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City of Blue Lake

2005 Community Greenhouse Gas Emissions Inventory

10/18/2013

Prepared for
City of Blue Lake

In Collaboration With
Streamline Planning Consultants

Striving to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region.

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Executive Summary

The City of Blue Lake secured funding for climate action planning from the California Department of Conservation Strategic Growth Council. This has facilitated the City's interest in pursuing steps towards planning for future climate change. This community emissions inventory is the first step towards planning for climate change by providing both information to inform policy decisions as well as a baseline from which to assess the success of future actions.

This community emissions inventory can be utilized to establish local government initiatives that help the City move towards a more sustainable and resilient community. Tracking of carbon dioxide emissions is considered to be an effective method of measuring the success of the Cities climate action initiatives. Future inventories can be compared with this baseline inventory as one metric of the effectiveness of government initiatives and community action.

There are numerous gases emitted by human activity that have a significant environmental impact. In accordance with version 1.0 of the Community Greenhouse Gas Inventory Protocol drafted by the International Council on Local Environmental Initiatives (ICLEI), three primary greenhouse gases are considered for this inventory: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). There are three other primary greenhouse gases also addressed by the Protocol but are not applicable to the City of Blue Lake as they are associated only with large industrial processes. Furthermore, in addition to these three primary gases, there are a small handful of refrigerants that are also tracked by this inventory.

These greenhouse gases all vary in their impact on global warming, otherwise known as their global warming potential (GWP). This GWP has to do with the how well these gases absorb and emit heat. The result is that emission of one gas will have a different impact on global warming compared with another gas.

Because of this, all emissions of greenhouse gases are presented as a comparable amount of CO_2, called equivalent CO_2 (CO_2e). This is analogous to possessing different forms of currency and converting the value of all currencies to dollars in order to determine the total value. This means that while there are multiple greenhouse gases tracked in this inventory, all are converted to CO_2e for this report.

All CO_2e missions are presented as originating either from a source or an activity. Source emissions are those that occur within the jurisdictional boundaries of the City of Blue Lake. Activity emissions are those associated with actions by Blue Lake residents and businesses such as the use of electricity or the creation of solid waste. It is useful to make this distinction in order to facilitate meaningful and effective government initiatives and community action.

In addition, emissions are presented in two frameworks: emissions sources and activities that are within significant influence of the City government, and those sources and activities that are outside significant influence. The first framework highlights those activities and sources that the government of Blue Lake can have a direct impact on. The latter, also referred to as "upstream" emissions, are included to provide additional information regarding the more global impact of the consumption associated with the activities of residents and businesses. This means that while a reduction in consumption of energy and fuel will reduce the emissions locally that are officially "assigned" to the City of Blue Lake, there will also be an additional global reduction in upstream emissions that do not occur locally and so are not officially assigned to the City.

The results of this inventory are shown in Figure 1 and summarized in Table 1 and Table 2. Results suggest that future climate action initiatives focus primarily on the reduction of fossil fuel use associated both with transportation and with cooking and heating. The next two primary emissions sectors are associated with electricity consumption and the generation of solid waste.

Table 1: Summary of emissions sources and activities that are within significant local government influence.

Emissions Sector	Quantity of Emissions (Metric Tons of CO_2e)
Sources and Activities Within Significant Local Government Influence	
Activity: Electricity Consumption	1,340
Source: Stationary Combustion of Fuels	3,610
Source: Mobile Combustion	3,530
Activity: Solid Waste Generation	1,100
Source: Wastewater Treatment[1]	108
Source: Leaked Refrigerants	6.12
Source: Industrial Point Sources[2]	1,190
TOTAL	**10,890**

Table 2: Summary of upstream emissions sources and activities that are outside significant local government influence.

Emissions Sector	Quantity of Emissions (Metric Tons of CO_2e)
Sources and Activities Outside Significant Local Government Influence	
Activity: Upstream Natural Gas Emissions	730
Activity: Upstream Gasoline Emissions	498
Activity: Upstream Electricity Emissions	383
Activity: Upstream Diesel Emissions	371
Activity: Upstream Propane Emissions	42.1
TOTAL	**2,010**

[1] Only wastewater process emissions are included, not utility energy consumption.

[2] Refer to Section 2.2.5 for what industries comprise this sector.

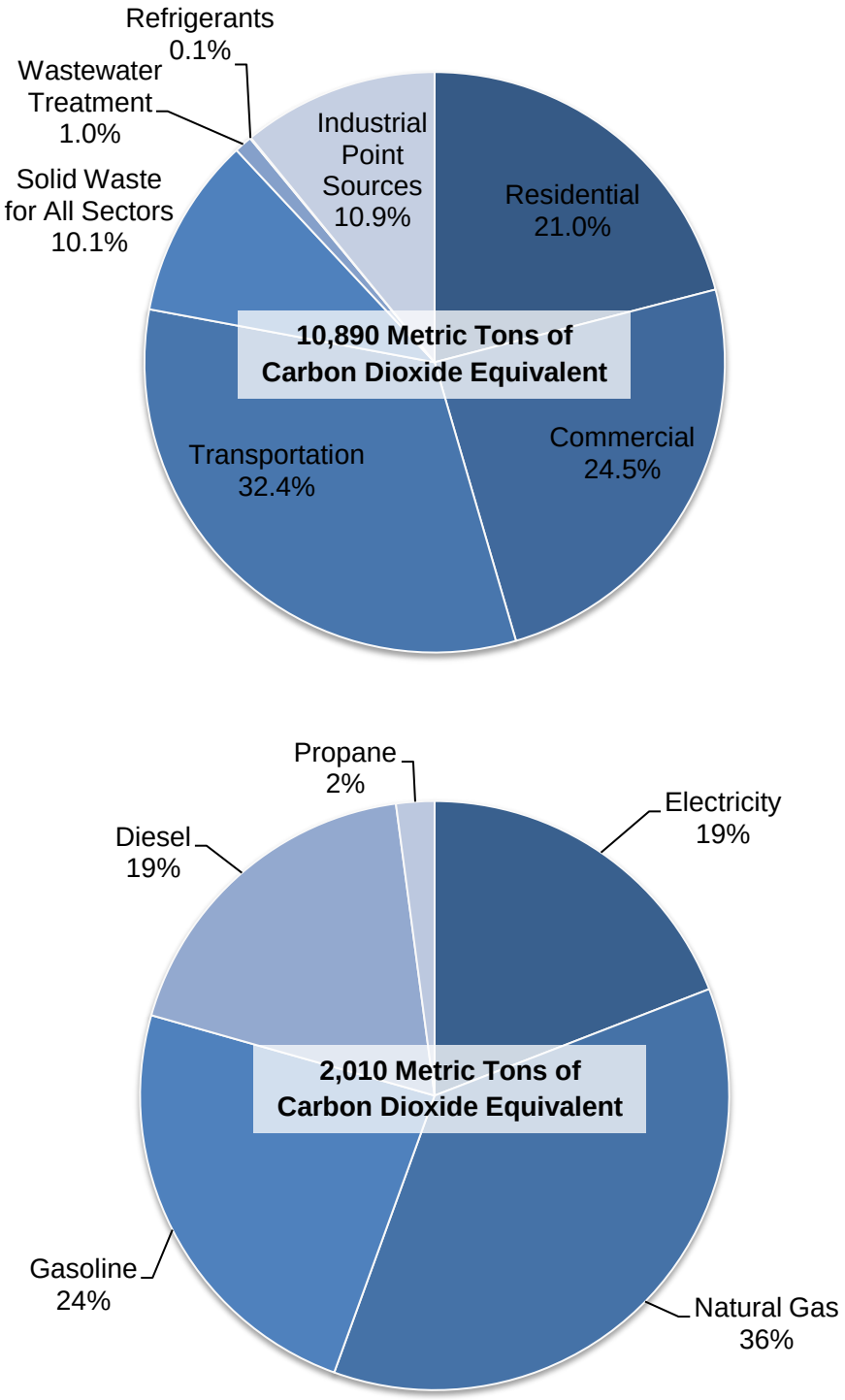

Figure 1: Summary of emissions sources and activities that are within (above) and outside (below) significant local government influence.

The combined result of all emissions from sources and activities both within and outside significant government influence is shown in Figure 2. The overall story conveyed by these results shows that

the local combustion of fuels, either for heating, cooking, or transportation, contributes the vast majority of emissions for Blue Lake. Electricity is the third largest contributor to emissions, followed by the emissions associated with solid waste.

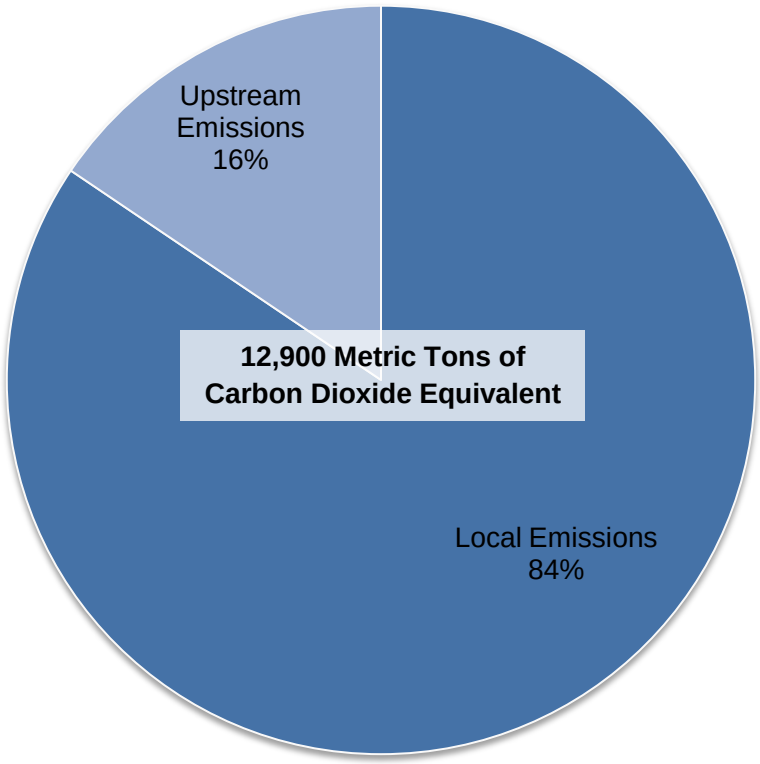

Figure 2: Combined emissions of all sectors both within significant government influence and outside significant government influence. Both direct and upstream emissions are included.

