/residential/data/2009/

Note: This is based on most recent data from the US. Energy Information Administration as of May 2017. There was a survey done in 2015, but the breakdown of fuel use by end use will not be available until 2018.

https://www.eia.gov/consumption/residential/data/2015/index.php?view=consumption

Average age of natural gas water heater at replacement (years) 13

	Percent of existing NG/Propane water heaters by age (EIA 2009)	**Assumed percent of existing NG/Propane water heaters replaced by this year by age**			
	2009	***2020***	***2030***	***2035***	***2050***
Less Than 2 Years	16%	0	100%	100%	100%
2 to 4 Years	16%	0	100%	100%	100%
5 to 9 Years	30%	50%	100%	100%	100%
10 to 14 Years	18%	100%	100%	100%	100%
15 to 19 Years	7%	100%	100%	100%	100%
20 Years or More	14%	100%	100%	100%	100%

	2014	***2020***	***2030***	***2035***	***2050***
Annual Residential Natural Gas Use in Folsom with Legislative Reductions (therms)	9,582,028	10,176,465	11,322,789	11,978,735	14,344,071
Total Therms	9,582,028	10,176,465	11,322,789	11,978,735	14,344,071

Energy Reduction Measure Quantification (Continued)

E-2 Water Heater Replacement in Existing Residential Development					
		2020	2030	2035	2050
Percent of replacement water heaters that are electric (only applicable to households that do not have natural gas connections per 2016 Energy Code)		5%	5%	5%	5%
Percent of replacement water heaters that are natural gas tankless		95%	95%	95%	95%
Existing Water Heater Replacement Participation Rate		10%	25%	35%	35%
Natural Gas Savings from not using traditional Water Heaters in new construction					
Natural gas usage in new water heaters (No Action) (therms)			3,225,323.15	3,225,323.15	3,225,323.15
Natural gas usage in participating new water heaters (therms)			-	-	-
Average annual natural gas usage per water heater (therms/heater) (assuming 64 gal/year and a 0.61 energy factor) (https://energy.gov/eere/femp/energy-cost-calculator-electric-and-gas-water-heaters-0#output)	244				
Estimated equivalent number of water heaters replaced			-	-	-
Natural Gas Savings from avoidance of traditional water heaters in new construction (therms)			-	-	-
GHG Reductions from Natural Gas Savings (MTCO2e)			-	-	-
Natural Gas Savings from replacement of Existing Water Heaters					
Natural gas usage in existing water heaters (No Action) (therms)			3,225,323	3,225,323	3,225,323
Natural gas usage in participating existing water heaters (therms)			806,331	1,128,863	1,128,863
Average annual natural gas usage per water heater (therms/heater) (assuming 64 gal/year and a 0.61 energy factor) (https://energy.gov/eere/femp/energy-cost-calculator-electric-and-gas-water-heaters-0#output)	244				
Estimated equivalent number of water heaters replaced			3,305	4,626	4,626
Natural Gas Savings from removal of traditional water heaters in existing homes (therms)			806,331	1,128,863	1,128,863
GHG Reductions from Natural Gas Savings (MTCO2e)			5,523.37	7,732.71	7,732.71
Propane Savings from replacement of Existing Water Heaters					
Propane usage in existing water heaters (No Action) (therms)			-	-	-
Propane usage in **existing** water heaters after replacement (therms)			-	-	-
Propane Savings from replacement of Existing Water Heaters (therms)			-	-	-
GHG Reductions from Propane Savings (MTCO2e)			-	-	-
Additional emissions from electricity use in new water heaters in Existing Propane-only homes					
Therms needed to heat 45 gallons of hot water (61% efficiency)	0.333333				
kWh needed to heat 45 gallons of hot water (99% efficiency)	6.6				
kwh per therm conversion for water heating	19.8000198				
Total electricity use needed to offset propane water heating (kWh)			-	-	-
Additional GHG emissions from Electricity Use (MTCO2e)			-	-	-
Additional emissions from natural gas use in new NG tankless water heaters in Existing NG Homes and New Construction					
Percent savings relative to storage tank natural gas water heaters (Average)	20%	*Source: https://energy.gov/energysaver/tankless-or-demand-type-water-heaters*			
Total natural gas use needed for new NG tankless water heaters (therms)			612,811	857,936	857,936
Additional GHG emissions from new NG Use (MTCO2e)			4,197.76	5,876.86	5,876.86
GHG Reductions from E-2 Water Heater Replacement in Existing Residential Development (MTCO2e)			1,326	1,856	1,856

Built Environment and Transportation Reduction Measure Quantification

Assumptions

	2020	2030	2035	2050
SMUD Emissions Factor (MTCO2e/MWh)	0.240	0.179	0.179	0.179
Natural Gas Emissions Factor (MTCO2e/therm)		0.00685		

T-1 Reduce VMT Through Mixed and High Density Land Use

Background Calculations

GP LU Designation	2035 Acres	2035 DU	2035 Population Estimate
MLD- 10 DU/acre	316	3155	7,257
MMD- 16 DU/acre	34	537	1,235
MHD- 24 DU/acre	112	2686	6,178
MU- 25 DU/acre	34	850	1,956
EBC- 25 du/acre	78	1947	4,477
HF- 25 du/acre	5	130	298
Population Affected by the Improved Design of Development			21,401

Persons/MF unit 2.3

Source: Mintier Harnish 2017

	2014	2020	2030	2035	2050
City of Folsom Population	73,334	80,833	95,074	103,110	131,526
Population affected by Improved Design of Development (applies to all new growth within TOD/MU areas)	-	6,114	16,305	21,401	21,401
Percent of Population or VMT affected		8%	17%	21%	16%
Passenger and LDT1 VMT (excluding City employee commute)	692,439,473	713,499,810	772,690,209	810,625,227	964,453,281
VMT affected by Improved Design (New Development)		53,971,081	132,515,717	168,245,867	156,925,845
Percent of all new development in TOD/MU areas		100%	100%	100%	100%

CAPCOA LUT-9: Improve Design of Development (note that CAPCOA mislabels LUT-9 as LUT-8)

% VMT Reduction (Low)	3%
% VMT Reduction (High)	21%
Median Percentage	12.2%
% VMT reduction	12.2%

Emissions Reductions

Annual VMT Reduced	6,557,486	16,100,660	20,441,873	19,066,490
Emissions per mile for Passenger and LDT1 vehicles (MTCO2e/mi)	0.0003108	0.0002312	0.0002139	0.0002029
Emissions Reductions (MTCO2e)	2,038	3,722	4,373	3,869
Emissions Reductions as of 2020 (MTCO2e)	-	1,684	2,335	1,831
GHG Reductions from LU 3.1.1, LU 3.1.5, LU 3.1.6, LU 4.1.2, LU 4.1.3, NCR 3.1.3 (MTCO2e)	2,038	3,722	4,373	3,869

Built Environment and Transportation Reduction Measure Quantification (Continued)

