Town of Truckee

Community-Wide and Municipal-Operations 2016 Greenhouse Gas Emissions Re-Inventories

with Comparison to 2008 Baseline Emissions Inventories
and Forecast of Community-Wide Emissions to 2050

Photo from Town of Truckee

Final Draft

Prepared by Sierra Business Council
In Collaboration with the Town of Truckee

May 31, 2018

SIERRA BUSINESS COUNCIL

May 8, 2018

Dear Truckee Town Council and Truckee Residents,

Climate change is a serious and immediate concern for our mountain character and way of life in Truckee, and a threat to the global environment. The impacts of a changing climate can amplify hazards such as wildfire; impact our town's businesses, winter sports, and more. We must all work together to reduce greenhouse gas (GHG) emissions to help protect Truckee's greatest asset – its natural environment.

The Town Council has been committed to addressing climate change and community resilience for a number of years. This past year, the Council committed to achieving 100% renewable electricity for the Town (as a municipal corporation) by 2020 and for the entire community by 2030. The Council has made sustainability one of its priority goals for 2018. Because we are now embarking on an update to our General Plan, the Council has directed that climate action goals and policies be integrated into the General Plan process. The first step in creating climate action policies is an up-to-date GHG Emissions Inventory. The inventory serves as a baseline to guide emission reduction efforts and to identify tangible measurements of future progress. The GHG Inventory was first developed based on 2008 data; this report serves as an update and refinement of that initial inventory.

I am very pleased to announce that, with the help and guidance of the Sierra Business Council, Truckee's GHG Inventory Update is complete. This is a critical step in the Town's Climate Action Planning process, leading us toward reducing emissions as a community.

The Town will need the support and efforts of every resident and visitor as we continue down the road of establishing comprehensive GHG emission reduction and mitigation strategies, implementation plans, and programs that foster sustainable practices. We invite you to analyze the GHG Inventory and consider how your daily activities affect our carbon footprint. We invite you to join the General Plan Update process where we address climate change in all aspects of future community development. As a community, we can make meaningful change to reduce emissions and improve the future quality of life for all Truckee residents and visitors.

Sincerely,

Jeff Loux
Town Manager

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Executive Summary

In California, governments, businesses and the general public are placing increasing focus on quantifying and reducing GHG emissions. California's legislature and regulatory agencies have established policies relating to GHG emissions reductions. Additionally, Truckee, like all communities in the Sierra Nevada, faces unique challenges associated with climate change in the region. Due to these drivers and other motivations like the 2018 Town Council Goal to "Keep Truckee Green"[1], the Town of Truckee directed the Sierra Business Council to conduct re-inventories and business-as-usual forecasts of GHG emissions resulting from both community activities and sources, and Truckee's municipal operations.

Truckee's baseline GHG emissions inventories use 2008 for the base year; selected because it is one of the earliest years for which relatively comprehensive data is available and for consistency with the 2008 baseline used in the Truckee Donner Public Utility District Greenhouse Gas Emissions Inventory. Sierra Business Council prepared these inventories in 2016 and presented to Council on August 9, 2016.

This report documents the results of the 2016 GHG emissions re-inventories with a comparison to the 2008 baseline GHG emissions inventories, and 2020, 2030 and 2050 business as usual (BAU) and adjusted scenario emissions forecasts for community-wide activities and sources, and the municipal operations of the Town of Truckee. The Executive Summary presents a general overview of the aforementioned inventories and forecasts of community-wide and municipal-operations GHG emissions. More detailed discussion of each inventory is provided in the Community-Wide Inventory Results and Municipal-Operations Inventory Results sections of the report. Sierra Business Council prepared these re-inventories and forecasts in 2017and 2018 and presented to Council on May 8, 2018.

With guidance from the Town's staff, the Sierra Business Council (SBC) completed all emissions estimates following the Local Government Operations Protocol (LGOP) and the United States Community Protocol (USCP). More information on the boundaries used to determine which emissions were included and the protocols used in the development of the inventories is provided in the Inventory Methodology section of this report.

This report is intended to guide local GHG emissions reduction efforts, provide a comparison to the Town's baseline performance and demonstrate progress in reducing emissions. This report can also be used for comparisons with forecasted emissions and to set emissions reduction targets in a Climate Action Plan. Through these and other efforts, the Town of Truckee can achieve benefits beyond reducing emissions. These benefits include saving community members' and tax payers' money, improving the Town's economic vitality and ultimately increasing the quality of life for residents and other community members.

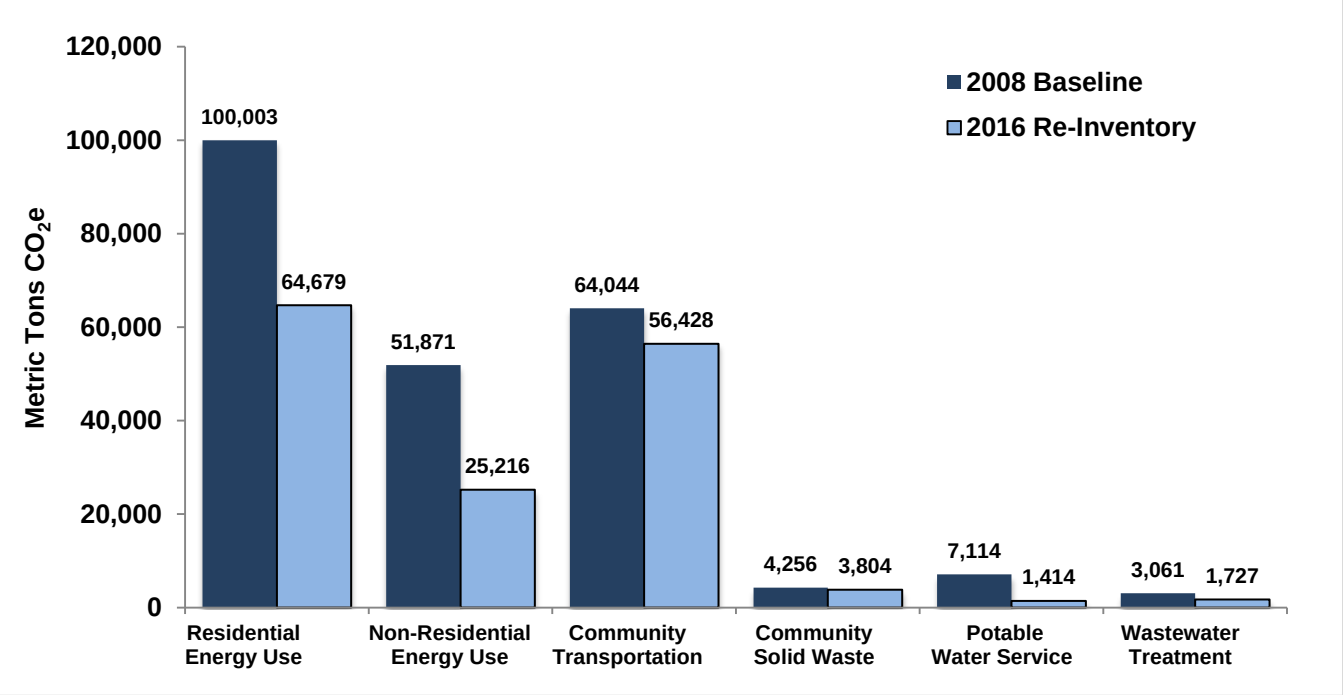
[1] http://www.townoftruckee.com/government/town-council

Community-Wide GHG Emissions Summary

In 2008, Truckee's residents and businesses emitted an estimated 230,349 metric tons of CO_2e as reported in the community-wide inventory. In 2016, the community's emissions decreased by approximately 33% to 153,268 metric tons of CO_2e primarily due to Truckee Donner Public Utility District (TDPUD) increasing the percent of renewables in their portfolio from 4.5% in 2008 to 60% in 2016.[2] This greatly exceeds the 25% of renewables in their portfolio required of utilities by California's RPS in 2016, the 30% required in 2020, and the 50% required in 2030. This is the main reason that the actual emissions in 2016 were lower than the forecasted BAU emissions in 2020 and 2030.

Figure ES-1 summarizes the community-wide GHG emissions which the Town of Truckee has the greatest potential to influence. The largest contributor to community emissions in the inventory is residential energy use, followed by community transportation, which includes on-road passenger, freight and public transit vehicles as well as off-road vehicles and mobile equipment. In conducting the 2016 re-inventory of Community-Wide emissions, three corrections were made to the previously conducted 2008 baseline inventory. These corrections resulted in a reduction in the 2008 baseline emissions of 6,839 metric tons of CO_2e.

Figure ES-1: 2008 &2016 Community-Wide GHG Emissions (Metric Tons CO_2e)



In addition to the emissions included in Figure ES-3, several information items were recorded separately from the community total to avoid overlap with other reported emissions or excluded from GHG inventories by USCP guidance. Truckee's community-wide inventory Information Items include electric on-road vehicles, transit vehicles,

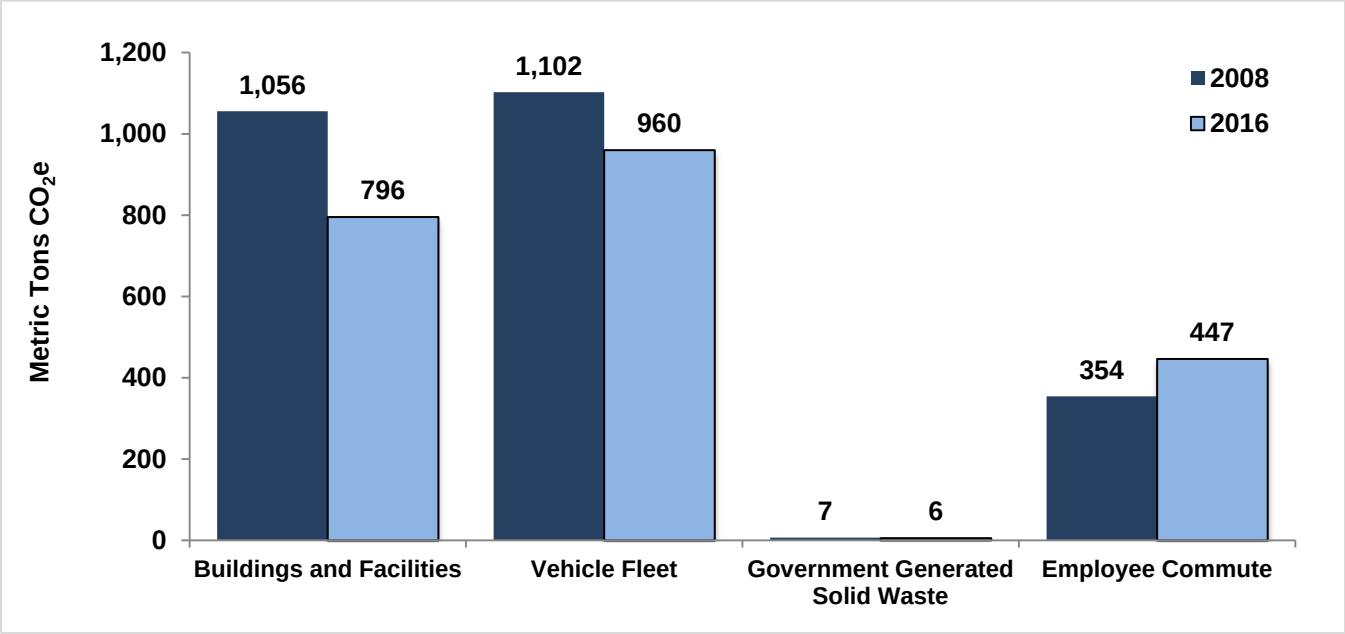
[2] TDPUD's 2016 power content label can be found at http://www.energy.ca.gov/pcl/labels/2016_labels/Truckee_Donner.pdf

and the collection and transportation of community-generated solid waste because emissions from these activities are counted elsewhere in the inventory. Also reported as an Information Item is the biogenic CO_2 produced from wood burned for home heating and from combustion of wastewater treatment digester gas. Biogenic CO_2 is not included in GHG emissions inventories because the same CO_2 would be produced if the wood or biogas (or other organic material) were left to decompose naturally.

Municipal-Operations GHG Emissions Summary

In 2008, the Town of Truckee's municipal operations emitted 2,519 metric tons of CO_2e reported in this municipal-operations inventory. In 2016, these emissions decreased 12% to 2,208 metric tons of CO_2e. As shown in Figure ES-2, the largest sources of emissions within the 2008 and 2016 municipal-operations inventories are the Vehicle Fleet (which includes all municipal on-road vehicles as well as off-road vehicles and mobile equipment) and Buildings and Facilities.

Figure ES-2: 2008 & 2016 Municipal-Operations GHG Emissions (Metric Tons CO_2e)



In addition to the emissions included in Figure ES-4, the following Information Items were recorded: biogenic CO_2 emissions resulting from biodiesel combustion by the Public Works department, and emissions from community-generated solid waste at the Train Depot and Downtown Cans which is collected by the Town, but generated by the community rather than municipal operations.

Community-Wide Forecasted Emissions Summary

To give additional context to the 2016 re-inventory's findings, Truckee's Community-Wide annual emissions were forecast out to 2020, 2030 and 2050 under a business-as-usual (BAU) scenario. From 2008 to 2020, 2030, 2040, and 2050, annual emissions were forecasted to increase by 3%, 9%, 15% and 19% as shown in Table ES-1. This equates to

230,249 metric tons of carbon dioxide equivalent (CO_2e) emitted in 2008, 236,800 metric tons of CO_2e emitted in 2020, 250,973 metric tons of CO_2e emitted in 2030, 263,923 metric tons of CO_2e emitted in 2040, and 274,427 metric tons of CO_2e emitted in 2050, as shown in Figure ES-3. The Town's municipal-operations emissions are included within the community-wide emissions, so a separate forecast for municipal-operations emissions was not completed. The BAU forecast, completed using the Statewide Energy Efficiency Collaborative (SEEC) ClearPath California toolkit, estimates how emissions would change from 2008 to 2020, 2030, 2040, and 2050 in the absence of any new emissions reductions policies and programs. Baseline data was collected from Truckee's 2008 Community-Wide GHG Inventory.

In addition to the BAU forecast, the adjusted scenario takes into account both the latest Renewable Portfolio Standard (RPS) requirements applicable to utilities in California and the Clean Car Standards. The scenario does not account for changes in per-capita energy use or per-capita vehicle miles traveled. Under the adjusted scenario, from 2008 to 2020, 2030, 2040, and 2050 emissions were forecast to decrease by 26%, 31%, 29% and 26%, as shown in Table ES-1 and presented graphically in Figure ES-4.

Table ES-1: Forecasted Community-Wide Emissions (Metric Tons CO_2e)

Year	BAU Forecast		Adjusted Forecast	
	Metric Tons of CO_2e	% Change From 2008 Emissions	Metric Tons of CO_2e	% Change From 2008 Emissions
2008	230,349	--	230,349	--
2020	236,800	+ 3%	170,265	- 26%
2030	250,973	+ 9%	159,845	- 31%
2040	263,923	+ 15%	164,597	- 29%
2050	274,427	+ 19%	170,490	-26%

Figure ES-3: Forecast of Community Wide Emissions Under a BAU Scenario

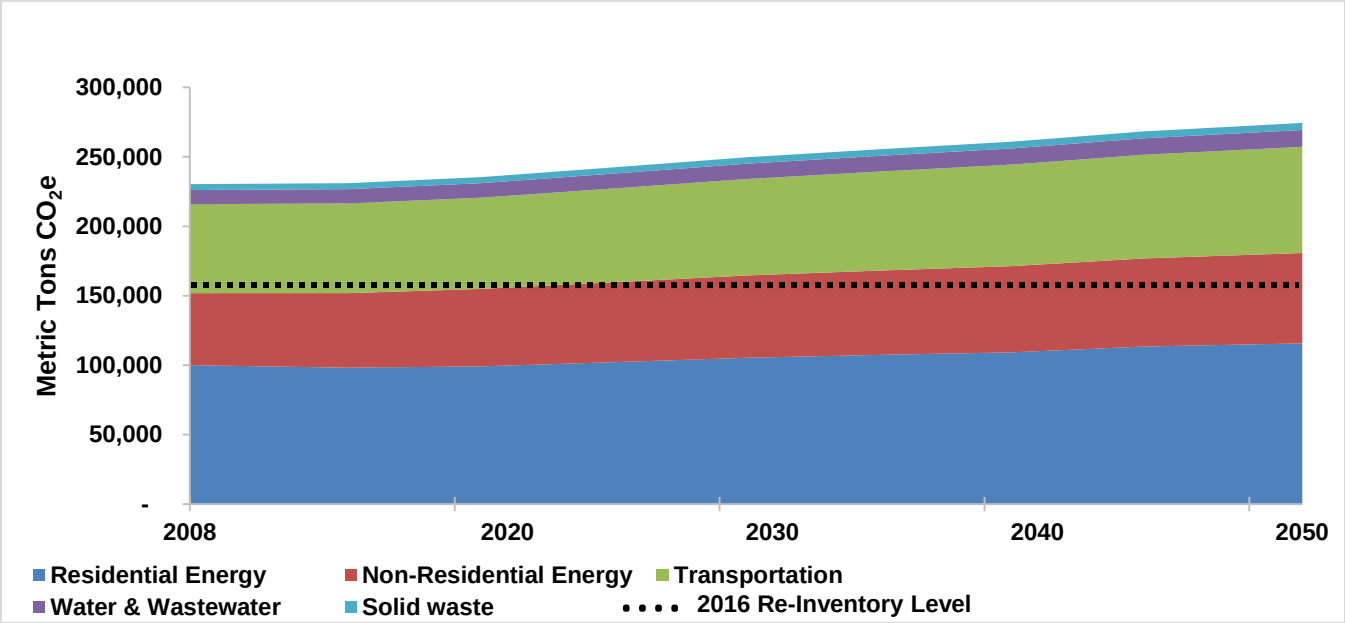
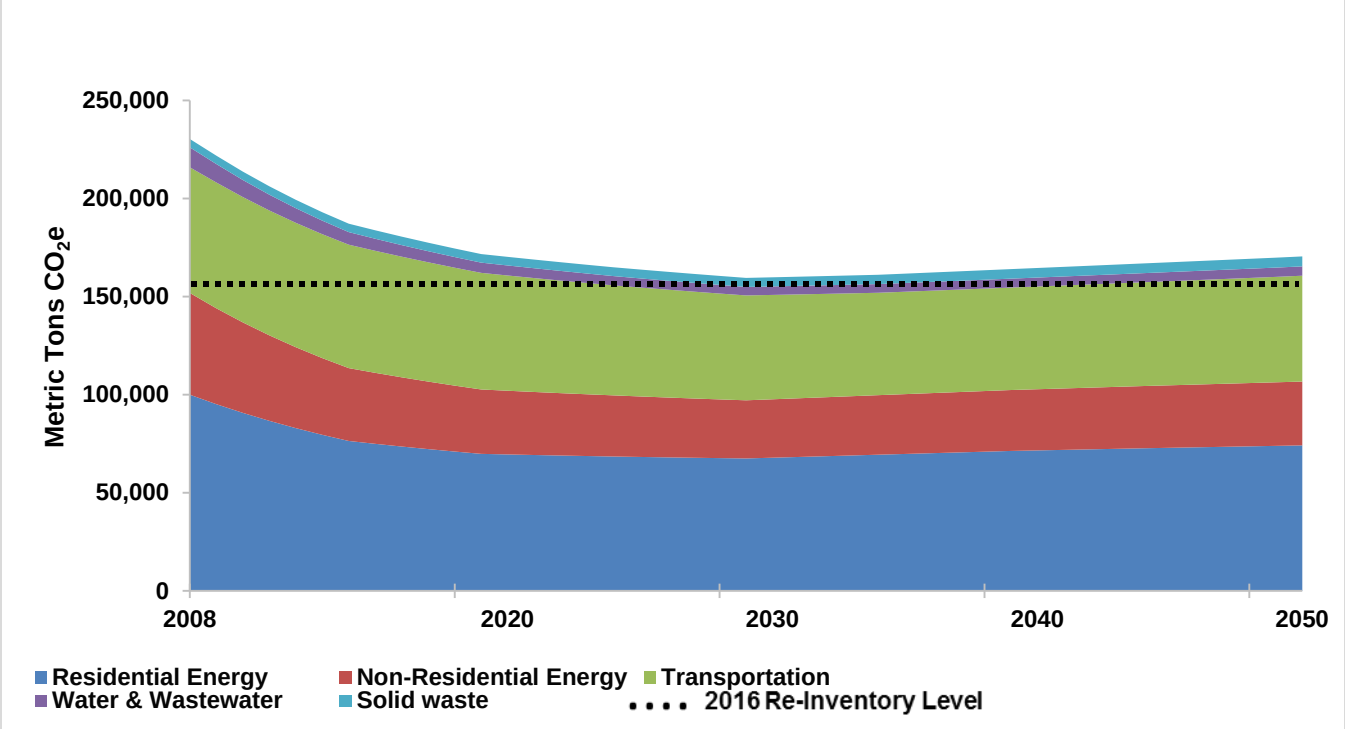


Figure ES-4: Forecast of Community-Wide Emissions Under an Adjusted Scenario



Introduction

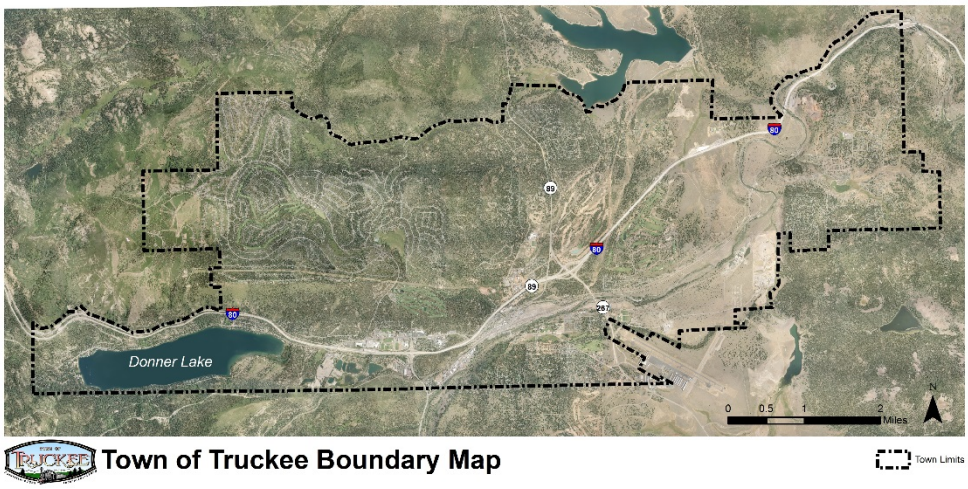
The Town of Truckee is a high Sierra community located on the Truckee River in California's Nevada County, and includes historic Donner Lake within its boundaries. The incorporated boundaries include nearly 34 square miles and range in elevation from 5,500 to 7,500 feet. From 2008 to 2016, the Town's population decreased approximately 1%, from 15,975 to 15,779 though the number of housing units in Truckee increased 6% from 12,372 to 13,118 based on the California Department of Finance population and housing estimates.[3,4] Every day, Truckee plays host to a variety of activities crucial to a properly functioning and robust community: burning fuel for transportation, collecting and treating waste, lighting, heating and cooling buildings. All of these activities contribute either directly or indirectly to the addition of carbon dioxide and other greenhouse gases (GHGs) into the environment.

In California, governments, businesses and the general public are placing increasing focus on quantifying and reducing GHG emissions. California's legislature and regulatory agencies have established policies relating to GHG emissions reductions. Specific regulatory policies and goals are discussed in more detail in the California Policy section to follow. In addition the Town Council has placed an importance on reducing emissions. In 2017 it passed Resolution 2017-58, which sets goals for the Town of 100% renewable electricity by 2030, 80% reduction in GHGs by 2040 and 100% renewable energy by 2050[5]. Furthermore, incorporated in the Town Council Goals for 2018 is the sustainability goal to continue to "Keep Truckee Green"[6].

Due to these drivers and other motivations, the Town of Truckee directed the Sierra Business Council to conduct baseline inventories and re-inventories of emissions resulting from both community activities and sources, and Truckee's municipal operations in 2008 and 2016. In addition, the Town of Truckee directed Sierra Business council to conduct a Business as Usual (BAU) forecast of emissions resulting of community activities and sources for 2020, 2030, and 2050. This report documents the findings and methodologies of the inventories of both 2008 and 2016 community-wide and municipal-operations inventories as well as the community-wide BAU forecast.

