Priority Climate Action Plan

Sokaogon Chippewa Community CPRP

Sokaogon Chippewa Reservation, Forest County, WI

SOKAO 177550 | March 29, 2024

SEH

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Priority Climate Action Plan

Prepared for:
Sokaogon Chippewa Community
Sokaogon Chippewa Reservation, Forest County, WI

SOKAOGON CHIPPEWA COMMUNITY
Mole Lake Band

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SEH

Executive Summary

Short Elliott Hendrickson Inc. (SEH®) worked with the Sokaogon Chippewa Community (SCC) to prepare a Priority Climate Action Plan (PCAP) utilizing a Climate Pollution Reduction Grant (CPRG) from the United States Environmental Protection Agency (EPA).

This PCAP is intended to provide a list of near-term, implementation-ready, priority greenhouse gas (GHG) reduction measures, and is a prerequisite for any implementation grant. It is made up of the following sections:

- GHG inventory
- Quantified GHG reduction measures (priority measures only)
- Benefits analysis
- Review of authority to implement

The leadership team from the SCC is comprised of Tina Van Zile and Nathan Podany of the SCC's Environmental Department. The GHG assessment was performed by SEH with the EPA's Tribal GHG Emissions Inventory Tools, using both the Tribal Community and Government Operations tools with 2023 data provided by the SCC.

Data was collected by the SCC and provided to SEH for use in this report. Where data was incomplete or missing, assumptions were made based on average homes, buildings, or vehicles in a typical American household, and adjusted based on geography, climate, and demographics.

The inventory determined that the largest GHG emitting sector is electricity use, at roughly 2,905 metric ton per year (MT/year) carbon dioxide equivalents (CO2e) in the community and 2,000 MT/year across government operations. Those emissions occur off the reservation at Wisconsin Public Service Corp's generating plants, but have an impact on the region, including tribal lands.

Emissions from vehicle traffic by residents and tribal operations is the second largest source of emissions, although this is based largely on assumptions of vehicle ownership and miles driven. It is estimated that 1,450 MT/year CO2e is emitted by vehicle usage.

All homes and businesses on the reservation are heated with propane, as there is no natural gas system in the community. Propane consumption is the third largest source of emissions at 945 MT/year CO2e.

Given the main source of GHG emissions is electricity production, priority energy reduction measures are home and facility energy audits and efficiency improvements, installation of a ground source heat pump for the casino and additional solar facilities. In addition, fleet electrification, charging infrastructure, e-bikes and biking infrastructure are also target areas for GHG reduction.

The next step under the CPRG is to complete the community engagement portion of the project. This will consist of meetings with tribal members and the surrounding community. The tribal members will be presented with the PCAP and discussions will be facilitated to determine target GHG emission goals. Neighboring communities will be contacted to determine the level of partnering that they would like to reduce regional GHGs, especially concerning a regional biking infrastructure. In addition, Forest County Potawatomi are also in the utilizing a CPRG grant for planning. We will determine where our goals align and there are partnering opportunities.

During this time, we will attempt to obtain additional information in areas where assumptions were made in the PCAP to refine the GHG inventory for the Comprehensive Climate Action Plan (CCAP). The refined inventory and community engagement out comes will be compiled in the CCAP. The CCAP will act as a baseline GHG inventory for the SCC to measure future reduction of GHG emission and assist the SCC in obtaining funding for future GHG reduction projects.

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Sokaogon Chippewa Community CPRP

Prepared for Sokaogon Chippewa Community

1 Introduction

Short Elliott Hendrickson Inc. (SEH®) has prepared this Priority Climate Action Plan (PCAP) for the Sokaogon Chippewa Community (SCC). This is the first required deliverable as part of the Climate Pollution Reduction Grant (CPRG) awarded to the SCC by the Environmental Protection Agency (EPA) on August 16, 2023.

1.1 Climate Pollution Reduction Grant Overview

The EPA initiated CPRGs to provide states, municipalities, tribes and territories resources to evaluate their greenhouse gas (GHG) emissions in the sectors of industry, electricity generation/use, transportation, commercial and residential buildings, agriculture, natural and working lands, and waste and materials management. The entity receiving the grant can then create a plan to reduce GHG emissions and achieve other environmental, economic and energy goals.

Deliverables for the CPRG grants include PCAPs and Comprehensive Climate Action Plans (CCAPs). Further discussion on the CCAP for the SCC is presented in Section 4.

1.2 Priority Climate Action Plan (PCAP) Overview and Definitions

1.2.1 Overview

This PCAP is intended to provide a list of near-term, implementation-ready, priority GHG reduction measures, and is a prerequisite for any implementation grant. It is made up of the following sections:

- GHG inventory
- Quantified GHG reduction measures (priority measures only)
- Benefits analysis
- Review of authority to implement

1.2.2 Definitions

Adaptation: Preparations made to and adjust to the current and projected impacts of climate change. These measures increase resilience and minimize climate vulnerabilities.

Carbon Neutral: Balancing the amount of greenhouse gases emitted with those removed from the atmosphere.

Carbon Sequestration: The removal of carbon dioxide from the atmosphere. This is often accounted for in forests.

Climate: The typical weather (temperature, precipitation, wind patterns) in an area, usually measured over three decades.

Climate Change: Changes in climate over time.

Greenhouse Gas (GHG): A gas that traps heat in the Earth's atmosphere. GHGs inventoried in this PCAP are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The group of GHGs are reported as CO_2 equivalents (CO2e).

Mitigation: A combinations of actions taken towards reducing the amount of greenhouse gases emitted to the atmosphere or increase the carbon sequestered.

Resilience: The ability of a community or its infrastructure to withstand and recover from the effects of climate change, including extreme weather events.

Sustainability: Practices that promote long-term community or infrastructure well-being by balancing environmental, social, and economic considerations.

Vulnerability: Climate vulnerability is the extent that a community or infrastructure is susceptible to the effects of climate change and extreme weather events.

1.3 Approach to Developing the PCAP

For the PCAP, SEH worked with the SCC Environmental Department to collect data on the tribal facilities and residences within the community, including electrical usage of the SCC, primary heating sources and amounts of fuel used, fleet vehicles, drinking water, solid waste disposal and adjoining sites. Details on the data collected are presented in Section 3.