T-2 Improve Streets and Intersections for Multi-Modal Use and Access

	2014	2020	2030	2035	2050
Passenger and LDT1 VMT (excluding City employee commute)	692,439,473	713,499,810	772,690,209	810,625,227	964,453,281
New Passenger and LDT1 VMT since 2020 (for calculation of T-3 Adopt Citywide TDM)			59,190,399	97,125,417	250,953,471

CAPCOA SDT-2 (Percent reduction in VMT for rural contexts)

% of streets with improvements								
	30%	**30%**	25%	**25%**	50%	**30%**	75%	100%
% of intersections with improvements	% VMT Reduction							
30%	0.25%	0.25%	0.15%	0.34%	0.40%	0.40%	0.40%	0.65%
30%	0.25%	0.25%	0.15%	0.34%	0.40%	0.40%	0.40%	0.65%
25%	0.15%	0.15%	0.25%	0.06%	0.25%	0.05%	0.50%	0.50%
25%	0.15%	0.15%	0.06%	0.43%	0.44%	0.53%	0.31%	0.69%
50%	0.40%	0.40%	0.25%	0.44%	0.50%	0.50%	0.50%	0.75%
30%	0.40%	0.40%	0.05%	0.53%	0.50%	0.66%	0.30%	0.75%
75%	0.40%	0.40%	0.50%	0.31%	0.50%	0.30%	0.75%	0.75%
100%	0.65%	0.65%	0.50%	0.69%	0.75%	0.75%	0.75%	1%

Note: Bolded percentage values were interpolated based on CAPCOA estimates for 25%, 50%, 75%, and 100%.

Folsom Street/Intersection Targets

	2020	2030	2035	2050
Percent of intersections in the City with improvements	0%	30%	30%	30%
Percent of streets in the City with improvements	0%	25%	30%	30%
Percent Reduction in VMT under T-2 Improve Streets and Intersections for Multi-Modal Use and Access	0.00%	0.15%	0.25%	0.25%
Annual VMT Reduced under T-2 Improve Streets and Intersections for Multi-Modal Use and Access	-	1,157,935	2,012,602	2,394,523
Annual VMT Reduced under T-2 Improve Streets and Intersections for Multi-Modal Use and Access (from new VMT as of 2020	-	88,701	241,141	623,062
Emissions per mile for Passenger and LDT1 vehicles (MTCO2e/mi)	3.11E-04	2.31E-04	2.14E-04	2.03E-04
GHG Reductions from T-2 Improve Streets and Intersections for Multi-Modal Use and Access (MTCO2e)	-	268	431	486

Built Environment and Transportation Reduction Measure Quantification (Continued)

T-3 Adopt Citywide TDM

		2020	2030	2035	2050
Passenger and LDT1 VMT (excluding non-unincorporated City employee commute)	694,653,925	715,940,714	775,294,804	813,738,819	822,166,218
New Passenger and LDT1 VMT since 2020		0	59,354,090	97,798,105	106,225,504
New Passenger VMT (since 2020) reduced from other measures					
T-1 Reduce VMT Through Mixed and High Density Land Use		0	1,684	2,335	1,831
T-2 Improve Streets and Intersections for Multi-Modal Use and Access		0	88,701	241,141	623,062
Adjusted New Passenger and LDT1 VMT (assumed to represent all new household VMT)		0	59,263,705	97,554,629	105,600,611
Percent of Household VMT for commuting (AASHTO 2013)	28%				
City Commute VMT reduced from Adjusted Passenger and LDT1 VMT		-	16,593,837	27,315,296	29,568,171
Reductions in Commute VMT from other measures not included as the percent reduction is from the forecasted commute VMT					
Target					
Target Percent Reduction in New Commute VMT starting in 2020		0%	15.0%	15%	15%
Annual VMT reduced under T-3 Adopt Citywide TDM		-	2,489,076	4,097,294	4,435,226

CAPCOA Percent Commute VMT reduction from TRT-1, TRT-2, and TRT-3

CAPCOA TRT-1 Percent Shift in Vehicle Mode Share of Commute Trips for Participating Employees (Commute Trip Reduction Programs - Voluntary) - Low Density Suburb	5.2%
CAPCOA TRT-2 Percent Shift in Vehicle Mode Share of Commute Trips for Participating Employees (Commute Trip Reduction Programs with Monitoring)	21.0%
CAPCOA TRT-3 Percent Shift in Vehicle Mode Share of Commute Trips with a Ride Sharing Program - Low Density Suburb	5%

	2020	2030	2035	2050
Percent of New Employees eligible/participating in TDM programs (Required to meet the Target Percent Reduction in Commute VMT)		100%	100%	100%
Commute Trip Reduction Programs - Voluntary (TRT-1)	0%	33%	33%	33%
Commute Trip Reduction Programs - Monitored (TRT-2)	0%	62%	62%	62%
Commute Trip Reduction Programs - Ride Sharing (TRT-3)	0%	5%	5%	5%
Total Participation Rate	0%	100%	100%	100%
Emissions per mile for Passenger and LDT1 vehicles (MTCO2e/mi)	3.11E-04	2.31E-04	2.14E-04	2.03E-04
GHG Reductions from T-3 Adopt Citywide TDM (MTCO2e)	-	575	877	900

Built Environment and Transportation Reduction Measure Quantification (Continued)

T-4 Adopt TDM For City Employees

	2014	2020	2030	2035	2050
City employee commute VMT from Inventory	2,214,452	2,440,904	2,604,596	3,113,592	3,971,666
Emissions per mile for Employee commute (MTCO2e/mi)	3.64E-04	3.11E-04	2.31E-04	2.14E-04	2.03E-04
Forecasted emissions from Employee Commuting (MTCO2e)	806	759	602	666	806
Percent reduction in employee commute miles **below 2014 levels**		0%	15%	15%	15%
Annual employee commute miles after reduction (VMT)		2,440,904	1,882,284	1,882,284	1,882,284
Annual reduction in employee commute miles from forecasts (VMT)		-	722,311	1,231,308	2,089,382
Forecasted commute emissions after reduction (MTCO2e)		759	435	403	382
GHG Reductions from T-4 Adopt TDM For City Employees (MTCO2e)		-	167	263	424

T-5 Reduce Minimum Parking Standards

	2014	2020	2030	2035	2050
Passenger and LDT1 VMT (excluding City employee commute)	692,439,473	713,499,810	772,690,209	810,625,227	964,453,281
New Passenger VMT (since 2020)		0	59,190,399	97,125,417	250,953,471
New Passenger VMT (since 2020) reduced from other measures					
T-1 Reduce VMT Through Mixed and High Density Land Use		0	1,684	2,335	1,831
T-2 Improve Streets and Intersections for Multi-Modal Use and Access		0	88,701	241,141	623,062
T-3 Adopt Citywide TDM		0	2,489,076	4,097,294	4,435,226
Adjusted New VMT		0	56,610,937	92,784,646	245,893,352
Percent of Household VMT for commuting (AASHTO 2013) 28%					
New Commute VMT		-	15,851,062	25,979,701	68,850,139
Reductions in Commute VMT from other measures not included as the percent reduction is from the forecasted commute VMT					
Target Percent VMT reduction from New Commute VMT		2%	2%	2%	5%
Calculated Percent Reduction in Parking Spaces at new land uses to achieve the target percent reduction (CAPCOA PDT-1)		4%	5%	5%	10%
VMT reduction under this measure		-	356,649	584,543	3,442,507
Emissions per mile for Passenger and LDT1 vehicles (MTCO2e/mi)		0.000310796	0.000231189	0.000213948	0.000202931
GHG Reductions from T-5 Reduce Minimum Parking Standards (MTCO2e)		-	82	125	699