[3] California Department of Finance Population Estimates E-8 Report. Accessed 11/11/2017. Available at: http://www.dof.ca.gov/research/demographic/reports/estimates/e-8/2000-10/
[4] California Department of Finance Population Estimates E-5 Report. Accessed 11/11/2017. Available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/
[5] Town of Truckee Resolution 2017-58. Accessed 4/30/2018. Available at: http://laserfiche.townoftruckee.com/WebLink/DocView.aspx?dbid=0&id=59300835&page=1&cr=1
[6] Town of Truckee 2018 Town Council Goals: Accessed 4/30/2018. Available at http://www.townoftruckee.com/government/town-council

Figure 1: Town of Truckee - Jurisdictional Boundary



The Town of Truckee has already implemented projects that have or will lead to ancillary benefits in the form of energy conservation and greenhouse gas mitigation. These include:

- Added hybrid and electric vehicles to municipal fleet.
- Upgraded and retrofitted municipal buildings.
- Partnered with the Truckee Donner Public Utility District (TDPUD) to provide electric vehicle charging station at the Depot.
    - Private developers have installed Tesla charging stations, and a hydrogen fuel cell recharging station is currently being built.
- Consolidated many of the Town's environmental programs and outreach under Keep Truckee Green (keeptruckeegreen.org)
- Installed solar PV system at the Stevens Lane Corp Yard.
- Passed Resolution 2017-58[7] establishing community wide goals of:
    - 100% renewable electricity by 2030
        - Town facilities by 2020
    - 80% reduction in community baseline GHG emissions by 2040
    - 100% renewable energy by 2050
- Updated solid waste collection services to reduce the use of plastic waste bags.

Climate Change Background

Naturally occurring gases dispersed in the atmosphere influence the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Abundant scientific evidence shows that human activities are increasing the concentration of GHGs and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other GHGs into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower-atmospheric temperatures to rise.

[7] Town of Truckee, Resolution 2017-58: http://laserfiche.townoftruckee.com/WebLink/0/doc/59300835/Page6.aspx

The Intergovernmental Panel on Climate Change (IPCC) is the scientific body charged with bringing together the work of thousands of climate scientists. The IPCC's Fourth Assessment Report states: "warming of the climate system is unequivocal."[8] Furthermore, the report finds that "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations."

It was confirmed in August 2017 that 2016 was the warmest year in the 137-year period of U.S. National Oceanic and Atmospheric Administration (NOAA) record keeping. Consecutive high monthly temperature records were set from January through August of 2016. The global temperatures in 2016 were strongly influenced by strong El Niño conditions. The average Arctic sea ice extent for January 2016 was 7.1 percent below the 1981–2010 average. This was the smallest January extent since records began in 1979, according to analysis by the National Snow and Ice Data Center based on data from NOAA and NASA.[9] The steady uptick in average temperatures will likely have significant negative impacts on California's environment and economy if action is not taken to greatly reduce GHG emissions.

Reducing fossil fuel use in communities has many benefits in addition to reducing greenhouse gas emissions. For example, retrofitting homes and businesses to be more efficient creates local jobs, reduces energy costs, improves air quality, and improves community members' health. In addition, money not spent on energy is more likely to be spent at local businesses, improving the local economy.[10]

Regional and Local Impacts

Truckee, like all communities in the Sierra Nevada, faces unique challenges associated with climate change in the region. Forests face the threat of increased catastrophic wildfires, new diseases, altered species composition and other effects of rapid landscape transformation. Potential impacts on water resources include reduced snowpack, delayed snow accumulation, earlier snow melting and ultimately shortages in runoff and water supply. Increased frequency and altered timing of flooding will increase risks to people, ecosystems and infrastructure. With rapid change, loss of critical habitat and alteration of fragile ecosystems is likely. Since local economies in the Sierra Nevada rely so heavily on these natural resources for tourism, recreation, forestry and other industries, climate change has the potential to negatively affect economic activity, and ultimately impact quality of life for community members.

California Policy

California has been a leader in developing policies that aim to reduce GHG emissions, and these policies are some of the drivers behind the completion of GHG inventories at the local level. The major policies are described here.

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[8] IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

[9] https://www.ncdc.noaa.gov/sotc/

[10] American Council for an Energy Efficient Economy: Energy Efficiency and Economic Opportunity. Accessed 4/30/2018. Available at: http://aceee.org/blog/2012/09/energy-efficiency-and-economic-opport

State Emissions Reduction Targets

California passed the Global Warming Solutions Act (AB 32) in 2006, which charged the California Air Resources Board (CARB) with implementing comprehensive regulatory, reporting and market mechanisms to achieve quantifiable reductions in GHG emissions statewide. AB 32 requires statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through a comprehensive suite of actions, the most visible of which is an enforceable statewide cap on GHG emissions that went into effect in 2012. Additionally, Executive Order S-3-05 establishes a long-range target of reducing GHG emissions 80% below 1990 levels by 2050. The Executive Order is binding only on State agencies, and has no force of law for local governments; however, the signing of S-3-05 sent a clear signal to the California Legislature and local jurisdictions on the long-range goal for California. In April 2015, Governor Brown set an interim target for California of reducing GHG emissions to 40% below 1990 levels by 2030 in Executive Order B-30-15.

The AB 32 Scoping Plan provides guidance on how local governments can help the State reach these goals; specifically the Plan recommends that local governments establish an emissions reduction goal of 15 percent below "current" levels by 2020.[11] "Current" levels are considered to be between 2005 and 2010. The first update to the AB 32 Scoping Plan released in 2013 recommends that local governments set goals consistent or exceeding the statewide goal of reducing emissions 80 percent below 1990 levels by 2050.[12] Truckee's GHG emissions inventory is intended to enable the Town to develop effective GHG reduction policies in line with these state goals and programs and track emissions reduction progress.

Senate Bill 375 and Metropolitan Planning Organizations

Senate Bill (SB) 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets and land use planning and housing allocation efforts. SB 375 requires each Metropolitan Planning Organization (MPO) to adopt a Sustainable Community Strategy (SCS) as part of the MPO's Regional Transportation Plan (RTP) that sets land use allocation and transportation investments necessary to meet GHG emissions reduction targets for the region.

With the assistance of the Regional Targets Advisory Committee (RTAC) and in consultation with the MPOs, CARB provided each affected region with reduction targets for GHGs emitted by passenger cars and light trucks for 2020 and 2035. Truckee is not part of a MPO region and therefore does not have requirements under SB 375.

[11] The AB 32 Scoping Plan is available at: http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm
[12] The first update to the AB 32 Scoping Plan is available at: http://www.arb.ca.gov/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf

California Environmental Quality Act

Another policy driver for climate action planning in California is SB 97, which established that GHG emissions and their impacts are appropriate subjects for analysis under the California Environmental Quality Act (CEQA). This law, passed in 2007, directed the State's Office of Planning and Research (OPR) to develop CEQA guidelines on the mitigation of GHG emissions for agencies, such that they may follow appropriate standards on calculating GHG emissions from projects, determine potential significance, and implement mitigation measures if necessary and feasible.

Energy-Efficiency and Renewable Energy Standards

California's Renewable Portfolio Standard (RPS) requires investor-owned utilities, electric service providers and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. In 2015, SB 350 was signed into law increasing the RPS requirements for 2030 to 50% renewable electricity procurement and directs the State Energy Resources Conservation and Development Commission to establish statewide efficiency standards that will result in a doubling of energy-efficiency savings.

California's Building Energy Efficiency Standards (California Code of Regulations, Title 24, Part 6) were recently updated to require new buildings to become even more energy-efficient than under the previous code. According to the California Energy Commission the new 2016 standards, which became effective in January 2017, will increase the efficiency of new construction by 25 percent for residential uses and 30 percent for nonresidential uses, compared to the 2008 Title 24 standards previously in effect. The 2019 standards, set to become effective in January 2020, will require near zero net energy consumption for new residential construction.

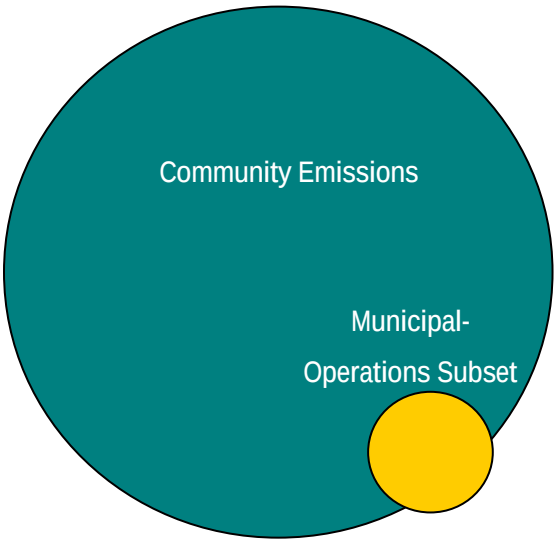
Inventory Methodology

This section provides information on the protocols and specific inventory methodologies used in the development of the community-wide and municipal-operations GHG emissions inventories.

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible GHG emissions reductions requires identifying baseline levels and sources of emissions in the community. As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential.

Figure 2: Municipal-Operations Inventory as a Subset of the Community-Wide Inventory.



Standard processes of accounting for emissions have been developed to which these inventories adhere. The inventories use the approach and methods provided by the U.S. Community Protocol (USCP) and the Local Government Operations Protocol (LGOP), both of which are described below.[13]

Note that the municipal-operations inventory is a subset of the community inventory. For example, non-residential energy use by the community includes energy consumed by municipal buildings within the community, and community vehicle miles traveled include miles driven by municipal fleet vehicles and employees' personal vehicles used in their commute to work. While the majority of municipal-operations emissions are captured within the community-wide inventory, there are potential emissions from municipal buildings or facilities located outside of the Town limits that are not captured in the community-wide inventory. This relationship is illustrated in Figure 2.

U.S. Community Protocol

The USCP was released by ICLEI in October 2012, and represents the national standard in guidance to help U.S. local governments develop effective community-wide GHG emissions inventories. It establishes reporting requirements for

[13]Local Government Operations Protocol (LGOP). http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol
U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. http://www.icleiusa.org/tools/ghg-protocol/community-protocol.

all community-wide GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emissions sources and community-wide activities, and provides reporting frameworks to help local governments customize their community-wide GHG emissions inventory reports based on their local goals and capacities. The State of California Governor's Office of Planning and Research recommends that California local governments follow the USCP when undertaking their greenhouse gas emissions inventories. SBC used the USCP to inventory Truckee's community-wide emissions.

Local Government Operations Protocol

In 2008, ICLEI, CARB, and the California Climate Action Registry (CCAR) released the LGOP to serve as the national standard for quantifying and reporting GHG emissions from local government (or municipal) operations. The purpose of the LGOP is to provide the principles, approach, methodology, and procedures needed to develop a municipal-operations GHG emissions inventory. SBC used the LGOP to inventory Truckee's municipal-operations emissions.

Greenhouse Gas Emissions

The USCP and LGOP recommend assessing emissions from the six internationally recognized GHGs regulated under the Kyoto Protocol and listed in Table 1. The municipal-operations inventory included analysis of emissions of each of these gases, although no perfluorocarbons or SF_6 emissions were found. Emissions of hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the community-wide inventory because of the difficulty in obtaining data on these emissions at a community scale.

Greenhouse gas emissions are commonly aggregated and reported in terms of equivalent carbon dioxide units, or CO_2e. This standard is based on the Global Warming Potential (GWP) of each gas, which is a measure of the amount of warming a GHG may cause over a 100-year period, measured against the amount of warming caused by carbon dioxide. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different GHGs in comparable terms. For example, methane is twenty-five times more powerful than carbon dioxide in its warming effect over 100 years; so one metric ton of methane emissions is equal to twenty-five metric tons of carbon dioxide equivalents. Table 1 presents the GWPs of the commonly occurring GHGs according to the Intergovernmental Panel on Climate Change's 4th Assessment Report.[14, 15]

[14] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[15] The 5th Assessment Report is currently out but, is not yet in general use by the State of California

Table 1: Greenhouse Gases

Greenhouse Gas	Chemical Formula	IPCC 4th Assessment Global Warming Potential
Carbon Dioxide	CO_2	1
Methane	CH_4	25
Nitrous Oxide	N_2O	298
Hydrofluorocarbons	Various	38-12,200
Perfluorocarbons	Various	9,500-18,200
Sulfur Hexafluoride	SF_6	32,600

Quantifying Greenhouse Gas Emissions

Establishing a Base Year

The inventory process requires the selection of a base year in order to compare baseline emissions against current and future emissions inventories. Truckee's baseline GHG emissions inventories use 2008 for the base year; selected because it is one of the earliest years for which relatively comprehensive data is available and for consistency with the 2008 baseline used in the Truckee Donner Public Utility District Greenhouse Gas Emissions Inventory. The emissions quantified in this report will serve as the baseline for the development of emissions forecasts and for comparison with emissions in future inventories to track progress in emissions reductions.

Establishing Boundaries

Setting an organizational boundary for GHG emissions accounting and reporting is an important step in the inventory process. The organizational boundary for an inventory determines which aspects of municipal operations and community-wide activities are included in the emissions inventory and which aspects are excluded.

Community-Wide Inventory Boundaries

Under the USCP, there are three available reporting frameworks; Local Government Significant Influence, Community-Wide Activities and Household Consumption. The USCP recommends the Local Government Significant Influence framework, which emphasizes policy relevance, highlighting emissions sources and activities that the local government has the greatest opportunity to address. The Local Government Significant Influence framework also includes all five of the Basic Emissions Generating Activities required by the USCP to be protocol compliant: 1) Use of Electricity by the Community, 2) Use of Fuel in Residential and Commercial Stationary Combustion Equipment, 3) On-Road Passenger and Freight Motor Vehicle Travel, 4) Use of Energy in Potable Water and Wastewater Treatment and Distribution and 5) Generation of Solid Waste by the Community. For this reason, the community-wide inventory was conducted according to the Local Government Significant Influence framework in order to provide as complete a picture as possible of all of the direct GHG emissions produced within the community.

Several potential emissions sources were omitted from this inventory because of data limitations or uncertainty in the emissions calculation methodologies. The omitted emissions are from passenger rail and air travel by community

members, leaked refrigerants and fire suppressants in the community, emissions associated with the cultivation of agriculture and livestock, and emissions from forest fires, forest management activities and crop burning.

Municipal-Operations Inventory Boundaries

Under the LGOP, two frameworks can be used for reporting emissions at the municipal-operations level: operational control or financial control. A local government has operational control over an emissions source if it has full authority to introduce and implement policies or programs that impact the emissions source. A local government has financial control if the emissions source is fully consolidated in financial accounts. The LGOP strongly encourages local governments to utilize operational control as the organization boundary for a municipal-operations emissions inventory. Operational control is believed to most accurately represent the emissions sources that local governments can directly influence, and this boundary is consistent with other environmental and air quality reporting program requirements. For this reason, the municipal-operations inventory was conducted using the operational control framework.

Quantification Methods

All of the emissions in this report were quantified using calculation-based methodologies. Calculation-based methodologies calculate emissions using activity or source data and emissions factors, in accordance with the following basic equation: *Activity or Source Data x Emissions Factor = Emissions.* Activity or source data refers to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption or annual vehicle miles traveled. Standard emissions factors are applied to activity or source data to determine the associated emissions. Emissions factors are typically expressed as emissions per unit of activity or source data (e.g. lbs CO_2/kWh of electricity). Please refer to the appendices provided for a detailed listing of the activity / source data and emissions factors used in development of these inventories.

Evaluating Emissions

There are several important concepts involved in the analysis of emissions arising from many different sources and chemical / mechanical processes throughout the community. There are four main emissions types discussed throughout this report.

- **Stationary or mobile combustion:** These are emissions resulting from on-site combustion of fuels (natural gas, diesel, gasoline, etc.) to generate heat, electricity, or to power vehicles and mobile equipment.
- **Purchased electricity, district heating, cooling or steam:** These are emissions produced by the combustion of fuels by utilities or other facilities outside of the operational control of the Town or community members.
- **Fugitive emissions:** These are emissions that result from the unintentional release of GHGs into the atmosphere (leaked refrigerants, methane from waste decomposition, etc.).

- **Process emissions**: These are emissions from physical or chemical processing (e.g., wastewater treatment).

Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two categories of emissions are used in the community-wide inventory: 1) GHG emissions that are produced by "sources" located within the community boundary, and 2) GHG emissions produced as a consequence of community "activities" and may be produced outside of the community boundary.

Table 2: Source vs. Activity

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere ***(for example, natural gas combusted at homes and business)***	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions that may be outside of the community boundaries ***(for example, electricity used at homes and business)***

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. Some emissions can be categorized as both source and activity. For example, fuel used for heating is both a source of emissions within the community as well as a community activity. In these cases, the emissions are considered a source because they are known to have originated within the community. Alternatively, on-road transportation emissions calculated using a transportation model are based on estimates of the travel of community members in the region and are therefore considered an activity because a portion of emissions occur outside the jurisdiction. The division of emissions into sources and activities for community-wide inventories replaces the scopes framework that is used in municipal-operations inventories.

Emissions by Scope

For the municipal-operations inventory, emissions are categorized by scope, rather than into sources and activities. The scopes framework identifies three scopes for municipal-operations emissions:

- **Scope 1:** All direct stationary combustion, fugitive and process emissions from a facility or piece of equipment operated by the local government. Examples include tailpipe emissions from local government vehicles, and emissions from a furnace in a local government building.

- **Scope 2:** Indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, and cooling. Scope 2 emissions occur as a result of activities that take place within the organizational boundary of local government, but that rely upon emissions-producing processes often located outside of the organizational boundary.

- **Scope 3:** All other indirect or embodied emissions not covered in Scope 2 that occur as a result of activity within the organizational boundary. Examples include emissions associated with the disposal of solid

waste generated by the local government (which occur over time as the waste decomposes) and the emissions associated with employees' personal commute to work.

The LGOP requires reporting of all Scope 1 and Scope 2 emissions within the local government's operational or financial control. Using the scopes framework helps prevent double counting of emissions, specifically where one jurisdiction's Scope 2 emissions from electricity use could potentially be another jurisdiction's Scope 1 emissions from the stationary combustion of fuels to produce electricity. For this reason, emissions with different scopes can, with caution, be summed within a jurisdiction, though should not be summed across jurisdictions. In addition to the categories in the scopes framework, emissions sources may also be highlighted as Information Items.

Information Items

Information Items are GHG emissions that are either reported separately from total emissions to avoid overlap with other reported emissions or excluded from emissions totals by protocol guidance.

A common source of emissions that is categorized as an information item is the combustion of biogenic fuels that releases carbon dioxide. Local governments, industrial facilities and community members sometimes burn fuels that are of biogenic origin (wood, landfill gas, organic solid waste, biofuels, etc.) to generate heat or electricity. Carbon dioxide emissions from the combustion of biogenic fuels are not included in Scope 1 emissions, in accordance with established international principles. Methane and nitrous oxide emissions from biogenic fuels are considered Scope 1 stationary combustion emissions and are included in the stationary combustion sections for the appropriate facilities.

These principles reflect that biogenic fuels, if left to decompose in the natural environment, would release CO_2 into the atmosphere, where it would then enter back into the natural carbon cycle. Therefore, when wood or another biogenic fuel is combusted, the resulting CO_2 emissions are akin to the natural emissions during decomposition and should therefore not be considered as human activity-generated emissions. The CH_4 and N_2O emissions, however, would not have occurred naturally and are therefore included as Scope 1 emissions. Because there is continued debate over the true effect of biogenic fuels, the emissions from the combustion of biogenic fuels are included as Information Items.

Another common source of emissions that is categorized as an information item is ozone-depleting substances used as refrigerants. Ozone-depleting substances are regulated under the Montreal Accord and are therefore not considered GHG emissions under the Kyoto Protocol. The most common ozone-depleting substances in use as refrigerants, R-12 and R-22, are reported as Information Items because they still have global warming potential and in the future will be replaced by non-ozone depleting refrigerants that will have to be reported as GHG emissions in future inventories.

Information Items quantified for this report include:

- **Municipal-Operations Inventory**

- Community-generated solid waste emissions from waste collected by the Town from the Train Depot and downtown cans.
- Biogenic CO_2 emissions from the public works department's combustion of biodiesel fuel in off-road equipment

- **Community-Wide Inventory**
  - Transportation Sector emissions from electric vehicles, included in Residential and Non-Residential Energy Use Sector emissions.
  - Transportation Sector emissions from transit vehicles (Fixed Route and Dial-a-Ride), included in Community Transportation Sector emissions.
  - Solid Waste Sector emissions from the transportation and collection of community-generated solid waste included in the Community Transportation Sector emissions.
  - Biogenic CO_2 emissions generated from burning wood in residences.
  - Biogenic CO_2 emissions generated by burning wastewater treatment digester gas

Included Sources and Activities

Tables 3 and 4 document all of the emissions sources and activities included in the community-wide and municipal-operations inventories. For a full list of potential emissions activities and sources for the community-wide inventory please refer to Appendix A.

Table 3: Sources and Activities Included in the Town of Truckee Community-Wide Inventory

Sector	Source	Activity	Information Items
Residential Energy Use	Stationary Fuel Combustion in the Community	Electricity Use in the Community and Associated Transmission and Distribution Losses	Biogenic Fuel Combustion in the Community
Non-Residential Energy Use	Stationary Fuel Combustion in the Community	Electricity Use in the Community and Associated and Transmission and Distribution Losses	
Community Transportation	Fuel Combustion in Off-Road Vehicle Travel Associated with Community Land Uses	Fuel Combustion in On-Road Vehicle Travel Associated with Community Land Uses	Transit and Electric Vehicles used by Community Members
Community Solid Waste		Future Decomposition of Solid Waste Produced by the Community	Collection and Transportation of Solid Waste Produced by the Community
Potable Water Service and Wastewater Treatment	Wastewater Treatment Facilities in the Community	Electricity Use Associated with Potable Water & Wastewater Management	Biogenic Digester Gas Combustion

Table 4: Sources and Activities Included in the Town of Truckee Municipal-Operations Inventory

Sector	Scope 1	Scope 2	Scope 3	Information Items
Buildings and Facilities	Natural Gas Combustion	Electricity Use	Electricity Transmission and Distribution Losses, Train Depot Tenant Electricity Use	
Vehicle Fleet	Gasoline and Diesel Fuel Combustion and R-134a Refrigerant Loss			Biogenic Fuel Combustion in the Off-road Equipment
Government Generated Solid Waste			Future Decomposition of Municipal-Operations Waste	Future Decomposition of Community Waste (Train Depot / Downtown Cans)
Employee Commute			Gasoline and Diesel Fuel Combustion	

Significance Thresholds

Within any inventory, there will be emissions sources that fall within the inventory boundaries though are minimal in magnitude or difficult to accurately measure. Within the context of community-wide and municipal-operations inventories, leaked refrigerants and fuel used by backup generators are common sources of these types of emissions. For these less than significant emissions sources, the LGOP specifies that up to five percent of total emissions can be reported using methodologies that deviate from the recommended methodologies in the LGOP or be excluded. In the context of registering emissions with an independent registry (such as The Climate Registry), emissions that fall under this significance threshold are called *de minimis*. For the Town of Truckee's municipal-operations inventory, emissions from leaked refrigerants used in building air conditioning units were excluded as *de minimis*. For the community-wide inventory, emissions from leaked refrigerants and fire suppressants used in the community were excluded as *de minimis*.

Project Resources

This report was made possible by the expertise and resources provided by the Statewide Energy Efficiency Collaborative (SEEC) and ICLEI – Local Government for Sustainability (ICLEI).

Statewide Energy Efficiency Collaborative

The Statewide Energy Efficiency Collaborative (SEEC) provides support to cities and counties to help them reduce GHG emissions and save energy. SEEC is an alliance between three statewide non-profit organizations and California's four Investor-Owned Utilities. SEEC provides education and tools at no cost to representatives of local governments within California, as well as state and regional government agencies, special districts and school districts. These inventories leveraged the expertise and tools provided by SEEC and ICLEI.

All SEEC tools are available at no cost to California local governments and their representatives at www.californiaSEEC.org. The following tools should be saved as resources and supplemental information to this report:

- The "Master Data Workbooks" that contains most or all of the raw data (including emails), data sources, emissions, notes on inclusions and exclusions, and reporting tools
- Detailed instruction documents to assist with data collection, emissions calculations and inventory reporting.

ClearPath California

To facilitate efforts to measure GHG emissions as a first step towards reducing them, ICLEI, on behalf of SEEC, developed ClearPath California in order to provide a no-cost, easy-to-use online tool for California local governments to calculate, monitor, and forecast community-wide and municipal-operations GHG emissions. ClearPath was developed to assist in the preparation of USCP and LGOP compliant GHG inventories.

Community-Wide Inventory Results

The community-wide baseline inventory and re-inventory include estimates of the Town of Truckee's GHG emissions resulting from activities and sources in the community as a whole in 2008 and 2016, respectively. The community-wide inventory was conducted under the Local Government Significant Influence framework of the USCP. This framework is designed to highlight emissions sources and activities which the Town has the greatest ability to influence through education, outreach, incentive, or regulatory policies and programs. For more information on the Local Government Significant Influence framework and specific inventory methods please refer to the Inventory Methodology section of this report and the USCP.