SEH also located wastewater permits, county plat data and reports pertaining to the work performed under the tribal Clean Energy Initiative Grant. Details of the data referenced are also provided in Section 3.

Data collected was entered into the EPA's Tribal GHG Emissions Inventory Tools, using both the Tribal Community and Government Operations tools. From there, SEH met with the Environmental Department to review GHG reduction measures to utilize in the PCAP. For the CCAP, a public engagement process will be utilized to engage additional stakeholders. From this process and the further refinement of the data for the EPA tools, recommendations for final GHG reduction methods will be presented in the CCAP.

2 Tribal Organization and Considerations

The Sokaogon Chippewa Community (SCC), or the Mole Lake Band of Lake Superior Chippewa, is a band of the Lake Superior Chippewa, many of whom reside on the Mole Lake Indian Reservation, located at 45°29′52″N 88°59′20″W in the Town of Nashville, in Forest County, Wisconsin. The reservation is located partly in the community of Mole Lake, Wisconsin, which lies southwest of the city of Crandon. Figure 1 depicts the location of the reservation, trust and fee lands included in this plan.

The SCC has been committed to combating rising energy prices and achieving long term energy independence through the use of emissions-free technology that reduces the overall carbon footprint of the community while supporting clean energy practices.

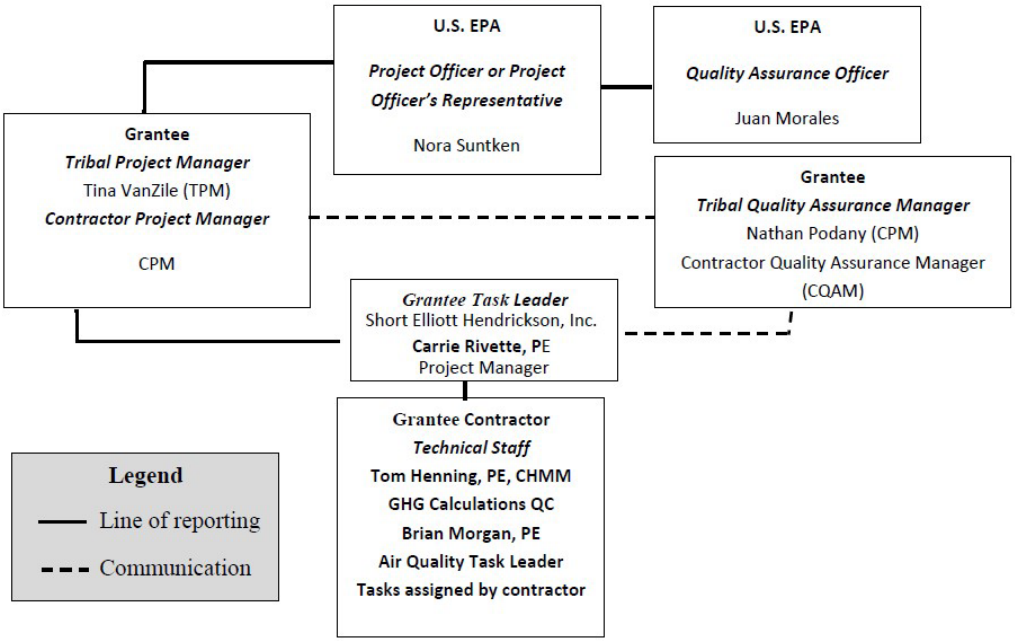
Previous emissions-free projects include the construction of 11 “Green Homes” that utilize geothermal technology for heating and cooling and the installation of renewable resource, wood-fired boilers to reduce reliance on fossil fuels and the installation of solar photovoltaic panels the SCC’s 17 buildings and three residences.[1]

The SCC developed strong initiatives to protect air and water quality on its reservation and is very active in combating legislation that would have a negative impact on the environment.

2.1 The Tribal PCAP Management and Development Team

The Environmental Department of the SCC is the lead department for the PCAP.

Figure 2 – Project Organization[2]



As noted above, further stakeholder engagement will be performed as part of preparation for the CCAP.

[1] Final Report: Sokaogon Chippewa Community, Community Wide Solar Project
[2] Under CIO 2105-S-02.002.0, section 3, the organization chart must also identify any contractor relationships relevant to environmental information operations.

2.1.1 Special Considerations for Tribal Entities

As noted above, the SCC has already performed extensive work to reduce GHG emissions and energy consumption on the property. This PCAP required a deeper dive into options that have not already been implemented by the SCC.

2.1.2 Collaborations

For the PCAP, collaboration occurred with SCC's Environmental Department and Indian Health Services.

For the CCAP, collaboration will be expanded to include the following:

- Individual tribal members
- Private businesses
- Utilities
- Forest County Potawatomi
- Forest County
- City of Crandon
- School District of Crandon

3 PCAP Elements

The PCAP was compiled by engineers at SEH, with input from Tina Van Zile and Nathan Podany of the SCC.

3.1 Greenhouse Gas (GHG) Inventory

Methods for performing the GHG inventory and the emissions summary are presented in Sections 3.1.1 and 3.1.2 below.

3.1.1 Scope

The GHG assessment was performed with the EPA's Tribal GHG Emissions Inventory Tools, using both the Tribal Community and Government Operations tools with 2023 data provided by the tribe. In the instances where data was unavailable, assumptions were made based on population, average home size, and regional data from government sources.