Built Environment and Transportation Reduction Measure Quantification (Continued)

T-6 Require the Use of High-Performance Renewable Diesel in Construction Equipment		2014	2020	2030	2035	2050
Measure assumes the level of conversion from diesel to alternative fuels is proportional to level of emissions reductions from such actions. Measure also assumes that any emissions related to additional electricity use from converted equipment are negligible. Emissions from electricity use would decrease in future years due to the increasing renewable energy mix in the electricity generation. This measure only applies to all construction activity/off road equipment.						
Construction Equipment Emissions (MTCO2e)			17,391	20,462	22,196	28,330
Percent construction fuel offset due to conversion of equipment to renewable diesel or electric fuel sources			0%	50%	100%	100%
Assumed percent converted to renewable diesel			50%	50%	100%	100%
Assumed percent converted to electric			0%	0%	0%	0%
Non-Renewable Diesel fuel emission factors (kg CO2/gal)	(The Climate Registry 2016)	10.21				
Ratio of non-CO2 GHGs to CO2	(GREET 2016 for low sulfur diesel)	1.04				
Non-Renewable Diesel fuel emission factors (kg CO2e/gal)		10.61				
Renewable diesel fuel emission factors (kg CO2e/gal)		0.40				
Emissions reductions from switching one gallon of non-renewable diesel fuel with renewable diesel fuel (kgCO2e/gal)		10.21				
Non-Renewable diesel fuel use offset by renewable diesel conversions (gal)			-	501,037	2,173,960	2,774,702
GHG Reductions from NCR 3.2.7, Program PFS-26 (MTCO2e)			-	5,116	22,196	28,330
GHG reduction attributed to municipal fleet						
Municipal Offroad Emissions (MTCO2e)			152	179	194	247
Reductions from municipal off-road feet (MTCO2e)			0	45	194	247

Built Environment and Transportation Reduction Measure Quantification (Continued)

T-7 Alternative Fuel in City Fleet			2014	2020	2030	2035	2050
Forecasted Emissions by Fuel from City Fleet Operations (MTCO2e)			2014	2020	2030	2035	2050
CNG			-	-	-	-	-
Diesel			2,019	2,218	2,600	2,817	3,587
Gasoline			1,422	1,571	1,850	2,007	2,562
Total			3,441	3,790	4,450	4,825	6,149
Fuel Type Gallons Used		Scaling Factors for business-as-usual forecasted emissions					
Diesel			195,906	215,939	253,984	275,450	351,361
Gasoline			168,006	185,186	217,812	236,221	301,321
				2020	2030	2035	2050
Percent of diesel onroad fleet converted to CNG				0%	50%	100%	100%
percent of gasoline onroad fleet converted to EV				0%	50%	100%	100%
percent of diesel fleet using HPRD					75%	100%	100%
Fuel/Energy Use							
Diesel Gallons converted to CNG				-	126,992	275,450	351,361
Efficiency: Diesel LHD vocational vehicle (MJ/mi) (GREET 2017)	15						
Efficiency: CNG LHD vocational vehicle (MJ/mi) (GREET 2017)	18						
CNG scf based on diesel gallon equivalent (126.67 scf/gal) (adjusted for difference in efficiency)				-	19,303,264	41,869,497	53,408,300
Gasoline gallons converted to electric				-	108,906	236,221	301,321
Onroad annual miles associated with gasoline use converted to EV				-	4,826,329	11,180,827	14,830,647
KWH associated with gasoline miles per year				-	1,435	3,325	4,410
Emission Factors							
CNG emission factor (mtco2e/scf)		0.00005444					
Diesel emission factor (mtco2e/gal)			0.01031	0.01027	0.01027	0.01024	0.01023
Gasoline emission factor (mtco2e/gal)			0.0085	0.0085	0.0085	0.0085	0.0085
GHG Emissions from Fuel Conversion							
Emissions from CNG use (mtco2e)			-	-	1,050.87	2,279.38	2,907.55
EV GHG Emissions				-	0.257	0.595	0.789
Emissions from Diesel Gallons still in fleet			2,019	2,218	1,305	-	-
Emissions from gasoline gallons still in fleet			1,422	1,571	925	-	-
Emissions from CNG in Fleet			-	-	1,051	2,279	2,908
Total Emissions with CNG/EV in Fleet			3,441	3,790	3,281	2,279	2,908
Diesel Emissions with RD					650	-	-
Total Emissions with RD and EV					1,576	1	1
GHG Reductions from T-7 Alternative Fuel in City Fleet (MTCO2e)			-	-	1,169	2,545	3,241
GHG Reduction with RD instead of CNG					2,874	4,824	6,148

T-8 Install Electric Vehicle Charging Stations	2020	2030	2035	2050
The reductions calculated for this measure are assumed to achieve reductions above and beyond those forecasted by the State.				
EMFAC2014 Outputs for Sacramento City				
Total Vehicle Miles per day	37,440,165	41,850,063	44117927	50,735,777
VMT/year	13,665,660,062	15,275,272,915	16,103,043,326	18,518,558,673
Number of Evs in Sacramento County	10,614	73,269	101254	141,705
Scaled for Folsom Population				
Folsom Population	80,833	95,074	103,110	131,526
Sacramento County Population	1,578,029	1,762,759	1,854,128	2,105,299
Folsom to Sacramento County Population	5%	5%	6%	6%
Folsom EV Population	544	3,952	5,631	8,853
10% of EVs	54	395	563	885
10% of EVs (rounded)	50	400	560	890
Emissions from EV Charger Usage				
Number of Chargers installed by 2035 (no additional targets set for 2050)	-	400	560	560
Number of Connections per Charge	0	2	2	2
Average Charging hours per Connection per day	0	3	3	3
Number of hours of charge per year for all chargers (h/year)	-	817,600	1,144,640	1,144,640
Average Efficiency of EV LDV (kWh/100-mi) (1)	34	34	34	34
GHG Emissions per MWh in Folsom (MTCO2e/MWh)	0.240	0.179	0.179	0.179
Charger Power (kW) (Level 2 - High) (2)	6.6	6.6	6.6	6.6
Charged amount (kWh)	-	5,396,160	7,554,624	7,554,624
EV emissions (MT CO2e)	-	966	1,352	1,352
Source:				
(1) http://www.fueleconomy.gov/feg/download.shtml (Without EV efficiency forecasts, EV efficiency assumed to be the same for all future years)				
(2) https://www.driveclean.ca.gov/pev/Charging.php				
Emissions from Equivalent Gasoline Usage				
Equivalent Annual VMT (mi)	-	16,046,626	22,465,276	22,465,276
Average Efficiency of Gasoline LDV (mpg)	34	44	47	49
Gallons of gasoline displaced (gal)	-	362,092	474,632	456,438
GHG Emissions per mi for average gasoline LDV (gCO2/mi) (EMFAC2014)	325	325	325	325
Equivalent Gasoline emissions (MT CO2e)	-	5,209	7,301	7,301
Emissions Reductions				
Emissions reductions (MT CO2e)	-	4,243	5,949	5,949
Emissions reductions per hour of charge (kg CO2e/h)		5.2	5.2	5.2
GHG Reductions from T-8 Install Electric Vehicle Charging Stations (MTCO2e)	-	4,243	5,949	5,949

Solid Waste Reduction Measure Quantification

SW-1 Increase Solid Waste Diversion

See additional quantification on inventory/forecast sheets.