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1 Climate Change Background

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Conclusive evidence shows that human activities are increasing the concentration of greenhouse gases 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 greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise.

Reducing electricity, natural gas, and fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions including;

- more efficient use of energy further decreases utility and transportation costs for residents and businesses,
- money not spent on energy is more likely to be spent at local businesses and add to the local economy
- retrofitting homes and businesses to be more efficient creates local jobs,
- reducing fossil fuel use improves air quality which reduces criteria pollutants that impact the health of the community,
- promoting alternative transportation provides opportunities for walking and bicycling which improves residents' health.

1.1 Climate Adaptation is Insurance Against the Risks of Climate Change

For many of the same reasons that home owners carry fire insurance and car owners carry auto insurance, the City of Blue Lake has completed this inventory in order to inform decisions that will insure the community against the risks of climate change. Planning for future climate change, and targeting methods of adaptation, will allow Blue Lake to reap significant benefits in the quality of life, economic health, and environmental stewardship of the community. Regardless of the reasons for climate change, government and community action now will help buffer the citizens of Blue Lake from future changes in the climate.

1.2 Evidence of Climate Change

There is international scientific consensus that the global climate is changing, and that human actions, primarily the burning of fossil fuels, are a main cause of those changes. 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 that "warming of the climate system is unequivocal."[3] 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 greenhouse gas (GHG) concentrations."

[3] 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.

The year 2012 was the hottest year on record for the continental United States, with two dozen cities breaking or tying their all-time high temperature records.[4] Globally, the 12 years from 2001-2012 are among the hottest on record, and 1998 was the only year in the 20th century hotter than 2012.[5] The year 1976 was the last year with a below average global temperature.

In addition to the study of the global impacts of climate change, there has been significant scientific work looking at the potential impacts of climate change at the regional level. Results say that the City of Blue Lake could be impacted by[6];

- a possible fivefold increase in the number of days above 85 °F,
- an 80% to 90% loss in annual snow pack,
- a 3.6% increase in acreage burned by forest fires,
- a roughly 15% reduction in annual precipitation,
- increased vulnerability to extreme weather events (e.g. flooding),
- increased load and stress on community infrastructure such as roads, power lines, and communication systems.

1.3 California Policy

California has a number of state level policies that serve as regulatory drivers for climate action planning at the local government levels, which are described below.

1.3.1 Global Warming Solutions Act (AB32)

California passed the Global Warming Solutions Act (AB 32) in 2006, which charged the California Air Resources Board (CARB) with implementing a comprehensive statewide program to reduce greenhouse gas emissions. AB 32 established the following greenhouse gas emissions reduction targets for the state of California:

- 2000 levels by 2010
- 1990 levels by 2020

1.3.2 SB 375

SB 375 enhances California's ability to reach its AB 32 goals by promoting good planning with the goal of more sustainable communities. SB 375 requires CARB to develop regional greenhouse gas emission reduction targets for passenger vehicles. CARB is to establish targets for 2020 and 2035 for each region covered by one of the State's 18 metropolitan planning organizations (MPOs).

1.3.3 Executive Order S-3-05

Executive Order S-3-05, issued by Governor Schwarzenegger, reinforces these goals and also sets a schedule for the reporting of both the measured impacts of climate change upon California's

[4] Burt, Christopher C. "2012 a Record Warm Year for Continental U.S". January 2, 2013. http://www.wunderground.com/blog/weatherhistorian/comment.html?entrynum=112

[5] NOAA: State of the Climate 2012 Summary. http://www.ncdc.noaa.gov/sotc/

[6] Local impact estimates obtained from http://cal-adapt.org/ and the California Adaptation Planning Guide available at http://resources.ca.gov/climate_adaptation/docs/APG_Defining_Local_and_Regional_Impacts.pdf

natural environment and the emissions reduction efforts undertaken by a myriad of state, regional, and local groups. Executive Order S-3-05 establishes an additional target of 80% below 1990 levels by 2050. Blue Lake's GHG emissions inventory is intended to enable the City to develop effective GHG reduction policies and programs to meet these targets and track emissions reduction progress.

1.3.4 California Environmental Quality Act (CEQA)

CEQA requires public agencies to evaluate the environmental impacts of discretionary development plans and projects in their jurisdictions. CEQA guidelines were updated in March 2010 to require analysis of climate change in CEQA documents. Many jurisdictions are finding that climate change impacts from local government activities are "significant" under CEQA, and are identifying emissions reductions targets and Climate Action Plans as mitigation measures to reduce climate change impacts to less-than-significant levels.

1.4 Sustainability and Climate Change Mitigation Activities in the City of Blue Lake

Blue Lake has already taken significant steps that have or will lead to ancillary benefits in the form of community resilience, energy conservation and greenhouse gas mitigation. These include:

- incorporation of numerous climate adaptation measures into the Infrastructure Element of the 2013-2018 City of Blue Lake Strategic Plan,
- securing and implementation of a grant from the California Department of Conservation Strategic Growth Council to complete a climate action plan,
- assistance with a pilot alternative energy distributed generation project being implemented at the Blue Lake Rancheria,
- completion of a 2005 baseline greenhouse gas inventory of municipal operations to help the City spearhead climate action measures

2 Inventory Methodology

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from the Blue Lake community as a whole; emissions from operations of the Blue Lake government are presented in the previously released City of Blue Lake 2005 Government Operations Greenhouse Gas Emissions Inventory. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 3. For example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

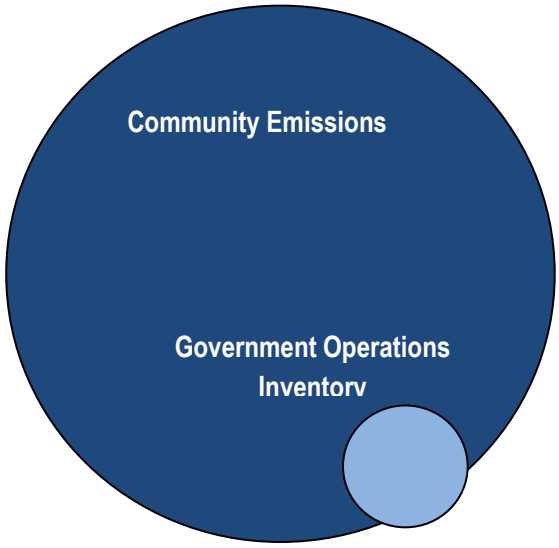

Figure 3: Relationship of community and government operations inventories.

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Community Greenhouse Gas Emissions Protocol (Community Protocol)[7].

2.1 Community Emissions Protocol

The Community Protocol was released by ICLEI in October 2012, and represents a new national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks to help local governments customize their community 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 Community Protocol when undertaking their greenhouse gas emissions inventories.

2.2 Quantifying Greenhouse Gas Emissions

A summary of the approach and method used to quantify emissions are given below. A more detailed methodology that includes data sources and calculations is available in a separate document entitled Humboldt County Greenhouse Gas Emissions Inventory Tool: Calculation Methodologies. This document is available by request from Redwood Coast Energy Authority.

2.2.1 Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the community 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". Emissions sources and activities are color coded as shown in the following table.

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

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. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the "scopes framework" that is used in government operations inventories, which does not have a clear definition for application to community inventories.

[7] http://www.icleiusa.org/tools/ghg-protocol/community-protocol

2.2.2 Regional and Upstream Emissions Sources and Activities

In addition to emissions sources and activities that are assigned to the City of Blue Lake, additional upstream emissions are shown in order to provide a more complete picture of the global impacts from the consumption of energy and fuels. Upstream emissions are those that occur during the manufacture and transportation of raw materials and fuels related to the production of end use products consumed by the City of Blue Lake. For example, upstream emissions associated with the consumption of electricity is calculated based on the fuels used to produce that electricity. It is possible to estimate the quantity of different petroleum-based fuels used to produce a portion of the electricity consumed. The upstream emissions associated with the production of these fuels (e.g. mining, extraction, and shipping) are estimated and assigned as the upstream emissions for the consumption of electricity. Upstream emissions are color coded as shown in the following table.

Upstream Emissions
Emissions associated with the mining, extraction, and shipping of raw materials required to provide the end use products that are consumed by the City.

2.2.3 Information Items

There are additional emissions sources and activities that are included solely as an information item to further inform policy decisions. Information items can be labeled as such for two possible reasons:

- the emissions source is partially due to the activities of Blue Lake residences and businesses but there is not enough information to guide a fair allocation to individual jurisdictions,
- or emissions associated with a particular source or activity are already accounted for in another sector.

Information items are labeled separately in the tables throughout this inventory. Information items are not included in the total roll up of emissions for the jurisdiction.

2.2.4 Base Year

The inventory process requires the selection of a base year with which to compare current emissions. Blue Lake's community greenhouse gas emissions inventory utilizes 2005 as its base year. This year was chosen during the City's Municipal Operations Emissions Inventory due to constraints on data availability for earlier years. This same base year is chosen for this inventory to allow consistency with the municipal operations inventory.

2.2.5 Quantification Methods

Greenhouse gas emissions can be quantified in three ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Report / Survey-based methodologies refer to emissions reported to a regulating agency such as the North Coast Unified Air Quality Management District (NCUAQMD).
- Calculation-based methodologies use activity data and emission factors.

Most emissions sources in this inventory are quantified using calculation based methodologies. Activity data refer to the relevant measurement or modeling of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity

consumption, and annual vehicle miles traveled. See the Humboldt County Greenhouse Gas Emissions Inventory Tool: Calculation Methodologies report for additional information.

Some measurement-based data is also used in this inventory. The process emissions from the wastewater treatment plant uses recorded biological oxygen demand and average volume of influent. Also, the North Coast Unified Air Quality Management District (NCUAQMD) keeps track of the large emitters in the County. Data from the NCUAQMD is used to estimate emissions from industrial point sources and large refrigeration units.

Note that while the NCUAQMD does track emissions from Calgon Carbon, there is no greenhouse gas emissions data available for the inventory year (2005). Greenhouse gas emissions from Calgon Carbon are only available for the years after 2008. It is assumed that greenhouse gas emissions did not change significantly between years, so data for 2010 was used for this analysis.