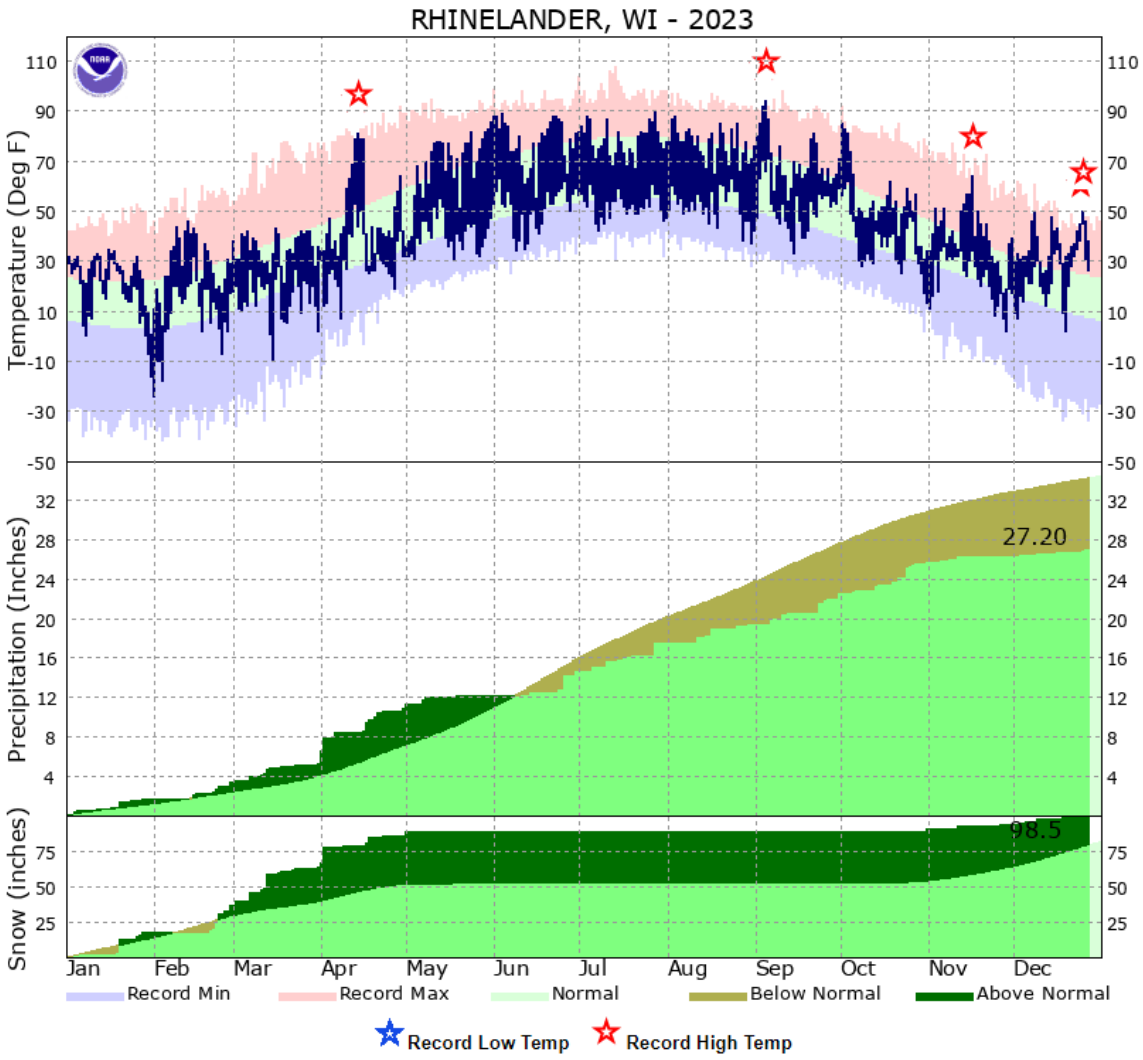
Weather from 2023 is fairly representative of a normal year for temperatures, although January, February, and December were generally warmer than average. Climate records for Rhinelander, Wisconsin, are used for this summary. Precipitation was above normal in the spring, with snowstorms bringing 20 inches of snow above normal through April. However, by year end, the region was roughly 7 inches of total rainfall short of average, a deviation of 20 percent. The US Drought Monitor[3] provided by the National Oceanographic and Atmospheric Administration, also noted a moderate to severe drought in the region for the second half of 2023.

The impact of warmer winter months and a dry second half of the year impacted home heating data, which could be 10 to 20 percent higher in a "normal" year versus 2023. This report does not include a correction factor for this difference, but consideration should be given to the potential

[3] www.drought.gov

for higher stationary emissions in a colder winter year. Electric use is likely typical for a “normal” year as the summer months did not include a major heat wave.

Figure 3 – 2023 Climate data for Rhinelander, WI[4]



3.1.1.1 Data Collection

Data was collected by the SCC and provided to SEH for use in this report. Where data was incomplete or missing, assumptions were made based on average homes, buildings, or vehicles in a typical American household, and adjusted based on geography, climate, and demographics. The following discrete data was provided:

- Electric bills by month for all tribal operations buildings
- Propane bills for all tribal operations and some residential properties

[4] Monthly Yearly Climate Graphics (weather.gov)

- Wastewater data
- Tribal operations fleet information, including odometer readings as of February 2024
- GIS map of tribal land ownership
- Housing inventory, including breakdown of whether solar had been installed
- 2016 report from solar installation on tribal buildings

3.1.1.2 GHG Accounting Method

All emissions have been tabulated using the EPA's Tribal GHG Inventory Tool. Actual data was used wherever possible, with assumptions made using the tool's formulas when necessary to complete a dataset.

3.1.2 GHG Emission Results by Sector

3.1.2.1 Stationary Combustion

Stationary fuel combustion in the community is predominantly propane usage to heat residential buildings, homes, community spaces, and commercial/institutional buildings. Propane bills from the SCC were used to calculate propane usage for government operations and community housing. Household propane usage was calculated using the number of homes in the community and assuming approximate square footage based on the number of bedrooms in the home. Assumptions used were:

- 750 square feet for a 1 bedroom
- 1,000 square feet for a 2 bedroom
- 1,300 square feet for a 3 bedroom
- 2,000 square feet for a 4 bedroom
- and 2,500 square feet for a 5 bedroom

Using these assumptions and a usage factor of 0.44 gallons of propane per square footage per year, household propane usage was determined. Calculations for stationary combustion are presented in Tables 1 and 2. Overall, stationary combustion accounts for 17 perc ent of the SCC's total GHG emissions.