	2020	2030	2035	2050
community emissions	14,410	16,949	18,382	**23,447**
community emissions with measure	9,737	9,162	7,452	9,506
municipal emissions	78	92	100	128
municipal emissions with measure	53	50	41	52

based on meeting 1.5 pound/person (exceeds state goal of 2.7)

	2020	2030	2035	2050
GHG Reductions from SW-1 Increase Solid Waste Diversion (MTCO2e)	4,674	7,787	10,930	13,942
Municipal reduction	25	42	59	76

SW-2 Divert organic waste from landfills

	2020	2030	2035	2050
Generation of Organic Waste In Folsom Based on 2014 Inventory Data				
Disposal	54,986	64,674	70,140	89,470
Commercial/Municipal				
Percentage of Disposal that is Commercial/Municipal ⁺	74%	74%	74%	74%
Commercial Disposal	40,930	48,141	52,209	66,598
Percentage of Commercial/Municipal Disposal that is Organic ⁺†	50%	50%	50%	50%
Commercial/Municipal Organic Disposal	20,465	24,070	26,105	33,299
Residential				
*Percentage of Disposal that is Residential**	26%	26%	26%	26%
Residential Disposal	14,057	16,533	17,930	22,872
*Percentage of Residential Disposal that is Organic** †	51.6%	51.6%	51.6%	51.6%
Residential Organic Disposal	7,253	8,531	9,252	11,802

⁺ Based on Commercial Streams Export from CalRecycle Waste Characterization Web Tool

*Based on Residential Streams Export from CalRecycle Waste Characterization Web Tool

† This is a conservative assumption because the success of the 75% diversion target would most likely reduce the number of landfilled recyclables and increase the percentage of overall organics per ton of disposal. However, the BAU forecast is also conservative because it assumes the percent organics does not change.

SW-2 Continued

Commercial/Municipal Compost	2020	2030	2035	2050
Tons to Be Landfilled, Which Will Be Composted Instead				
AB 1826's Commercial Organic Waste Disposal Limit	10,232.42	12,035.18	10,232.42	10,232.42
Tons Composted Instead of Landfilled	10,232	12,035	15,872	23,067

City of Folsom Organic Breakdown		
	Residential	Commercial
Food	55%	49%
Green	11%	22%
Lumber	1%	1%
Paper	45%	91%
Manure	0.01%	0.1%

Percent of organics composted under SW-2				
Food	25%	50%	50%	50%
Green	35%	75%	75%	75%
Composted Commercial/Municipal Tons				
Food	2,506.94	5,897.24	6,395.66	8,158.24
Green	1,125.57	3,971.61	4,307.28	5,494.33

Residential Compost

Percent of organics composted under SW-2				
Food	25%	50%	50%	50%
Green	35%	75%	75%	75%
Composted Residential Tons				
Food	997.32	2,346.05	2,544.33	3,245.52
Green	279.25	703.81	1,526.60	973.66

TOTAL ORGANICS COMPOSTED INSTEAD OF LANDFILLED under SW-2				
Food	3,504.26	8,243	8,940	11,404
Green	1,404.81	4,675	5,834	6,468
Total	4,909	12,919	14,774	17,872

Emissions Calculations				
Emissions reductions per ton of food waste composted instead of landfilled (I	0.015658183	0.015658183	0.015658183	0.015658183
Emissions reductions per ton of green waste composted instead of landfilled	0.006658732	0.006658732	0.006658732	0.006658732
Emissions reductions from food waste composted instead of landfilled (MTCH	55	129	140	179
Emissions reductions from green waste composted instead of landfilled (MTC	9	31	39	43
Emissions reductions from food waste composted instead of landfilled (MTCC	1,372	3,227	3,500	4,464
Emissions reductions from green waste composted instead of landfilled (MTC	234	778	971	1,077
Total Emissions Reduction (MTCO2e)	1,606	4,005	4,471	5,541
GHG reductions from WM-2 (MTCO2e)	1,606	4,005	4,471	5,541
GHG Municipal Reduction (0.5% of redux empl/pop ratio)	16.06	40.05	44.71	55.41

Water and Wastewater Reduction Measure Quantification

Assumptions

	2020	2030	2035	2050
SMUD Average Electricity Emissions Factor (MTCO2e/MWh)	0.240	0.179	0.179	0.179
Natural Gas Emissions Factor (MTCO2e/therm)		0.00685		

W-1 Increase Water Efficiency in New Residential Development

	Mandatory Reqmt/ Standard Equivalent	Measure Reqmt/Energy Star Rating	Requirement Metric
Kitchen Faucet Flow Rate (gal per minute)	1.8	1.5	Flow Rate
Dishwasher water use (gal/cycle)	5	3.5	Energy Star Appliance - standard size
Dishwasher energy use (kWh/year)	307	270	Energy Star Appliance - standard size
Clotheswasher water use (gal/cycle)	16.82	9.25	Energy Star Appliance - 2.5 cu-ft front loading
Clotheswasher energy use (kWh/cycle)	7.93	5.95	Energy Star Appliance

Kitchen faucet water use per day per household with dishwasher (HH) (minutes)	5	Assumption based on water usage used for dishwashing and standard flowrate: https://water.usgs.gov/edu/qa-home-percapita.html. Assumes water is also used for washing produce, cooking, and drinking.
Average dishwasher cycles per unit per year	215	https://www.energystar.gov/products/appliances/dishwashers/key_product_criteria
Average dishwasher cycles per year per HH	215	
Average American family wash loads per year	300	https://www.energystar.gov/products/appliances/clothes_washers
Average clotheswasher cycles per year per HH	300	