Emissions Summary

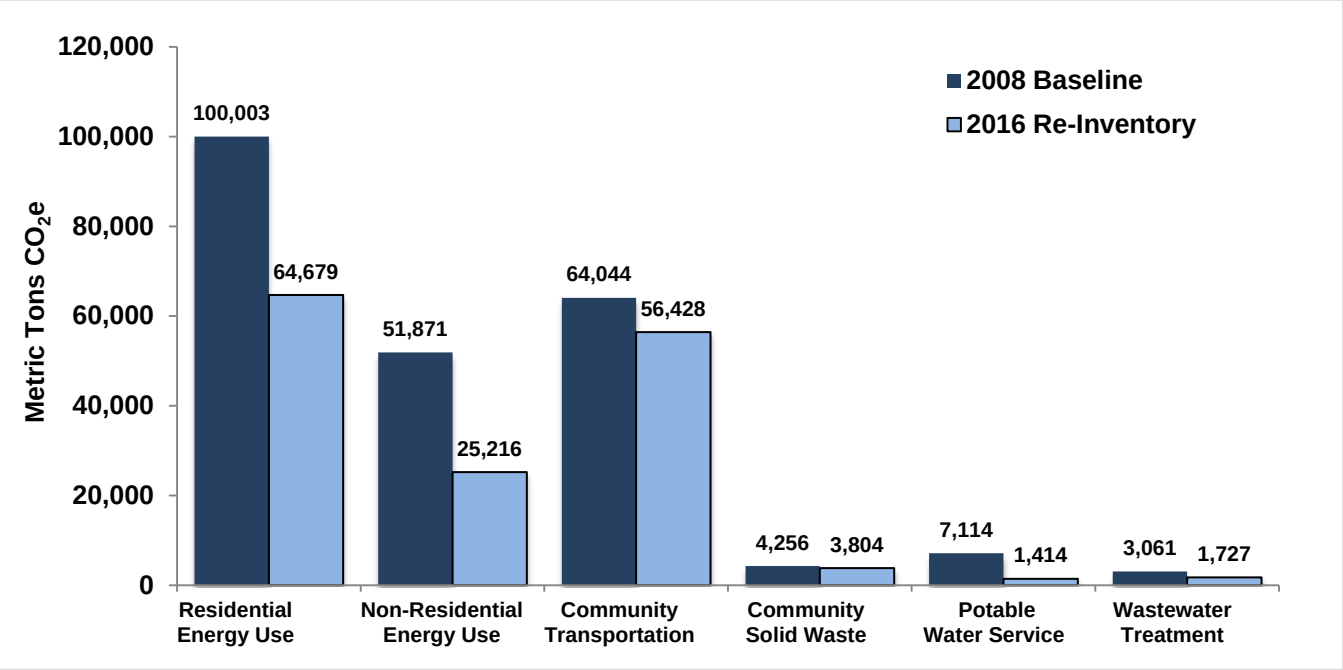
In 2008, the Town of Truckee's residents and businesses emitted an estimated 230,349 metric tons of CO_2e reported within the community-wide inventory. Figure 8 summarizes the community-wide GHG emissions which the Town has the greatest potential to influence. The largest contributor to community emissions in the baseline inventory was residential energy use, followed by community transportation, which includes on-road passenger, freight and public transit vehicles as well as off-road vehicles and mobile equipment. In conducting the 2016 re-inventory of Community-Wide emissions three corrections were made to the previously conducted 2008 baseline inventory. Residential and non-residential natural gas consumption was corrected to exclude a small portion of use that actually occurred in unincorporated Placer County, not the Town of Truckee. Kerosene and fuel oil use in the community was originally under accounted for and corrected. Additionally, wastewater generated by the community was underestimated in the initial baseline. This increase in wastewater electricity use resulted in a decrease in the reported non-residential electricity use in order to not double count electricity use in the community. These corrections resulted in a reduction in the 2008 baseline emissions of 6,839 metric tons of CO_2e.

In 2016, the Town of Truckee residents and businesses emitted an estimated 153,268 metric tons of CO_2e reported within the community-wide re-inventory, a 33% reduction from 2008 emissions. Figure 3 shows that the largest source of community emissions is still residential energy, followed closely by community transportation. Large reductions in residential and non-residential emissions from 2008 to 2016 can primarily be attributed to TDPUD's increased procurement of renewable energy. In 2008, only 4.5% of electricity provided by TDPUD came from renewable sources. In 2016, 60% of electricity provided by TDPUD came from renewable sources.[16] This greatly exceeds the

[16] TDPUD's 2016 power content label can be found at http://www.energy.ca.gov/pcl/labels/2016_labels/Truckee_Donner.pdf

25% of renewables in their portfolio required of utilities by California's RPS in 2016, the 30% required in 2020, and the 50% required in 2030. This is the main reason that the actual emissions in 2016 were lower than the forecasted BAU emissions in 2020 and 2030. Additionally, large reductions in emissions from potable water consumption can be attributed to TDPUD's increased procurement of renewable energy, along with a 50% decrease in water consumption.

Figure 3: 2008 and 2016 Community-Wide GHG Emissions (Metric Tons CO_2e)



Community-wide GHG emissions categorized as source emissions are those that are produced within the community boundaries. Community-wide GHG emissions categorized as activity emissions are those that are produced due to activities of community members, and may result in emissions within or outside of the community boundaries. The most common example of a community activity is electricity use, where the electricity is consumed within the community though the emissions are produced at power plants spread throughout the region. Some emissions can be categorized as both source and activity. For example, fuel used for heating is both a source of emissions within the community as well as a community activity. In cases such as this, the emissions are considered a source because the emissions are known to have originated within the community. Alternatively, on-road transportation emissions calculated using a transportation model are based on the travel of community members in the region and is therefore considered an activity because a portion of emissions occur outside the jurisdiction.

Table 5 presents the community-wide GHG emissions in more detail, as well as additional Information Items that are not included in the community-wide GHG emissions total though are reported here for additional context. Information Items are emissions that are reported separately in GHG inventories either to prevent double counting with other included emissions or by protocol guidance. Values presented in tables and figures may not sum to totals because of rounding. Community-wide inventory Information Items include electric on-road vehicles, transit vehicles, and collection and transportation of community-generated solid waste. Emissions from these items are included in the

Community Transportation totals. Also reported as information items are the biogenic CO_2 produced from wood burned for home heating and from wastewater treatment digester gas combustion. Biogenic CO_2 is not included in GHG emissions inventories because the same CO_2 would be produced if the wood or the biogenic material decomposed naturally.

Table 5: 2008 & 2016 Community-Wide GHG Emissions Summary (Metric Tons CO_2e)

Sector	Metric Tons CO_2e		Percent Change
Residential Energy Use	**2008**	**2016**	
Electricity Use - Primary Homes	31,702	10,542	- 67%
Electricity Use - Secondary Homes	21,401	6,505	- 70%
Stationary Combustion - Natural Gas - Primary Homes	19,990	24,273	+ 21%
Stationary Combustion - Natural Gas - Secondary Homes	15,443	14,888	- 4%
Stationary Combustion - Propane, Fuel Oil, Kerosene, Wood	9,811	6,576	- 33%
Transmission and Distribution (T&D) Losses	1,656	1,897	+ 15%
Total Residential Energy Use	**100,003**	**64,679**	**- 35%**
Non-Residential Energy Use			
Electricity Use	38,346	10,155	- 74%
Stationary Combustion - Natural Gas	11,610	13,120	+ 13%
Stationary Combustion - Propane	724	724	0%
Transmission and Distribution (T&D) Losses	1,190	1,217	+ 2%
Total Non-Residential Energy Use	**51,871**	**25,216**	**- 51%**
Community Transportation			
On-Road Transportation	55,653	48,268	- 13%
Off-Road Vehicles and Mobile Equipment	8,391	8,160	- 3%
Total Community Transportation	**64,044**	**56,428**	**- 12%**
Community Solid Waste			
Community-Generated Solid Waste	4,256	3,804	- 11%
Total Community Solid Waste	**4,256**	**3,804**	**- 11%**
Potable Water and Wastewater Treatment			
Potable Water Electricity Use and T&D Losses	7,114	1,414	- 80%
Wastewater Electricity Use and T&D Losses	2,330	834	- 64%
Wastewater Process and Fugitive Emissions	732	893	+ 22%
Total Potable Water and Wastewater Treatment	**10,175**	**3,140**	**- 69%**
Total Community Emissions	**230,349**	**153,268**	**- 33%**
Information Items			
Home Heating - Wood (Biogenic CO_2)	49,230	54,313	+ 10%
On-Road Electric Vehicles	13	39	+ 200%
Transit Gasoline Fixed Route	6	4	- 33%
Transit Diesel Fixed Route and Dial-a-Ride	112	124	+ 11%
Collection of Community Solid Waste	346	311	- 10%
Transportation of Community Solid Waste	102	93	- 9%

Wastewater Digester Gas Combustion (Biogenic CO_2)	395	592	+ 50%

Residential Energy Use

Truckee's residential energy use generated an estimated 100,003 metric tons of CO_2e in 2008. In 2016 emissions resulting from residential energy use decreased 35% to 64,679 metric tons of CO_2e. These reductions come primarily from increased procurement of electricity produced with renewable energy by TDPUD and Liberty Utilities (formerly Sierra Pacific Power Company) even though electricity use increased during this time. Table 6 shows that the consumption of nearly every type of residential energy increased from 2008 to 2016 with the exception of propane and fuel oil/kerosene.

Table 6: 2008 & 2016 Residential Energy Use

Residential Energy Use	Energy / Fuel Use		Percent Change
	2008	2016	
Electricity Primary Homes (kWh)	75,010,835	82,208,040	+ 10%
Electricity Secondary Homes (kWh)	8,204,392	8,750,777	+ 7%
Electricity T&D Losses (kWh)	4,229,712	4,576,124	+ 8%
Natural Gas Primary Homes (therms)	3,759,367	4,564,702	+ 21%
Natural Gas Secondary Homes (therms)	2,904,103	2,799,762	- 4%
Propane (gallons)	838,915	213,327	- 75%
Wood (Cords)	524,838	579,034	+ 10%
Fuel Oil / Kerosene (gallons)	9,910	2,827	- 71%

Residential energy use emissions were calculated using 2008 and 2016 electricity consumption data provided by Truckee-Donner Public Utility District (TDPUD) and natural gas consumption data provided by Southwest Gas. Liberty Utilities was not able to provide electricity consumption data for 2008, so the average of the 2013 and 2014 consumption was used, as this was the earliest data available. Use was scaled to estimate 2008 consumption using the number of residential service accounts in the Liberty service territory and the number of new households built in the Liberty service territory between 2008 and 2013. Liberty Utilities did provide electricity consumption data for 2016. Non-utility fuel use was estimated based on U.S. Census Bureau data and California average per-household fuel use for each fuel type. Truckee staff estimated the number of households using wood heat as their primary and secondary heating source in 2008. The number of households using wood heat in 2016 was determined based on Town staff provision of the number of permits approved for the removal of wood heat apparatuses between 2008 and 2016. Natural gas, propane (LPG), fuel oil / kerosene and wood are used in residences for home heating, water heating, and cooking. Biogenic emissions from wood combustion are reported as an Information Item. Where possible, residential energy use was broken out between primary and secondary homes based on the utilities' billing system. Truckee has a

high proportion of secondary homes or vacation homes, which constitute over 50 percent of the housing market.[17] Secondary homes will provide unique challenges and will require a different approach when it comes to reducing GHG emissions from residential energy use. Appendix A provides detailed residential energy use data, emissions factors and calculation methods. Table 7 and Figure 4 illustrate the breakdown of residential energy use GHG emissions.

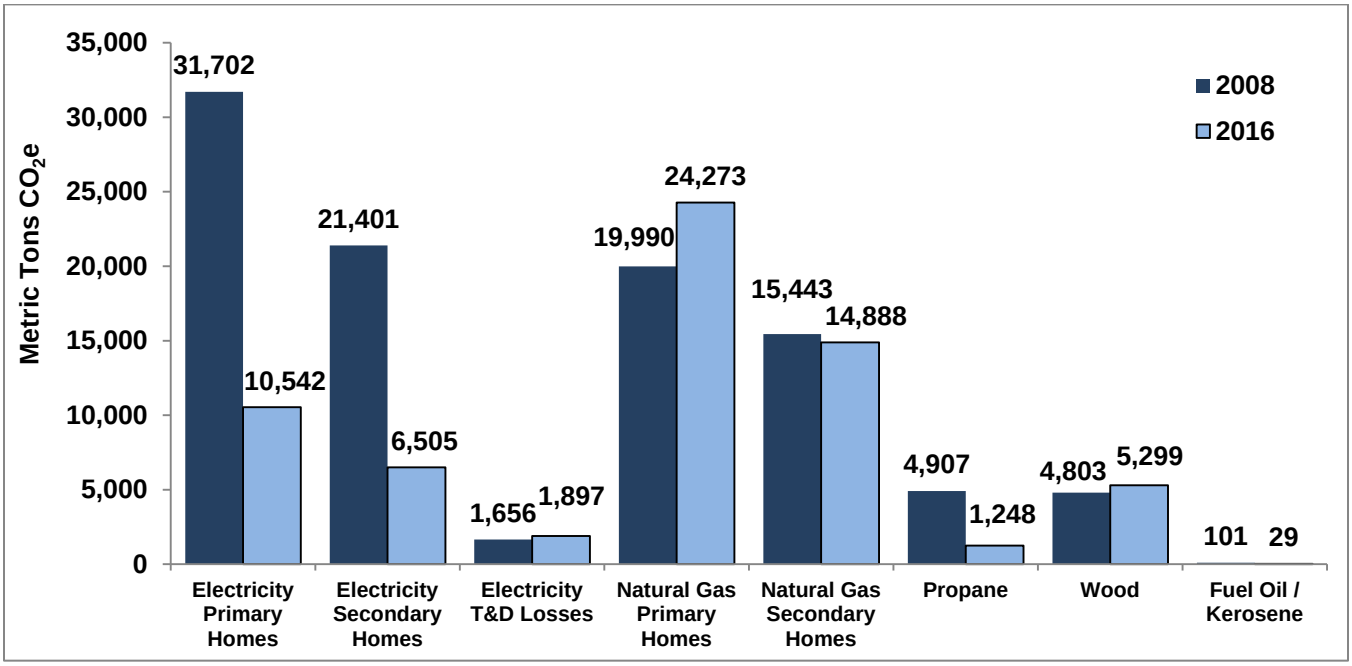
Data on fuel used specifically for residential emergency generators and other equipment, such as lawnmowers, was not available. Emissions resulting from this fuel use are included in the off-road equipment emissions estimates in the Community Transportation Sector. GHG emissions associated with residential transportation, solid waste and wastewater are accounted for in the community transportation, community solid waste and wastewater treatment emissions totals, respectively.

Table 7: 2008 & 2016 Residential Energy Use Emissions (Metric Tons CO_2e)

Residential Energy Use	Metric Tons CO_2e		Percent Change
	2008	2016	
Electricity – Primary Homes	31,702	10,543	- 67%
Electricity – Secondary Homes	21,401	6,505	- 70%
Electricity – Transmission and Distribution Losses	1,656	1,897	+ 15%
Subtotal Electricity	54,749	18,943	- 65%
Natural Gas – Southwest Gas Primary Homes	19,990	24,273	+ 21%
Natural Gas – Southwest Gas Secondary Homes	15,443	14,888	- 4%
Subtotal Natural Gas	35,433	39,160	+ 11%
Home Heating – Propane (LPG)	4,907	1,248	- 75%
Home Heating – Fuel Oil / Kerosene	101	29	- 71%
Home Heating – Wood	4,803	5,299	+ 10%
Total Residential Energy Use	**100,003**	**64,679**	- 35%
Information Items			
Home Heating - Wood (Biogenic CO_2)	49,230	54,313	+ 10%

[17] State of California, Department of Finance, *E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011- 2017.* http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/

Figure 4: 2008 & 2016 Residential Energy Use Emissions (Metric Tons CO_2e)



Non-Residential Energy Use

Truckee's non-residential energy use generated an estimated 51,871 metric tons of CO_2e in 2008. In 2016, emissions resulting from non-residential energy use decreased 51% to 25,216 metric tons of CO_2e. The majority of the reduction in emissions comes from the utilities' increased procurement of electricity generated by renewable energy though a small portion of this reduction can also be attributed to a reduction in non-residential electricity use, shown in Table 8.

Table 8: 2008 & 2016 Non-Residential Energy Use

Non-Residential Energy Use	Energy Use		Percent Change
	2008	2016	
Electricity Use (kWh)	59,776,948	58,355,550	- 2%
Electricity T&D Loss (kWh)	3,038,377	2,935,858	- 3%
Natural Gas (therms)	2,183,380	2,467,396	+ 13%
Propane (gallons)	123,856	123,856	0%

Non-residential energy use emissions were calculated using 2008 and 2016 electricity consumption data provided by Truckee Donner Public Utility District (TDPUD) and natural gas consumption data provided by Southwest Gas. Liberty Utilities was not able to provide electricity consumption data for 2008. Because no new non-residential construction occurred in the Liberty service territory between 2008 and 2013, 2008 consumption was estimated using the average of the 2013 and 2014 consumption, the earliest years for which data was available. Liberty Utilities was

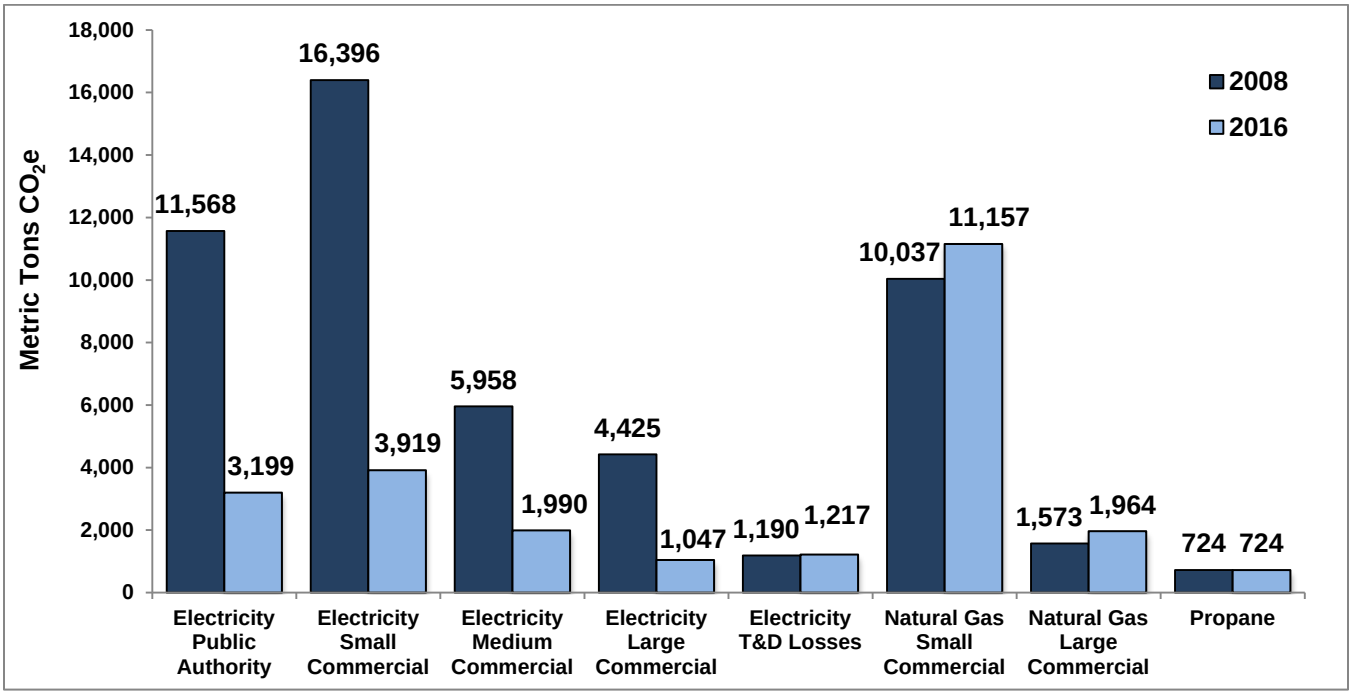
able to provide electricity consumption data for 2016. Propane consumption was estimated by Suburban propane and Amerigas (Truckee-Tahoe Propane) for 2008. Propane consumption estimates could not be provided for 2016, so 2008 data was used as a proxy for 2016 consumption.

The emissions resulting from the energy used for potable water service and wastewater treatment within the jurisdictional boundary are excluded from the Non-Residential Energy Use Sector and are instead reported in the Community Potable Water and Wastewater Treatment Sector, per protocol guidance. Appendix B provides detailed non-residential energy use data, emissions factors and calculation methods. Table 9 and Figure 5 illustrate the breakdown of the non-residential energy use GHG emissions.

Table 9: 2008 & 2016 Non-Residential Energy Use Emissions (Metric Tons CO_2e)

Non-Residential Energy Use	Metric Tons CO_2e		Percent Change
	2008	2016	
Electricity – Public Authority	11,568	3,199	- 72%
Electricity – Small Commercial	16,396	3,919	- 76%
Electricity – Medium Commercial	5,958	1,990	- 67%
Electricity – Large Commercial	4,425	1,047	- 76%
Electricity – Transmission & Distribution (T&D) Losses	1,190	1,217	+ 2%
Natural Gas – Southwest Gas Small Commercial	10,037	11,157	+ 11%
Natural Gas – Southwest Gas Large Commercial	1,573	1,964	+ 25%
Propane – All	724	724	0%
Total Non-Residential Energy Use	**51,871**	**25,216**	**- 51%**

Figure 5: 2008 & 2016 Non-Residential Energy Use Emissions (Metric Tons CO_2e)



Community Transportation

Truckee's community transportation generated an estimated 64,044 metric tons of CO_2e in 2008. In 2016, emissions decreased approximately 12% to 56,428 metric tons of CO_2e. This reduction in emissions can be attributed to a 7% decrease in total vehicle miles traveled, while electric vehicle miles traveled increased, as seen in Table 10, along with an increase in average fuel efficiency for most vehicle types. The community transportation analysis includes emissions from on-road vehicle use in the region associated with trips starting or ending in Truckee, as well as emissions from off-road vehicles and equipment. The annual vehicle miles traveled (VMT) associated with Truckee's community transportation were estimated using the Town of Truckee Traffic Model - 2009 Model Output, and weighted to 2008 and 2016 using the change in population. The traffic model estimates the travel within the region associated with Truckee's and the surrounding region's land uses.

The model allows us to separate out travel into four categories based on the origin and destination of the trips: Internal-Internal (trips beginning and ending in Truckee), Internal-External (trips beginning in Truckee and ending elsewhere in the region), External-Internal (trips beginning somewhere else within the region and ending in Truckee) and External-External (trips beginning and ending outside of Truckee). 100% of the VMT from Internal-Internal trips were attributed to Truckee. The VMT from Internal-External and External-Internal trips were attributed 50% to Truckee and the VMT from External-External trips or pass through traffic was excluded per protocol guidance. Appendix C provides detailed community transportation data, emissions factors and calculation methods. Table 11 and Figure 6 show the community transportation GHG emissions. Emissions from rail and air travel of residents are not included in this analysis.