Furthermore, emissions from Blue Lake Power are not tracked by this inventory since this company is under contract with San Diego Gas and Electric (SDG&E) such that the emissions from Blue Lake Power are tracked by and assigned to SDG&E rather than the City of Blue Lake. Because of these two facts, there are no emissions associated with the power plant.

The NCUAQMD also tracks emissions from Kernen Construction. However, these emissions also are not included in this report as the company is located outside the jurisidiction.

In addition, some refrigerants considered by this inventory are assigned zero emissions. This is due to the method which the NCUAQMD uses to track refrigerants. Only refrigeration units larger than 50 lbs are tracked. No unit larger than 50 lbs is known to exist within the jurisdictional boundaries of Blue Lake. It is likely that all refrigeration units are smaller than 50 lbs such that the emissions associated with the leakage of refrigerants are negligible. Therefore, there are no emissions associated with stationary refrigeration units reported in this inventory (see Table 12).

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. metric tons CO_2/kWh of electricity). Emissions factors used for each sector are given for sectors except the transportation sector where complex modeling software was used that uses a large database of emissions factors.

For this inventory, calculations were made using the Humboldt County Greenhouse Gas Emissions Inventory Tool. This tool was developed by the Redwood Coast Energy Authority to establish a consistent calculation methodology for the County of Humboldt and all incorporated jurisdictions. This tool is built upon an Excel spreadsheet template provided by ICLEI. This spreadsheet is used both for data entry and emissions calculations. This tool, along with a user manual, is available by request from the Redwood Coast Energy Authority.

3 Community Emissions Inventory Results

The Community Protocol recommends reporting results in one or more frameworks. Each framework includes a particular set of emissions sources and activities, and each tells a different story about community emissions. This report looks at Blue Lake's community emissions through two frameworks:

- Local government significant influence: this framework highlights emissions sources over which the City of Blue Lake has the most significant influence and has the greatest opportunity to address. These emissions are more regional in the location of occurrence.
- Community-wide activities: this framework highlights emissions associated with the activities of residents and businesses that occur in a more global geography. This is intended to provide a broader picture of the impact associated with consumption.

Some emissions sources and activities are reported in both frameworks, so it is important not to add the emissions presented by both frameworks together. The purpose of these two approaches is to provide different perspectives to better inform and guide both local government action and community action.

3.1 Community Profile

To put emissions inventory data in context for comparison with other jurisdictions, it is helpful to have some basic information about the community such as population and number of households. This information is provided in Table 3.

Table 3: City of Blue Lake 2005 community indicators.

Indicator	Value
Estimated Population	1,194
Estimated Number of Households	523
Estimated Number of Registered Vehicles	1,072
Average Temperature	52^{+12}_{-14} °F
Total Heating Degree Days	4,863

The community indicators were obtained from various sources. Population and number of households were pulled from the U.S. Census. The number of registered vehicles was pulled from DMV records. Temperature and heating degree days were pulled from www.wunderground.com historical data.

3.2 Emissions from Sources and Activities Under Significant Local Government Influence

This framework emphasizes policy relevance, highlighting a set of emission sources and activities that Blue Lake has the greatest opportunity to address. This frame includes all of the five Basic Emissions Generating Activities required by the Community Protocol, plus additional sources and activities. These are:

- Electricity Consumption
- Stationary Combustion
- Mobile Combustion
- Solid Waste Generation
- Wastewater Treatment
- Potable Water Consumption
- Refrigerant Leakage

- Industrial Point Sources

The total emissions estimated to be 10,890 metric tons of CO_2e from all of these sectors are summarized in Figure 4. Details regarding each sector are provided in the following sections.

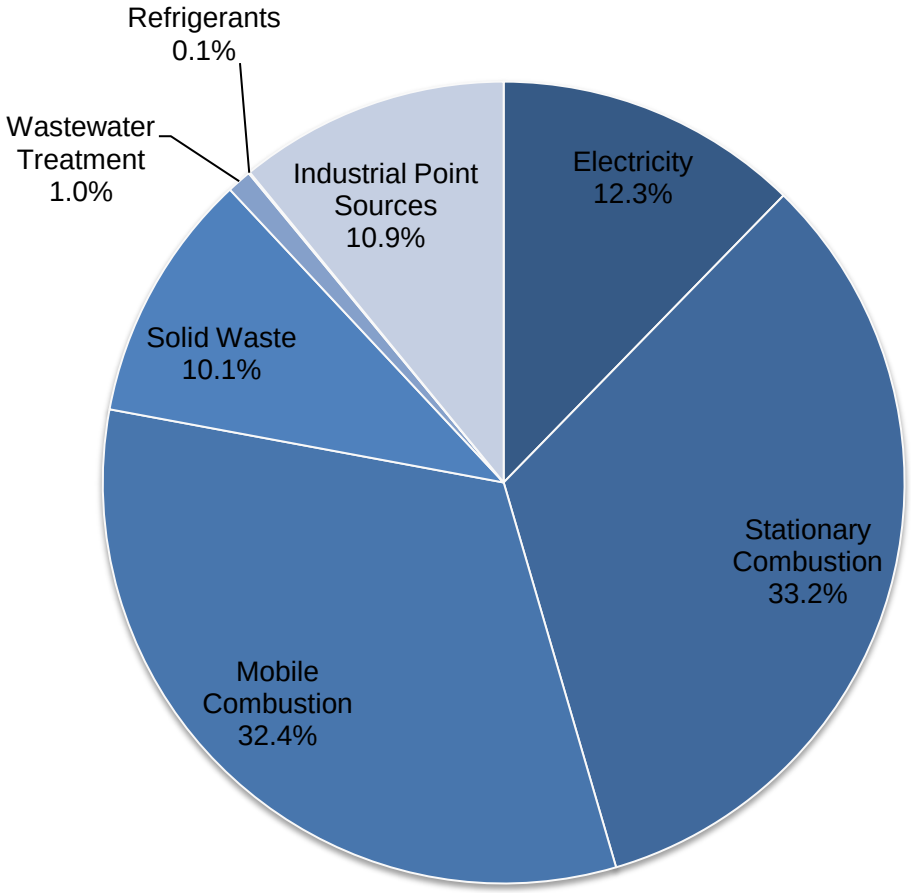

Figure 4: A summary of all emission sources and activities, by emissions sector, that are under significant government influence.

3.2.1 Activity: Electricity Consumption

Electricity consumption contributes to greenhouse gas emissions indirectly. Emissions are generated at generation plants, usually through the combustion of fuels which generate heat that is then used to drive steam engines. Additional electricity generation fuels, such as hydropower and wind, are also used and are considered to be free of emissions. Emissions factors used are generated by the Climate Registry on an annual basis for PG&E and reflect the average mix of electricity generation fuels for the inventory year. The results are shown in Table 4.

Some electricity is lost during transmission and distribution (T&D) due to resistive loses within the materials used. This lost electricity is also accounted for, the emissions of which are shown in Table 4.

Table 4: Emissions associated with the activity of electricity consumption within jurisdictional boundaries.

Activity: Electricity Consumption	Quantity of Electricity (kWh)		Emissions Factor (metric tons CO_2e / kWh)	Emissions (metric tons CO_2e)
Residential	Consumption:	3,140,000	0.000221807	697
	T&D Losses:	152,000	0.000329880	50.2
	Total:	**3,300,000**	**---**	**748**
Commercial	Consumption:	2,490,000	0.000221807	552
	T&D Losses:	120,000	0.000329880	39.7
	Total:	**2,610,000**	**---**	**591**
Industrial[8]	Consumption:	0.00	0.000221807	0.00
	T&D Losses:	0.00	0.000329880	0.00
	Total:	**0.00**	**---**	**0.00**
All Sectors	Consumption:	5,630,000	0.000221807	1,250
	T&D Losses:	272,000	0.000329880	89.9
	Total:	**5,900,000**	**---**	**1,340**

A visual comparison between the residential, commercial, and industrial sectors are shown in Figure 5. This can help Blue Lake visualize which sector to prioritize during emissions reduction planning efforts.

3.2.2 Source: Stationary Combustion

Stationary combustion is associated with the combustion of fuels at a specific location. This includes the combustion of natural gas, propane, fire wood, etc. The vast majority of these fuels are combusted for cooking and space heating. Emissions associated with the combustion of these fuels can be considered either a source or an activity since the activity usually occurs at the point of combustion. This inventory considers this sector an emissions source. Table 5 shows the results.

[8] Refer to Section 2.2.5 for why this sector has zero emissions.

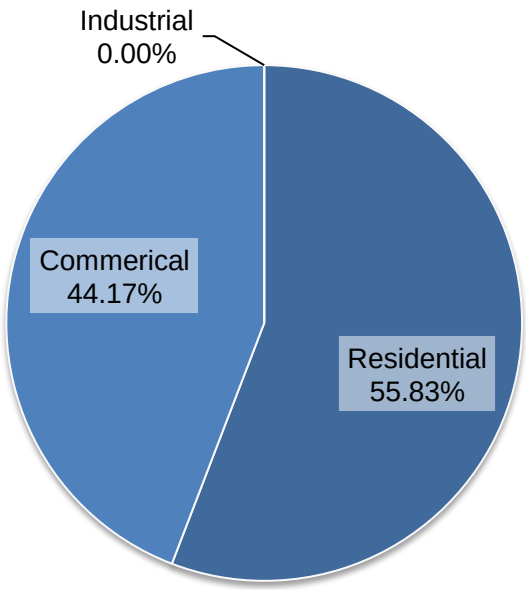

Figure 5: Emissions associated with the activity of electricity consumption within jurisdictional boundaries.

Table 5: Emissions associated with the stationary combustion of fuels within jurisdictional boundaries.