	2014	2020	2030	2035	2050
Households in Folsom	26,192	29,201	35,004	38,324	50,297
Number of new households since 2014		527	1,542	2,123	4,218
Percent of new households measure applies to		17.5%	17.5%	17.5%	17.5%
Activity in New Households Only					
Water use with standard equipment (MG/year)					
Kitchen Faucets			5	7	14
Dishwashers			2	2	5
Clotheswashers			8	11	21
Total			15	20	40
Water use with Tier 1 equipment (MG/year)					
Kitchen Faucets			4	6	12
Dishwashers			1	2	3
Clotheswashers			4	6	12
Total			10	13	26
Water Savings (MG/year)					
Kitchen Faucets			1	1	2
Dishwashers			0	1	1
Clotheswashers			4	5	10
Total			5	7	13
Emissions per gallon of water (MTCO2e/MG) (see calculation in measure W-4)			0.22	0.22	0.22
GHG Reductions from W-1 Increase Water Efficiency in New Residential Development (MTCO2e)	**For water reductions only**	-	1	1	3
		Note that this measure will not be in effect until after 2020.			
Electricity use with standard equipment (kWh/year)					
Dishwashers			473,125	651,406	1,294,285
Clotheswashers			3,670,047	5,052,978	10,039,816
Total			4,143,172	5,704,384	11,334,101
Electricity use with Tier 1 equipment (kWh/year)					
Dishwashers			416,350	573,237	1,138,971
Clotheswashers			2,752,535	3,789,734	7,529,862
Total			3,168,885	4,362,971	8,668,833
Electricity Savings (kWh/year)					
Dishwashers			56,775	78,169	155,314
Clotheswashers			917,512	1,263,245	2,509,954
Total			974,287	1,341,413	2,665,268
GHG Reductions from W-1 Increase Water Efficiency in New Residential Development (MTCO2e)	**Assumed to be included in E-1 Improve Building Energy Efficiency in New Development**	-	174	240	477

Water and Wastewater Reduction Measure Quantification (Continued)

W-2 Reduce Outdoor Water Use					
	2014	**2020**	**2030**	**2035**	**2050**
This measure only applies to potable water use in outdoor landscaping, and not all outdoor applications.					
Residential and Non-residential Landscape irrigation water use per capita per day (gallons) (Assumed for 2014)	94	*Source: California Water Plan Update 2013 Vol. 3. Table 3-2. Based on 2009 gallons and population.*			
Folsom Population	73,334	80,833	95,074	103,110	131,526
Estimated annual water demand for landscaping based on 2014 rates (MG)	2,521	2,779	3,269	3,545	4,522
In existing development		2,521	2,521	2,521	2,521
In new development		258	748	1,024	2,001
Percent reduction in outdoor landscaping water use rates from 2014 rates					
In existing development		0%	40%	40%	40%
In new development		0%	40%	40%	40%
Annual Water Reduction (MG)					
In existing development		-	1,009	1,009	1,009
In new development		-	299	410	800
TOTAL		-	1,308	1,418	1,809
Emissions per gallon of water (MTCO2e/MG) (see calculation in measure W-4)		0.30	0.22	0.22	0.22
Remaining water use for landscape irrigation (MG)					
In existing development		2,521	1,513	1,513	1,513
In new development		258	449	614	1,201
GHG Reductions from W-2 Reduce Outdoor Water Use (MTCO2e)		-	293	309	394
Electricity savings from local water distribution and treatment (MWh) to calculate E-4 Increase Use of Renewable Energy in Existing Development		-	1,181	1,281	1,633

W-3 Reduce Potable Water Consumption at City Facilities					
	2014	**2020**	**2030**	**2035**	**2050**
Imported Potable water consumption at all City facilities (Million gallons)	2,014	2,220	2,613	2,834	3,617
Forecasting method: Employee growth	34,800	38,368	45,145	48,970	62,502
Electricity Use from Potable Water Consumption (MWh)	1,819	2,005	2,359	2,559	3,266
Electricity intensity per million gallons of imported potable water (includes conveyance, treatment, and distribution)					
Water Activity	*kWh/MG*				
Local water distribution	*64*				
Conventional water treatment	*839*				
Total (kWh/MG)	*903*				
Total (MWh/MG)	*0.90*				
Percent reduction in potable water consumption at City facilities below 2014 levels		15%	20%	30%	30%
Water reduction (MG)		302	403	604	604
Electricity Use with water reduction (MWh)		273	364	546	546
Difference in electricity use (MWh)		1,732	1,996	2,014	2,721
GHG Reductions from W-3 Reduce Potable Water Consumption at City Facilities (MTCO2e)		416	357	360	487
Electricity savings from local water distribution and treatment (MWh) to calculate E-4 Increase Use of Renewable Energy in Existing Development		41	73	164	164

Assumptions	
Category	**Value**
Conversions	
sqin/sqft	144
cubic in/gallons	231
sqft/acre	43560
acre/hectare	2.47105
g/MT	1000000
lb/MT	2204.622622
g/lb	453.592
kg/MT	1000
lb/kg	2.20462
tons/MT	1.10231
kWh/MWh	1000
MWh/GWh	1000
btu/kWh	3412.14
Btu/therm	100000
MMBtu/therm	0.1
MMBtu/MWh	3.41214148
LPG Gallons/GGE	1.344086022
LNG Gallons/GGE	1.572327044
gal/cubic foot	7.480519481
gal/Liter	3.785411784
gallon/acrefoot	325851.429
million gal/hundred cubic feet	0.000748503
million gal/acre-feet	0.325851429
GWP	
CO2	1
CH4	25
N2O	298
Source	*IPCC Fourth Assessment Report*

NO LEGISLATIVE REDUC

Community

	2014	2020	2030	2035	2050	
Building Energy	235,955	261,730	311,117	339,213	439,718	36%
On-Road	342,865	353881	385554	406398	491608	52%
Off-Road	26,683	29,417	34,611	37,542	47,911	4%
Solid Waste	13,073	14,410	16,949	18,382	23,447	2%
Water-Related	1,325	1,460	1,718	1,863	2,376	0.2%
Wastewater	3,282	3,618	4,256	4,615	5,887	0.50%
High GWP	34,708	38,257	44,997	48,800	62,249	5%
Without Legislative Reductions	657,892	702,774	799,201	856,813	1,073,197	
Targets	657,892					

Municipal

	2014	2020	2030	2035	2050	
Building Energy	2,137	2,356	2,771	3,005	3,834	29%
On-Road	4,247	4,681	5,506	5,972	7,617	57%
Off-Road	138	152	179	194	247	2%
Solid Waste	71	78	92	100	128	1%
Traffic Signals	101	111	131	142	181	1%
Street Lights	727	801	942	1,022	1,303	10%
Water-Related	15	16	19	21	27	0%
Wastewater	33	36	42	46	58	0%
Without Legislative Reductions	7,469	8,232	9,683	10,501	13,395	
Targets	7,469					

Community

Built Environment/Transportation	404,256	421,555	465,162	492,741	601,769
Energy	235,955	261,730	311,117	339,213	439,718
Solid Waste	13,073	14,410	16,949	18,382	23,447
Water and Wastewater	4,607	5,078	5,973	6,478	8,263
	657,892	702,774	799,201	856,813	1,073,197