Table 1 – Stationary Combustion Breakdown

Month	Location	Total Gallons Used	500 Gal Tanks	LP Gas Bulk
Oct-23	3051 Sand Lake Rd.	8,860.60	1,500.00	7,360.60
Oct-23	Community Housing 3265 Indian Settlement Rd.	1,350.50	0	1,350.50
Nov-23	3051 Sand Lake Rd.	8,180.60	0	8,180.60
Nov-23	Community Housing 3265 Indian Settlement Rd.	1,600.00	0	1,600.00
Dec-23	3051 Sand Lake Rd.	10,362.20	0	10,362.20
Dec-23	Community Housing 3265 Indian Settlement Rd.	4,666.30	0	4,666.30
Jan-24	3051 Sand Lake Rd.	14,637.10	0	14,637.10
Jan-24	Community Housing 3265 Indian Settlement Rd.	4,441.70	0	4,441.70
Feb-24	3051 Sand Lake Rd.	9,127.50	0	9,127.50
Feb-24	Community Housing 3265 Indian Settlement Rd.	4,164.40	0	4,164.40
Total Usage	3051 Sand Lake Rd.	**51,168.00**	GOV. OPERATIONS	
	Community Housing 3265 Indian Settlement Rd.	**16,222.90**	COMMUNITY HOUSING	

Table 2 – Stationary Combustion Assumptions Based on Housing Unit Size

Bedrooms	Number of Units	Approx. Square Footage	Approx. Annual Propane Usage/Sq.ft	Annual Propane Usage- Gallons
1	37	750	330	12,210
2	21	1,000	440	9,240
3	72	1,300	572	41,184
4	38	2,000	880	33,440
5	1	2,500	1,100	1,100
			Total	**97,174**

3.1.2.2 Mobile Combustion

Mobile combustion sources include both the SCC's fleet vehicles, and the vehicle miles traveled by community members as part of their everyday lives. The tribal fleet includes 36 vehicles driven approximately 330,000 miles/year based on data provided by the tribe. Exact vehicle ownership for residents is unknown, so assuming 250 residents are of driving age and own a vehicle, the community drives roughly 3.1 million miles total each year. This results in up to 1,450 MT/year of CO2e, per the summarized table below. A more complete view of data and assumptions is included in the appendix.

Table 3 – Mobile combustion breakdown by fleet and personal vehicles

Vehicle Ownership	Miles Driven per Year	Average Fuel Economy (miles per gallon)	Gallons of Fuel per Year (gallon)	GHG Emissions per Year (MT/year CO2e)
Fleet	336,148	19.3	17,352	2,175
Personal Vehicles	3,121,000	21.0	148,619	18,577

This source of data has the most assumptions of any set provided in the report and will be assessed in greater detail in the CCAP. It was included because of the large role vehicle emissions play in the community's overall carbon footprint. The assumptions were based on conversations with SCC environmental staff, who note the average commute is only a few miles for the majority of residents who work within the community. Car ownership is also assumed to be lower than the national average, which led to an assumed average VMT of 6,100 miles per capita, compared to an average of 11,000 VMT[5] per capita in Wisconsin. Not included in the assumptions are emission from off-road vehicles such as snowmobiles or ATVs.

3.1.2.3 Electricity

Electricity is the single largest component of the emissions for both the community and tribal operations. The total GHG emissions from electrical consumption was calculated to be 2,888 MT/year CO2e for the community, of which 2,041 MT/year CO2e were related to SCC operations. The casino alone represents 75 percent of the SCC operations' annual load, and just over half of the community's annual load.

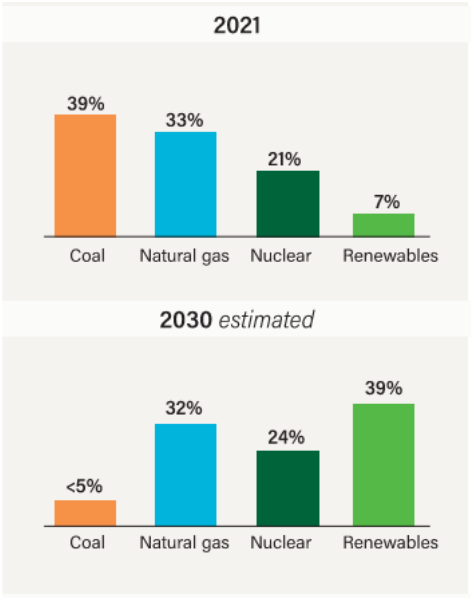
All electricity imported to the community is purchased from the Wisconsin Public Service Corporation (WPS), an investor-owned utility. WPS relies on coal and natural gas for the majority of its power generation, which is typical for the Midwest Reliability Organization (MRO) East region of the national electrical grid. As a result, the SCC's power supply has a high comparative carbon footprint when compared with other regions in the Midwest.

In 2016, the SCC embarked on two solar installation projects that outfitted many residences and nearly all tribal facilities with rooftop solar systems. Data was not available for total kWh prior to the project, but system sizing suggests roughly half of the annual load for the SCC is self-supplied via the combined output of the residential and commercial solar arrays. This suggests the GHG emissions from electricity would be nearly double the current values without the solar installations providing carbon-free electricity. The typical Midwestern US home consumes 13,376 kWh/month per the Energy Information Administration[6], while the average Mole Lake home consumes roughly 7000 kWh.

[5] FOTW #1113, December 23, 2019: Average Annual Highway Vehicle Miles Traveled Per Capita Varies by State | Department of Energy

[6] Electricity use in homes - U.S. Energy Information Administration (EIA)

Figure 4 – Electric Generation Fuel Mix in 2021 and Proposed in 2030[7]



A significant factor in the high GHG emissions from electricity is the fact that the MRO, which provides grid-supplied electricity to the region, is one of the dirtiest grids in America, at 1,592 pounds CO2e per megawatt-hour. However, nationwide the grid is becoming less carbon-intensive by the year, and the SCC's utility provider, WPS, intends to decarbonize its generation resources to net zero by 2050. More immediately the utility is pushing to reduce reliance on coal generation by approximately 85 percent by the end of the decade while replacing that load almost entirely with renewables. As electricity becomes cleaner at the grid level, it creates a significant opportunity to electrify other combustion sources (home heating, vehicle use) as a means of further carbon reduction via electrification.

3.1.2.4 Wastewater Treatment

GHG emissions from the 0.09 million gallon per day (MGD) Wastewater Treatment Plant account for only a small fraction of the SCC's total GHG emissions, at 224.7 MT/year CO2e. The Wastewater Treatment Plant, located just east of Bishop Lake, is an anaerobic treatment system that consists of a fine screening process followed by two primary septic tanks, two secondary septic tanks, four recirculating sand filter beds, and UV-disinfection. Effluent from the process surfaces approximately 50 feet from Wetland 22, where it flows over riprap directly into the Wetland. Treated sludge from the Wastewater Treatment process is hauled offsite by a private hauler when needed, and land applied.