Source: Stationary Combustion	Quantity of Fuel Consumed		Emissions Factor (metric tons CO_2e / unit)	Emissions (metric tons CO_2e)
Residential	Natural Gas (therm)	249,000	0.005307	1,320
	Propane (gal.)	32,000	0.005686	182
	Fuel Wood (MMBTU)	3,750	0.009152	34.3
	Total	**---**	**---**	**1,540**
Commercial	Natural Gas (therm)	391,000	0.005307	2,080
	Propane (gal.)	0.00	0.005683	0.00
	Fuel Wood (MMBTU)	0.00	0.009152	0.00
	Total	**---**	**---**	**2,080**
Industrial[9]	Natural Gas (therm)	0.00	0.005307	0.00
	Propane (gal.)	0.00	0.005683	0.00
	Fuel Wood (MMBTU)	0.00	0.009152	0.00
	Total	**---**	**---**	**0.00**
All Sectors	Natural Gas (therm)	640,000	0.005307	3,400
	Propane (gal.)	32,000	0.005683	182
	Fuel Wood (MMBTU)	3,750	0.009152	34.3
	Total	**---**	**---**	**3,610**
Info Item **Estimated Emissions from Commercial Generators**	Diesel (gallons)	130	0.01021	1

[9] Refer to Section 2.2.5 for why this sector has zero emissions.

A visual comparison between the residential, commercial, and industrial sectors are shown in Figure 6. This can help Blue Lake visualize which sector to prioritize during emissions reduction planning efforts.

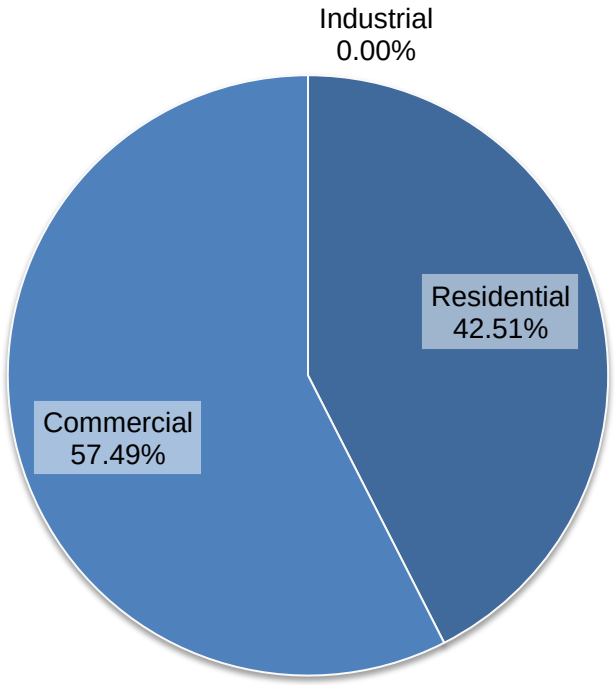

Figure 6: Emissions associated with the stationary combustion of fuels within jurisdictional boundaries.

3.2.3 Source: Mobile Combustion

Mobile emissions are associated with mobile vehicles and equipment. This includes passenger vehicles, freight and service trucks, off-road vehicles, and construction equipment to name a few. Emissions results are shown in Table 6.

These emissions are considered a source due to the inventory methodology used. Blue Lake is assigned mobile emissions based on whether the emissions occur within the jurisdictional boundaries of Blue Lake. For example, under this method, a resident of Blue Lake that commutes between Blue Lake and Eureka only contributes emissions to the City for the miles traveled within the jurisdictional boundaries.

The emissions factors used are those associated with two computer models created by the California Air Resources Board (CARB): EMFAC2011-SG and OFFROAD2007. A wide range of emissions factors are used by these models that depend on numerous factors such as vehicle age and type, fuel type, and temperature and humidity to name a few. Refer to the Inventory Methodology Report and the documentation for these computed models for more information.

Table 6: Emissions associated with the combustion of fuels by mobile vehicles and equipment.

Source: Mobile Combustion	Quantity of Fuel Consumed (gallons)		Emissions Factor	Emissions (metric tons CO_2e)
On-Road Passenger Vehicles	Gasoline	186,000	EMFAC	1,760
	Diesel	6,260	EMFAC	71.1
	Total	**---**	**---**	**1,830**
Retail and Commercial Trucks	Gasoline	2,750	EMFAC	30.5
	Diesel	7,510	EMFAC	88.4
	Total	**---**	**---**	**119**
Off-Road Vehicles and Equipment	Gasoline	19,100	OFFROAD2007	111
	Diesel	145,000	OFFROAD2007	1,450
	LPG / CNG	4,260	OFFROAD2007	26.8
	Total	**---**	**---**	**1,580**
All Sectors	Gasoline	207,000	Combined	1,900
	Diesel	160,000	Combined	1,610
	LPG / CNG	4,260	Combined	26.6
	Total	**---**	**---**	**3,530**

A visual comparison between passenger vehicles, retail and commercial trucks, and off-road vehicles is shown in Figure 7. This can help Blue Lake visualize which sector to prioritize during emissions reduction planning efforts.

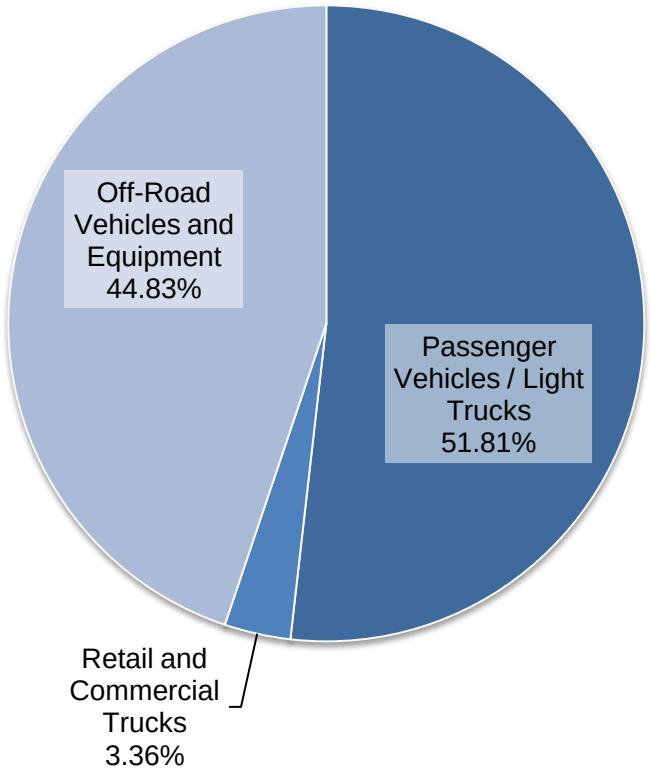

Figure 7: Emissions associated with on- and off-road vehicle travel.

Additional detail regarding the primary contributors to on-road vehicle emissions are shown in Figure 8. Results are disaggregated by vehicle type and fuel. This demonstrates that gasoline fueled passenger vehicles and light duty trucks are the primary contributor to emissions in this sector. Note, however, that this is not the case for the off-road vehicle sector where diesel is the dominant fuel.

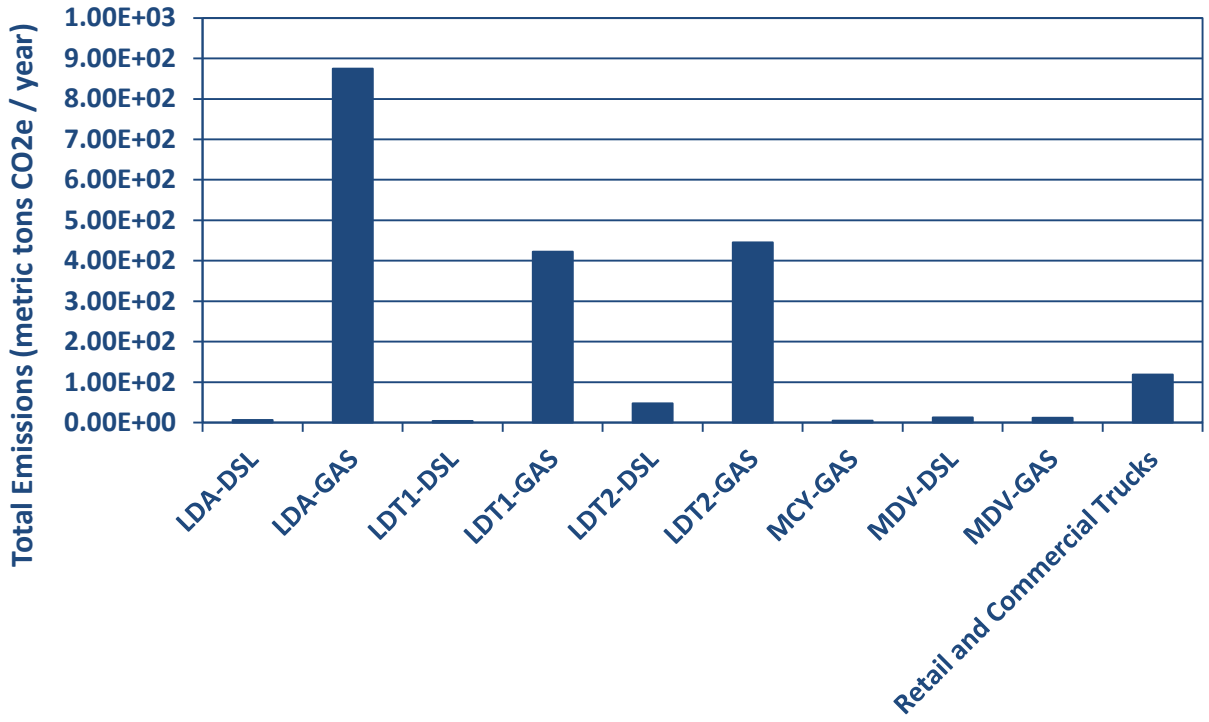

Figure 8: Disaggregation of on-road vehicle emissions by vehicle class and fuel type.

Definitions of the different vehicle classes are shown in Table 7. The relevant fuels are represented by GAS (gasoline) and DSL (diesel). The Retail and Commercial Trucks value represents both gasoline and diesel fuels for all vehicles greater than 8,500 lbs.

Table 7: Description of vehicle class labels.

Vehicle Class Label	Description
LDA	Passenger car
LDT1	Light Duty Truck <= 3,750 lbs
LDT2	Light Duty Truck (3,751 - 5,750 lbs)
MCY	Motorcycles
MDV	Medium Duty Trucks (5,751 - 8,500 lbs)
Retail and Commercial Trucks	All on-road vehicles greater than 8,500 lbs

Off-road transportation emissions are composed of various sectors. These sectors are summarized in Figure 9. What activities compose these different off-road vehicle sectors are described in Table 8.