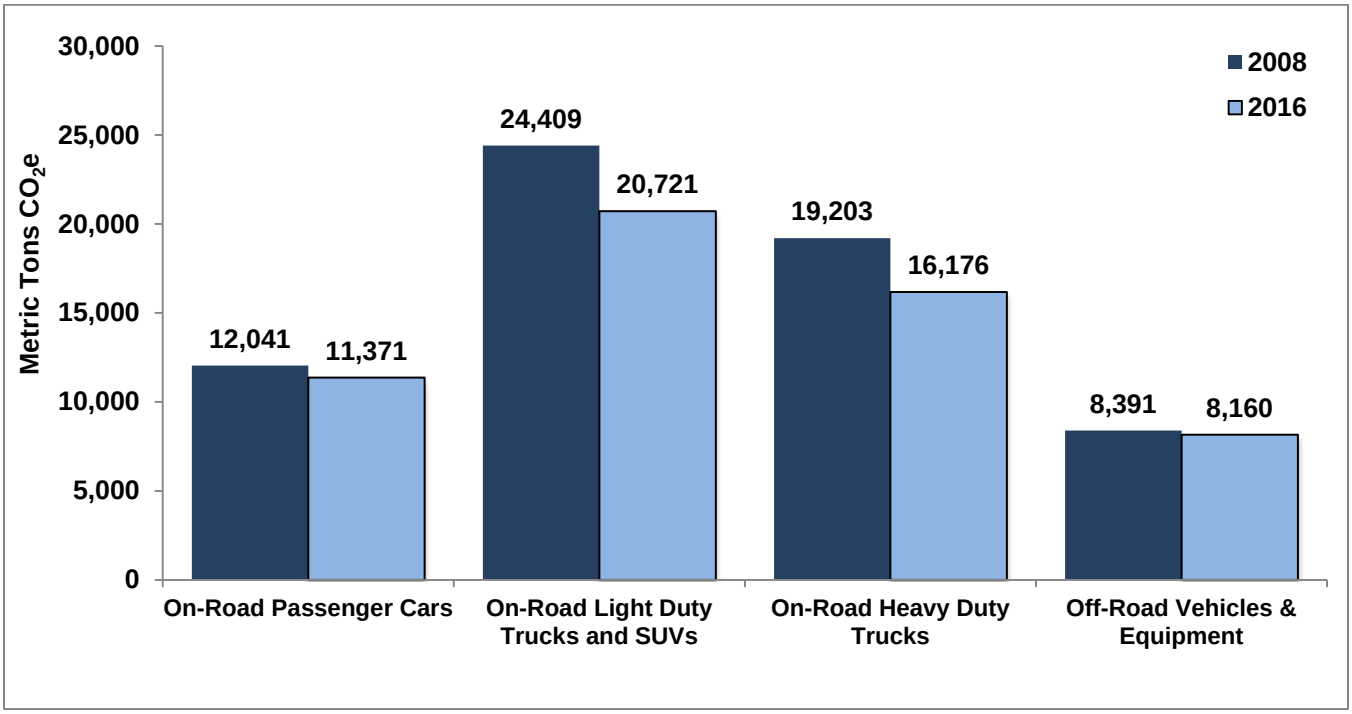
Table 10: 2008 & 2016 Community Transportation Vehicle Miles Traveled

Community Transportation	Vehicle Miles Traveled		Percent Change
	2008	2016	
Passenger Cars	35,111,922	36,165,919	+ 3%
Light Trucks	47,492,203	43,261,689	- 9%
Heavy Trucks	16,637,115	13,073,960	- 21%
Electric Vehicles	56,375	271,640	+ 382%
Total	**99,347,615**	**92,773,207**	**- 7%**

Table 11: 2008 & 2016 Community Transportation Emissions (Metric Tons CO_2e)

Community Transportation	Metric Tons CO_2e		Percent Change
	2008	2016	
On-Road Gasoline Passenger Cars	11,949	11,218	- 6%
On-Road Gasoline Light Trucks	24,382	20,611	- 15%
On-Road Gasoline Heavy Trucks	4,081	2,611	- 36%
On-Road Diesel Passenger Cars	92	153	+ 66%
On-Road Diesel Light Trucks	27	110	+ 307%
On-Road Diesel Heavy Trucks	15,122	13,565	- 10%
Off-Road Gasoline, Diesel and CNG	8,391	8,160	- 3%
Total Community Transportation	**64,044**	**56,428**	**- 12%**
Information Items			
On-Road Electric Vehicles	13	39	+ 200%
Transit Gasoline Fixed Route	6	4	- 33%
Transit Diesel Fixed Route and Dial-a-Ride	112	124	+ 11%

Figure 6: 2008 & 2016 Community-Wide Transportation Emissions (Metric Tons CO_2e)



Community Solid Waste

Truckee's community solid waste generated in 2008 results in an estimated 4,256 metric tons of CO_2e. Emissions resulting from solid waste generated in 2016 decreased approximately 11% to 3,804 metric tons of CO_2e. This decrease in emissions can be attributed primarily to the 10% reduction in the tonnage of community generated solid waste from 2008 to 2016, as shown in Table 12. The remaining reduction is due to the estimated reduction in organic waste between 2008 and 2016. Community-generated solid waste emissions are an estimate of the methane generated by the anaerobic decomposition of organic wastes (such as paper, food scraps, plant debris, wood, etc.) in a landfill over the period of decomposition, estimated to be approximately 100 years. Both the baseline inventory and re-inventory accounted for the future emissions from decomposition of waste generated by the community in 2008 and 2016. Additionally, simplified emissions estimates for the collection and transportation of community generated solid waste are provided as Information Items. These emissions are reported here to provide additional context, and are reported as Information Items because of the overlap with community transportation emissions. Table 13 details community solid waste emissions. Appendix D provides detailed community solid waste data, emissions factors and calculation methods.

Going forward, it is important to acknowledge the benefits of recycling and composting programs that lower waste volumes and lower emissions. When incoming organic waste is diverted, landfill emissions are reduced and upstream emissions from materials manufacturing are reduced when recycled materials displace virgin materials.

Table 12: 2008 & 2016 Community-Generated Solid Waste

Community Solid Waste	Wet Short Tons / Year		Percent Change
	2008	2016	
Community-Generated Solid Waste	17,283	15,548	- 10%
Total Community Solid Waste	**17,283**	**15,548**	**- 10%**

Table 13: 2008 & 2016 Community Solid Waste Emissions (Metric Tons CO_2e)

Community Solid Waste	Metric Tons CO_2e		Percent Change
	2008	2016	
Community-Generated Solid Waste	4,256	3,804	- 11%
Total Community Solid Waste	**4,256**	**3,804**	**- 11%**
Information Items			
Collection of Community-Generated Solid Waste	346	311	- 10%
Transportation of Community-Generated Solid Waste	102	93	- 9%

Community Potable Water and Wastewater Treatment

This section includes energy use, process and fugitive emissions from potable water and wastewater treatment facilities serving the Town of Truckee's residents and community members. Emissions are estimated based on the potable water used and wastewater generated within the Town by full time, seasonal, and part time residents. The potable water sector primarily uses electricity for water extraction (wells) and distribution (booster stations) to residents and community members. Wastewater treatment includes the energy use associated with collection, treatment and discharge of community-generated wastewater as well as the process and fugitive emissions associated with wastewater treatment. Table 14 shows the water volumes and electricity use for both potable water and wastewater.

Table 14: 2008 & 2016 Community Potable Water and Wastewater Activity Data

Potable and Wastewater	Units	2008	2016	Percent Change
Potable Water Consumption	Million Gallons	2,297	1,093	- 52%
Potable Water Electricity Use and T&D Losses	kWh	11,310,799	7,533,465	- 33%
Wastewater Generation	Million Gallons	558	731	+ 31%
Wastewater Electricity Use and T&D Losses	kWh	3,699,595	4,830,810	+ 31%

Energy used for potable water service and wastewater treatment within the Town limits was subtracted from non-residential energy use to prevent double counting and is reported separately per USCP protocol guidance to provide information on the connection between water use and energy use.

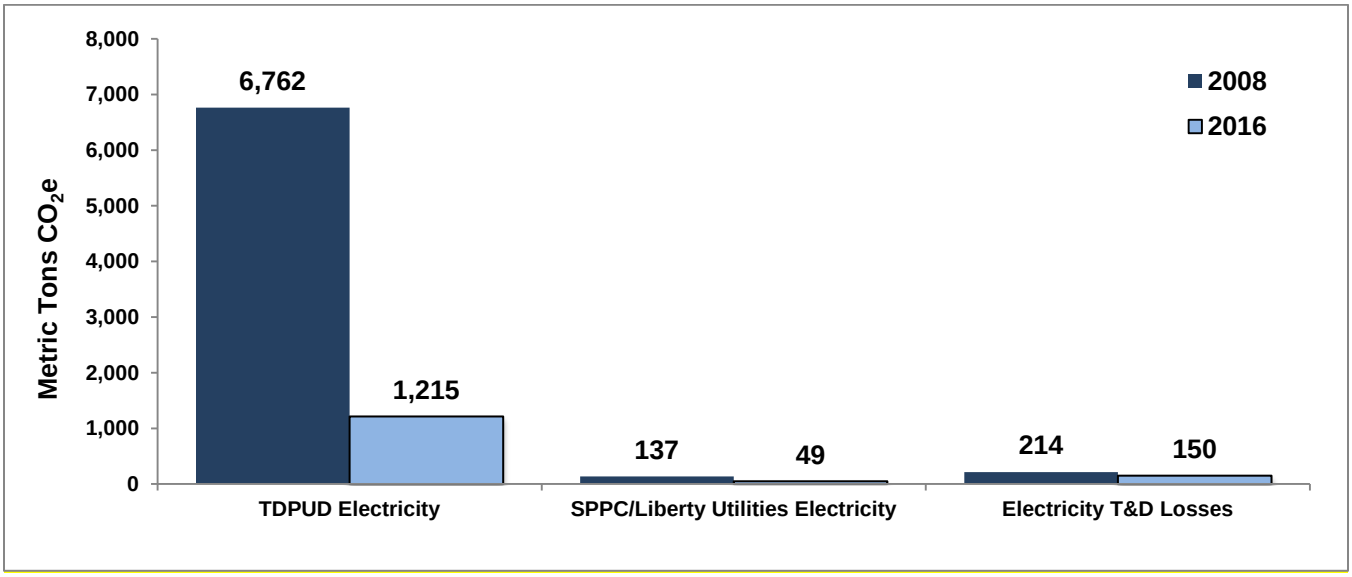
Table 15 and Figure 7 detail community potable water emissions. Potable water service generated an estimated 7,114 metric tons of CO_2e in 2008. Emissions decreased approximately 80% to 1,414 metric tons of CO_2e in 2016. This reduction in emissions can be attributed to two main changes between 2008 and 2016. The first change was that potable water consumption decreased by over 50%, as shown in Table 14, reducing electricity use by 33%. The second change was increased procurement of renewable energy, reducing the CO_2-per-kWh emissions factors by 73% for TDPUD and 47% for SPPC/Liberty Utilities.

The majority of Truckee is served by the TDPUD potable water system. It should be noted that the TDPUD's water system service area extends outside the Town limits encompassing small adjoining areas of unincorporated Nevada and Placer Counties. There are also small developed areas within the Town of Truckee that utilize private wells and are not supplied water by the TDPUD. This analysis did not account for the small number of residents outside of the Town served by TDPUD and the small number of residents within the Town utilizing private wells. Appendix E provides detailed potable water activity data, emissions factors, and calculation methods.

Table 15: 2008 & 2016 Community Potable Water Emissions (Metric Tons CO_2e)

Community Potable Water Service	Metric Tons CO_2e		Percent Change
	2008	2016	
Electricity - TDPUD	6,762	1,215	- 82%
Electricity - SPPC/Liberty Utilities	137	49	- 64%
Electricity T&D Losses	214	150	- 30%
Total Community Potable Water Use	**7,114**	**1,414**	**- 80%**

Figure 7: 2008 & 2016 Community Potable Water Emissions (Metric Tons CO_2e)



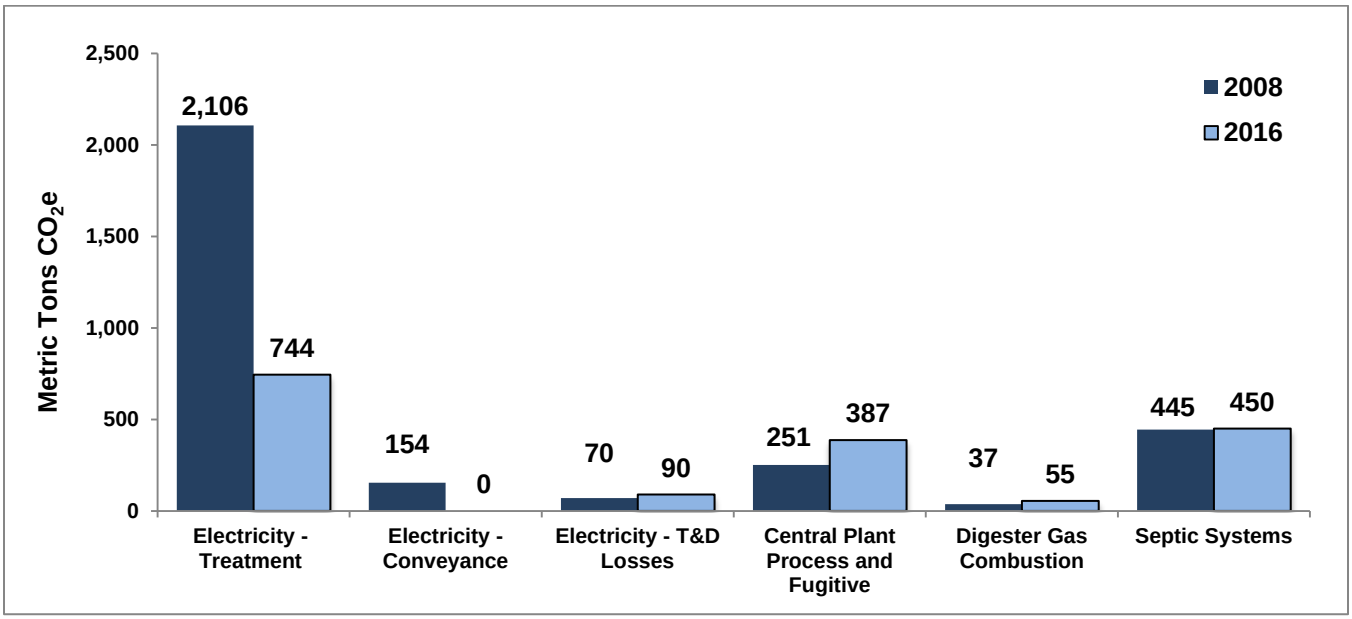
Treatment of wastewater generated by Truckee community members in 2008 emitted an estimated 3,061 metric tons of CO_2e. In 2016, emissions decreased approximately 44% to 1,727 metric tons of CO_2e. This reduction in emissions can primarily be attributed to TDPUD's increased procurement of renewable energy since wastewater volumes actually increased from 558 million gallons in 2008 to 731 million gallons in 2016. Emissions reductions also occurred from Truckee Sanitary District's installation of zero-emissions solar energy. Wastewater process and fugitive emissions were calculated using information on site-specific operating processes and nutrient loads, and standard emissions factors. The electricity use data was collected from TDPUD, Truckee Sanitary District (TSD) and Tahoe-Truckee Sanitation Agency (T-TSA).

Table 16 and Figure 8 detail community wastewater treatment emissions. The majority of Truckee is served by a central wastewater collection and treatment system. TSD collects wastewater from the Town and portions of unincorporated Placer County. T-TSA treats wastewater delivered by TSD and other regional wastewater agencies at their central plant located in Truckee. In 2009 TSD installed on-site solar panels that meet or exceed its energy demand. Only the energy use and emissions associated with wastewater generated by Truckee residents and community members are included in this analysis. Additionally, some Truckee residents are served by private septic systems. The population served by septic was estimated based on the number of households in Truckee not served by TSD. Appendix F provides detailed wastewater treatment activity data, site-specific operating processes, emissions factors and calculation methods.

Table 16: 2008 & 2016 Community Wastewater Treatment Emissions (Metric Tons CO_2e)

Community Wastewater Treatment	Metric Tons CO_2e		Percent Change
	2008	2016	
Electricity TDPUD Treatment	2,106	744	- 65%
Electricity TDPUD Conveyance	154	0	- 100%
Electricity TDPUD T&D Losses	70	90	+ 29%
Central Plant Process and Fugitive	31	30	- 3%
Central Plant Effluent N_2O	24	28	+ 17%
Methanol CO_2	196	329	+ 68%
Digester Gas Combustion	2	3	+ 50%
Digester Gas Incomplete Combustion	35	52	+ 49%
Septic System CH_4	445	450	+ 1%
Total Community Wastewater Treatment	**3,061**	**1,727**	**- 44%**
Information Items			
Digester Gas Combustion (Biogenic CO_2)	395	592	+ 50%

Figure 8: 2008 & 2016 Community Wastewater Emissions (Metric Tons CO_2e)



The Town of Truckee Community-Wide Emissions Efficiency Metrics

Community-wide emissions efficiency metrics can be useful for measuring progress in reducing GHGs and for comparing one community's emissions with neighboring cities or counties and against regional and national averages.[18] That said, due to differences in emissions inventory methods, it can be difficult to get a directly comparable per-capita emissions number, and one must be cognizant of this margin of error when comparing figures. All efforts were made to estimate a community-wide emissions total and per-capita emissions metric that will be comparable to other communities operating under the Significant Influence framework of the USCP.

Table 17 presents community efficiency metrics calculated as part of this inventory. These metrics only include emissions directly tied to community-wide activities and sources: residential and non-residential energy use, on-road and off-road transportation, community-generated solid waste, potable water and wastewater energy use, process and fugitive emissions from wastewater treatment and the transmission and distribution losses associated with community-wide electricity use. It should be noted that a significant portion of the Truckee community is comprised of seasonal and second-home owners that, on an annual basis, use less energy, produce less waste and consume less water than full time residents. Due to this fact, the Truckee GHG Emissions/Housing Unit metric is lower than similar communities with a higher percentage of full time residents. On the other hand the GHG Emissions/Resident and GHG Emissions/Occupied Household metrics are higher than similar communities with a higher percentage of full time residents because they account for emissions from full time and seasonal residents but can only attribute them to full time residents.

Table 17: The Town of Truckee 2008 & 2016 Community-Wide GHG Emissions Efficiency Metrics

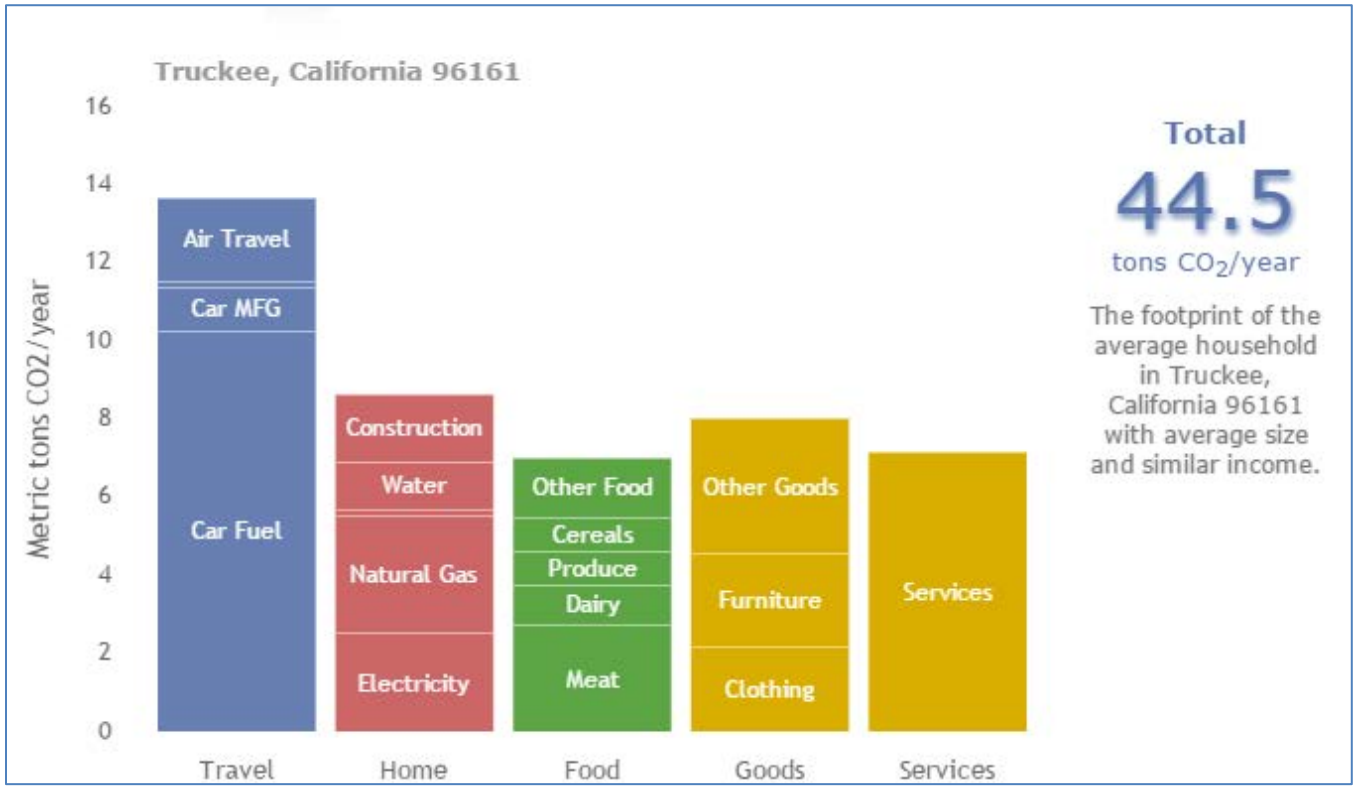
Community-Wide Emissions Efficiency Metrics			
	2008	2016	Percent Change
Estimated Population	15,975	15,779	- 1%
Estimated Occupied Households	6,208	6,062	- 2%
Estimated Total Housing Units	12,372	13,118	+ 6%
Community GHG Emissions (Metric Tons CO_2e)	**230,349**	**153,268**	**- 33%**
GHG Emissions / Resident (Metric Tons CO_2e)	**14.4**	**9.7**	**- 33%**
GHG Emissions / Occupied Household (Metric Tons CO_2e)	**37.1**	**25.3**	**- 32%**
GHG Emissions / Housing Unit (Metric Tons CO_2e)	**18.6**	**11.7**	**- 37 %**

[18] Per capita CO_2e emissions were 16.5 metric tons per year for the United States in 2014, and 11.3 metric tons per year for California in 2015. (https://www.arb.ca.gov/cc/inventory/data/graph/trends/ghg_trends_00-15.png, https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=US)

Cool California Household Consumption GHG Estimates

It is important to understand that these efficiency metrics are not the same as the carbon footprint of the average individual or household living in Truckee, which also includes other community-wide activities not measured in this inventory as well as all upstream emissions from the consumption of goods and services by community members. For comparison purposes, Figure 9 presents the results of a simplified household consumption GHG inventory for Truckee produced by Cool California and available at www.coolcalifornia.org. Additionally, Cool California allows residents and businesses within Truckee to develop a simplified consumption-based GHG inventory to calculate their individual carbon footprint and learn ways to reduce their personal carbon footprint while saving money in the process.

Figure 9: Cool California Household Consumption GHG Estimate (Metric Tons CO_2e)[19]



[19] Household consumption estimate developed using Cool California Calculator. Available at: www.coolcalifornia.org/calculator

Municipal-Operations Inventory Results

This section presents a detailed analysis of emissions resulting from the Town of Truckee's municipal operations. As described in the Inventory Methodology section of this report, municipal-operations emissions are a subset of community-wide emissions. The municipal-operations emissions included in this inventory were determined using the operational control framework discussed in the Inventory Methodology section. The operational control framework includes emissions sources and activities for which the Town has the full authority to introduce and implement operating policies. The municipal-operations inventory also includes two additional emissions sectors for which the Town has less control: emissions from employee-generated solid waste and emissions from employees' personal commutes to work. Including these optional sources is strongly recommended by the LGOP even though the Town does not have full operational control.

Emissions Summary

In 2008, the Town of Truckee's municipal operations generated 2,519 metric tons of CO_2e within the municipal-operations inventory. In 2016 these emissions decreased 12% to 2,208 metric tons of CO_2e. Figure 10 summarizes the municipal-operations GHG emissions. As shown, the largest sources of emissions are the vehicle fleet (which includes all on-road municipal vehicles as well as off-road vehicles and mobile equipment) and building and facilities.

In conducting the 2016 re-inventory four corrections were made to the original 2008 baseline inventory.

- Municipal solid waste collection receptacle size was corrected for Town Hall.
- A corrected landfill diversion rate of approximately 49% was applied to municipal solid waste (originally considered to be 0%)
- The vehicle fleet emissions factors were updated from 2006 national averages to 2008 Nevada County specific averages provided by EMFAC 2014.
- The original assumption that off-road equipment was not air conditioned was updated to reflect approximately 90% of off-road equipment with air conditioning, at the guidance of town staff.

These corrections resulted in a net decrease of 6 metric tons of CO_2e from the originally prepared baseline inventory.

Figure 10: 2008 & 2016 Municipal-Operations GHG Emissions (Metric Tons CO_2e)

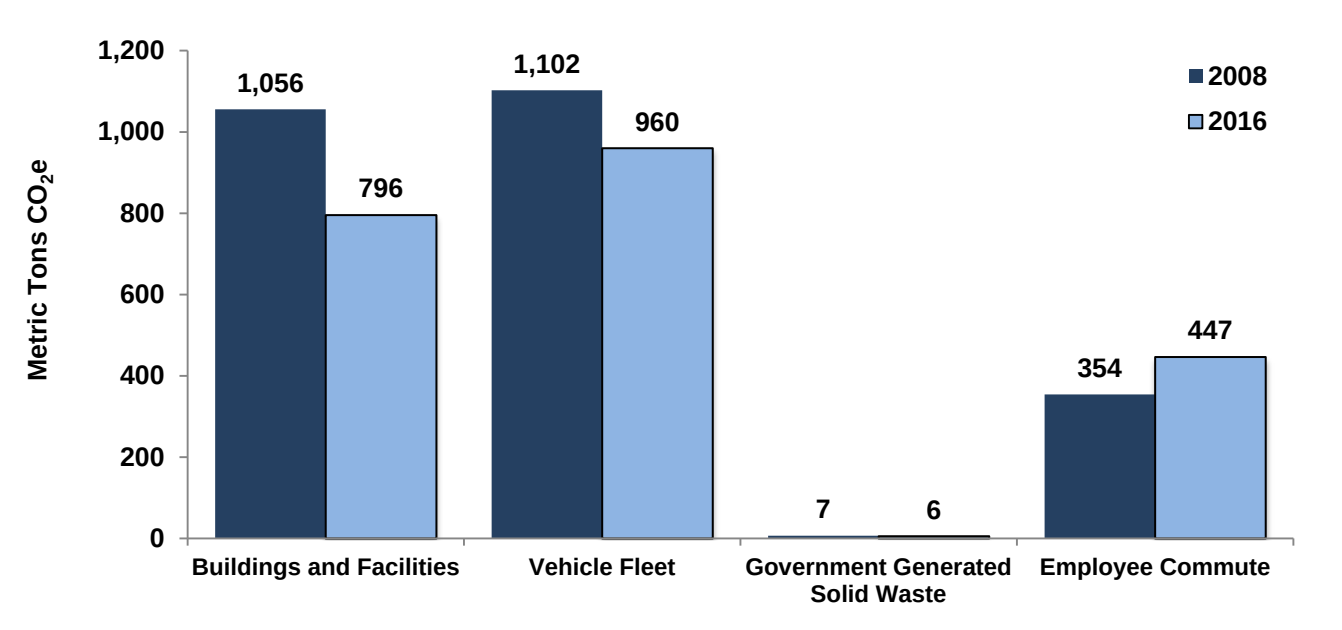


Table 18 presents the municipal-operations GHG emissions with more detail as well as additional Information Items that are not included in Figure 10. Information Items are GHG emissions that are either reported separately from municipal-operations emissions totals to avoid overlap with other reported emissions or excluded from GHG inventories by LGOP guidance. The Information Items presented in Table 18 include:

- Biogenic CO_2 emissions resulting from biodiesel combustion by the Public Works department
- Emissions from community-generated solid waste at the Train Depot and downtown trash cans which is collected by the Town, and but generated by the community rather than municipal operations.