3.1.2.5 Forestry

According to Forest County Plat maps, the developed (residential, commercial/Institutional, industrial) portion of the SCC property is comprised of approximately 1,200 acres of land. Approximately 900 acres (75%) are tree-covered. This was determined by finding all of the parcels within the community, determining if they were Residential, Commercial/Institutional, or Industrial, and approximating the amount of tree-covered vs. non-tree covered area using Google

[7] WEC Energy Group – Pathway to a Clean Energy Future, 2022 Climate Report.

Earth for each parcel. Table 4 depicts the breakdown of tree cover on the developed portion of the site.

Table 4 – Tree Cover by Sector

Sector (acres)	Residential	Commercial/ Institutional	Industrial
Non Tree Cover	175.26	80.05	40.65
Tree Cover Area	704.16	138.9	30.75
Total Area	879.42	218.95	71.4
% Tree Cover	80%	63%	43%

Owner	Parcel Number	Total Acres	Tree Covered Acres	Non-Tree Covered Acres	% Tree Covered
Residential					
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00508-0000	39.25	19.04	20.21	49%
US GOVERNMENT INDIAN TRUST	022-00580-0000	20	17.02	2.98	85%
US GOVERNMENT	022-00560-0000	25.8	4.5	21.3	17%
US GOVERNMENT	022-00581-0000	40.25	28.41	11.84	71%
US GOVERNMENT	022-00561-0000	40	28.42	11.58	71%
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00583-0000	4.29	2.78	1.51	65%
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00602-0000	28.6	7.9	20.7	28%

Owner	Parcel Number	Total Acres	Tree Covered Acres	Non-Tree Covered Acres	% Tree Covered
Residential					
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00601-0000	23.02	17.77	5.25	77%
US GOVERNMENT	022-00639-0000	52.46	40.96	11.5	78%
US GOVERNMENT	022-00642-0000	80	56.86	23.14	71%
US GOVERNMENT	022-00641-0000	125.6	115.1	10.5	92%
US GOVERNMENT	022-00636-0000	25.05	15.25	9.8	61%
US GOVERNMENT	022-00635-0000	95.1	90.95	4.15	96%
US GOVERNMENT	022-00634-0000	120	111.7	8.3	93%
US GOVERNMENT	022-00476-0000	160	147.5	12.5	92%

Owner	Parcel Number	Total Acres	Tree Covered Acres	Non-Tree Covered Acres	% Tree Covered
Commercial/Industrial					
US GOVERNMENT	022-00633-0000	40	14.5	25.5	36%
US GOVERNMENT	022-00584-0000	37.7	15.9	21.8	42%
US GOVERNMENT	022-00585-0000	141.25	108.5	32.75	77%
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00604-0000	27	4.75	22.25	18%
UNITED STATES IN TRUST FOR SOKAOGON CHIPPEWA COMMUNITY	022-00608-0000	10	0	10	0%
US GOVERNMENT	022-00641-0000 (Part of the Parcel with WWTP)	34.4	26	8.4	76%

Table 5 – Forestry Carbon Sequestration Summary

Carbon Sequestered (MT CO_2e)

	Carbon Sequestration	TOTAL
Residential	2,328.04	2,328.04
Commercial/Institutional	456.45	456.45
Industrial	101.59	101.59
Energy Generation	-	-
Total Sequestration from Urban Trees	**2,886.08**	**2,886.08**

It is estimated that almost 2,900 MT/year CO2e are sequestered by the forests on the SCC's developed property, as shown in the tables 5 & 6. A tree cover ratio of 43% is significantly higher than the national average of 27%, and is consistent with a rural Northwoods community.

3.1.3 Emissions Summary

The largest GHG emitting sector is electricity use, at roughly 2,905 MT/year CO2e in the community and 2,040 MT/year CO2e across government operations. Those emissions occur off the reservation at Wisconsin Public Service Corp's generating plants, but have an impact on the region, including tribal lands.

Emissions from vehicle traffic by residents and tribal operations is the second largest source of emissions, though this is based largely on assumptions of vehicle ownership and miles driven. It is estimated that roughly 1,450 MT/year CO2e is emitted by vehicle usage.

All homes and businesses on the reservation are heated with propane, as there is no natural gas system in the community. Propane consumption is the third largest source of emissions at 945 MT/year CO2e.

Table 6 – Total GHG Emissions by Scope and Source

Total Emissions (MT CO_2e)								
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total MT CO_2e	Percent of Total
Scope 1	2,399.42	225.33	3.02	-	-	-	2,627.77	47%
Scope 2 - Location Based	2,887.76	7.56	10.64	-	-	-	2,905.97	
Scope 2 - Market Based (for informational purposes only)	2,887.76	7.56	10.64				2,905.97	53%
Scope 3	(2,886.08)	-	-	-	-	-	(2,886.08)	-52%
Total Gross Emissions	**5,287.19**	**232.89**	**13.66**	**-**	**-**	**-**	**5,533.74**	**48%**
Total Net Emissions	**2,401.11**	**232.89**	**13.66**	**-**	**-**	**-**	**2,647.66**	**48%**

Emissions by Source (MT CO_2e)								
Source	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total	Percent of
Stationary Combustion	941.50	1.26	2.38	-	-	-	945.14	17%
Mobile Combustion	1,457.92	-	-	-	-	-	1,457.92	26%
Solid Waste	-	-	-	-	-	-	-	0%
Wastewater Treatment	-	224.07	0.64	-	-	-	224.70	4%
Electricity - Location Based	2,887.76	7.56	10.64	-	-	-	2,905.97	
Electricity - Market Based (for informational purposes only)	2,887.76	7.56	10.64				2,905.97	53%
Water	-	-	-	-	-	-	-	0%
Ag & Land Management	-	-	-				-	0%
Urban Forestry	(2,886.08)	-	-				(2,886.08)	-52%
Waste Generation	-	-	-				-	0%
Total (Gross Emissions)	**5,287.19**	**232.89**	**13.66**	**-**	**-**	**-**	**5,533.74**	**100%**
Total (Net Emissions)	**2,401.11**	**232.89**	**13.66**	**-**	**-**	**-**	**2,647.66**	**100%**

3.1.4 Out of Scope for PCAP

Imported Water

Water is provided onsite by wells. Because of this, the Imported Water section was omitted. Electricity for water distribution is accounted for in Section 3.1.2.3.