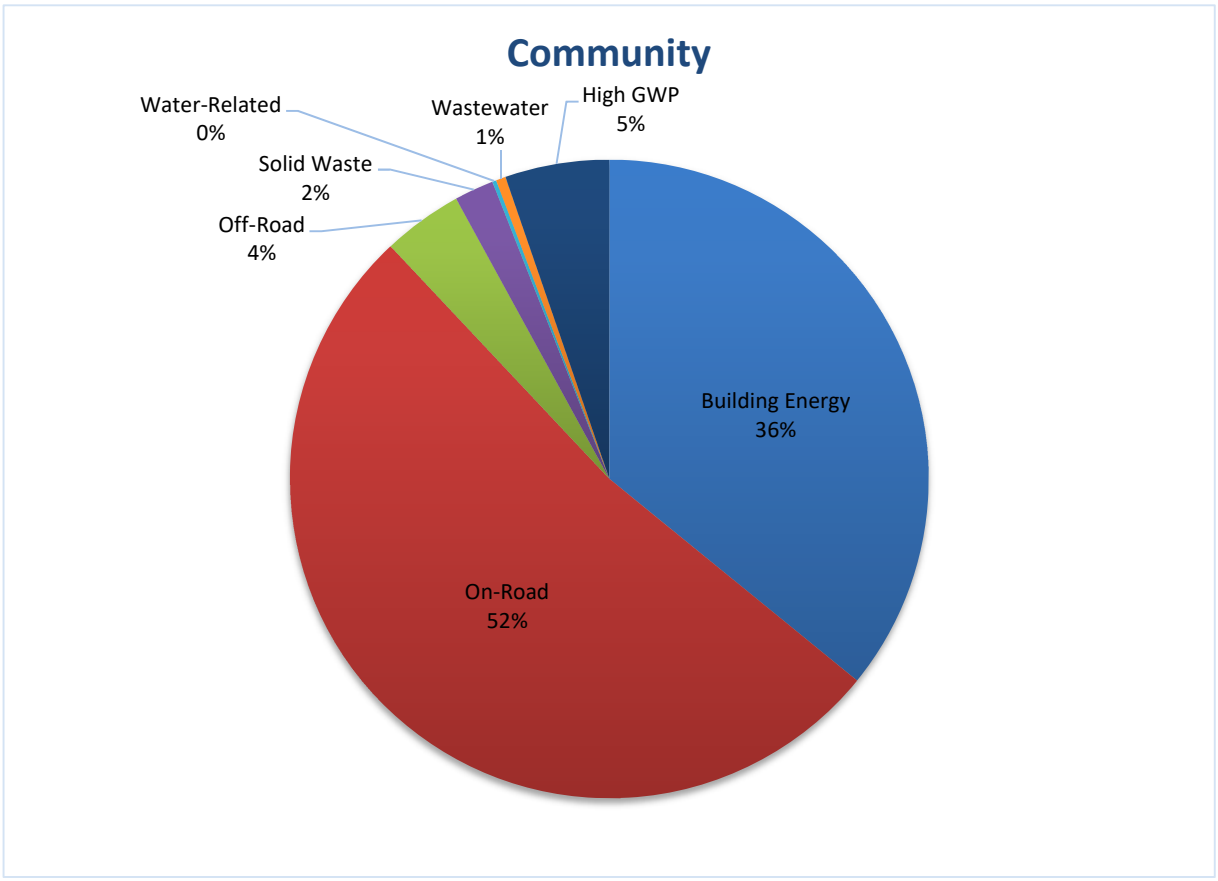
Municipal

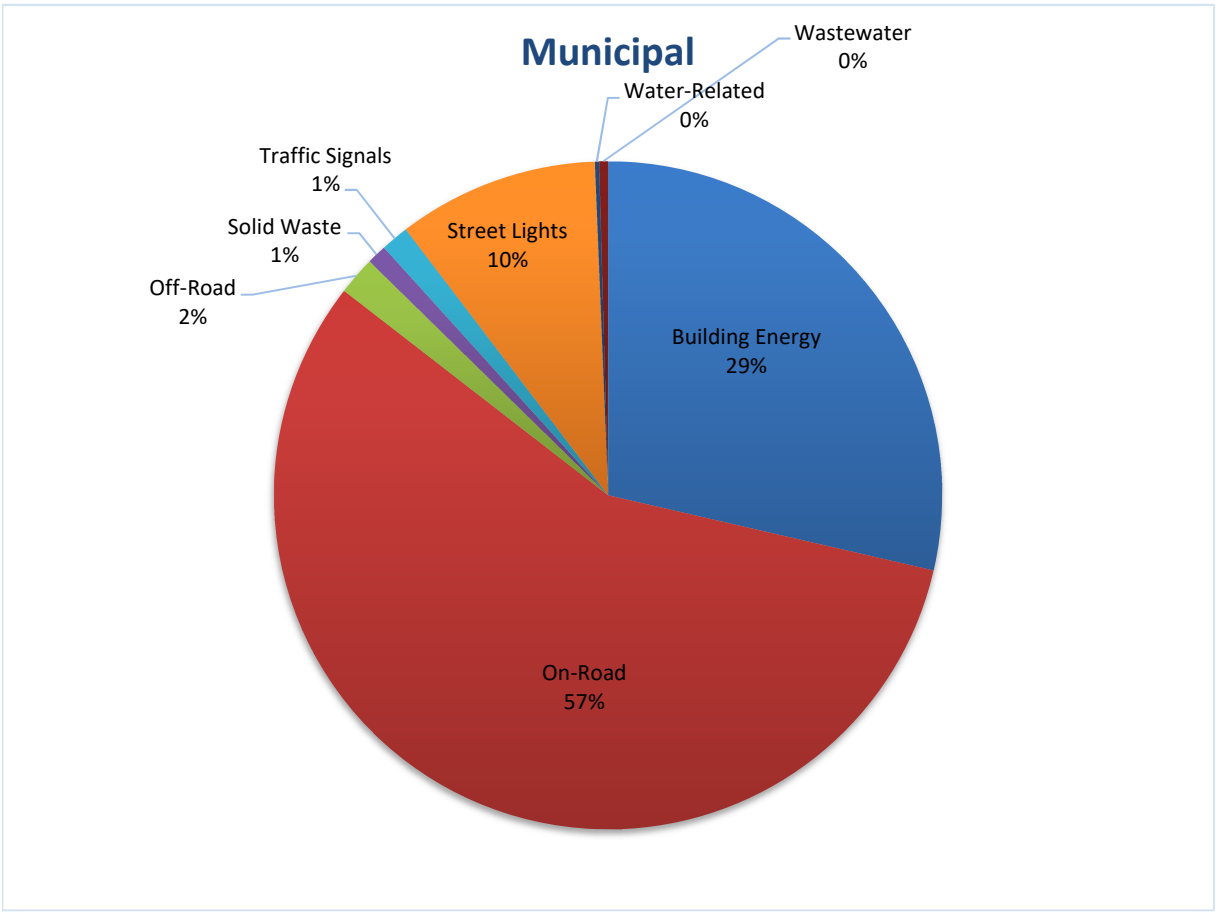
Built Environment/Transportation	5,213
Energy	2,137
Solid Waste	71
Water and Wastewater	47
	7,469