Table 18: 2008 & 2016 Municipal-Operations GHG Emissions Summary (Metric Tons CO_2e)

Sector	Metric Tons CO_2e		Percent Change
	2008	2016	
Buildings and Facilities			
Building Electricity Use	630	284	- 55%
Building Natural Gas Combustion	358	460	+ 29%
Public Lighting Electricity Use	40	15	- 63%
Train Depot Tenet Electricity Use	7	1	- 88%
Building and Public Lighting Electricity Transmission & Distribution (T&D) Losses	21	36	+ 72%
Total Buildings and Facilities	**1,056**	**796**	**- 25%**
Vehicle Fleet			
Vehicle Fleet Gasoline Combustion	435	346	- 21%
Vehicle Fleet Diesel Combustion	628	565	- 10%
Leaked Refrigerants	39	49	+ 26%
Total Vehicle Fleet	**1,102**	**960**	**- 13%**
Government-Generated Solid Waste			
Government-Generated Solid Waste	7	6	- 19%
Total Government-Generated Solid Waste	**7**	**6**	**- 19%**
Employee Commute			
Employee Commute Emissions	354	447	+ 26%
Total Employee Commute	**354**	**447**	**+ 26%**
Total Municipal-Operations Emissions	**2,519**	**2,208**	**- 12%**
Information Items			
Community-Generated Solid Waste - Downtown Cans	6	8	+ 31%
Community-Generated Solid Waste - Train Depot	3	1	- 54%
Public Works – Road Maintenance Biodiesel (Biogenic CO2)	NA	8	NA

Emissions Sources and Activities

Identifying the major emissions sources and activities can help target reduction strategies that will have the greatest effect on emissions. Table 19 presents the municipal-operations emissions by source / activity.

Table 19: 2008 & 2016 Municipal-Operations GHG Emissions by Source / Activity (Metric Tons CO_2e)

Source / Activity	Metric Tons CO_2e		Percent Change
	2008	2016	
Gasoline Combustion	764	756	- 1%
Diesel Combustion	654	602	- 8%
Electricity Use	670	298	- 55%
Natural Gas Combustion	358	460	+ 29%
Government-Generated Solid Waste	7	6	- 19%
Electricity T&D Losses	21	36	+ 73%
Leaked Refrigerants	39	49	+ 26%
Municipal-Operations Total	**2,512**	**2,207**	**- 12%**

Buildings and Facilities

The Town's Buildings and Facilities Sector generated an estimated 1,056 metric tons of CO_2e in 2008 as shown in Table 21. In 2016, emissions decreased 25% to 796 metric tons of CO_2e. This reduction in emissions can be attributed to TDPUD's increased procurement of renewable energy since electricity use and natural gas combustion both increased from 2008 to 2016, as seen in Table 20. Buildings and Facilities emissions include those generated by electricity use and stationary fuel consumption at Truckee's buildings and other facilities including public lighting and energy use by the Town's tenants at the Train Depot.

Fire suppression, air conditioning and refrigeration equipment can emit hydrofluorocarbons (HFCs) and other GHGs when these systems leak and during normal operation or maintenance. Due to the difficulty in collecting this data and limited significance to the municipal-operations inventory total, these fugitive emissions were not estimated. Refer to Appendix G for detailed activity data, emissions factors, and calculation methods used in the Buildings and Facilities Sector.

Table 20: 2008 & 2016 Buildings and Facilities Energy Use

Energy Source	Energy Use		Percent Change
	2008	2016	
Electricity Use (kWh)	992,634	1,643,039	+ 66%
Natural Gas Combustion (Therms)	67,274	86,588	+ 29%
Electricity T&D Losses (kWh)	50,454	82,661	+ 64%

It is helpful to identify the largest emissions sources and activities within each sector to help target reduction strategies. Table 21 presents the municipal buildings and facilities emissions by energy source.

Table 21: 2008 & 2016 Buildings and Facilities Emissions by Source / Activity (Metric Tons CO_2e)

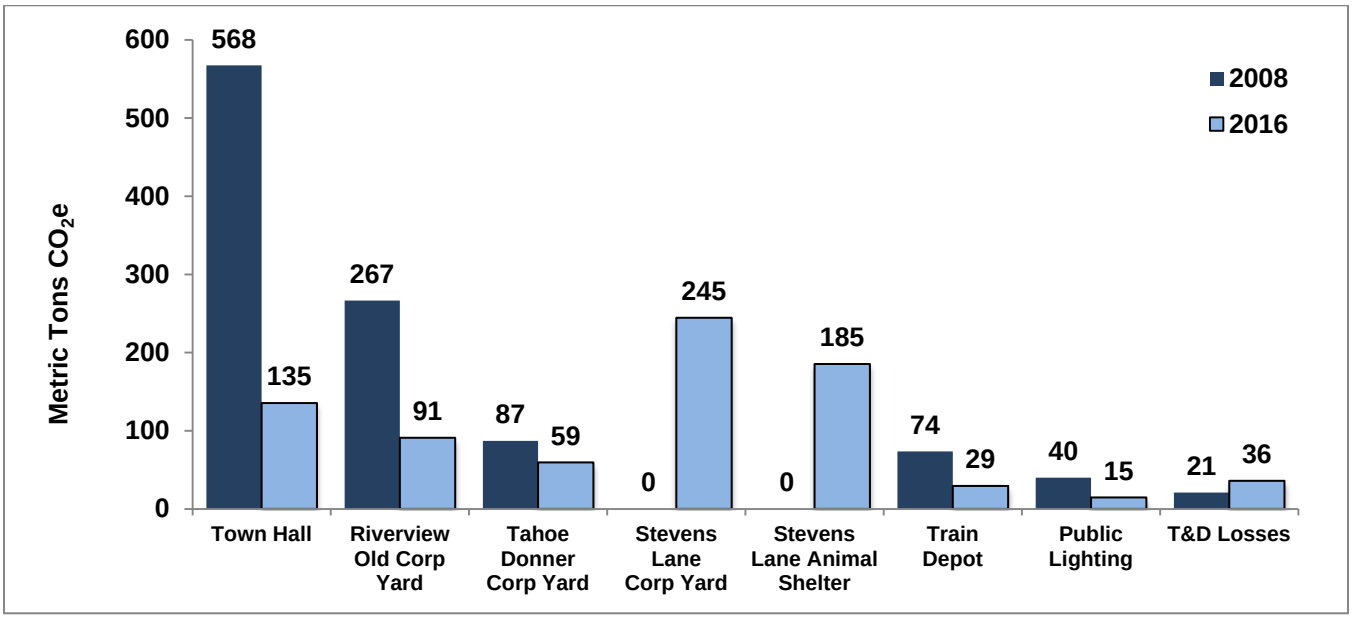
Energy Source	Metric Tons CO_2e		Percent Change
	2008	2016	
Electricity Use	677	299	- 56%
Natural Gas Combustion	358	460	+ 29%
Electricity T&D Losses	21	36	+ 72%
Buildings and Facilities Total	**1,056**	**796**	**- 25%**

Table 22 and Figure 11 detail the Town of Truckee's major buildings and facilities and their associated emissions. Since 2008, the Town has moved the majority of operations at the Riverview Corp Yard to the new Stevens Lane Corp Yard.

Table 22: 2008 & 2016 Buildings and Facilities Emissions (Metric Tons CO_2e)

Buildings and Facilities	Metric Tons CO_2e		Percent Change
	2008	2016	
Town Hall Electricity Use	421	87	- 79%
Town Hall Natural Gas Combustion	146	48	- 67%
Stevens Lane Corp Yard and Admin Electricity Use	NA	77	NA
Stevens Lane Corp Yard and Admin Natural Gas Combustion	NA	167	NA
Stevens Lane Animal Shelter Electricity Use	NA	55	NA
Stevens Lane Animal Shelter Natural Gas Combustion	NA	130	NA
Riverview Old Corp Yard Electricity Use	121	45	- 63%
Riverview Old Corp Yard Office Electricity Use	12	< 1	- 98%
Riverview Old Corp Yard Natural Gas Combustion	134	46	- 66%
Tahoe Donner Corp Yard Electricity Use	25	3	- 88%
Tahoe Donner Corp Yard Natural Gas	62	56	- 10%
Train Depot Lobby / Chamber / Welcome Center Electricity Use	51	16	- 69%
Train Depot Tenant Electricity Use	7	1	- 88%
Train Depot Natural Gas Combustion	15	13	- 15%
Public Lighting Roundabouts Electricity Use	16	8	- 53%
Public Lighting Signals Electricity Use	15	5	- 68%
Public Lighting Train Depot Electricity Use	3	1	- 65%
Public Lighting Other Electricity Use	6	1	- 80%
Buildings and Public Lighting Electricity T&D Losses	21	36	+ 72%
Buildings and Facilities Total	**1,056**	**796**	**- 25%**

Figure 11: 2008 & 2016 Buildings and Facilities Emissions (Metric Tons CO_2e)



Vehicle Fleet

The vehicles and mobile equipment used in the Town of Truckee's daily operations burn gasoline and diesel fuel resulting in GHG emissions. In addition, vehicles with air conditioning use refrigerants that are GHGs that can leak from the vehicles during normal operation and maintenance. In 2008, the Town of Truckee operated a vehicle fleet with 91 vehicles; including snow removal equipment, police and transit vehicles, and a host of other on and off-road equipment. By 2016, the vehicle fleet had grown in size to 121 vehicles. The fleet performed essential services, supporting the police and building departments, public works and engineering among others.

The Town of Truckee's 2008 Vehicle Fleet Sector emissions totaled 1,102 metric tons of CO_2e. In 2016, emissions decreased approximately 13% to 960 metric tons of CO_2e. This emissions reduction can primarily be attributed to an increase in vehicle efficiency since total vehicle miles traveled increased 10% as shown in Table 23, but fuel consumption decreased 15%. Refer to Appendix H for detailed activity data, emissions factors, and calculation methods used in the Vehicle Fleet Sector.

Table 23: Vehicle Fleet Activity Data

Department	2008	2016	Percent Change
Gasoline (Gallons)	48,999	38,970	- 20%
Diesel (Gallons)	60,932	54,881	- 10%
Total Fuel Use (Gallons)	109,931	93,851	- 15%
Total Vehicle Miles Travelled	456,270	503,691	+ 10%
Biodiesel (Gallons)	0	887	NA

Table 24 presents the Town's vehicle fleet emissions by department. Other Minor Departments includes Engineering, Administrative Services, Recycling, Code Compliance and Trails.

Table 24: 2008 Vehicle Fleet Emissions (Metric Tons CO_2e)

Department	Metric Tons CO_2e		Percent Change
	2008	2016	
Public Works - Snow Maintenance Gasoline	42	36	- 15%
Public Works - Snow Maintenance Diesel	453	352	- 22%
Police Department, Animal Services & Parking Gasoline	298	214	- 20%
Transit Fixed Route Gasoline	6	4	- 36%
Transit Fixed Route & Dial-a-Ride Diesel	113	124	+ 9%
Public Works - Road Maintenance Diesel	58	77	+ 31%
Public Works - Road Maintenance Gasoline	35	43	+ 25%
Facilities Management Gasoline	18.6	19.1	+3%
Facilities Management Diesel	NA	3	NA
Building Department Gasoline	16	13	- 17%
Fleet Vehicles Gasoline	7.3	6.7	-8%
Fleet Vehicles Diesel	4	2	- 51%
Other Minor Departments Gasoline	13	18	+ 42%
Leaked Refrigerants (R-134a)	39	49	+ 26%
Vehicle Fleet Total	**1,102**	**960**	**- 13%**
Information Items			
Public Works – Road Maintenance Biodiesel (Biogenic CO_2)	NA	8	NA

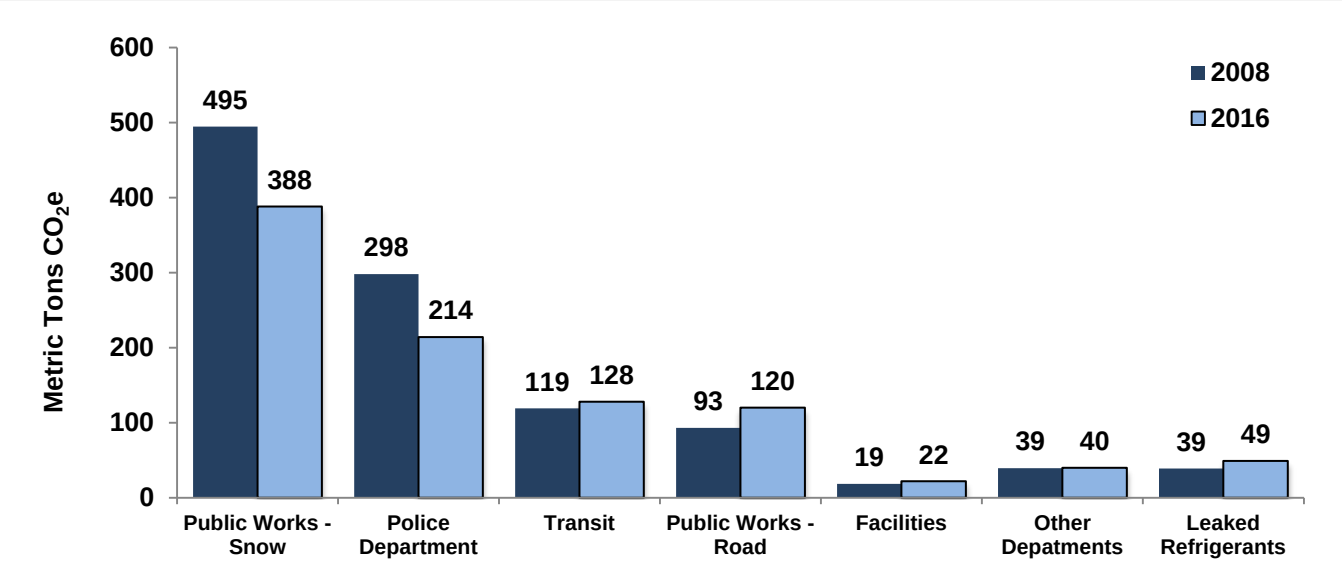
Identifying the largest emissions sources and activities within each sector can be helpful when targeting reduction strategies. While Table 24 lists emissions by department, Table 25 summarizes the vehicle fleet emissions by fuel or refrigerant source.

Table 25: 2008 & 2016 Vehicle Fleet Emissions by Source / Activity (Metric Tons CO_2e)

Source / Activity	Metric Tons CO_2e		Percent Change
	2008	2016	
Diesel Combustion	628	565	-10%
Gasoline Combustion	435	346	-21%
Leaked Refrigerants	39	49	+ 26%
Vehicle Fleet Total	**1,102**	**960**	**- 13%**
Information Items			
Biodiesel (Biogenic CO_2)	NA	8	NA

Figure 12 presents the Town's vehicle fleet emissions by department. "Other Departments" includes Building, Fleet Services, Engineering, Administrative Services, Recycling, Trails and Code Compliance.

Figure 12: 2008 & 2016 Vehicle Fleet Emissions (Metric Tons CO_2e)



Government-Generated Solid Waste

Government operations generate solid waste during normal operations, much of which is eventually landfilled. Typical waste from municipal operations includes paper and food waste from offices and facilities as well as construction waste from public works. Organic materials in solid waste (including paper, food scraps, plant debris, wood waste, etc.) generate methane as they decompose in the anaerobic environment of a landfill. Emissions from the Government-Generated Solid Waste Sector are an estimate of methane generation that will result from the anaerobic decomposition of the organic portion of waste sent to landfills in 2008 and 2016. Only solid waste generated by the Town's municipal operations is included in the inventory total. Community-generated waste collected from the Train Depot and downtown trash cans is reported as an information item. These emissions are excluded from the inventory total because although the Town collects this waste as a public service, the Town has little control over the waste that is

deposited. It is important to note that although these emissions are attributed to the inventory in the year in which the waste is generated, the emissions themselves will occur over the 100+ year timeframe during which the waste will decompose, and are therefore categorized as Scope 3 emissions. See the "Emissions by Scope" section of this report for more information on scopes.

The Town's 2008 Government-Generated Solid Waste emissions were 6.8 metric tons of CO_2e. In 2016, emissions decreased 19% to 5.5 metric tons of CO_2e. This reduction can be attributed to the 14% reduction in government generated solid waste from 2008 to 2016, as shown in Table 26 and a change in composition of the waste to more food and less paper between 1999 and 2014, the years for which there is public administration waste composition data. Refer to Appendix I for detailed activity data, emissions factors, and calculation methods used in the Government Generated Solid Waste Sector. Table 27 and Figure 13 present Truckee's solid waste emissions by location.

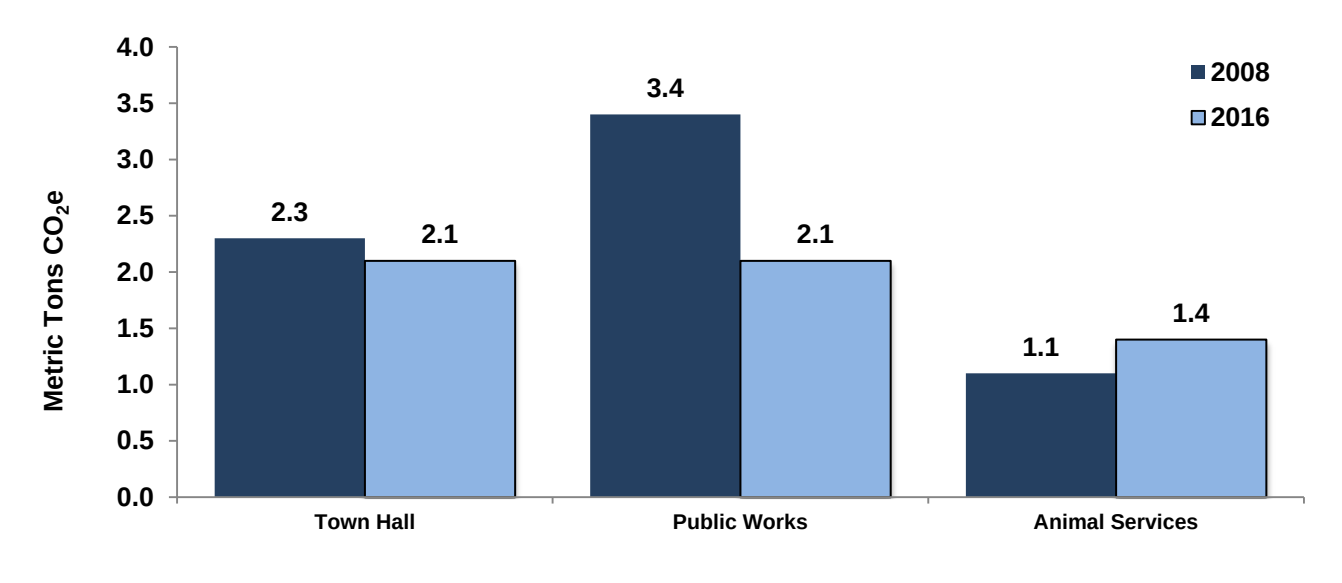
Table 26: 2008 & 2016 Government Solid Waste Generation Data

Department	Solid Waste Landfilled (Wet Short Tons)		Percent Change
	2008	2016	
Town Hall	7.0	6.9	- 3%
Public Works	10.6	6.9	- 35%
Animal Services	3.5	4.6	+ 30%
Government Generated Solid Waste Total	**21.1**	**18.3**	**- 14%**
Information Items			
Downtown Cans	23.8	31.4	+ 32%
Train Depot	11.9	5.5	- 53%

Table 27: 2008 & 2016 Government-Generated Solid Waste Emissions

Department	Metric Tons CO_2e		Percent Change
	2008	2016	
Town Hall	2.3	2.1	-9%
Public Works	3.4	2.1	- 39%
Animal Services	1.1	1.4	+ 21%
Government Generated Solid Waste Total	**6.8**	**5.5**	**- 19%**
Information Items			
Downtown Cans	5.9	7.7	+ 31%
Train Depot	2.9	1.3	- 54%

Figure 13: 2008 & 2016 Government Generated Solid Waste (Metric Tons CO_2e)



Employee Commute

Although employees' personal commutes are not under the direct operational control of the Town, there are a variety of tools and resources available to influence employee commute patterns. For this reason a survey was administered to Truckee employees to collect the data needed to estimate emissions. The survey results from the 78 respondents in 2015 were extrapolated using the number of employees in the inventory years. County-specific fuel efficiency data was used to scale employee vehicle efficiency, calculated from the 2015 survey results.

The Town of Truckee's 2008 Employee Commute Sector emissions were 354 metric tons of CO_2e. In 2016, emissions increased approximately 26% to 447 metric tons of CO_2e. This increase in emissions can be attributed to the 34% increase in employees resulting an estimated 34% increase in miles traveled, as shown in Table 28, offset by better fuel efficiency. Refer to Appendix J for detailed activity data, emissions factors, and calculation methods used in the Employee Commute Sector. Employee commute emissions are categorized as Scope 3 emissions because they are outside of the direct operational control of the Town. Table 29 presents the emissions from the Employee Commute Sector.

Table 28: 2008 & 2016 Employee Commute Mileage

Source	Vehicle Miles Traveled		Percent Change
	2008	2016	
Employee Commute – Gasoline	749,509	1,007,341	+ 34%
Employee Commute – Diesel	44,269	59,498	+ 34%
Employee Commute Total	**793,778**	**1,066,839**	**+ 34%**

Table 29: 2008 & 2016 Employee Commute Emissions (Metric Tons CO_2e)

Source	Metric Tons CO_2e		Percent Change
	2008	2016	
Employee Commute – Gasoline	328	410	+ 25%
Employee Commute – Diesel	26	37	+ 42%
Employee Commute Total	**354**	**447**	**+ 26%**

Community-Wide Forecast Results

To give additional context to 2016 re-inventory's findings, a forecast of Truckee's Community-Wide emissions from 2008 to 2020, 2030, 2040, and 2050 was completed under a business-as-usual (BAU) scenario and an adjusted scenario. A BAU scenario does not account for any local, state, or federal policy that would impact future greenhouse gas emissions. The BAU and adjusted forecasts, completed using the Statewide Energy Efficiency Collaborative (SEEC) ClearPath California toolkit[20], estimate how annual emissions would change from 2008 to 2020, 2030, 2040, and 2050. A BAU and adjusted forecast require two inputs — baseline emissions data and growth rates — both of which are presented in Appendices K - O. Baseline data was collected from Truckee's 2008 Community-Wide GHG Emissions Inventory. The growth rates were calculated using projections of Nevada County's number of households, in-County employment in Nevada County, and in-County service population, which is the sum of population and employment, prepared by state agencies.

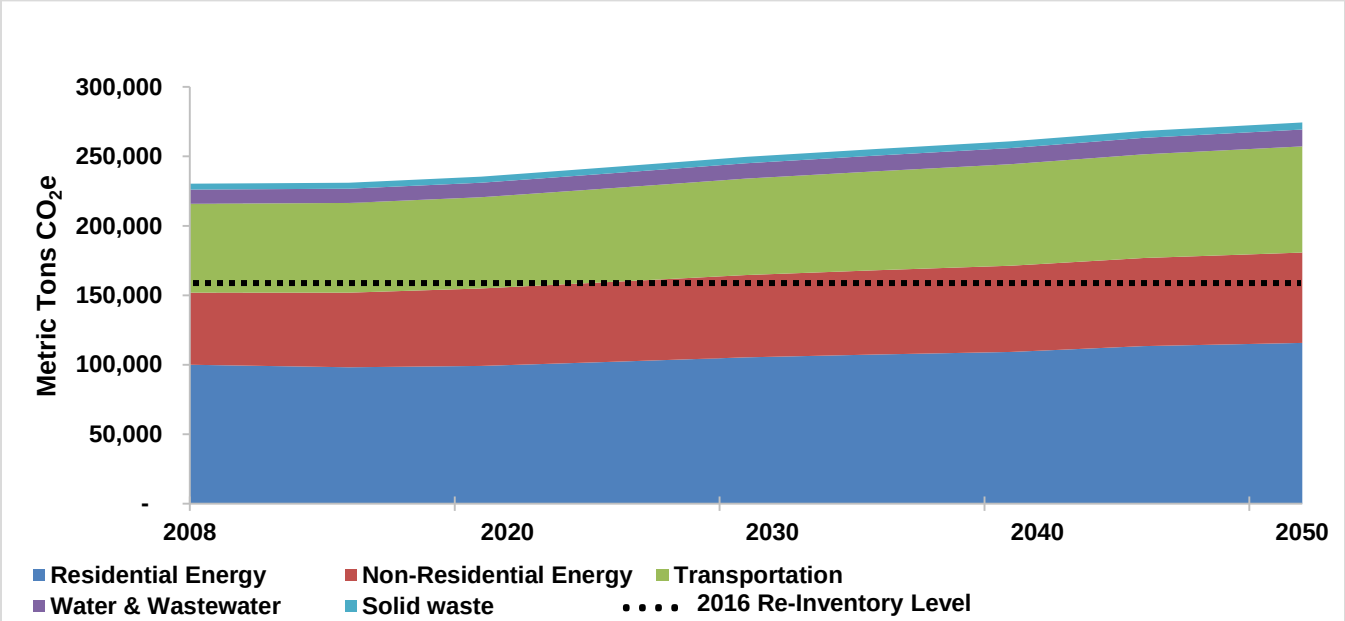
Under the BAU scenario, from 2008 to 2020, 2030, 2040, and 2050, emissions were forecast to increase by 3%, 9%, 15%, and 19%, as shown in Table 30 and Figure 14. This equates to 274,424 metric tons of CO_2e in 2050, as shown in Figure 14. The Town's municipal-operations emissions are included within the community-wide emissions, so a separate forecast for municipal energy use was not completed.