Waste Generation

Given that all solids waste is disposed of offsite, and the SCC does not have control of the private landfill operations, Waste Generation was not addressed. Private waste haulers and offsite disposal will be further addressed in the CCAP.

3.1.4.1 Agriculture and Land Management

Given that there are no large-scale agricultural practices onsite, Agriculture and Land Management was not addressed in the PCAP. There is a farm adjoining the property and attempts will be made to address those operations in the CCAP.

3.2 GHG Reduction Measures

The Sokaogon Chippewa Community has a number of environmental policies and goals, and is further along a sustainability journey than nearly every other community of its size. Below is a list of recent projects or programs contributing to emissions reduction:

- Eleven "green homes" were built in 2010 with geothermal HVAC systems and wood-fired boiler backup heat.
- Seventeen tribal facilities and three residences received solar arrays in 2016 as part of a DOE Grant.[8] 606kW of total capacity was installed across the facilities. Preliminary estimates indicate offsets for the percentage of energy consumption range from 3.2 percent to as high as 103 percent. After one year of installation, performance was recorded and offsets were calculated to be less that preliminary estimates.
- Forty-nine additional homes received rooftop solar arrays as a follow-up to the 2016 DOE project.

The results of the greenhouse gas inventory can help prioritize various reduction efforts to determine the impact those efforts would have on the SCC. The inventory also provides a measuring stick to compare the current state with any future year. The following section outlines high-priority options for reducing emissions, many of which carry additional benefits to the community.

3.2.1 Building Energy Audits and Energy Efficiency Improvements

The first step in reducing emissions at the residential and commercial scale is to address common energy inefficiencies found in most buildings. Addressing issues with building insulation, older appliances, lighting, and vampire loads can add up to meaningful reductions in energy for the community, and in this case provide the lowest cost per ton of GHG reduction and the highest financial payback for the resident or business.

Step 1 in reducing emissions for the community would be for each home and tribal facility to receive an energy audit from a certified professional to identify opportunities with each building. This could be completed community-wide within a few months. Step 2 would be an implementation of the improvements identified in the audit. Step 2 can occur concurrently with Step 1, with upgrades made at each building as auditors finish their work. Quick implementation could include appliance upgrades, building insulation improvements, and lighting changes. More comprehensive efforts such as window replacements or other building envelope changes could take more time.

The Department of Energy requires these audits prior to implementing improvements as a prerequisite for Inflation Reduction Act (IRA) tax credits or utility rebates, which are readily available to reduce the cost of implementation.

[8] Final Report: Sokaogon Chippewa Community, Community Wide Solar Project

This project assumes some amount of insulation will be required for the majority of homes, and that lighting, kitchen appliances, and water heaters would be upgraded in at least 50% of homes as a result of the audit. There is some flexibility to consider fully electrifying homes as part of this effort if this measure is taken in conjunction with a community-scale solar installation.

Table 7 – Building Energy Audits and Efficiency Improvements Summary

Reduction Measure	Building Energy Audits and Efficiency Improvements
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning – 3 months Audits – 3 months Implementation – 6 months
Funding sources	CPRG IRA Tax Credits ($150/home for audit + credits for installation) Utility Rebates
Metrics tracking	Electric and heating costs per facility
Implementation authority milestones	Apply for funding RFP for energy audit Audit completion Implementation complete
Annual estimated GHG and criteria air pollutant emission reductions	310 MT/year CO2e - 15% of residential and commercial energy use avoided
Projected Cost	$1.6m ($110k for audits, $1,376k for implementation)
Cost per MT CO2e	$1,850

Beyond implementing these improvements, the SCC is also encouraged to adopt green building standards that will ensure future buildings are constructed with energy efficiency in mind. With IRA tax credits and utility rebates also available for new construction, these upgrades can often be built into new construction without significantly impacting upfront cost, and will pay back quickly in lower utility costs while keeping emissions to a minimum.

3.2.2 Home and Facility Electrification

Fuel switching both residential and commercial buildings from propane to electric heating is the next opportunity after completing efficiency upgrades. This is not a new idea for the tribe as 11 homes were upgraded to ground-source geothermal heating and cooling with wood-fired boiler backups roughly 10 years ago. In reviewing this project however, maintenance has been an issue with those systems and there have been instances of residents not having sufficient heat to stay warm due to equipment failure. Learning from this experience, and with upfront cost and maintenance support in mind, upgrading the remaining homes to an air-source heat pump HVAC system installed with a fuel backup to reduce or eliminate propane use for heating is proposed.

Implementing this measure for every home in the community would reduce emissions by 80 MT/year CO2e, while also saving the SCC $40,000 per year in propane costs. The cost savings may be more significant if price volatility in the gas market continues, while electric rates remain stable seasonally. Additionally, the GHG reduction will increase year over year as WPS continues to decarbonize its grid, with the potential for GHG reduction from this effort to reach

290 MT/year CO2e by 2030 if WPS meets its stated goal of 80% reduction in GHG emissions in that time.

Table 8 – Air Source Heat Pump Summary

Reduction Measure	Air Source Heat Pumps
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning & Design – 6 months Installation – 12 months
Funding sources	CPRG Utility Rebates IRA Tax Credit
Metrics tracking	Electric and heating costs per facility
Implementation authority milestones	Apply for funding Planning and design completion Installation completion
Annual estimated GHG and criteria air pollutant emission reductions	78 MT/year CO2e (2024 GHG rates) 290 MT/year CO2e (2030 projected GHG rates w/ grid decarbonization)
Projected Cost	$910k
Cost per MT CO2e	$11,700

3.2.3 Ground Source Heat Pump for Casino

The casino consumes 77 percent of the community's electrical load, and 31 percent of its propane load. The scale of the property makes it a strong candidate for a vertical geothermal heating and cooling system. Provided the geology of the area can accommodate drilling the vertical runs and provide sufficient heat transfer, switching heating and cooling to geothermal can save the community 21 MT/year CO2e of GHG emissions and $40,000 dollars annually. The GHG savings, as with any fuel switching option listed, will provide increased reductions as the grid continues to decarbonize. Of note is the 7.5-year payback, which makes this an attractive option financially as well.