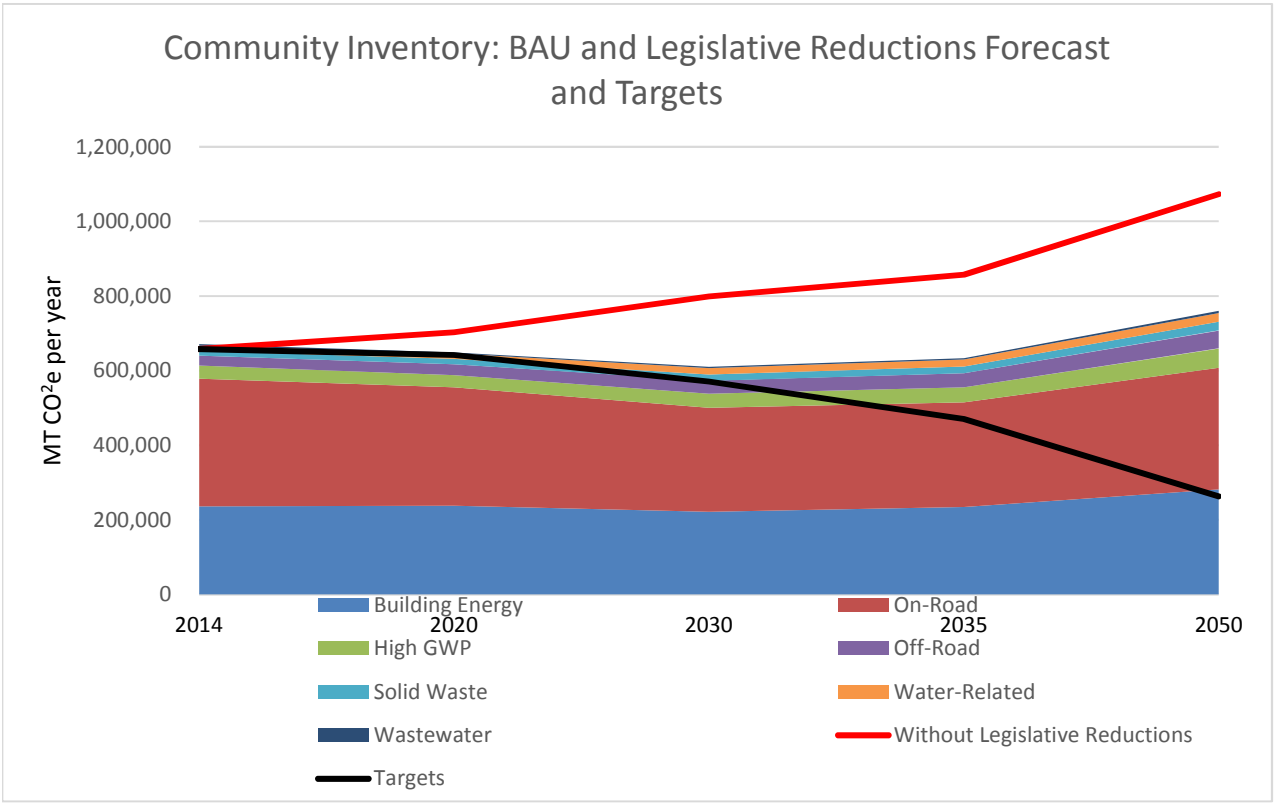
WITH LEGISLATIVE REDUDUCTIONS

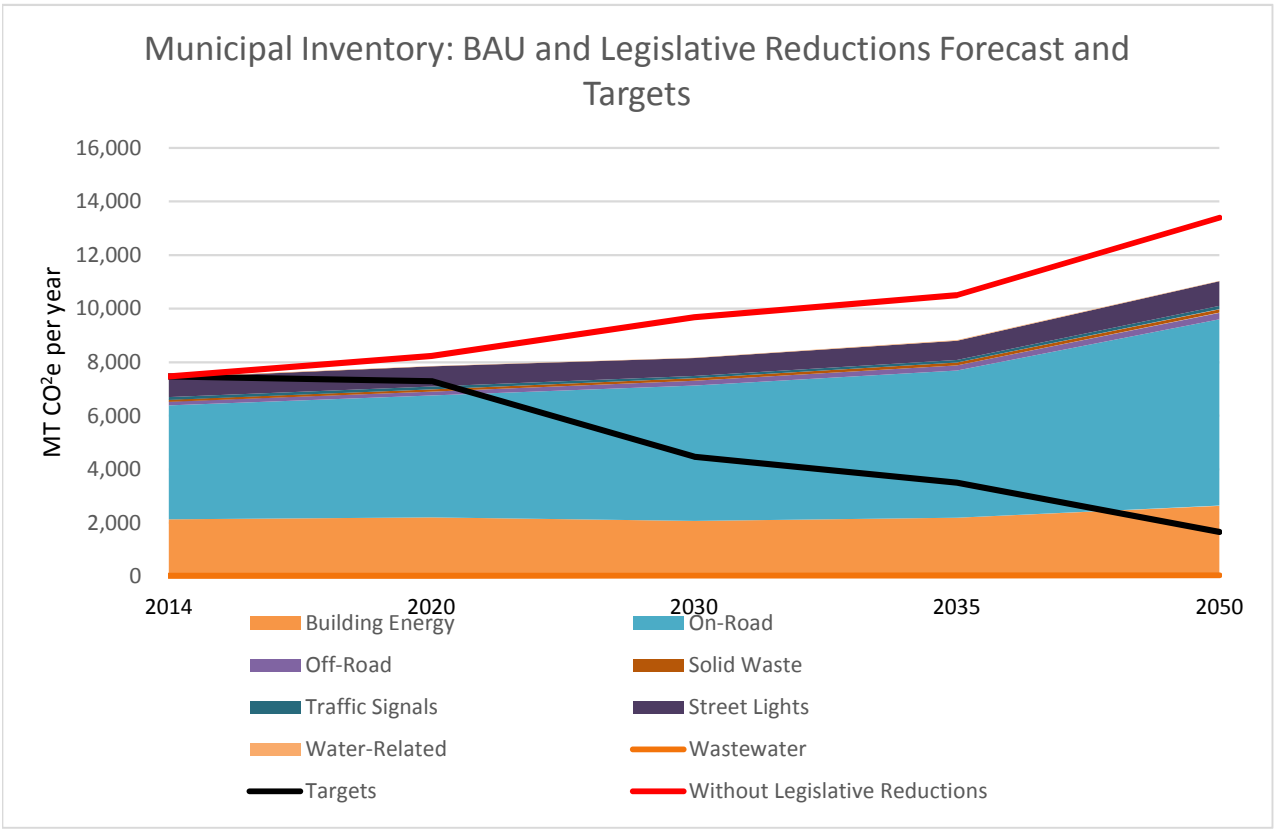
2020	2030	2035	2050
238,335	221,661	234,787	281,736
317,361	279019	279867	325871
29,417	34,611	37,542	47,911
14,410	16,949	18,382	23,447
1,381	1,212	1,277	1,628
3,529	3,708	4,576	5,877
31,956	37,586	40,762	51,996
636,389	594,745	617,192	738,467
-3.3	-9.6	-6.2	12.2
642,246	570,447	470,080	263,052