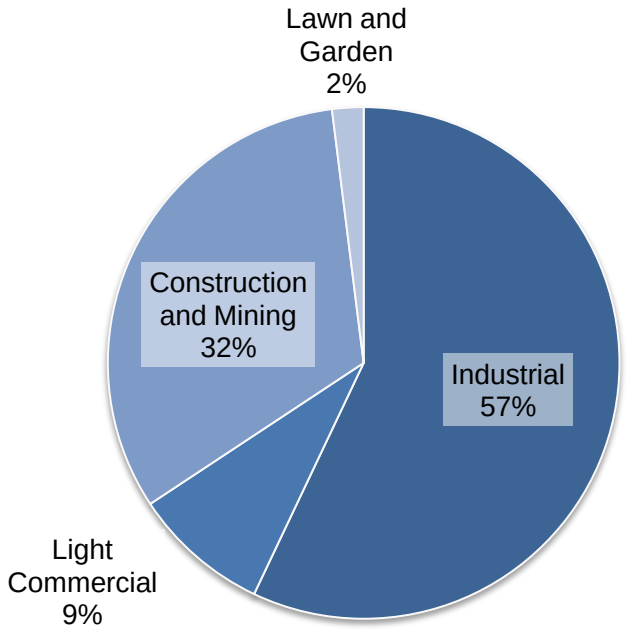

Figure 9: Break down of activity sectors that comprise the off-road transportation emissions sector.

Additional data used to determine emissions from the transportation sector are provided in the Appendices. Refer to the Methodology Report for information regarding how this data is used.

Table 8: Description of the various activities that comprise each off-road vehicle sector.

Off-road Activity Sector	Description
Industrial	Agricultural, industrial, and logging
Construction and Mining	All construction
Light Commercial	Entertainment, light commercial, and recreational
Lawn and Garden	Landscaping and maintenance

3.2.4 Activity: Solid Waste Generation

Emissions are generated by the transportation, processing, and decomposition of solid waste. This inventory estimates the emissions associated with all three.

Emissions from the transportation of waste include only those miles associated with trucking of waste out of the County from the Humboldt Waste Management Authority (HWMA) distribution center. Emissions from self-hauling and from trash trucks are assumed to be reasonably modeled within the Mobile Combustion sector (see Section 3.2.3).

Waste processing emissions are associated with the equipment used at the landfill site to manage the landfill. Different emissions factors are used based on whether the equipment is fueled by either diesel or compressed natural gas (CNG). All landfills that are used by HWMA utilize diesel equipment with the exception of the Altamont Landfill in Livermore, CA. Only a small fraction of waste is trucked to this site and therefore the large majority of process emissions are associated with diesel equipment.

Emissions from the decomposition of waste is associated with paper, food, plant, animal, wood, and textile wastes. Appropriate emissions factors are used for each type of waste. Results of all emissions are shown in Table 9.

Table 9: Emissions associated with the transportation, processing, and decomposition of solid waste.

	Activity: Solid Waste Generation	Quantity of Waste Generated (wet short ton)		Emissions Factor (metric tons CO_2e / short ton)	Emissions (metric tons CO_2e)
	Paper Waste	Waste Decomposition	248	Numerous. Refer to Methodology Report.	478
	Food Waste		269		371
	Plant Waste		168		130
	Wood / Textile Waste		112		122
	Other Waste		386		0
	All Sectors	Waste Decomposition	1,183	Numerous. Refer to Methodology Report.	1,100
Info Item	**Additional Emissions Sources**	Landfill Process Equipment	1,183	Numerous. Refer to Methodology Report.	19
		On-Road Transportation of Waste	1,183		60

A visual comparison between the emissions produced by the various waste types is shown in Figure 10. This can help Blue Lake visualize which sector to prioritize during emissions reduction planning efforts. Note that transportation to landfills is estimated to comprise roughly 5% of total emissions from the generation of solid waste.

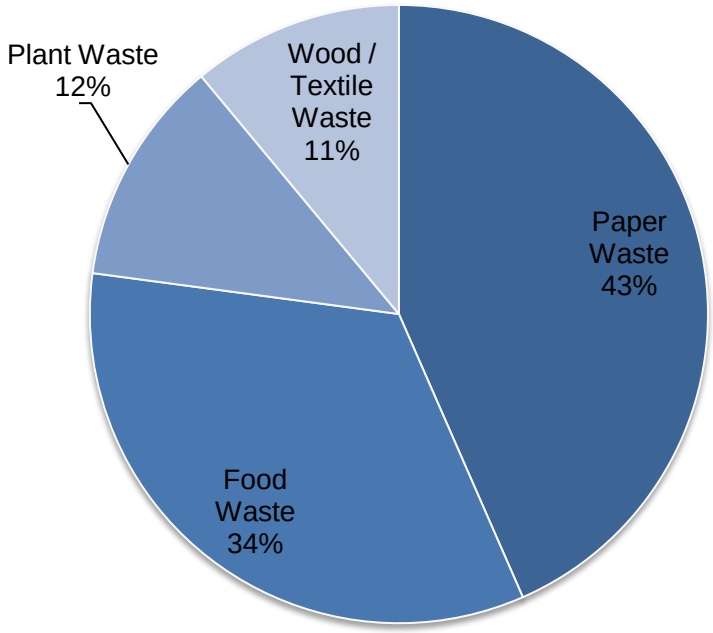

Figure 10: Solid waste emissions by waste type.

3.2.5 Source and Activity: Wastewater Treatment

Greenhouse gases are emitted from processing as well as the energy consumed for processing. Both the central treatment plant and septic systems are considered. Process emissions are considered an emissions source while energy consumption from the central plant is considered an emissions activity.

Central treatment plant process emissions are associated with methane release from anaerobic activity and the creation of nitrous oxide during the conversion of ammonia. Septic system process emissions are associated with methane release from anaerobic conditions. Central treatment plant energy consumption is associated with the electricity and natural gas required to run the plant. Emissions results are shown in Table 10.

Because the emissions associated with electricity consumption by the wastewater treatment plant are already included in the Electricity Consumption sector (see Section 3.2.1), these emissions should not be added to the total emissions role-up for Blue Lake. It is only provided here for information purposes to provide a more complete picture of the emissions associated with the community of Blue Lake.

Table 10: Emissions associated with the processing of wastewater from both the central treatment plant and septic systems within jurisdictional boundaries.

Source: Wastewater Treatment		Indicators		Emissions Factor (metric tons CO_2e / unit)	Emissions (metric tons CO_2e)
Central Treatment Process Emissions		Average influent BOD5	87.06 kg / day	Numerous. Refer to Methodology Report.	107
		Average daily volume of wastewater	117,000 gallons		
		Population served	1,255		
Fugitive Emissions from Septic		Estimated population served	Approx. 10	0.108 metric tons CO_2e per person per year	1.08
		Number of permitted septic systems	5		
Total		---	---	---	**108**
Info Item	Central Treatment Energy Consumption	Consumed electricity	150,811 kWh	0.000221807	33.5
		Consumed natural gas	50 therms	0.005307	0.265

3.2.6 Activity: Consumption of Potable Water

The Community Protocol requires reporting of emissions associated with potable water consumption. This sector is highlighted to emphasize the impact that water saving measures can have on reducing a communities emissions. Results of the estimated emissions associated with pumping and treatment of potable water are shown in Table 11.

This emissions source is already accounted for in the Electricity Consumption and Stationary Combustion sectors, so should not be added to these sectors. Instead, this emissions activity should be considered as an information item to guide policy decisions.

Table 11: Emissions associated with pumping and treatment of potable water served to the City of Blue Lake.

Activity: Potable Water Consumption		Indicators		Emissions Factor (metric tons CO_2e / million gallons)	Emissions (metric tons CO_2e)
Info Item	Pumping and Treatment Energy Consumption	Population served	~1,500	0.2018	17.6
		Gallons of water consumed (MG)	87.2		
		Energy Intensity (MWh/MG)	0.849		

3.2.7 Source: Fugitive Leakage of Refrigerants

Leaked refrigerants can be a significant source of greenhouse gases as many refrigerants have extremely large global warming potential factors. Even though the relative quantity of leaked refrigerants is generally small, their large global warming potential makes their relative impact significant. This inventory estimates the emissions associated with stationary and mobile refrigeration equipment operated within industrial and commercial sectors. Mobile refrigeration is not tracked given the difficulty of the task and the lack of local government influence over the emissions source. The estimated emissions associated with leaked refrigerants are shown in Table 12.

Table 12: Estimated emissions associated with the leakage of refrigerants from commercial and industrial stationary and mobile equipment.

Source: Fugitive Refrigerant Emissions	Number of Refrigeration Units		Emissions Factor (metric tons CO_2e / refrigeration unit)	Emissions (metric tons CO_2e)
Stationary Refrigeration Equipment[10]	Size 50 - 200 lbs	0	11.907	0
	Size 200 - 2000 lbs	0	47.627	0
	Size >2000 lbs	0	340.195	0
	Total	**0**	**---**	**0**
Transport Units	3 lbs	4	1.530	6.12

Note that transportation units refer to mobile refrigeration units such as those carried by food delivery trucks. This emissions sector is a rough estimate modeled by the OFFROAD2007 emissions model created by the California Air Resources Board (CARB). This model estimates the emissions from this sector at a County level and allocated to the City of Blue Lake based on the percentage of jobs within the jurisdiction.

3.2.8 Source: Industrial Point Sources

Industrial point sources are tracked by the North Coast Unified Air Quality Management District (NCUAQMD) given their large contribution to overall emissions. Estimated emissions from all industrial sources within the jurisdictional boundary of Blue Lake are included. In addition, criteria

[10] The NCUAQMD does not track refrigeration units smaller than 50lbs. The commercial units within Blue Lake are under this threshold and therefore no data is available. Furthermore, because of their relatively small size, their emissions are likely negligible.

pollutants associated with environmental and health concerns are also included for information purposes. The results are shown in Table 13.

Table 13: Greenhouse gas and criteria pollutant emissions estimates from industrial point sources.