Table 9 – Casino Geothermal Heat Pump Summary

Reduction Measure	Casino Geothermal HVAC
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning & Design – 8 months Installation – 4 months
Funding sources	U.S. Department of Energy Grant Utility Rebate IRA Direct Payment
Metrics tracking	Electric and heating costs per facility
Implementation authority milestones	Apply for funding Planning and design completion Installation completion

Reduction Measure	Casino Geothermal HVAC
Annual estimated GHG and criteria air pollutant emission reductions	21 tons CO2e
Projected Cost	$450k
Cost per MT CO2e	$11,200

3.2.4 Community Scale Solar Array

Once the tribe's facilities have been evaluated and made more efficient, finding carbon-free power sources is the last step to reducing emissions from electricity consumption.

Fifteen tribal buildings were outfitted with solar panels in 2016 as part of a DOE grant. Many of the buildings still have a net positive electric bill and could expand their solar arrays to produce additional power. Roughly 100 residences could add rooftop solar in addition to the 57 that already have rooftop systems. Solar has been a reliable asset for the community already, and offers a cost-effective way to reduce emissions.

Installation of a community-scale solar array can provide the community with power, and is more cost-effective than building or expanding existing rooftop systems. A community-sized system can also improve the operating efficiency of the panels when sited on already-cleared land rather than partially shaded yards.

A community solar garden sized at 2.2 MW would offset the entire community's electric consumption on a net basis yearly and lower energy costs. Doing so also provides a level of energy independence as energy is provided by the tribe, for the tribe. This keeps utility expenses within the tribe's economy, and will provide a financial boost to residents in the process.

Table 10 – Solar + Storage Microgrid Summary

Reduction Measure	Community Scale Solar Array
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning, Design, & Interconnect – 6 months Procurement – 12 months Installation – 6 months
Funding sources	CPRG Utility Rebates Inflation Reduction Act Tax Credits
Metrics tracking	Electric generation Net electric consumption vs production
Implementation authority milestones	Apply for funding Planning and design completion Construction complete System energized
Annual estimated GHG and criteria air pollutant emission reductions	2050 MT/year CO2e
Projected Cost	$2.9m
Cost per MT CO2e	$1,400

Additionally, the tribe could consider a full microgrid system, including battery storage. This could be designed in as part of the initial project, or expanded later as storage costs continue to come down. This would allow the tribal facilities to operate almost entirely autonomously from the grid, and provide additional resilience during power outages form the utility.

Table 11 – Solar + Storage Microgrid Summary

Reduction Measure	Solar + Storage Microgrid
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning, Design, & Interconnect – 9 months Procurement – 12 months Installation – 9 months
Funding sources	CPRG Utility Rebates Inflation Reduction Act Tax Credits
Metrics tracking	Electric generation Net electric consumption vs production % of time off-grid
Implementation authority milestones	Apply for funding Planning and design completion Construction complete System energized
Annual estimated GHG and criteria air pollutant emission reductions	2050 MT/year CO2e
Projected Cost	$5.7m
Cost per MT CO2e	$2,950

3.2.5 Fleet Electrification & Charging Infrastructure

Strategic replacement of tribal fleet vehicles with electric vehicles (EVs), Plug-in Hybrid Electric Vehicles (PHEVs), and hybrids can reduce vehicle emissions by 20% of scope 1 mobile source emissions, and 5% overall. Choosing the right fuel type for each fleet vehicle will depend on average daily mileage, service duty, and availability of charging.

An entire fleet replacement is impractical, as many vehicles are not driven often or for very far, or are heavier duty than what is available in the EV market. Selectively upgrading the fleet to EVs and hybrids would still make a sizable impact on the overall carbon footprint. The table below shows the reduction opportunity based on the current fleet and vehicle miles traveled.

Table 12 – Fleet GHG Rate Summary with Reduction Opportunity

Vehicle Type	Current CO2e per mile (kilogram /mi)	New CO2e per mile (kilogram/mi)	Annual GHG Savings (MT/year CO2e)
Van	0.39	0.24	6.5
SUV - EV Option	0.39	0.29	11.1
SUV - Hybrid Option	0.39	0.24	4.1
Light Duty Truck	0.47	0.42	4.2
Heavy Duty Truck	0.82	----	----

A complete fleet replacement to the most efficient option available would cost roughly 1.5 million dollars which would not be cost effective for the 26 MT/year CO2e reduction opportunity. Selective replacement of frequently used vehicles would maximize the opportunity. Upgrading seven vehicles to EVs, and another four upgraded with hybrids while adding level 2 and level 3 charging capability would achieve 17.5 MT/year of the overall 26 MT/year CO2e potential reduction.

Table 13 – Fleet Replacement Summary

Reduction Measure	Selective Fleet Replacement
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Vehicle Procurement – 3 months Charger Design and Construction – 9 months Implementation – 1 month
Funding sources	CPRG WPS EV Charger Pilot Program IRA EV Tax Credit
Metrics tracking	Mileage and fuel tracking Maintenance / Issue tracking
Implementation authority milestones	Apply for funding Procurement completion Construction completion for charger
Sector	
Annual estimated GHG and criteria air pollutant emission reductions	17.5 MT CO2e
Projected Cost	$590,000
Cost per MT CO2e	$33,700

Building out charging infrastructure for electric vehicles will have second order benefits as well. This can improve the likelihood of community members purchasing an EV and will be an amenity for visitors to the reservation.