Table 30: Forecast of Community-Wide Emissions

Year	BAU Forecast		Adjusted Forecast	
	Metric Tons of CO_2e	% Change From 2008 Emissions	Metric Tons of CO_2e	% Change From 2008 Emissions
2008	230,349	--	230,349	--
2020	236,800	+ 3%	170,265	- 26%
2030	250,973	+ 9%	159,845	- 31%
2040	263,923	+ 15%	164,597	- 29%
2050	274,424	+ 19%	170,490	-26%

[20] ClearPath informational homepage, http://californiaseec.org/seec-clearpath/

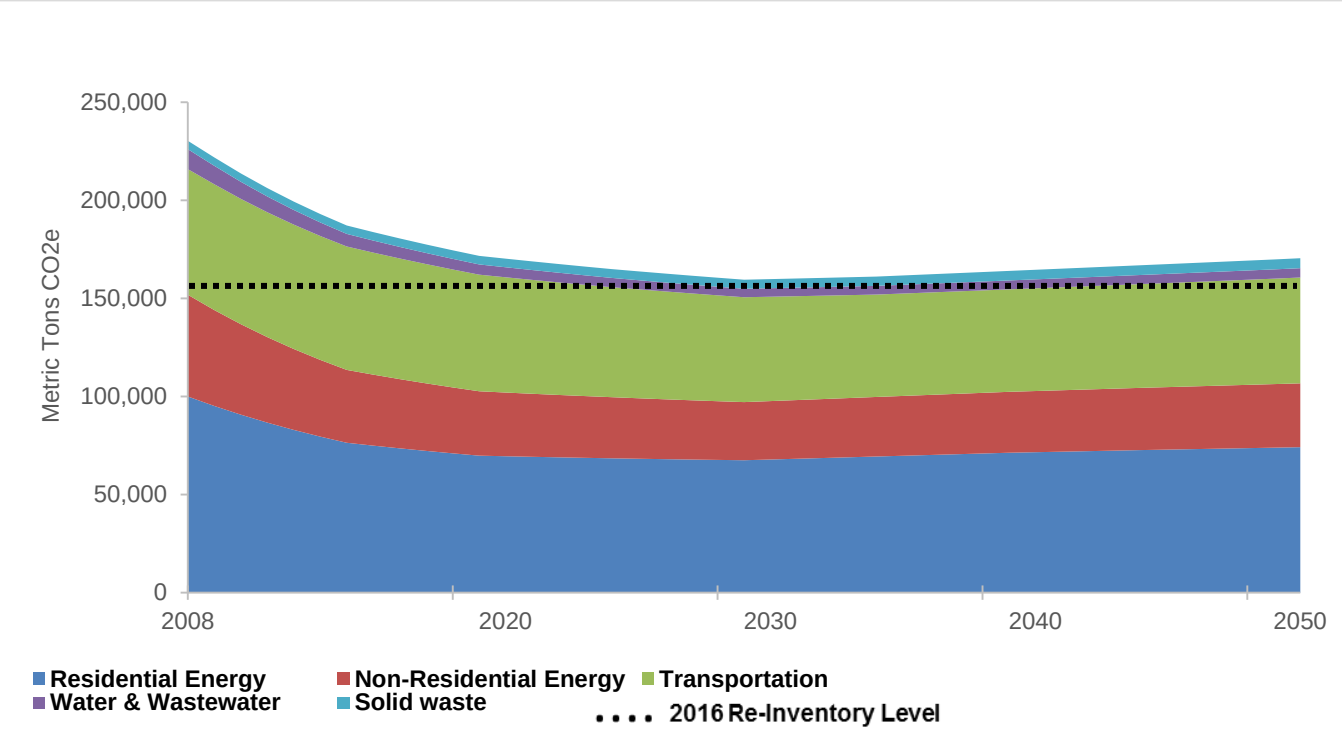
Figure 14: Business-As-Usual Community-Wide Emissions Forecast



In addition to baseline emissions and growth rates, an adjusted scenario forecast also requires carbon intensity growth factors for changes expected to occur from local, state, or federal policy. The adjusted scenario in this report takes into account both the latest Renewable Portfolio Standard Requirements applicable to utilities in California and the Clean Car Standards. The adjusted scenario does not account for changes in per-capita energy use or per-capita vehicle miles traveled. The carbon intensity factor for the California Renewable Portfolio Standards was calculated based on the change in Truckee Donner Public Utility District (TDPUD) emission rates after complying with utilities' required renewable electricity procurement rates of 20% by 2010, 33% by 2020 and 50% by 2030. The carbon intensity factor set for the California Clean Car Standards was provided by the ClearPath California toolkit

Under the adjusted scenario, from 2008 to 2020, 2030, 2040, and 2050 emissions were forecast to decrease by 26%, 31%, 29%, and 26%, as shown in Table 30 and Figure 15. This equates to 170,490 metric tons of CO_2e emitted annually in 2050, as shown in Figure 15.

Figure 15: Adjusted Community-Wide Emissions Forecast



Conclusion & Next Steps

The data presented in this report is intended to provide valuable information that Truckee can use to inform future planning efforts, identify cost saving opportunities, and identify climate action planning priorities. This analysis found that in the base year 2008, the community as a whole was responsible for emitting 230,349 metric tons of CO_2e. The Town of Truckee's municipal operations contributed 2,519 metric tons of CO_2e to that total. In 2016, the community as a whole reduced emissions by 33% to 153,268 and the Town's municipal operations reduced emissions 12% to 2,208 metric tons of CO_2e. Town staff should continue to update these inventories as additional data become available. Additional key findings from this analysis include:

- The largest contributor to community-wide GHG emissions is residential energy use (100,003 metric tons of CO_2e in 2008 and 64,679 metric tons of CO_2e in 2016).
- Significant emissions originate from community transportation (64,044 metric tons CO_2e in 2008 and 56,428 metric tons CO_2e in 2016) as well non-residential energy use (51,871 metric tons CO_2e in 2008 and 25,216 Metric Tons CO_2e in 2016).
- The largest source of municipal-operations GHG emissions is the vehicle fleet (1,102 metric tons CO_2e in 2008 and 960 metric tons CO_2e in 2016).
- Significant emissions also originate from buildings and facilities (1,056 metric tons CO_2e in 2008 and 796 metric tons CO_2e in 2016).
- Gasoline use for the combined vehicle fleet and employee commute was the largest single source of the municipal-operations emissions (764 metric tons CO_2e in 2008 and 756 metric tons CO_2e in 2016).
- There are ample opportunities for reducing GHG emissions as well as energy and transportation costs. Opportunities include energy efficiency projects, use of electric vehicles or higher efficiency vehicles and the further procurement of low-carbon or non-carbon based electricity.

As Truckee moves forward with emissions reduction strategies and uses this data to inform planning efforts, the Town should identify the emissions reduction benefits of climate and sustainability strategies that could be implemented in the future including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction, and other strategies. Through these efforts and others, Truckee can achieve benefits beyond reducing emissions, including saving money, improving the Town's economic vitality, and ultimately increasing the quality of life for its residents.

Community-Wide Inventory Appendices

Appendix A – Residential Energy Use Sector Notes

Table A-1: Residential Activity Data Inputs

Activity / Source	2008	2016	Units	Data Source
Electricity – TDPUD Primary	42,284,791	45,808,271	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Secondary	32,726,044	36,399,769	kWh	Truckee Donner Public Utility District
Electricity – Liberty Primary	7,547,454	8,117,951	kWh	Liberty Utilities
Electricity – Liberty Secondary	656,938	632,826	kWh	Liberty Utilities
Electricity Transmission & Distribution Losses	4,229,712	4,576,124	kWh	U.S. Environmental Protection Agency
Natural Gas – Southwest Gas Primary	3,584,784	4,318,136	Therms	Southwest Gas
Natural Gas – Southwest Gas Secondary	2,904,103	2,799,762	Therms	Southwest Gas
Natural Gas – Southwest Gas Primary CARE	174,583	246,566	Therms	Southwest Gas
Propane (LPG) Consumption	838,915	213,327	Gallons	Energy Information Administration and U.S. Census Bureau
Fuel Oil / Kerosene Consumption	9,910	2,827	Gallons	Energy Information Administration and U.S. Census Bureau
Wood Consumption	524,838	579,034	MMBTU	Energy Information Administration and Town staff

Table A-2: Residential GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 lbs/MWh	CH_4 lbs/GWh	N_2O lbs/GWh	Emissions Factor Source
2008 Electricity – TDPUD	BE.2.2	1,410.50	16.34	13.64	2008 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2008 Electricity – T&D Losses	BE.4.1	858.79	16.34	13.64	2007 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2008 Electricity – SPPC / Liberty	BE.2.2	1,328.16	16.34	13.64	2008 Sierra Pacific Power Company (SPPC) (CO_2) 2007 EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – TDPUD	BE.2.2	374.95	97.80	14.20	2016 TDPUD REC-adjusted (CO_2) 2014 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – T&D Losses	BE.4.1	907.00	97.80	14.20	2014 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 Electricity – SPPC / Liberty	BE.2.2	702.86	97.80	14.20	2016 Sierra Pacific Power Company (SPPC) (CO_2) 2014 EPA eGRID WECC NWPP (CH_4 and N_2O)
Activity / Source	**Method**	**CO_2**	**CH_4**	**N_2O**	**Emissions Factor Source**
Natural Gas	BE.1.1	53.02 kg/MMBtu	0.005 kg/MMBtu	0.0001 kg/MMBtu	USCP Appendix C - Table B.1 Natural Gas Pipeline (US Weighted Average) and Table B.3 Natural Gas Residential
LPG (Propane)	BE.1.2	5.79 kg/Gallon	0.001 kg/Gallon	0.0001 kg/Gallon	USCP Appendix C - Table B.1 LPG and Table B.4 Residential LPG
Fuel Oil / Kerosene	BE.1.2	10.15 kg/Gallon	0.0015 kg/Gallon	0.0001 kg/Gallon	USCP Appendix C - Table B.1 Kerosene and Table B.4 Residential Kerosene
Wood	BE.1.2	93.80 kg/MMBtu	0.316 kg/MMBtu	0.0042 kg/MMBtu	USCP Appendix C - Table B.2 Wood and Wood Residuals and Table B.3 Biomass Fuels Solid Residential

Methods:

Utility-Derived Data

Utility-provided activity data is shown in Tables A-1. Electricity and natural gas consumption data was collected from Truckee Donner Public Utility District (TDPUD), Liberty Utilities, and Southwest Gas for consumption within Truckee. Since 2008, Liberty Utilities purchased Sierra Pacific Power Company and only maintains records for 2 full calendar years. The average of 2013 and 2014 electricity use provided by Liberty Utilities was scaled to estimate 2008 use using the average number of residential customer accounts in 2013 and 2014 and the number of new households built in the Liberty Utilities service territory between 2008 and 2013. This data was provided by Town staff and is shown in Table A-3. The full 2016 calendar year record was used for Liberty Utilities 2016 data. The data provided was categorized as residential and non-residential. The residential electricity and natural gas data was reported as

primary (for permanent residents) and secondary (for seasonal residents). The residential electricity and natural gas data was entered into ClearPath where the GHG emissions were calculated using appropriate grid emissions factors. The USCP calculation methods and emissions factors are shown in Table A-2.

Table A-3: Liberty Utilities Residential Electricity Use Scaling Calculations

Class	2013	2014	2013 / 2014 Average		2008-2013	2008 (Scaled)
	kWh	kWh	kWh	# of Accounts	New Construction	kWh
Residential - Primary	7,719,861	7,615,072	7,667,467	920	14.4	7,547,454
Residential - Secondary	707,754	702,849	705,302	140	9.6	656,938

Table A-4: 2008 Residential Non-Utility Home Heating Fuel Use Calculations

Fuel Type	LPG	Fuel Oil / Kerosene / Other	Wood	Data Source
California Fuel Use	8,372	226	1,419	Energy Information Administration (EIA) State Energy Data System (SEDS) 2008 California Residential Energy Use Estimates
Units	Thousand Barrels	Thousand Barrels	Thousand Cords	
# of California Households	382,257	35,226	211,023	U.S. Census Bureau, 2008 American Community Survey (ACS) 1-year estimates Table B25040. California Households using Non-Utility Fuels for Home Heating
Per Household Fuel Use	919.9	122.3	6.7	
Units	Gallons	Gallons	Cords	
Community Households	912	81	3,903	U.S. Census Bureau, 2006-2010 American Community Survey (ACS) 5-year estimates. Table DP04. Community Households using Non-Utility Fuels for Home Heating. Town staff for Households using wood.
Estimated Fuel Use	838,915	9,910	524,838	
Units	Gallons	Gallons	MMBtu	

Fuel Type	Households per ACS	Margin of Error	Estimates Used in Inventory
Propane (LPG)	912	+/-266	912
Fuel Oil / Kerosene / Other	81	+/-28	81
Wood	873	+/-229	3,903

Table A-5: 2016 Residential Non-Utility Home Heating Fuel Use Calculations

Fuel Type	LPG	Fuel Oil / Kerosene / Other	Wood	Data Source
California Fuel Use	5,200	121	1,627	Energy Information Administration (EIA) State Energy Data System (SEDS) 2015 California Residential Energy Use Estimates
Units	Thousand Barrels	Thousand Barrels	Thousand Cords	
# of California Households	399,275	73,702	218,185	U.S. Census Bureau, 2015 American Community Survey (ACS) 1-year estimates Table B25040. California Households using Non-Utility Fuels for Home Heating
Per Household Fuel Use	547.0	69.0	7.45	
Units	Gallons	Gallons	Cords	
Community Households	321	41	3,883	U.S. Census Bureau, 2011-2015 American Community Survey (ACS) 5-year estimates. Table DP04. Community Households using Non-Utility Fuels for Home Heating. Town staff for Households using wood.
Estimated Fuel Use	213,327	2,827	579,034	
Units	Gallons	Gallons	MMBtu	

Fuel Type	Households per ACS	Margin of Error	Estimates Used in Inventory
Propane (LPG)	390	+/-178	912
Fuel Oil / Kerosene / Other	41	+/-19	41
Wood	650	+/-216	3,883

Non-Utility Derived Data

Non-utility activity data is shown in Table A-1. Propane (LPG), fuel oil / kerosene / other fuel, and wood used for home heating were estimated using Energy Information Administration (EIA) and U.S. Census Bureau American Community Survey (ACS) data. The EIA State Energy Data System 2008 California residential energy use estimates and the U.S. Census Bureau 2008 ACS 1-year estimates of California households using non-utility fuels for home heating were used to calculate California per household fuel use in 2008. Similarly, The EIA State Energy Data System 2015 California residential energy use estimates and the U.S. Census Bureau 2015 ACS 1-year estimates of California households using non-utility fuels for home heating were used to calculate California per household fuel use in 2016, since 2016 data wasn't available. This per household fuel use factor was applied to U.S. Census Bureau 2006-2010 ACS 5-year estimates and 2011-2015 ACS 5-year estimates of Truckee households using non-utility fuels for home heating. Truckee has a significant number of homes using wood as a secondary heating source, resulting in a high level of uncertainty for the ACS number-of-households with wood heating. Town staff were consulted to determine a more accurate estimate. Table A-4 and Table A-5 show the data used in these calculations. Activity data was then entered into the ClearPath calculator using the calculation methods and emissions factors shown in Table A-2.

Direct Access Electricity Data

Direct access electricity is energy supplied by a competitive energy service provider other than a utility, but uses a utility's transmission lines to distribute the energy. According to TDPUD and Liberty Utilities, direct access electricity was not used in the Town of Truckee in 2008 and 2016, and is not included in this inventory.

Electricity Transmission and Distribution Losses Data

Electricity transmission and distribution (T&D) losses activity data is shown in Table A-1. T&D Losses were calculated for the electricity total, using the 2007 eGRID Western Gross Grid Loss Factor of 4.837% and 2014 eGRID Western Gross Grid Loss Factor of 4.790%. The calculated T&D losses were entered into the ClearPath calculator where the GHG emissions were calculated using 2007 and 2014 eGRID WECC Northwest (NWPP) sub-region grid average emissions factors. 2007 factors were used as proxies for 2008 since 2008 data is unavailable. Similarly 2014 factors were used for 2016 since 2016 data wasn't available.

Appendix B – Non-Residential Energy Use Sector Notes

Table B-1: Non-Residential Activity Data Inputs

Activity / Source	2008	2016	Units	Data Source
Electricity – TDPUD Small Commercial	23,564,929	21,354,059	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Large Public Authority	10,781474	8,994,867	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Medium Commercial	9,282,816	11,495,318	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Small / Medium Public Authority	6,992,815	8,956,656	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Large Commercial	6,894,480	6,048,480	kWh	Truckee Donner Public Utility District
Electricity – TDPUD Other Non-Residential	1,730,877	1,147,466	kWh	Truckee Donner Public Utility District
Electricity – Liberty A1- Small Commercial and Outdoor light	265,887	73,220	kWh	Liberty Utilities
Electricity – Liberty A1 & A2 - Special District	263,671	285,484	kWh	Liberty Utilities
Electricity Transmission & Distribution Losses	3,038,377	2,935,858	kWh	U.S. Environmental Protection Agency
Natural Gas – Southwest Gas Small Commercial	1,887,506	2,098,115	Therms	Southwest Gas
Natural Gas – Southwest Gas Large Commercial	295,874	369,281	Therms	Southwest Gas
Propane	123,856	123,856	Gallons	Suburban Propane and Amerigas / Truckee Tahoe Propane

Table B-2: Non-Residential GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 lbs/MWh	CH_4 lbs/GWh	N_2O lbs/GWh	Emissions Factor Source
2008 Electricity – TDPUD	BE.2.2	1,410.50	16.34	13.64	2008 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2008 Electricity – T&D Losses	BE.4.1	858.79 l	16.34	13.64	2007 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2008 Electricity – SPPC / Liberty	BE.2.2	1,328.16	16.34	13.64	2008 Sierra Pacific Power Company (SPPC) (CO_2) 2007 EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – TDPUD	BE.2.2	374.95	97.80	14.20	2016 TDPUD REC-adjusted (CO_2) 2014 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – T&D Losses	BE.4.1	907.00	97.80	14.20	2014 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 Electricity – SPPC / Liberty	BE.2.2	702.86	97.80	14.20	2016 Sierra Pacific Power Company (SPPC) (CO_2) 2014 EPA eGRID WECC NWPP (CH_4 and N_2O)

Activity / Source	Method	CO_2	CH_4	N_2O	Emissions Factor Source
Natural Gas	BE.1.1	53.02 kg/MMBtu	0.005 kg/MMBtu	0.0001 kg/MMBtu	USCP Appendix C - Table B.1 Natural Gas Pipeline (US Weighted Average) & Table B.3 Natural Gas
LPG (Propane)	BE.1.2	5.79 kg/Gallon	0.001 kg/Gallon	0.0001 kg/Gallon	USCP Appendix C - Table B.1 LPG and Table B.4 LPG

Methods:

Utility-Derived Data

Utility-provided activity data is shown in Table B-1. Electricity and natural gas consumption data was collected from Truckee Donner Public Utility District, Liberty Utilities, and Southwest Gas for consumption within Truckee. Since 2008, Liberty Utilities purchased Sierra Pacific Power Company and only maintains records for 2 full calendar years. The average of 2013 and 2014 electricity use provided by Liberty Utilities was used to estimate 2008 use since there was no significant non-residential construction in the Liberty Utilities service territory between 2008 and 2013. Data is shown in Table B-3. The Liberty Utilities 2016 calendar year record was used for 2016 data. The non-residential electricity and natural gas data was entered into ClearPath where the GHG emissions were calculated using appropriate grid emissions factors. The calculation methods and emissions factors are shown in Table B-2.

Table B-3: Liberty Utilities Non-Residential Electricity

Class	2013	2014	2013 / 2014 Average
	kWh	kWh	kWh
A1 - Small Commercial Less </= 50kilowatts	225,136	305,040	265,088
A1 - Small Commercial Less </= 50kilowatts	33,953	33,068	33,511
A2 - Medium Commercial 50-200 kilowatts	230,880	229,440	230,160
Outdoor Light	795	802	799

Direct Access Electricity Data

Direct access electricity is energy supplied by a competitive energy service provider other than a utility, but uses a utility's transmission lines to distribute the energy. According to TDPUD and Liberty Utilities direct access electricity was not used in the Town of Truckee in 2008, and is not included in this inventory.

Electricity Transmission and Distribution Losses Data

Electricity transmission and distribution (T&D) losses activity data is shown in Table B-1. T&D Losses were calculated for the electricity consumption total, using the 2007 eGRID Western Gross Grid Loss Factor of 4.837% for 2008 and the 2014 eGRID Western Gross Loss Factor of 4.790% for 2016. The calculated T&D losses were entered into the ClearPath calculator where the GHG emissions were calculated using 2007 and 2014 eGRID WECC Northwest (NWPP) subregion grid average emissions factors since 2008 and 2016 data was unavailable.

Appendix C – Community Transportation Sector Notes

Table C-1: 2008 Community Transportation Activity Data Inputs

Activity / Source	Vehicle Type	2008 Vehicle Miles Traveled (VMT)	2016 Vehicle Miles Traveled (VMT)	Data Source
On-Road Vehicle Summary	Passenger Car - Gasoline	34,883,961	35,662,849	Town of Truckee Engineering Department, CalTrans, and California Air Resources Board (CARB) Emissions Factors (EMFAC) 2014 Model
	Passenger Car - Diesel	277,961	503,070	
	Light Truck - Gasoline	47,441,559	43,034,429	
	Light Truck - Diesel	50,644	227,260	
	Heavy Truck - Gasoline	4,095,380	2,603,201	
	Heavy Truck - Diesel	12,541,735	10,470,759	
	Passenger Car - Electric	56,139	269,899	
	Light Truck - Electric	236	1,741	
Activity / Source	**CO_2 (Metric Tons)**	**CH_4 (Metric Tons)**	**N_2O (Metric Tons)**	**Data Source**
2008 Off-road Equipment	7,873.01	8.0855	1.0677	CARB OFFROAD2007 Model
2016 Off-road Equipment	8,060.33	0.9780	0.2536	CARB Staff

Table C-2: 2008 Community Transportation GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 (grams / mile)	CH_4 (grams / mile)	N_2O (grams / mile)	Emissions Factor Source
Passenger Car - Gasoline	TR.1.B	335.0403	0.053312	0.020659	2008 Nevada County - CARB EMFAC2014 Model
Passenger Car - Diesel	TR.1.B	329.2911	0.008753	0.010833	
Light Truck - Gasoline	TR.1.B	500.6829	0.063261	0.039183	
Light Truck - Diesel	TR.1.B	521.5561	0.011717	0.017158	
Heavy Truck - Gasoline	TR.1.B	964.7924	0.171817	0.091963	
Heavy Truck - Diesel	TR.1.B	1,192.6761	0.054855	0.039235	

Table C-3: 2016 Community Transportation GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 (grams / mile)	CH_4 (grams / mile)	N_2O (grams / mile)	Emissions Factor Source
Passenger Car - Gasoline	TR.1.B	311.2875	0.024216	0.008935	2016 Nevada County - CARB EMFAC2014 Model
Passenger Car - Diesel	TR.1.B	300.5646	0.002631	0.009888	
Light Truck - Gasoline	TR.1.B	471.5080	0.034246	0.022103	
Light Truck - Diesel	TR.1.B	479.4966	0.001665	0.015774	
Heavy Truck - Gasoline	TR.1.B	976.9938	0.115069	0.077142	
Heavy Truck - Diesel	TR.1.B	1,282.5130	0.018321	0.042191	

Methods:

On-Road Vehicles

Since actual fuel consumption data is not available at the Town level, on-road transportation emissions for Truckee are calculated using estimated vehicle-miles traveled (VMT) data coupled with county-level data on the proportions of vehicle types and fuel types. On-road transportation activity data is shown in Table C-1. Activity data was entered into the ClearPath calculator where county-level fuel-specific and vehicle-specific emissions factors shown in Table C-2 and Table C-3 were applied to calculate the on-road transportation GHG emissions. The methodology for collecting and conditioning this data is as follows:

Vehicle Miles Traveled Estimates

2009 and 2016 data on VMT was provided by the Town of Truckee Engineering Department's origin-destination based transportation model. The transportation model provides an estimate of the typical-weekday afternoon peak-hour VMT. Since peak-hour VMT is not representative of annual-average VMT an adjustment (K) factor of 11.8% and 13.0% was derived from CalTrans and Town of Truckee peak-hour and average-daily traffic counts for 2009 and 2016, respectively, on various roadways within the Town. The K factor was applied to the transportation model VMT outputs to convert from peak-hour VMT to annual average VMT. The subsequent VMT was broken into four categories based on the origin and destination of the trips: Internal-Internal (trips beginning and ending in the community), Internal-External (trips beginning in the community and ending elsewhere in the region), External-Internal (trips beginning somewhere else within the region and ending in the community) and External-External (trips beginning and ending outside of Truckee). 100% of the VMT from Internal-Internal trips was attributed to Truckee. 50% of the VMT from Internal-External and External-Internal trips was attributed to Truckee. The VMT from External-External trips or pass through traffic was excluded per protocol guidance. Data is shown in TablesC-4 and C-5. Finally, the estimated 2009 VMT was scaled to 2008 using the change in population between 2008 and 2009.