Source: Industrial Point Sources	Quantity of GHGs and Other Criteria Pollutants (metric tons)		Emissions Factor (metric tons CO_2e / unit)	Emissions (metric tons CO_2e)
Sources Tracked by the NCUAQMD[11]	CO_2	1,190	1	1,190
	CH_4	0.02	25	0.57
	N_2O	Unknown	298	Unknown
	CO	0.0	---	---
	NO_x	0.0	---	---
	SO_x	0.0	---	---
	PM	0.644	---	---
	TOG	0.0	---	---
	Total	---	---	**1,190**

A detailed table of criteria pollutants tracked by the NCUAQMD is provided in Table 14. These criteria pollutants impact local air quality which has human health and environmental impacts. The NCUAQMD only tracks entities who emit over a certain threshold amount so not all local industries are included.

Table 14: Criteria pollutant information for large industry obtained from the North Coast Unified Air Quality Management District.

Source: Criteria Pollutants	Carbon Monoxide (Ton/ Yr.)	Oxides of Nitrogen (Ton/ Yr.)	Oxides of Sulfer (Ton/ Yr.)	PM10 Particulates (Ton/ Yr.)	Total Organic Gases (Ton/ Yr.)
CALGON CARBON CORP.	0	0	0	0.71	0
ULTRAPOWER 3	0	0	0	0	0

Note that Ultrapower (Blue Lake Power) was not operating during the inventory year of 2005. However, Table 15 and Table 16 below show the emissions associated with the power plant for 1990 and 2010.

Table 15: Criteria pollutant emissions information for Ultrapower for the year 1990.

Source: Criteria Pollutants	Carbon Monoxide (Ton/ Yr.)	Oxides of Nitrogen (Ton/ Yr.)	Oxides of Sulfer (Ton/ Yr.)	PM10 Particulates (Ton/ Yr.)	Total Organic Gases (Ton/ Yr.)
1990	646.4	83.5	0	9.7	81.5

[11] The NCUAQMD only has information for large industrial sites for certain years. Refer to Section 2.2.5 for more information.

Table 16: Greenhouse gas emissions information for Blue Lake Power for the year 2010.

Source: Greenhouse Gases	Reported CO2 (lbs/yr)	Reported CH4 (lbs/yr)	Reported N2O (lbs/yr)
2010	1.21E+08	3.81E+04	5083.79

Furthermore, greenhouse gas emissions were not reported for Calgon Carbon in 2005, but were reported for 2010. It is likely that these emissions did not change significantly over these five years. Therefore, these emissions are included in this 2005 emissions inventory. The emissions data for Calgon Carbon for 2010 is shown in Table 17 below.

Table 17: Criteria pollutant emissions information for Calgon Carbon for the year 2010.

Source: Greenhouse Gases	Reported CO2 (lbs/yr)	Reported CH4 (lbs/yr)	Reported N2O (lbs/yr)
2010	2.62E+06	50.12	0.00

3.3 Additional Emissions Sources Outside of Significant Local Government Influence

Included in these results are additional inventoried sources and activities over which the City of Blue Lake does not have significant influence. However, consumption of goods and services within the community indirectly contribute to these emissions. Therefore, it is useful to include these sources to provide a more complete picture of the impact the City of Blue Lake has on global emissions.

The majority of the emissions shown here are upstream emissions of petroleum fuels. These are emissions associated with the production of these fuels. The fuels considered are those used for transportation, those used for stationary combustion, and those used to generate electricity. Also included are estimates of direct emissions, not upstream emissions, associated with commercial and private airplane flights. Figure 11 summarizes these emissions (2,010 Metric Tons of CO_2e).

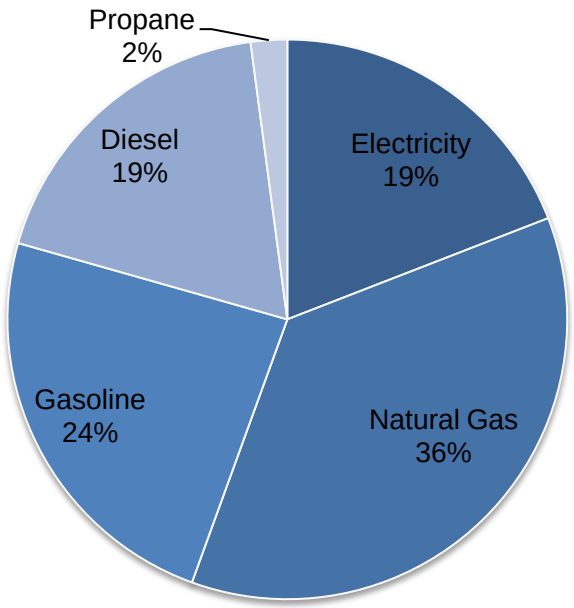

Figure 11: Summary of all emissions outside significant influence by the City of Blue Lake

3.3.1 Activity: Upstream Emissions from Utility Energy Consumption

In addition to the emissions associated with electricity, natural gas, and propane that are accounted for in Sections 3.2.1 and 3.2.2, there are additional emissions associated with the production of these fuels. These upstream emissions can account for a significant portion of the total emissions associated with the consumption of these fuels, and can often be overlooked since the production of these fuels occurs in places very far removed from the City of Blue Lake. However, there is a direct connection between the demand for these fuels and the emissions associated with their supply.

Table 18 provides estimates of these upstream emissions. These estimates apply only to the production of fuels, not to the mining of fuels, or to the construction, operation, or decommissioning of fuel processing infrastructure. Hence, while these estimates provide a bigger picture of the impact associated with the consumption of electricity, natural gas, and propane, there are additional emissions not accounted for that further increase this impact.

Table 18: Upstream emissions estimates associated with processing of fuels used to generate electricity and for stationary combustion.

Upstream: Utility Fuel Emissions	Quantity of Fuel Consumed		Emissions Factor (metric tons CO_2e / unit)	Emissions (metric tons CO_2e)
Electricity	Coal (kg)	25,543	0.000189	4.83
	Residual Fuel Oil (L)	12,066	0.000535	6.46
	Distillate Fuel Oil (L)	7,714	0.000492	3.80
	Natural Gas (m^3)	827,216	0.000445	368
	Total	**---**	**---**	**383**
Stationary Combustion	Propane (gallon)	32,007	0.00116212	37.2
	Natural Gas (therm)	639,881	0.00114139	730
	Total	**---**	**---**	**768**

3.3.2 Activity: Upstream Emissions from Mobile Combustion of Gasoline and Diesel

As with the utility energy-related fuels, there are also emissions associated with the production of gasoline and diesel used in on- and off-road vehicles. These emissions are important to account for as they form a significant fraction of the overall emissions associated with the demand for these fuels. In 2007 the State acknowledged this fact by enacting the Low Carbon Fuel Standard (LCFS). The purpose of the LCFS is to reduce the lifecycle carbon intensity of all fuels utilized by the State, including gasoline and diesel as well as compressed natural gas, ethanol, hydrogen, and other alternative fuels.

The significance of including these upstream emissions is to emphasize the additional impact that a reduction in fuel consumption will have. By reducing the consumption of gasoline and diesel, not only will greenhouse gas emissions, as well as local criteria pollutants that impact the health of community residents, be reduced locally, these emissions will also be reduced in all regions affected by the production and transportation of these fuels.

Upstream emissions factors, also referred to as well-to-pump emissions factors, were pulled from the GREET model[12] developed by the Argonne National Laboratory. These factors are used to estimate the emissions associated with the consumption of gasoline and diesel by the Blue Lake

[12] Database version 8065 was used to obtain emissions factors.

community. These factors, along with the resulting emissions, are shown in Table 19. Note that, for 2005, the ethanol content in blended California gasoline was 5.5%[13]. This is also factored in to the total emissions estimate.

Table 19: Upstream emissions associated with gasoline and diesel fuel consumption.

Upstream: Gas and Diesel Emissions	Quantity of Fuel Consumed (gallons)		Emissions Factor (metric tons CO_2e / gallon)	Emissions (metric tons CO_2e)
Gasoline	CARFG	206,738	0.002087	411
	Ethanol	11,385	0.005855	67.7
Diesel	California Low Sulfur Diesel	160,481	0.002330	371
Propane	Liquid Propane Gas	4,257	0.001162	4.95

3.3.3 Emissions From Air Travel

Commercial air travel is a difficult emissions source to allocate to jurisdictions within a County as it is difficult to determine the origin and destination of passengers. Commercial air flight emissions are estimated for the County using total in-County sales of jet fuel as a proxy. Small private airplane flight emissions are estimated for the County using 100% of in-County fuel sales of 100LL AvGas.

The total emissions are then allocated to Blue Lake based on the percent of the County population that resides within jurisdictional boundaries. Again, this is neither a reliable nor fair method, but is given here for information purposes and to give a sense of the impact of air travel to a communities over all emissions impact.

Furthermore, aviation fuel sales were obtained only for the year 2012, so are not directly representative of the inventory year. Hence, the numbers provided should be considered only as a ballpark estimate.

Both direct combustion emissions as well as upstream emissions were quantified for the consumption of aviation fuel. Table 20 shows the direct combustion emissions estimates, and Table 21 shows the upstream emissions estimates.

Table 20: Direct CO_2 emissions estimates associated with commercial and private air travel.

Activity: Air Travel Emissions		Quantity of Fuel Consumed Countywide (gallons)		Emissions Factor (metric tons CO_2e / gallon)	Fraction Allocated To Jurisdiction	Emissions (metric tons CO_2e)
Info Item	Commercial and Private Jets	Jet Fuel	371,471	0.009637	0.87%	31.1
Info Item	Other Private Small Airplanes	AVGAS (100LL)	74,378	0.008368	0.87%	5.4

[13] Determined from historical fuel consumption data obtained from NCUAQMD

Table 21: Upstream CO_2e emissions estimates associated with commercial and private air travel.

Upstream: Air Travel Emissions	Quantity of Fuel Consumed (gallons)		Emissions Factor (metric tons CO_2e / gallon)	Fraction Allocated To Jurisdiction	Emissions (metric tons CO_2e)
Commercial and Private Jets	Jet Fuel	371,471	0.002377	0.87%	7.7
Other Private Small Airplanes	AVGAS (100LL)	74,378	0.002189	0.87%	1.4

4 Community Emissions Forecast

An emissions forecast is useful for projecting community growth and the corresponding growth of emissions. This can inform local government action when setting emissions reductions goals. Forecast growth factors used are detailed in Appendix E.