2020	2030	2035	2050
2,200	2,070	2,196	2,641
4,548	5,052	5,491	6,958
152	179	194	247
78	92	100	128
105	92	100	128
756	665	721	919
15	14	15	19
34	32	36	46
7,889	8,196	8,852	11,086
5.6	9.7	18.5	48.4
7,291	4,468	3,511	1,663
378,734	351,216	358,172	425,778
238,335	221,661	234,787	281,736
14,410	16,949	18,382	23,447
4,910	4,920	5,852	7,506
636,389	594,745	617,192	738,467
5,561	5,988	6,506	8,252
2,200	2,070	2,196	2,641
78	92	100	128
50	46	51	65
7,889	8,196	8,852	11,086


Community
Water-Related
0%
Wastewater
1%
High GWP
5%
Solid Waste
2%
Off-Road
4%
Building Energy
36%
On-Road
52%


Municipal
Wastewater
0%
Water-Related
0%
Traffic Signals
1%
Solid Waste
1%
Street Lights
10%
Off-Road
2%
Building Energy
29%
On-Road
57%


Community Inventory: BAU and Legislative Reductions Forecast and Targets
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
MT CO2e per year
2014
2020
2030
2035
2050
Building Energy
On-Road
High GWP
Off-Road
Solid Waste
Water-Related
Wastewater
Without Legislative Reductions
Targets


Municipal Inventory: BAU and Legislative Reductions Forecast and Targets
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
MT CO2e per year
2014
2020
2030
2035
2050
Building Energy
On-Road
Off-Road
Solid Waste
Traffic Signals
Street Lights
Water-Related
Wastewater
Targets
Without Legislative Reductions

Per-capita GHG Reduction Targets	
Milestone Year	State Targets for Local Level Climate Action Plans (MTCO2e/cap)
2030	6
2035	4.6
2050	2

-0.053449177

Source: ARB. Public Workshop on the 2030 Target Scoping Plan November 7, 2016

GHG Reduction Targets			
Milestone Year	Statewide Existing and Target Emissions (MMTCO2e)	Statewide Target Percent Reduction below 1990 levels by Target Years	Adjusted Target Percent Reduction below 2014 levels by Target Years
1990 (Historical)	431	NA	NA
2014 (Historical)	442	NA	NA
2020 (Target)	431	0%	2.4%
2030 (Target)*	264.12	40.0%	40.2%
2035 (Target)	207.53	51.8%	53.0%
2050 (Target)*	98.32	80.0%	77.7%

** State emissions calculated from ARB's scoping plan community-wide per-capita goal and population forecasts from the Department of Finance*

Source: California GHG Inventory. ARB 2014 and 2016

Demographics	Value	Source
2030 Statewide Population	44,019,846	Department of Finance
2035 Statewide Population	45,521,334	Department of Finance
2050 Statewide Population	49,158,401	Department of Finance

City of Folsom

Community Inventory	**2014**	**2020**	**2030**	**2035**	**2050**
Population	73,334	80,833	95,074	103,110	131,526
BAU Emissions (MTCO2e)	657,892	702,774	799,201	856,813	1,073,197
Per capita emissions	9.0	8.7	8.4	8.3	8.2
BAU with Legislative Reductions (MTCO2e)	657,892	636,389	594,745	617,192	738,467
Per capita emissions	9.0	7.9	6.3	6.0	5.6
With Measures (MTCO2e)					
Per capita emissions					
Percent below BAU					

Municipal Inventory					
BAU Emission	7,469	8,232	9,683	10,501	13,395
With Leg Reduction	7,469	7,889	8,196	8,852	11,086

Community Targets	**2020**	**2030**	**2035**	**2050**
Per Capita	0	6	4.6	2
Mass Emissions	642,246	570,447	470,080	263,052
Needed Reductions	(5,857)	24,299	147,112	475,415

Municipal Targets				
Mass Emissions	7,291	4,468	3,511	1,663
Needed Reductions	-598	3,728	5,342	9,423

Municipal

Folsom Employee Commute Emissions			2014	
	2014 Employee VMT	**2014 Total Trips**		
	2,214,452	174,756		
	grams	MT		
CO2	800486486.4	800.4864864		
CH4	30418.36302	0.030418363		
N2O	15995.33561	0.015995336		
TOTAL			**806**	**CO2E MT**

			2014	
Folsom On Road Fleet				
	Total Gas (gal)	Total DSL (gal)		
	168005.5	195905.81		
	grams	grams	MT	
CO2	1420438098	1974697348	3395.13545	
CH4	57566.79366	1009086.895	1.06665369	
N2O	30879.66112	64962.3666	0.09584203	
	1422	**2019**		
			3,441	**CO2E MT**
			4,247	

Folsom Off Road Equipment			2014	
	Total Gas (gal)	Total DSL (gal)		
	1974.6	11681.95		
	grams	grams	MT	
CO2	17336988.00	119272709.50	136.609698	
CH4	1145.27	5840.98	0.00698624	
N2O	513.40	2570.03	0.00308343	
			138	**CO2E MT**

Community Wide

2015 Folsom Community Wide On Road Transportaion Emissions

2014 Annual VMT

Speed Bin	2015	CO2	CH4	N2O	g CO2E	MT CO2E
5	529,838	966543756	343430.567	650479.917	1168972535	1168.97254
10	1,639,448	2359074143	555052.928	1403079.7	2791068215	2791.06822
15	5,891,234	5476579135	784675.368	3114487.89	6424313410	6424.31341
20	63,783,538	46670634890	8725170.42	17575615.2	52126297468	52126.2975
25	52,457,673	27085695009	1414394.8	4683584.81	28516763154	28516.7632
30	55,613,407	26322533974	1237728.33	6793070.64	28377812233	28377.8122
35	99,692,744	41404476509	1840716.02	7532740.75	43695251152	43695.2512
40	98,988,501	37540576182	1561840.94	6049139.14	39382265670	39382.2657
45	94,908,364	38192186013	1419636.51	10205972.9	41269056840	41269.0568
50	27,424,755	11274496416	387267.217	3785840.33	12412358514	12412.3585
55	51,391,083	20492070178	723402.811	4710785.98	21913969470	21913.9695
60	104,028,520	41653843199	1598423.14	5820766.03	43428392053	43428.3921
65	36,600,160	17639049351	645847.257	3626193.64	18735801238	18735.8012
70	1,704,660	744609065	29281.3948	16704.4864	750,319,037	750.319037
	694,653,925					
	TOTAL				3.40993E+11	**340,993**

Electric Vehicles

Electric VMT	CO2	CH4	N2O	g CO2E	MT CO2e
20,776,454	1,811,143,501	92,629	196,053	1,871,883,041	1871.8830
.					**342,865**