Table C-4: 2009 Town of Truckee Transportation Model Outputs

Activity / Source	Trip Type	2009 Peak hour VMT	2009 Average Annual Daily VMT	Truckee Attribution	2009 Truckee Average Annual Daily VMT	Data Source
On-Road Vehicles	Internal – Internal Trips	17,035	144,752	100%	144,752	CalTrans and Town of Truckee Engineering Department
	Internal – External Trips	15,520	131,877	50%	65,939	
	External – Internal Trips	14,979	127,283	50%	63,641	
	External – External Trips	30,716	261,001	0%	0	

Table C-5: 2016 Town of Truckee Transportation Model Outputs

Activity / Source	Trip Type	2016 Peak hour VMT	2016 Average Annual Daily VMT	Truckee Attribution	2016 Truckee Average Annual Daily VMT	Data Source
On-Road Vehicles	Internal – Internal Trips	17,588	134,935	100%	134,935	CalTrans and Town of Truckee Engineering Department
	Internal – External Trips	15,789	121,134	50%	60,567	
	External – Internal Trips	15,249	116,994	50%	58,497	
	External – External Trips	30,851	236,686	0%	0	

Fuel / Vehicle Type Breakdown and Emissions Calculations

Since the regional transportation model does not provide VMT by fuel and vehicle type, county-level fuel and vehicle type percentages were extracted from the CRB's Mobile Source Emissions Inventory On-Road Motor Vehicles Emissions Factor (EMFAC) 2014 model. The EMFAC2014 model was run for 2008 and 2016 for Nevada County. Daily VMT by fuel and vehicle classification (Passenger Car, Light-Duty Truck and Heavy-Duty Truck) was used to calculate vehicle percentages by fuel and vehicle type for the County. These County percentages were applied to the Truckee-specific annual VMT, resulting in final VMT figures by fuel and vehicle type for Truckee. EMFAC2014 reports CO_2, CH_4 and N_2O emissions factors for 51 different vehicle type and fuel combinations for every county in California, informed by California Department of Motor Vehicles registrations, the Smog Check program and many other data sources. Average CO_2 emissions factors were calculated for gasoline and diesel passenger vehicles, light trucks and heavy trucks. The local vehicle and fuel-specific average CH_4 and N_2O emissions factors were calculated from EMFAC2014. The CH_4 emissions for all vehicles were calculated from County EMFAC2014 reported methane total exhaust (CH_4_Totex). N_2O emissions for gasoline-fueled vehicles were calculated from County EMFAC2014 reported nitrogen oxides total exhaust (NOx_Totex) multiplied by 0.0416, the average fraction of NOx emissions that are, or react into, N_2O, based on guidance from CARB. N_2O emissions for diesel fueled vehicles were calculated from County EMFAC2014 reported Fuel Use multiplied by 0.3316 grams per gallon, based on guidance from CARB.

Off-Road Emissions

Off-road emissions for 2008 were estimated with standard procedures using CARB's OFFROAD2007 modeling program. OFFROAD2007 produces county-level emissions for various off-road, fuel-consuming machines. Off-road emissions for 2016 were provided by CARB staff. After discussion with Town staff, agricultural, logging, and railyard operations equipment was assumed to not operate within Town limits and emissions were excluded. Construction & mining, entertainment, industrial, lawn and garden, light commercial, pleasure craft, recreational equipment and transport refrigeration units were included. Off-road equipment in the Town of Truckee was estimated to emit 16.2049% of 2008 county emissions and 16.0016% of 2016 county emissions based on the ratio of Truckee population

to County population. This information was collected in an initial questionnaire distributed to a government staff person and additional information regarding machine operations was confirmed through phone calls and emails with Town staff. The OFFROAD2007 data and CARB staff data is reported as daily usage – and was multiplied by 365.25 to produce annual emissions. The final data was entered into ClearPath directly as annual metric tons of CO_2, CH_4, and N_2O. Table C-6 and Table C-7 show the proportions applied to each off-road machine category.

Table C-6: 2008 Off-Road Proportions by Category

Off-Road Machine Type Category	Proportion Applied to OFFROAD2007 County-Wide Output
Agricultural Equipment	Assumed 0% in Town – excluded.
Construction & Mining Equipment	16.2049% Truckee-to-Nevada County Population ratio
Entertainment Equipment	16.2049% Truckee-to-Nevada County Population ratio
Industrial Equipment	16.2049% Truckee-to-Nevada County Population ratio
Lawn & Gardening Equipment	16.2049% Truckee-to-Nevada County Population ratio
Light Commercial Equipment	16.2049% Truckee-to-Nevada County Population ratio
Logging Equipment	Assumed 0% in Town – excluded.
Pleasure Craft	16.2049% Truckee-to-Nevada County Population ratio
Railyard Operations	Assumed 0% in Town – excluded.
Recreational Equipment	16.2049% Truckee-to-Nevada County Population ratio
Transport Refrigeration Units	16.2049% Truckee-to-Nevada County Population ratio
Oil Drilling	Assumed 0% in Town – excluded.

Table C-7: 2016 Off-Road Proportions by Category

Off-Road Machine Type Category	Proportion Applied to CARB Staff County-Wide Data
Agricultural Equipment	Assumed 0% in Town – excluded.
Construction & Mining Equipment	16.0016% Truckee-to-Nevada County Population ratio
Entertainment Equipment	16.0016% Truckee-to-Nevada County Population ratio
Industrial Equipment	16.0016% Truckee-to-Nevada County Population ratio
Lawn & Gardening Equipment	16.0016% Truckee-to-Nevada County Population ratio
Light Commercial Equipment	16.0016% Truckee-to-Nevada County Population ratio
Logging Equipment	Assumed 0% in Town – excluded.
Pleasure Craft	16.0016% Truckee-to-Nevada County Population ratio
Railyard Operations	Assumed 0% in Town – excluded.
Recreational Equipment	16.0016% Truckee-to-Nevada County Population ratio
Transport Refrigeration Units	16.0016% Truckee-to-Nevada County Population ratio
Oil Drilling	Assumed 0% in Town – excluded.

Appendix D – Community Solid Waste Sector Notes

Table D-1: 2008 Solid Waste Activity Data Inputs

Landfill	2008 Wet Tons Waste Deposited	Landfill Gas Capture?	Distance to Facility (Miles)	Transport Fuel	Data Source
Lockwood Landfill	17,282	Yes	42.2	Diesel	Tonnage from CalRecycle Disposal Reporting System. Landfill gas capture data from EPA GHG MRR database. Distance to facility from Google maps.

Table D-2: 2016 Solid Waste Activity Data Inputs

Landfill	2016 Wet Tons Waste Deposited	Landfill Gas Capture?	Distance to Facility (Miles)	Transport Fuel	Data Source
Lockwood Landfill	15,393	Yes	42.2	Diesel	Tonnage from CalRecycle Disposal Reporting System. Landfill gas capture data from EPA GHG MRR database. Distance to facility from Google maps.
Additional Facilities	155	Yes	103.8	Diesel	

Table D-3: 2008 Solid Waste GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	Type	Percent by Weight	Emissions Factor (metric tons CH_4 / wet short ton waste)	Emissions Factor Source
Community Solid Waste Characterization	SW.4	Newspaper	1.4	0.043	CalRecycle *California 2008 Statewide Waste Characterization Study,* *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	4.9	0.203	
		Corrugated Cardboard	5.2	0.120	
		Magazines / Third Class Mail	5.9	0.049	
		Food Scraps	15.5	0.078	
		Grass	1.9	0.038	
		Leaves	1.9	0.013	
		Branches	3.3	0.062	
		Dimensional Lumber	14.5	0.062	
		All other (Non-Organic)	45.5	0	
Collection and Transportation of Solid Waste	SW.6	Solid Waste Collection	N/A	0.020 Metric Ton CO_2e / wet short ton	USCP Appendix E (page 29)
		Solid Waste Transportation	N/A	0.00014 Metric Ton CO_2e / wet short ton / mile	USCP Appendix E (page 29)

Table D-4: 2016 Solid Waste GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	Type	Percent by Weight	Emissions Factor (metric tons CH_4 / wet short ton waste)	Emissions Factor Source
Community Solid Waste Characterization	SW.4	Newspaper	1.2	0.043	CalRecycle *California 2014 Statewide Waste Characterization Study,* *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	4.6	0.203	
		Corrugated Cardboard	3.3	0.120	
		Magazines / Third Class Mail	8.1	0.049	
		Food Scraps	18.7	0.078	
		Grass	1.1	0.038	
		Leaves	2.7	0.013	
		Branches	4.8	0.062	
		Dimensional Lumber	11.9	0.062	
		All other (Non-Organic)	43.6	0	
Collection and Transportation of Solid Waste	SW.6	Solid Waste Collection	N/A	0.020 Metric Ton CO_2e / wet short ton	USCP Appendix E (page 29)
		Solid Waste Transportation	N/A	0.00014 Metric Ton CO_2e / wet short ton / mile	USCP Appendix E (page 29)

Methods:

Community Generated Solid Waste

Solid waste generated in 2008 and 2016 within the Town of Truckee and transferred to Lockwood landfill and other facilities for disposal emits methane over the entire period of waste decomposition, estimated to be 100 years. Data on the tonnage of waste generated by Truckee's residents and businesses and then landfilled was collected from the California Integrated Waste Management Board (CalRecycle). Waste characterization percentages from the CalRecycle *California 2008 Statewide Waste Characterization Study* and *California 2014 Statewide Waste Characterization Study* were applied to the 2008 tonnage and 2016 tonnage, respectively. The community waste tonnage and waste characterizations, shown in Tables D-1 and Table D-2, were entered into ClearPath where GHG emissions were calculated based on standard factors for organic content and methane generating potential for each waste type. Emissions were adjusted based on the presence of a landfill gas capture systems.

Solid Waste Collection and Transportation

A variety of emissions are associated with solid waste management services including emissions resulting from collection, processing, and storage of solid waste generated by residents and businesses. Collection and transportation emissions are included in community transportation sector total emissions, but they are reported with the waste sector for completeness and to provide context.

Solid waste collection and transportation emissions result from the trucks used to collect municipal solid waste within the community and transport the waste to Lockwood regional landfill serving Truckee. In 2016 approximately 1% of

solid waste generated by the community was transported to other facilities. The waste tonnage and the distance to receiving landfills (based on the distance from the center of the community to the landfill) were entered into the ClearPath calculator to calculate GHG emissions using default CO_2e emissions factors listed in Table D-3 and D-4.

Appendix E – Community Potable Water Use Sector Notes

Table E-1: Community Potable Water Electricity Use Activity Data

Activity/Source	2008 Electricity Use (kWh)	2016 Electricity Use (kWh)	Data Source
TDPUD Total	10,536,252	7,021,050	TDPUD - Assumed TDPUD equipment serving the Town coincides with Town of Truckee boundary. Equipment out of town coincides with SPPC territory
SPPC Total	227,444	151,562	Assume relative use of 2016 TDPUD-to-Liberty reflects use of 2008 TDPUD-to-SPPC.
Electricity Transmission and Distribution (T&D) Losses	547,103	360,853	2007 eGRID Grid Loss Factor (Western) = 4.837%. Loss = GLF/(1-GLF) = 5.083% 2014 eGRID Grid Loss Factor (Western) = 4.790%. Loss = GLF/(1-GLF) = 5.031%

Table E-2: Community Potable Water GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 lbs/MWh	CH_4 lbs/GWh	N_2O lbs/GWh	Emissions Factor Source
2008 Electricity – TDPUD	BE.2.2	1,410.50	16.34	13.64	2008 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2008 Electricity – T&D Losses	BE.4.1	858.79 l	16.34	13.64	2007 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2008 Electricity – SPPC / Liberty	BE.2.2	1,328.16	16.34	13.64	2008 Sierra Pacific Power Company (SPPC) (CO_2) 2007 EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – TDPUD	BE.2.2	374.95	97.80	14.20	2016 TDPUD REC-adjusted (CO_2) 2014 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – T&D Losses	BE.4.1	907.00	97.80	14.20	2014 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 Electricity – SPPC / Liberty	BE.2.2	702.86	97.80	14.20	2016 Sierra Pacific Power Company (SPPC) (CO_2) 2014 EPA eGRID WECC NWPP (CH_4 and N_2O)

Methods:

Community Potable Water Electricity Use

The Town of Truckee's potable water use activity data is shown in Table E-1. Truckee Donner Public Utility District (TDPUD) electricity use data was collected from TDPUD. Electricity used outside the Town boundaries is provided by SPPC/Liberty Utilities. 2016 Liberty Utilities electricity use was estimated assuming the relative use of 2016 TDPUD-to-Liberty kWh use was the same as the 2008 TDPUD-to-SPPC kWh use. The electricity use was entered

into ClearPath where the GHG emissions were calculated using methods and reported grid emissions factors for electricity as shown in Table E-2.

Electricity transmission and distribution (T&D) losses activity data is shown in Table E-1. T&D Losses were calculated for 2008 electricity use, using the 2007 eGRID Western Gross Grid Loss Factor of 4.837%, and for 2016 electricity use, using the 2014 eGRID Western Gross Grid Loss Factor of 4.790%. The T&D losses in kWh were entered into the ClearPath calculator where the GHG emissions were calculated using 2007 eGRID WECC Northwest (NWPP) sub-region grid average emissions factors for 2008, since 2008 data was unavailable, and using 2014 eGRID WECC Northwest (NWPP) sub-region grid average emissions factors for 2016, since 2016 data was unavailable.

Appendix F – Community Wastewater Treatment Sector Notes

Table F-1: 2008 Community Wastewater Treatment Electricity Use Activity Data

Process	Electricity Use (kWh)	Energy Intensity (kWh / Million Gallons)	Wastewater Treated (Million Gallons)	Data Source
TSD Conveyance	239,283	429	557.77	Truckee Sanitary District (TSD), Tahoe-Truckee Sanitation Agency (T-TSA)
T-TSA Treatment	3,281,363	5,883	557.77	
Electricity T&D Losses	178,949			eGRID Grid Loss Factor (Western) =4.837%. Loss = GLF/(1-GLF) = 5.083%

Table F-2: 2016 Community Wastewater Treatment Electricity Use Activity Data

Process	Electricity Use (kWh)	Energy Intensity (kWh / Million Gallons)	Wastewater Treated (Million Gallons)	Data Source
TSD Conveyance	313,624	429	731.06	Truckee Sanitary District (TSD), Tahoe-Truckee Sanitation Agency (T-TSA)
T-TSA Treatment	4,300,813	5,883	731.06	
Electricity T&D Losses	216,373			eGRID Grid Loss Factor (Western) = 4.790%. Loss = GLF/(1-GLF) = 5.031%

Table F-3: Community Wastewater Treatment Operations Activity Data

Facility	Activity / Source	2008	2016	Data Source
Tahoe-Truckee Sanitation Agency (T-TSA) Central Plant	Population Served	11,874	11,631	T-TSA
	Nitrification / Denitrification Process (Yes / No)	Yes	Yes	
	Commercial / Industrial Factor	1.25	1.25	
	Nitrogen Load (kg/day)	27.71	33.30	
	Aerobic or Anaerobic	Anaerobic	Anaerobic	
	Flare Digester Gas (DG) (Cubic Feet / Day)	5,529	7,457	
	Boiler Digester Gas (Cubic Feet / Day)	25,538	39,098	
	DG Destruction Efficiency	99%	99%	
	DG % Methane	65%	65%	
	Type of Solids Treatment	Anaerobic Digestion	Anaerobic Digestion	
	Methanol Use (Metric Tons CH_3OH/day)	0.4343	0.7305	
Private Septic Systems	Population Served	4,101	4,148	Remaining Population

Table F-4: Community Wastewater Treatment GHG Calculation Methods and Emissions Factors

Activity / Source	USCP Method	CO_2 lbs/MWh	CH_4 lbs/GWh	N_2O lbs/GWh	Emissions Factor Source
2008 Electricity – TDPUD (including TSD)	BE.2.2	1,410.50	16.34	13.64	2008 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2008 Electricity – T&D Losses	BE.4.1	858.79	16.34	13.64	2007 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 Electricity – TDPUD	BE.2.2	374.95	97.80	14.20	2016 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – T&D Losses	BE.4.1	907.00	97.80	14.20	2014 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 TSD Solar	BE.2.2	0	0	0	Zero-emission solar-generated.
Septic Systems (population based)	WW.11 (alt)	N/A	0.6 kg / kg BOD_5	N/A	USCP App F page 52
Central Plants – with nitrification / denitrification process (population based)	WW.7	N/A	N/A	7 g N_2O / person / year	USCP App F page 41
Effluent (N known)	WW.12	N/A	N/A	0.005 kg N_2O / kg sewage N	USCP App F page 54
Combustion of Digester Gas (DG)	WW.1,2 & 3	52.07 kg/MMBTU (Biogenic CO_2)	0.0032 kg/MMBTU	$6.3X10^{-4}$ kg/MMBTU	USCP App F page 21
Incomplete Combustion of DG	10.1	N/A	N/A	N/A	LGOP (May 2010) page 109
Methanol Use	WW.9	N/A	N/A	N/A	USCP App F page 45

Methods:

Community Wastewater Treatment Electricity Use

Community-generated wastewater electricity use activity data is shown in Tables F-1 and F-2. Electricity use was estimated using the 2008 and 2016 million gallons of wastewater collected and treated multiplied by the current energy intensity. Data on current (2013-2014) energy intensity (kWh / million gallons) was collected from wastewater agencies serving Truckee's residents and businesses and used as a proxy for both 2008 and 2016. The 2008 and 2016 volume of wastewater treated for Truckee residents and businesses was derived from flow volume information provided by Truckee Sanitary District.

Since the wastewater collection and treatment infrastructure lies within the Town limits, this electricity use was subtracted from the non-residential totals to prevent double-counting. The electricity use was entered into ClearPath where the GHG emissions were calculated using reported grid emissions factors for electricity, listed in Table F-4.

Electricity transmission and distribution (T&D) losses activity data is shown in Table F-1 and Table F-2. T&D losses were calculated using the, 2007 eGRID Western Gross Grid Loss Factor of 4.837% for 2008 and using the 2014

eGRID Western Gross Grid Loss Factor of 4.790% for 2016. The calculated T&D losses were entered into the ClearPath calculator where the GHG emissions were calculated using 2007 and 2014 eGRID WECC Northwest (NWPP) sub-region grid average emissions factors since 2008 and 2016 data was unavailable.

Community Wastewater Treatment Facility Process and Fugitive Emissions

Wastewater treatment process emissions account for a small part of total community-based GHG emissions. Wastewater was treated using a centralized anaerobic plant with nitrification / denitrification processes, and a few private septic systems. There are two emissions associated with these processes: methane (CH_4) and nitrous oxide (N_2O). Biogenic CO_2 emissions occur during combustion of digester gas as well. Calculating the makeup and amount of emissions depends on the processes involved and the management practices employed. The plant characteristics shown in Table F-3 were collected from T-TSA staff. There were also septic systems used to treat wastewater, summarized in Table F-3. The wastewater treatment activity data was entered into ClearPath where GHG emissions were calculated using the standard methods and emissions factors from the USCP and LGOP shown in Table F-4.

Uncertainties

According to the latest EPA national inventory of greenhouse gas emissions considerable uncertainty exists within any of the EPA/IPCC-based methodologies used to estimate wastewater process and fugitive emissions. EPA states that population-based methane emissions could be underestimated by 37% or overestimated by 47% while nitrous oxide emissions could be underestimated by 76% or overestimated by 93%. Emissions estimates based on direct source measurements can possibly have higher accuracy and less uncertainty. This extreme degree of uncertainty exists because these methodologies were originally developed for international countrywide inventories that were mainly population-based. Although these methodologies had the advantage of being relatively simple, the trade-off was a compromised level of accuracy. Nevertheless, the methodologies in this Appendix reflect the evolution of knowledge since the development of the LGOP. Methods are evolving but caution should be used drawing conclusions and establishing policies based on these calculations, especially population-based methods.

Municipal-Operations Inventory Appendices

Appendix G – Buildings and Facilities Sector Notes

Table G-1: Buildings and Facilities Activity Data Inputs

Facility Name	Activity / Source	2008	2016	Units	Data Source
Town Hall - Truckee Airport Rd	Electricity 10181 – TDPUD	369,120	243,480	kWh	TDPUD, Southwest Gas
	Electricity 10185 – TDPUD	287,040	259,800	kWh	
	Natural Gas – Southwest Gas	27,529	9,094	Therms	
Stevens Ln Corp Yard and Admin	Electricity 10969 Stevens Ln - TDPUD	NA	444,960	kWh	
	Natural Gas – Southwest Gas	NA	31,496	Therms	
Stevens Lane Animal Shelter	Electricity 10969/10961 Stevens Ln - TDPUD	NA	318,840	kWh	
	Natural Gas – Southwest Gas	NA	24,467	Therms	
Riverview Old Corp Yard / Animal Shelter	Electricity – TDPUD	188,120	259,800	kWh	
	Natural Gas – Southwest Gas	25,242	8,592	Therms	
Riverview Old Corp Yard Office	Electricity – TDPUD	18,128	1,342	kWh	
Tahoe Donner Corp Yard	Electricity – TDPUD	38,959	19,409	kWh	
	Natural Gas – Southwest Gas	11,680	10,536	Therms	
Train Depot Lobby & Exterior	Electricity – TDPUD	79,753	90,195	kWh	
	Natural Gas – Southwest Gas	2,823	2,403	Therms	
Transmission & Distribution (T&D) Grid Loss Factor (GLF)	Electricity	4.837	4.790	%	U.S. EPA eGRID WECC
T&D Losses	Electricity	49,868.9	82,399	kWh	
Train Depot Tenant	Electricity – TDPUD	11,514	5,213	kWh	TDPUD, U.S. EPA eGRID WECC
	Electricity T&D Losses	585	262	kWh	

Table G-2: Buildings and Facilities GHG Calculation Methods and Emissions Factors

Activity / Source	Method	CO_2	CH_4	N_2O	Emissions Factor Source
2008 Electricity – TDPUD	6.2	1,410.50 lbs/MWh	16.34 lbs/GWh	13.64 lbs/GWh	2008 TDPUD REC-adjusted (CO_2) 2007 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2008 Electricity – T&D Losses	6.2	858.79 lbs/MWh	16.34 lbs/GWh	13.64 lbs/GWh	2007 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
2016 Electricity – TDPUD	6.2	374.95 lbs/MWh	97.80 lbs/GWh	14.2 lbs/GWh	2016 TDPUD REC-adjusted (CO_2) 2014 U.S. EPA eGRID WECC NWPP (CH_4 and N_2O)
2016 Electricity – T&D Losses	6.2	907.00 lbs/MWh	97.80 lbs/GWh	14.2 lbs/GWh	2014 EPA eGRID WECC NWPP (CO_2, CH_4 and N_2O)
Natural Gas – Southwest Gas	6.1	53.02 kg/MMBtu	0.005 kg/MMBtu	0.0001 kg/MMBtu	LGOP Appendix G - Table G.1 (CO_2) and Table G.3 (CH_4 and N_2O)

Methods:

2008 and 2016 buildings and facilities electricity and natural gas consumption data, shown in Table G-1, was collected from Truckee Donner Public Utility District (TDPUD) and Southwest Gas. The activity data was entered into ClearPath where the GHG emissions were calculated using appropriate grid emissions factors. The calculation methods and emissions factors are shown in Table G-2. Emissions from fire suppressants and refrigerants used in Truckee's HVAC and refrigeration equipment were not included because the data was not readily available and emissions were deemed *de minimis*.