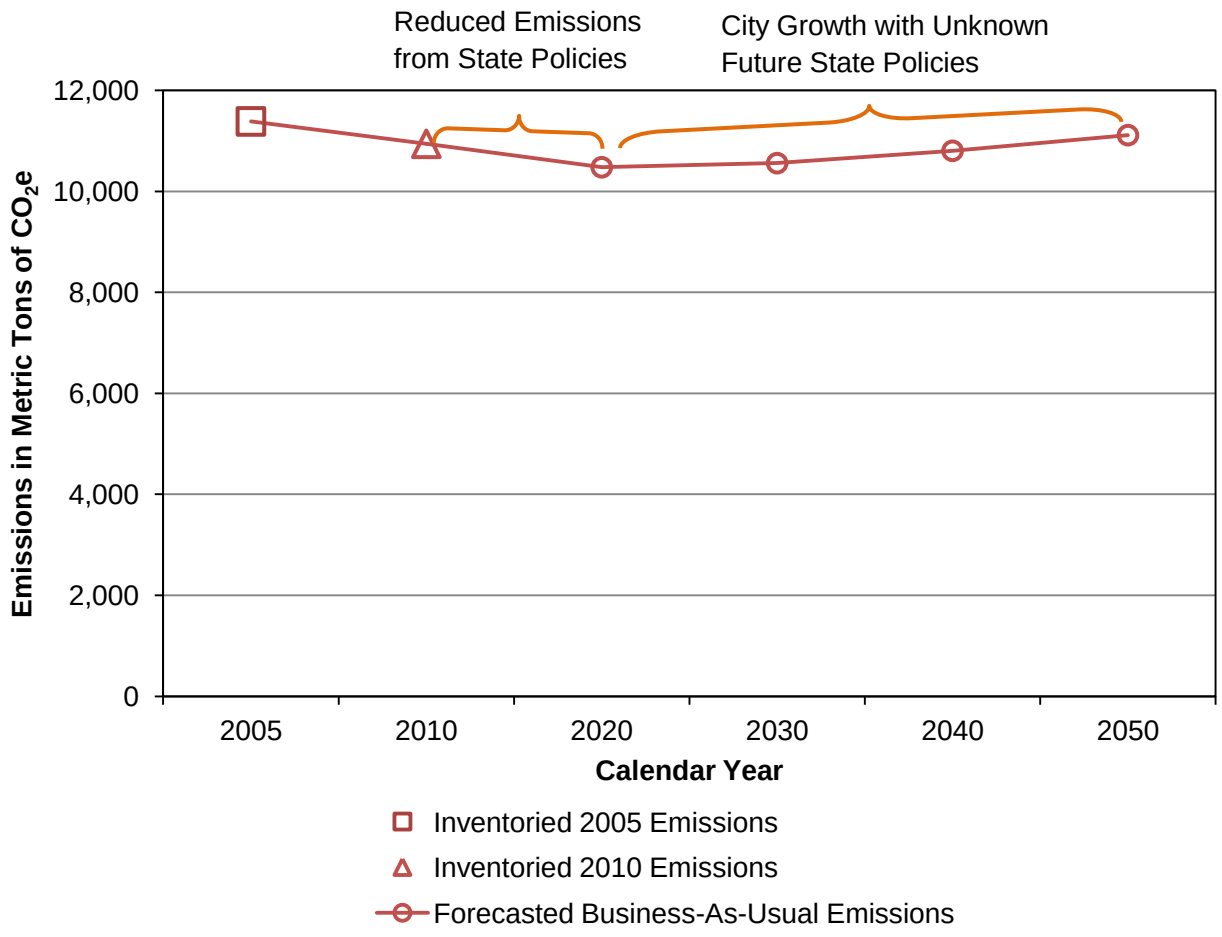

Figure 12: Forecasted greenhouse gas emissions for the City of Blue Lake. Community emissions for the year 2010 were also estimated for this forecast.

The online Statewide Energy Efficiency Collaborative forecasting tool[14] was used to generate the forecast based on the results of this emissions inventory for 2005.

5 Discussion

Two primary classes of emissions are presented in this report: local emissions activities and sources that are within local government significant influence, and upstream emissions activities and sources that are outside local government influence. Furthermore, emissions results are presented as either an activity or a source. This distinction can help guide local government action by targeting either a specific source within jurisdictional boundaries, or the activities of the residents and businesses of Blue Lake. Additional emissions information items are presented to further inform policy decisions.

The next steps are to set an emissions reduction target, and to develop a climate action plan that identifies specific quantified strategies that can cumulatively meet that target. In addition, Blue Lake should continue to track key energy use and emissions indicators on an on-going basis by completing a re-inventory at least every five years to measure emissions reduction progress.

According to this Greenhouse Gas (GHG) Inventory, total emissions for the City of Blue Lake in the baseline inventory year (2005) were approximately 10,890 metric tons of CO_2e from local emissions sources and activities, and an additional 2,010 metric tons of CO_2e from upstream emissions. For most communities in California it is assumed that population and development has increased and therefore so has greenhouse gas (CO_2e) emissions. However, according to the US Census the City of Blue Lake's population has only increased by approximately 18 persons from 1990 (1,235 persons) to 2010 (1,253 persons). In addition, the population decreased from 1990 to 2000 (1,135 persons) and increased from 2000 to 2010. Therefore, the emissions generated in 1990 may have been greater than the emissions generated in the baseline inventory year (2005). Due to this, it may not be as useful to set emissions reduction targets such as those established by AB 32 which focus on achieving 1990 emission levels by 2020. It may be more useful to simply focus on reducing emissions by a certain percentage (e.g. 15%) by 2020.

Emissions reduction strategies to consider for the climate action plan include energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, and waste reduction among others. This inventory shows that transportation fuel consumption and PG&E electricity and natural gas consumption will be particularly important to focus on. Through these efforts and others the City of Blue Lake can achieve additional benefits beyond reducing emissions, including saving money and improving Blue Lake's economic vitality and quality of life.

[14] http://cems.californiaseec.org

Appendix A Inventory Scope and Reporting Table

The Community Inventory Protocol requires summarizing the primary emissions sectors that were inventoried in this report in the following standardized table.

Emissions Type		Source or Activity?	Required	Included	Explanation if Excluded	Explanatory Notes	Emissions ($MTCO_2e$)
Built Environment							
Use of fuel in residential and commercial stationary combustion equipment		Source AND Activity	●	●			3,612
Industrial stationary combustion sources		Source		●			0
Electricity	Power generation in the community	Source			Not Applicable		
	Use of electricity by the community	Activity	●	●			1,249
District Heating/ Cooling	District heating/cooling facilities in the community	Source			Not Applicable		
	Use of district heating/cooling by the community	Activity			Not Applicable		
Industrial process emissions in the community		Source		●			1,606
Refrigerant leakage in the community		Source		●			6
Transportation and Other Mobile Sources							
On-road Passenger Vehicles	On-road passenger vehicles operating within the community boundary	Source	● or	●			1,830

Emissions Type		Source or Activity?	Required	Included	Explanation if Excluded	Explanatory Notes	Emissions ($MTCO_2e$)
	On-road passenger vehicle travel associated with community land uses	Activity	●		Not Estimated		
On-road Freight Vehicles	On-road freight and service vehicles operating within the community boundary	Source		●			119
	On-road freight and service vehicle travel associated with community land uses	Activity			Not Estimated		
On-road transit vehicles operating within the community boundary		Source		●			Included in On-road Freight
Transit Rail	Transit rail vehicles operating within the community boundary	Source			Not Applicable		
	Use of transit rail travel by the community	Activity			Not Applicable		
Inter-city passenger rail vehicles operating within the community boundary		Source			Not Applicable		
Freight rail vehicles operating within the community boundary		Source			Not Applicable		
Marine	Marine vessels operating within the community boundary	Source			Included Elsewhere	Will be Included in future County-wide inventory	
	Use of ferries by the community	Activity			Not Applicable		

Emissions Type		Source or Activity?	Required	Included	Explanation if Excluded	Explanatory Notes	Emissions ($MTCO_2e$)
Off-road surface vehicles and other mobile equipment operating within the community boundary		Source		●			1,584
Use of air travel by the community		Activity		●			37
Solid Waste							
Operation of solid waste disposal facilities in the community		Source			Not Applicable		
Generation and disposal of solid waste by the community		Activity	●	●			1,101
Water and Wastewater							
Potable Water - Energy Use	Operation of water delivery facilities in the community	Source			Not Estimated		
	Use of energy associated with use of potable water by the community	Activity	●	●			18
Use of energy associated with generation of wastewater by the community		Activity	●	●			33
Centralized Wastewater Systems - Process Emissions	Process emissions from operation of wastewater treatment facilities located in the community	Source		●			107
	Process emissions associated with generation of wastewater by the community	Activity			Not Applicable		

Emissions Type	Source or Activity?	Required	Included	Explanation if Excluded	Explanatory Notes	Emissions ($MTCO_2e$)
Use of septic systems in the community	Source AND activity		●			1
Agriculture						
Domesticated animal production	Source			Not Estimated		
Manure decomposition and treatment	Source			Not Estimated		
Upstream Impacts of Community-Wide Activities						
Upstream impacts of fuels used in stationary applications by the community	Activity		●			768
Upstream and transmission and distribution (T&D) impacts of purchased electricity used by the community	Activity		●			473
Upstream impacts of fuels used for transportation in trips associated with the community	Activity		●			863
Upstream impacts of fuels used by water and wastewater facilities for water used and wastewater generated within the community boundary	Activity			Not Estimated	Included in electricity and stationary combustion upstream emissions estimate	
Upstream impacts of select materials (concrete, food, paper, carpets, etc.) used by the whole community	Activity			Not Estimated		

Emissions Type	Source or Activity?	Required	Included	Excluded (IE, NA, NO, or NE)	Explanatory Notes	Emissions ($MTCO_2e$)
Independent Consumption-Based Accounting						
Household Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all households in the community)	Activity			Not Estimated		
Government Consumption (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all governments in the community)	Activity			Not Estimated		
Life cycle emissions of community businesses (e.g., gas & electricity, transportation, and the purchase of all other food, goods and services by all businesses in the community)	Activity			Not Estimated		

Appendix B NCAIS Job Sector Data

As described in the Methodology Report, census data on the number of jobs for a jurisdiction, classified using the North American Industry Classification System (NCAIS), is used to allocate County-wide vehicle miles traveled from retail and commercial to the City. The percentage of County jobs within the City are shown in Table 22.

Table 22: NCAIS employment sectors used to allocate County-wide HPMS VMT to retail and commercial truck vehicle classes.

NCAIS Employment Sectors	% Of County Jobs In Jurisdiction
Agriculture, Forestry, Fishing and Hunting	0.06%
Mining, Quarrying, and Oil and Gas Extraction	0.00%
Utilities	0.00%
Construction	0.18%
Manufacturing	0.00%
Wholesale Trade	0.00%
Retail Trade	0.00%
Transportation and Warehousing	0.00%

Appendix C DMV Vehicle Population Percentage Values

DMV data was used to further localize the allocation of vehicle miles traveled VMT. The percentage values used for this VMT allocation are shown in Table 23. Refer to the Methodology Report for further details.

Table 23: Percent population of vehicles registered to owners that have an address within the jurisdiction.

Vehicle Class and Fuel	% Total Jurisdiction DMV Population
LDA-Diesel	0.39%
LDA-Electric	0.11%
LDA-Gasoline	53.32%
LDA-Gasoline Hybrid	0.35%
LDA-Propane	0.00%
LDT1-Compressed Natural Gas	0.00%
LDT1-Diesel	0.25%
LDT1-Gasoline	22.12%
LDT1-Gasoline Hybrid	0.00%
LDT2- Compressed Natural Gas	0.01%
LDT2-Diesel	2.80%
LDT2-Gasoline	19.59%
LDT2-Gasoline Hybrid	0.00%
MDV-Diesel	0.74%
MDV-Gasoline	0.31%

Appendix D Daily Vehicle Miles Traveled Data Used for EMFAC2011 Emissions Modeling

The following tables list the vehicle miles traveled data (VMT) that was input into the EMFAC2011 model to obtain emissions estimates for the transportation sector. Both the EMFAC2011-SG (SG) and the EMFAC2011-LDV (LDV) sub-models were run. The SG model was used to obtain CO_2 emissions for all vehicle classes[15] as well as total organic gases (TOG) and nitrous oxides (NO_x). The LDV model was used to estimate the CH_4 and N_2O emissions from those vehicle classes modeled by the LDV sub-model. The CH_4 and N_2O emissions from all other vehicle classes were estimated from the TOG and NO_x emissions estimated from the SG model (see the Methodology Report for additional details).

VMT data used for the EMFAC2011-SG sub-model

The following table lists the daily VMT values used to estimate CO_2 emissions for all vehicle classes.

Table 24: Daily VMT values used to estimate CO_2 emissions from the EMFAC2011-SG sub-model. Refer to the Methodology Report for definitions of vehicle classes.

EMFAC2011-SG Vehicle Classes	Daily VMT
All Other Buses-DSL	10.30
LDA-DSL	46.65
LDA-GAS	6386.88
LDT1-DSL	29.37
LDT1-GAS	2627.27
LDT2-DSL	332.68
LDT2-GAS	2327.07
LHD1-DSL	15.60
LHD1-GAS	9.06
LHD2-DSL	9.37
LHD2-GAS	3.17
MCY-GAS	78.20
MDV-DSL	87.99
MDV-GAS	36.24
MH-DSL	5.30
MH-GAS	47.21
Motor Coach-DSL	10.56
OBUS-GAS	12.83
PTO-DSL	12.11
SBUS-DSL	19.78
SBUS-GAS	4.64
T6 Ag-DSL	1.81
T6 CAIRP heavy-DSL	0.02
T6 CAIRP small-DSL	0.07

[15] Refer to the Humboldt County Greenhouse Gas Emissions Inventory Tool: Calculation Methodologies for additional information regarding vehicle class definitions as well as the methods used to estimate CH_4 and N_2O emissions.

EMFAC2011-SG Vehicle Classes	Daily VMT
T6 instate construction heavy-DSL	0.26
T6 instate construction small-DSL	0.54
T6 instate heavy-DSL	2.40
T6 instate small-DSL	5.05
T6 OOS heavy-DSL	0.01
T6 OOS small-DSL	0.04
T6 Public-DSL	0.31
T6 utility-DSL	0.04
T6TS-GAS	2.52
T7 Ag-DSL	4.24
T7 CAIRP-DSL	8.53
T7 CAIRP construction-DSL	0.14
T7 NNOOS-DSL	9.59
T7 NOOS-DSL	3.11
T7 other port-DSL	0.71
T7 POAK-DSL	0.00
T7 POLA-DSL	0.00
T7 Public-DSL	0.46
T7 Single-DSL	3.91
T7 single construction-DSL	0.35
T7 SWCV-DSL	0.22
T7 tractor-DSL	4.69
T7 tractor construction-DSL	0.26
T7 utility-DSL	0.02
T7IS-GAS	0.92
UBUS-DSL	17.20
UBUS-GAS	4.44
Total Daily VMT =	**12184.14**

VMT data used for the EMFAC2011-LDV sub-model

The following VMT values were used to estimated CH4 and N2O emissions using the EMFAC2011-LDV sub-model. Only a subset of vehicle classes are modeled by this sub-model. Note that while the EMFAC2011-LDV and EMFAC2011-SG sub-models do not use the same names for vehicle classes, there is a direct correlation. This correlation is provided by the EMFAC2011 model documentation.

Table 25: Daily VMT values used to estimate CH_4 and N_2O emissions from the EMFAC2011-LDV sub-model. Refer to the Methodology Report for definitions of vehicle classes.

EMFAC2011-LDV Vehicle Classes	Daily VMT
01 - Light-Duty Autos (PC)	6433.54
02 - Light-Duty Trucks (T1)	2656.64
03 - Light-Duty Trucks (T2)	2659.74
04 - Medium-Duty Trucks (T3)	124.23
05 - Light HD Trucks (T4)	24.66
06 - Light HD Trucks (T5)	12.53
07 - CAIRP+OOS+IS Trc/Sngl (T6)	2.52
08 - Agriculture (T6)	0
09 - Public + Utility (T6)	0

EMFAC2011-LDV Vehicle Classes	Daily VMT
10 - Out of State (T7)	0
11 - CAIRP (T7)	0
12 - Instate Tractor (T7)	0
13 - Instate Single (T7)	0.92
14 - Port (Drayage) (T7)	0
15 - Agriculture (T7)	0
16 - Public+Util+SolidWaste(T7)	0
17 - Other Buses	10.30
18 - Urban Buses	21.64
19 - Motorcycles	78.20
20 - School Buses	24.42
21 - Motor Homes	52.51
Total Daily VMT =	**12101.84**

Appendix E Appendix E Compound Annual Growth Rates Used to Forecast Future Emissions

To properly forecast for the City of Blue Lake, specific growth rates were used to estimate growth in population and job sectors. Population growth rates for Blue Lake were used up until 2012 and can be seen in Table 26. Population growth rates for the county were then used for the other periods as displayed in Table 27. The growth rate used for the period of 2025-2030 seen in Table 27 was used to extend the forecast to 2050.

Refer to the inventory tool to gain further information on how growth rates were used to calculate forecasted emissions.

Table 26: Population compound annual growth rates calculated from ACS 5 year estimates of SF1 100% Census data.

Period	Blue Lake
2000 - 2004	0.0043
2005 - 2009	-0.0013
2010 - 2014[16]	-0.0015

Table 27: Population compound annual growth rates calculated from the County General Plan, version dated 03/2012.

Period	Incorporated County
2015-2019	0.0033139
2020-2024	0.0014023
2025-2029[17]	0.0013925
2030-2034	0.0013925
2035-2039	0.0013925
2040-2044	0.0013925
2045-2049	0.0013925

The job growth rates for the City of Blue Lake can be seen in Table 28. It was found that the calculated annual growth rates for the job sector were unrealistic and therefore the average Humboldt County growth rates were used for the 2005-2050 periods seen in Table 28.

[16] The compound annual growth rate calculated from ACS 5 year estimate SF1 100% census data for the years 2010 - 2012 was applied to forecast years 2010 - 2014.
[17] The population growth factor for 2025 - 2029 was applied to all future years.

Table 28: Compound annual growth rates calculated for NCAIS job sectors.

Period	Blue Lake
2000 - 2004	0.1
2005 - 2009	-0.0866
2010 - 2014[18]	0.0042
2015 - 2019	0.0042
2020 - 2024	0.0042
2025 - 2029	0.0042
2030 - 2034	0.0042
2035 - 2039	0.0042
2040 - 2044	0.0042
2045 - 2049	0.0042

To forecast into 2050 carbon intensity reduction rate factors were used from PG&E's Renewable Portfolio Standard (RPS). For the periods preceding the period 2010-2014 seen in Table 29 the SEEC forecast tool assumes the -0.045 RPS carbon intensity. The SEEC tool assumes that the periods following the 2015-2019 period use the -0.059 RPS carbon intensity.

Table 29: Carbon intensity reduction rate factors estimated from the PG&E Renewable Portfolio Standard.

Period	PG&E RPS Carbon Intensity
2010-2014	-0.045
2015-2019	-0.059

Highway performance monitoring systems are assumed the same throughout Humboldt County. Thus, all jurisdictions have the same vehicle miles traveled growth rates that can be seen in Table 30. The rate for 2010-2014 period was applied to all future years to provide a forecast to 2050. Similarly, all traffic carbon intensity factors are used for all jurisdictions as seen in Table 31.

Table 30: County vehicle miles traveled (VMT) growth rates estimated from the state highway performance monitoring system (HPMS). VMT growth rates are the same across all jurisdictions.

Period	VMT Growth Factors
2000-2004	0.005392
2005-2009	0.005392
2010-2014[19]	0.006010
2015-2019	0.006010
2020-2024	0.006010
2025-2029	0.006010
2030-2034	0.006010
2035-2039	0.006010
2040-2044	0.006010
2045-2049	0.006010

[18] 2010 - 2014 growth rate was estimated from 2006 - 2010 NCAIS data. This rate was then applied to all future years.
[19] 2010 - 2014 growth rate was estimated from 2006 - 2010 HPMS data. This rate was then applied to all future years.

Table 31: Vehicle emissions carbon intensity reduction factor values.

Period	Carbon Intensity Factor
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