Table G-3: Public Lighting Activity Data Inputs Details

Facility Name	Activity / Source	2008	2016	Units	Data Source
Traffic Signals	Electricity – TDPUD	23,015	27,195	kWh	TDPUD
Other Depot Lighting	Electricity – TDPUD	5,153	6,779	kWh	
Roundabouts	Electricity – TDPUD	24,951	43,648	kWh	
Other Lights	Electricity – TDPUD	9,303	6,993	kWh	
Transmission & Distribution Grid Loss Factor	Electricity	4.837	4.790	%	EPA eGRID Western
Transmission & Distribution (T&D) Losses	Electricity	3,173	4,257	kWh	

Public lighting electricity use data, shown in Table G-3, was collected from TDPUD. The activity data was entered into ClearPath where the GHG emissions were calculated using appropriate grid emissions factors. The calculation methods and emissions factors are shown in Table G-2.

Appendix H – Vehicle Fleet and Mobile Equipment Sector Notes

Table H-1: Vehicle Fleet and Mobile Equipment Activity Data Inputs

Facility Name	Activity / Source (On-Road)	Fuel Type	2008 Fuel Use (Gallons)	2008 Vehicle Miles Traveled	2016 Fuel Use (Gallons)	2016 Vehicle Miles Traveled	Data Source
Building	Light Truck/ SUV/Pickup	Gasoline	1,757	29,293	1,460	43,408	Town of Truckee staff
Police, Animal Services & Parking	Light Truck/ SUV/Pickup	Gasoline	33,692	177,383	24,177	250,270	
Public Works Maintenance	Light Truck/ SUV/Pickup	Gasoline	3,890	50,264	4,879	84,870	
Facilities	Light Truck/ SUV/Pickup	Gasoline	2,095	15,806	2,166	13,366	
Engineering	Light Truck/ SUV/Pickup	Gasoline	575	16,229	433	6,428	
Fleet	Light Truck/ SUV/Pickup	Gasoline	814	12,203	752	11,496	
Fleet	Heavy Truck	Diesel	356	4,231	175	686	
Code Compliance	Light Truck/ SUV/Pickup	Gasoline	296	16,010	323	4,351	
General Government	Light Truck/ SUV/Pickup	Gasoline	263	5,517	259	9,017	
Solid Waste / Recycling	Light Truck/ SUV/Pickup	Gasoline	240	9,049	85	2,820	
Transit (Fixed Route)	Heavy Truck	Gasoline	660	6,583	426	3,486	
Transit (Fixed Route & Dial-a-Ride)	Heavy Truck	Diesel	10,940	113,702	12,030	67,701	
Public Works - Maintenance	Off-Road	Diesel	5,666	NA	7,442	NA	
Public Works - Maintenance	Off-Road	Biodiesel	0	NA	887	NA	
Public Works - Snow	Off-Road	Gasoline	4,717	NA	4,011	NA	
Public Works - Snow	Off-Road	Diesel	43,970	NA	34,185	NA	
Trails	Off-Road	Diesel	0	NA	791	NA	
Record Name	**Activity /Source**	**2008 # of Vehicles**	**2016 # of vehicles**	**Full Charge Capacity (kg/vehicle)**	**Annual Operating Loss**	**GWP**	**Data Source**
Leaked Refrigerants	R-134a	91	114	1.5	20%	1,430	Town Staff, EPA (2014)

Table H-2: Vehicle Fleet GHG Calculation Methods and Emissions Factors

Activity / Source	Method	CO_2 kg/ gallon	CH_4 grams / mile	N_2O grams / mile	CH_4 grams / mile	N_2O grams / mile	Emissions Factor Source
			2008		2016		
On-Road Light Trucks Gasoline	7.1.1.1 and 7.1.3.3	8.78	0.063261096	0.039182605	0.034246182	0.022102963	LGOP Appendix G - Table G.11 (CO_2), CARB EMFAC 2014 Nevada Co (CH_4 and N_2O)
On-Road Heavy Trucks Gasoline	7.1.1.1 and 7.1.3.3	8.78	0.171816886	0.091963356	0.115069096	0.077142049	
On-Road Heavy Trucks Diesel	7.1.1.1 and 7.1.3.3	10.21	0.054855061	0.039235256	0.018321434	0.042190607	
Activity / Source	**Method**	**CO_2 kg/ gallon**	**CH_4 grams / gallon**	**N_2O grams / gallon**	**CH_4 grams / gallon**	**N_2O grams / gallon**	**Emissions Factor Source**
			2008		2016		
Off-Road– Gasoline Large Utility	7.2	8.78	0.50	0.22	0.50	0.22	LGOP Appendix G - Table G.11 (CO_2), and Table G.14 (CH_4 & N_2O)
Off-Road – Diesel Large Utility	7.2	10.21	0.26	0.58	0.26	0.58	
Refrigerant	7.4	N/A					LGOP

Methods:

Detailed vehicle fleet information was collected from Town staff, including vehicle descriptions, fuel type, gallons of fuel, and vehicle miles traveled (VMT). The activity data, shown in Table H-1, was entered into ClearPath where the GHG emissions were calculated using standard LGOP methods and the emissions factors shown in Table H-2. Standard CO_2 emissions factors were used for both years along with custom Nevada County specific fuel and vehicle type CH_4 and N_2O emissions factors from CARB's EMFAC2014 model for 2008 and 2016. Standard equipment and fuel type specific CO_2, CH_4 and N_2O emissions factors were used for off-road equipment.

The fugitive emissions from vehicle air conditioning refrigerants were estimated using the LGOP default method, which may overestimate emissions. It assumes full-charge-capacity of 1.5 kg refrigerant per vehicle and 20% loss per year. All vehicles were assumed to be 1994 or newer models, and the refrigerant was assumed to be R-134a. The majority of automakers changed from R-12 to R-134a as the refrigerant of choice in their cars in that year. The estimated full-charge volume of refrigerant is the upper bound of the range approved for the equipment type, and the default leakage rate is likely to be higher than if refrigerant use was tracked directly.

Appendix I – Government-Generated Solid Waste Sector Notes

Table I-1: 2008 Government-Generated Solid Waste Activity Data Inputs

Facility Name	Activity / Source	2008 Tons	2016 Tons	Waste Characterization	Data Source
Town Hall	Muni-Ops Solid Waste	7.0	6.9	Public Administration	Tahoe Truckee Sierra Disposal
PW- Stevens Lane Corp Yard	Muni-Ops Solid Waste	NA	6.9	Public Administration	
Stevens Lane Animal Shelter	Muni-Ops Solid Waste	NA	4.6	Public Administration	
PW- Riverview Corp Yard	Muni-Ops Solid Waste	7.0	NA	Public Administration	
PW- Tahoe Donner Corp Yard	Muni-Ops Solid Waste	3.5	NA	Public Administration	
Riverview Animal Shelter	Muni-Ops Solid Waste	3.5	NA	Public Administration	
Train Depot	Community Solid Waste	11.9	5.5	California Statewide	
Downtown Cans	Community Solid Waste	23.8	31.4	California Statewide	

Table I-2: 2008 Solid Waste GHG Calculation Methods and Emissions Factors

Activity / Source	Method	Type	Percent by Weight	Emissions Factor (metric tons CH_4 / wet short ton waste)	Percentages and Emissions Factor Source
Community-Generated Statewide Waste Characterization	12.2.2	Newspaper	1.4	0.043	CalRecycle *California 2008 Statewide Waste Characterization Study,* *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	4.9	0.203	
		Corrugated Cardboard	5.2	0.120	
		Magazines/Third Class Mail	5.9	0.049	
		Food Scraps	15.5	0.078	
		Grass	1.9	0.038	
		Leaves	1.9	0.013	
		Branches	3.3	0.062	
		Dimensional Lumber	14.5	0.062	
		All other (Non-Organic)	45.5	0	
Government-Generated Public Administration Waste Characterization	12.2.2	Newspaper	5.7	0.043	CIWMB 1999 Public Admin for 2008 Municipal Operations Solid Waste *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	13.2	0.203	
		Corrugated Cardboard	5.1	0.120	
		Magazines/Third Class Mail	15.4	0.049	
		Food Scraps	9.8	0.078	
		Grass	8.1	0.038	
		Leaves	8.1	0.013	
		Branches	0.1	0.062	
		Dimensional Lumber	5.0	0.062	
		All other (Non-Organic)	29.5	0	

Table I-3: 2016 Solid Waste GHG Calculation Methods and Emissions Factors

Activity / Source	Method	Type	Percent by Weight	Emissions Factor (metric tons CH_4 / wet short ton waste)	Percentages and Emissions Factor Source
Community-Generated Statewide Waste Characterization	12.2.2	Newspaper	1.2	0.043	CalRecycle *California 2014 Statewide Waste Characterization Study,* *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	4.6	0.203	
		Corrugated Cardboard	3.3	0.120	
		Magazines/Third Class Mail	8.1	0.049	
		Food Scraps	18.7	0.078	
		Grass	1.1	0.038	
		Leaves	2.7	0.013	
		Branches	4.8	0.062	
		Dimensional Lumber	11.9	0.062	
		All other (Non-Organic)	43.6	0	
Government-Generated Public Administration Waste Characterization	12.2.2	Newspaper	2.3	0.043	CalRecycle Public Admin 2014 for Municipal Operations *USCP Appendix E (Page 34) & U.S. EPA Waste Reduction Model (WARM)*
		Office Paper	10.5	0.203	
		Corrugated Cardboard	3.1	0.120	
		Magazines/Third Class Mail	18.7	0.049	
		Food Scraps	17.2	0.078	
		Grass	1.2	0.038	
		Leaves	1.2	0.013	
		Branches	0.1	0.062	
		Dimensional Lumber	6.5	0.062	
		All other (Non-Organic)	39.2	0	

Methods:

The government-generated solid waste activity data was collected from Tahoe Truckee Sierra Disposal (TTSD) in the form of the number, size and pickup schedule of bins collected in 2008 and 2016. Bins were assumed to be 100% full except for the downtown cans which were split 50/50 between trash and recycling. Municipal-operations solid waste tons, shown in Table I-1, were calculated using a density of 89 lbs per cubic yard, provided by the California Integrated Waste Management Board (CalRecycle) and specifically tailored to public administration waste. Landfill diversion rate data was provided by TTSD. In 2008, 49.23% of solid waste was diverted from landfills and in 2016, the diversion rate was 50.60%. Community-generated waste tonnage from the train depot and downtown cans was calculated using a residential uncompacted waste density of 300 lbs per cubic yard. . The emissions from community-generated waste are reported as Information Items.

The emissions associated with solid waste are defined as Scope 3 since they occur at the landfill sites over the entire period of decomposition (estimated to be about 100 years) rather than in the inventory year itself. The solid waste activity data, shown in Table I-1, was entered into ClearPath where the GHG emissions were calculated using standard LGOP methods and emissions factors. The calculation methods and emissions factors adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI - Local Governments for Sustainability and The Climate Registry are shown in Table I-2 and I-3.

Appendix J – Employee Commute Sector Notes

Table J-1: 2008 Employee Commute Activity Data Inputs

Vehicle Type	Fuel Type	Vehicle Miles Traveled	Average Miles Per Gallon	Data Source
Passenger Vehicles	Gasoline	257,609	25.68952	2015 Employee Commute Survey, CARB EMFAC2014
	Diesel	NA	NA	
Light Trucks	Gasoline	491,147	18.63819	
	Diesel	3,686	15.93223	
Heavy Duty Trucks	Gasoline	753	14.20527	
	Diesel	40,583	18.10510	

Table J-2: 2016 Employee Commute Activity Data Inputs

Vehicle Type	Fuel Type	Vehicle Miles Traveled	Average Miles Per Gallon	Data Source
Passenger Vehicles	Gasoline	346,227	27.75154	2015 Employee Commute Survey, CARB EMFAC2014
	Diesel	NA	NA	
Light Trucks	Gasoline	660,102	19.73571	
	Diesel	4,954	17.32974	
Heavy Duty Trucks	Gasoline	1,012	14.20907	
	Diesel	54,544	16.83688	

Table J-3: 2008 & 2016 Employee Commute GHG Calculation Methods and Emissions Factors

Activity / Source	Method	CO_2 kg / gallon	CH_4 grams / mile	N_2O grams / mile	CH_4 grams / mile	N_2O grams / mile	Emissions Factor Source
			2008		2016		
Passenger Vehicles - Gasoline	7.1.1.1 and 7.1.3.3	8.78	0.053312143	0.020658546	0.024215507	0.008935148	LGOP Appendix G - Table G.11 (CO_2) and CARB EMFAC 2014 Nevada County (CH_4 and N_2O)
Light Trucks - Gasoline	7.1.1.1 and 7.1.3.3	8.78	0.063261096	0.039182605	0.034246182	0.022102963	
Heavy Duty Trucks - Gasoline	7.1.1.1 and 7.1.3.3	8.78	0.171816886	0.091963356	0.115069096	0.077142049	
Light Trucks - Diesel	7.1.1.1 and 7.1.3.3	10.21	0.011716501	0.017157539	0.001665058	0.015773916	
Heavy Duty Trucks - Diesel	7.1.1.1 and 7.1.3.3	10.21	0.054855061	0.039235256	0.018321434	0.042190607	

Methods:

Employee commute emissions were calculated using a 2015 employee survey given to 78 employees regarding commute distances, modes and frequencies. Vehicle miles traveled (VMT) and average miles per gallon (MPG) were estimated from the survey data and the California Air Resources Board (CARB) Emissions Factors (EMFAC2014) model. The VMT from responding employees was extrapolated to the 125 employees in 2008 and 168 employees in 2016. The average 2015 MPG from the survey was scaled to 2008 and 2016 using county-specific fuel efficiency as modeled by EMFAC2014 for 2008 and 2016. The VMT shown in Tables J-1 and J-2, was entered into ClearPath where GHG emissions were calculated using the methods and emissions factors shown in Table J-3. The calculated 2008 and 2016 average MPG for each vehicle and fuel type was used to convert VMT to fuel use for the CO_2 emissions calculations.

Community-Wide Forecast Appendices

Appendix K – Residential Energy Sector Forecast Notes

Table K-1: 2008 Residential Activity Data Inputs

Activity / Source	Quantity (MMBtu)	Metric Tons CO_2e	Data Source
Electricity - Energy Equivalent	298,446.89	54,759	ClearPath
Natural Gas - Energy Equivalent	666,347.0	35,433	
LPG – Energy Equivalent	77,180.18	4,907	
Kerosene – Energy Equivalent	1,337.85	101	
Wood – Energy Equivalent	524,838.0	4,803	

Table K-2: Nevada County Forecast Household Indicator Data

Time Period	Households	Indicator Data Source
2008	41,162	Caltrans Long-Term Socio-Economic Forecasts for Nevada County
2016	40,166	
2020	41,030	
2030	43,621	
2040	46,062	
2050	47,631	

Table K-3: Nevada County Forecast Household Growth Rates

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	-0.003057	Caltrans Long-Term Socio-Economic Forecasts for Nevada County
2010 - 2014	-0.003057	
2015 - 2019	0.001969	
2020 - 2024	0.005981	
2025 - 2029	0.006143	
2030 - 2034	0.005596	
2035 - 2039	0.005459	
2040 - 2044	0.003777	
2045 - 2049	0.003356	
2050 - 2054	0.003356	

Table K-4: TDPUD Emissions Growth Rates with Renewable Portfolio Standards Compliance

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	-0.082851	2008 TDPUD REC-adjusted (CO_2)
2010 - 2014	-0.082851	
2015 - 2019	-0.050130	
2020 - 2024	-0.028505	
2025 - 2029	-0.028714	
2030 - 2054	0	

Methods:

2008 Community-Wide residential energy use and emissions from the 2008 Community-Wide GHG inventory are shown in Table K-1. The ClearPath forecast calculator converted this energy use to MMBtu's and aggregated it by energy/fuel type. Similarly, the calculator also aggregated the emissions by energy/fuel type. These aggregates were used as a baseline for forecasting emissions under as Business-As-Usual (BAU) scenario for 2020, 2030, 2040, and 2050, using the forecasted Nevada County household growth rates shown in Table K-3. Calculated Nevada County household growth rates are based on the CalTrans Long Term Forecast of number of households in Nevada County shown in Table K-2. The adjusted scenario forecast scaled energy and emissions aggregates using a composite of Nevada County household growth rates and Truckee Donner Public Utility District (TDPUD) emission growth rates shown in Table K-4.

Appendix L – Non-Residential Energy Sector Forecast Notes

Table L-1: 2008 Non-Residential Activity Data Inputs

Activity / Source	Quantity (MMBtu)	Metric Tons CO_2e	Data Source
Electricity - Energy Equivalent	214,386.78	39,536	ClearPath
Natural Gas - Energy Equivalent	218,338.0	11,610	
LPG – Energy Equivalent	11,394.75	724	

Table L-2: Nevada County Forecast Employment Indicator Data

Time Period	Employment	Indicator Data Source
2008	30,120	Caltrans Long-Term Socio-Economic Forecasts for Nevada County
2016	31,550	
2020	32,664	
2030	34,603	
2040	36,210	
2050	37,771	

Table L-3: Nevada County Forecast Employment Growth Rates

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	0.005815	Caltrans Long-Term Socio-Economic Forecasts for Nevada County
2010 - 2014	0.005815	
2015 - 2019	0.007555	
2020 - 2024	0.006368	
2025 - 2029	0.005781	
2030 - 2034	0.004797	
2035 - 2039	0.004551	
2040 - 2044	0.004292	
2045 - 2049	0.004228	
2050 - 2054	0.004228	

Table L-4: TDPUD Emissions Growth Rates with Renewable Portfolio Standards Compliance

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	-0.082851	2008 TDPUD REC-adjusted (CO_2) 2007
2010 - 2014	-0.082851	
2015 - 2019	-0.050130	
2020 - 2024	-0.028505	
2025 - 2029	-0.028714	
2030 - 2054	0	

Methods:

2008 Community-Wide non-residential energy use and emissions from the 2008 Community-Wide GHG inventory are shown in Table L-1. The ClearPath forecast calculator converted this energy use to MMBtu's and aggregated it by energy/fuel type. Similarly, the calculator also aggregated the emissions by energy/fuel type. These aggregates were used to forecast emissions under a Business-As-Usual (BAU) scenario for 2020, 2030, 2040, and 2050, by scaling them at the same rate as the forecasted Nevada County employment growth rates shown in Table L-3. Nevada County employment growth rates were calculated based on the CalTrans Long Term Forecast of employment in Nevada County shown in Table L-2. The adjusted scenario forecast scaled energy and emissions aggregates by a composite of Nevada County employment growth rates and Truckee Donner Public Utility District (TDPUD) emission growth rates shown in Table L-4.

Appendix M – Community Transportation Sector Forecast Notes

Table M-1: 2008 Community Transportation Sector Activity Data Inputs

Activity / Source	Quantity	Metric Tons CO_2e	Data Source
Gasoline – On Road VMT	86,420,900.0 (miles)	40,412	ClearPath
Diesel – On Road VMT	12,870,340.0 (miles)	15,241	ClearPath
Off-Road Fuel Use	993,659 (gallons)	8,391	ClearPath

Table M-2: Nevada County Forecast Service Population Indicator Data

Time Period	Service Population	Indicator Data Source
2008	128,701	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2016	130,159	
2020	132,626	
2030	140,335	
2040	147,631	
2050	153,592	

Table M-3: Nevada County Forecast Service Population Growth Rates

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	0.001409	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2010 - 2014	0.001409	
2015 - 2019	0.003386	
2020 - 2024	0.005473	
2025 - 2029	0.005665	
2030 - 2034	0.005198	
2035 - 2039	0.005082	
2040 - 2044	0.004189	
2045 - 2049	0.003966	
2050 - 2054	0.003966	

Table M-4: Transportation Emissions Growth Rates with Clean Car Standards Compliance

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	0	SEEC ClearPath: Paveley II All Traffic Carbon Intensity Factors
2010 - 2014	-0.006	
2015 - 2019	-0.017	
2020 - 2024	-0.020	
2025 - 2029	-0.018	
2030 - 2034	-0.012	
2035 - 2039	-0.006	
2040 - 2044	-0.002	
2045 - 2049	-0.001	

Methods:

2008 Community-Wide transportation sector activity and emissions are shown in Table M-1. The ClearPath forecast calculator aggregated transportation sector activity data by fuel and activity type. Similarly the calculator also aggregated transportation sector emissions by fuel type and activity type. These aggregates were then used to forecast emissions under as Business-As-Usual scenario for 2020, 2030, 2040, and 2050, by scaling them at the same rate as the forecasted Nevada County service population growth rates shown in Table M-3. Nevada County service population was calculated by summing Caltrans employment projections for the County with California Department of Finance population projections for the County shown in Table M-2. Annual growth rates were then calculated for five year periods from 2005 through 2054. The adjusted scenario forecast scaled energy and emissions aggregates by a composite of the service population growth rates and transportation emission growth rates shown in Table M-4, which assumed compliance with required Clean Car Standards.

Appendix N – Community Solid Waste Sector Forecast Notes

Table N-1: 2008 Community Solid Waste Generation Activity Data Inputs

Activity / Source	Quantity (wet tons)	Metric Tons CO_2e	Data Source
Waste Generated	17,282.71	4,256	ClearPath

Table N-2: Nevada County Forecast Service Population Indicator Data

Time Period	Service Population	Indicator Data Source
2008	128,701	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2016	130,159	
2020	132,626	
2030	140,335	
2040	147,631	
2050	153,592	

Table N-3: Nevada County Forecast Service Population Growth Rates

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	0.001409	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2010 - 2014	0.001409	
2015 - 2019	0.003386	
2020 - 2024	0.005473	
2025 - 2029	0.005665	
2030 - 2034	0.005198	
2035 - 2039	0.005082	
2040 - 2044	0.004189	
2045 - 2049	0.003966	
2050 - 2054	0.003966	

Methods:

2008 Community-Wide solid waste tonnage and related GHG emissions are shown in Table N-1. These data were used to forecast emissions under a Business-As-Usual (BAU) scenario for 2020, 2030, 2040, and 2050, by using the forecast Nevada County service population growth rates shown in Table N-3. Nevada County service population was calculated by summing Caltrans employment projections for the County with California Department of Finance population projections for the County shown in Table N-2. Annual growth rates were then calculated for five year periods from 2005 through 2054. The adjusted scenario forecast assumed there were no additional growth factors affecting solid waste generation emissions, so it is the same as the BAU forecast.

Appendix O – Community Water and Wastewater Sector Forecast Notes

Table O-1: 2008 Community Transportation Sector Activity Data Inputs

Activity / Source	Quantity	Metric Tons CO_2e	Data Source
Annual Digester Gas Flared	11,347,221.75 (scf / year)	34.55	ClearPath
Annual Gas Production	11,347,221.75 (scf / year)	2.03	
Annual Methanol Load	158.628 (MT / year)	195.59	
Daily Septic System BOD5 Load	369.09 (kg / day)	444.87	
Process N_2O - Population Served	11,874	30.96	
Wastewater – Electric Energy Equivalent	12,626.60 (MMBtu)	2,329.70	
Water Supply – Electric Energy Equivalent	38,603.41(MMBtu)	7,114.11	
Daily N Load at Facility with Release to Environment	27.71 (kg / day)	23.68	

Table O-2: Nevada County Forecast Service Population Indicator Data

Time Period	Service Population	Indicator Data Source
2008	128,701	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2016	130,159	
2020	132,626	
2030	140,335	
2040	147,631	
2050	153,592	

Table O-3: Nevada County Forecast Service Population Growth Rates

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	0.001409	Caltrans Long-Term Socio-Economic Forecasts for Nevada County California Department of Finance Population Projections for Nevada County
2010 - 2014	0.001409	
2015 - 2019	0.003386	
2020 - 2024	0.005473	
2025 - 2029	0.005665	
2030 - 2034	0.005198	
2035 - 2039	0.005082	
2040 - 2044	0.004189	
2045 - 2049	0.003966	
2050 - 2054	0.003966	

Table O-4: TDPUD Emissions Growth Rates with Renewable Portfolio Standards Compliance

Time Period	ClearPath Growth Rate	Growth Rate Factor Source
2005 - 2009	-0.082851	2008 TDPUD REC-adjusted (CO_2) 2007
2010 - 2014	-0.082851	
2015 - 2019	-0.050130	
2020 - 2024	-0.028505	
2025 - 2029	-0.028714	
2030 - 2054	0	

Methods:

2008 Community-Wide water and wastewater activity data is shown in Table O-1. The ClearPath forecast calculator aggregated water and wastewater service data based on activity type. Similarly the calculator also aggregated the emissions based on activity type. These aggregates were then used to forecast emissions under a Business-As-Usual scenario for 2020, 2030, 2040, and 2050, by scaling them at the same rate as the forecasted Nevada County service population growth rates shown in Table O-3. Nevada County service population was calculated by summing Caltrans employment projections for Nevada County with California Department of Finance population projections for Nevada County shown in Table O-2. Annual growth rates were then calculated for five year periods from 2005 through 2054. The adjusted scenario forecast scaled energy and emissions aggregates by a composite of Nevada County service population growth rates and Truckee Donner Public Utility District (TDPUD) emissions growth rates shown in Table O-4.