Table 14 – EV Chargers for Casino & Lodge

Reduction Measure	Level 2 & 3 Chargers for Casino & Lodge
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Charger Design – 2 months Procurement – 3-12 months (transformer availability) Implementation – 2 months
Funding sources	CPRG WPS EV Charger Pilot Program IRA EV Infrastructure Tax Credit
Metrics tracking	kWh sold Utilization time
Implementation authority milestones	Apply for funding Procurement completion Charger online
Annual estimated GHG and criteria air pollutant emission reductions	9.4 MT/year CO2e
Projected Cost	$150,000
Cost per MT CO2e	$13,300

3.2.6 E-Bike Program and Biking Infrastructure

While cars are the dominant form of transportation for most individuals, there is a significant GHG cost associated with them. Switching to electric vehicles would reduce scope 2 emissions by only 25 percent today because of the relatively high emissions rate associated with northern Wisconsin's grid. The climate in Wisconsin can also make EV ownership a challenge, with efficiency reductions in cold weather, and energy losses to maintain battery temperatures on cold overnights. The community size and proximity of residences and tribal operations may be a good fit for an e-bike program, in which e-bikes are provided for residents as an alternative transportation means. The carbon footprint of riding e-bikes is 3% of driving an EV, and for shorter trips and agreeable weather can significantly reduce emissions from vehicle miles travelled. E-bikes are also very cost effective, costing between $1,500 - $3,000 for a typical commuter bike with a 40-60-mile range. Assuming that roughly 40 percent of tribal members work within 10 miles of their homes, and 30 percent of those drivers would willingly utilize an e bike, purchasing 30 e bikes is proposed as an initial investment for the program.

Table 15 – E Bike Program Summary

Reduction Measure	E Bike Program
Implementing agency	Sokaogon Chippewa Community
Implementation milestones	Planning – 4 months Procurement of Bikes and Bike Storage/Parking – 3 months Implementation – 1 month
Funding sources	CPRG
Metrics tracking	Program adoption rate Miles traveled Maintenance / Issue tracking
Implementation authority milestones	Apply for grant funding Select E bike vendor Roll out program
Annual estimated GHG and criteria air pollutant emission reductions	25 MT/year CO2e
Projected Cost	$60,000
Cost per MT CO2e	$2,500

Access to Crandon by bike would be a major enabler of the program's success. The Forest County Potawatomi tribe has a bicycle master plan[9] that highlights their community's demand for connectivity and desired expansion of trails, more so than the general public. That plan outlines the benefits to adding pedestrian and bike infrastructure, planning and design guidance, and funding opportunities for implementing the plan. The same plan would benefit the Sokaogon Chippewa Community, where car ownership is low, and travel to Crandon is required for students and anyone shopping for basic needs. Adding 10 miles of bike paths from Mole Lake to Crandon Public Schools and downtown would connect the two communities and enable more sustainable travel options. The Highway 55 right of way already accommodates winter snowmobile traffic, and placing the trail along this corridor would be both cost effective and feasible.

The trail would also benefit visitors staying in the area and seeking additional recreation opportunities, or convenient access to the casino from Crandon. This can increase the number of visitors to the area, and provide a boon to tourism, thereby improving the local economy.

Bike infrastructure within the Mole Lake area would further enhance the e-bike program, and provide safer options for those commuting by foot or by bike within the community.

[9] Forest County Potawatomi Community Bicycle and Pedestrian Plan

Table 16 – E Bike Program Summary

Reduction Measure	Bike Path to Crandon
Implementing agency	Forest County City of Crandon Sokaogon Chippewa Community
Implementation milestones	Planning & Funding – 12-24 months Design & Construction- 8 months
Funding sources	CPRG BIA Highway Safety Program Wisconsin DOT Forest County Public Works City of Crandon Public Works
Metrics tracking	Users/day
Implementation authority milestones	Apply for grant funding Select E bike vendor Roll out program
Annual estimated GHG and criteria air pollutant emission reductions	74 MT/year CO2e
Projected Cost	$3.0M
Cost per MT CO2e	$40,600

This option has a fairly high cost per MT reduced, but the assumptions used were fairly conservative at 40-60 round trips per day. If students utilized the path to get to-from school and recreational riding increased to levels seen on popular trails, the GHG reductions will exceed the stated 74 MT/year CO2e, and the cost per MT becomes more compelling.

The additional benefits the trail provide nonetheless make this an option to pursue. Improving access to basic needs like education, groceries, and employment can improve the lives of those in the community. The increased access to business also improves economic growth in these areas. Finally, addition of biking infrastructure incentivizes physical activity in an area which can lead to health improvements.

3.3 Benefits Analysis

Benefits of the proposed reduction measures will be compared against 2023 as the base year for this project. The tables below show the expected reduction in MT/year CO2e, co-pollutants, and air toxics/hazardous pollutants for each proposed reduction measure. Where possible, data from the GHG Inventory or National Emissions Inventory for Forest County, Wisconsin, were used.

Table 17 – Reduction Measures

Reduction Measure	Cost ($ million USD)	Annual CO2e Removal	% of Total CO2e from Baseline	Cost/MT CO2e Removed
Energy Audits & Efficiency Upgrades[10]	$ 1.1	310	12%	$ 3,500
Home Electrification[11,12,13]	$ 0.95	80	3%	$ 11,900
Casino Geothermal[14]	$ 0.3	21	1%	$ 14,300
Community Scale Solar[15]	$ 3.1	2050	77%	$ 1,500
Fleet Electrification	$ 0.55	15	1%	$ 36,700
EV Chargers	$ 0.13	9.4	.4%	$ 13,800
E Bike Program	$ 0.50	200	8%	$ 2,500
Bike Trail to Crandon	$ 3.0	74	3%	$ 40,500
Total	**$ 6.5**	**2676**	**101%**	**$ 3,500**

Additional benefits beyond the reduced emissions include:

- Increased self-reliance and less money spent outside the reservation for energy
- Increased energy resiliency for the community, protection from the impacts of major storms and changes in the energy marketplace
- Jobs creation for the construction and maintenance of systems

[10] Professional Home Energy Assessments | Department of Energy

[11] Energy Saver 101 Infographic: Home Energy Audits | Department of Energy

[12] Residential Energy Consumption Survey Dashboard (arcgis.com)

[13] Wisconsin Standard Electric Rates for Residential Services | Wisconsin Public Service

[14] CHP in the Hotel and Casino Market Sectors, EPA. 2005.

[15] PVWatts Calculator (nrel.gov)

- Capitalizing on outside funding to reduce project costs and bring money into the community
- Providing improved quality of life for residents from investment in the community's future

3.4 Review of Authority to Implement

The Mole Lake Band of Lake Superior Chippewa Indians or the Sokaogon Chippewa Community (SCC) is a federally recognized Indian Tribe located in Mole Lake, WI. The Tribes' governance operates under a Constitution and By-Laws ratified on November 3, 1938. As of March 2018, the total number of enrolled tribal members is 1,568. The community occupies a land base of approximately 4,904 acres consisting of Reservation, Trust and Fee Lands.

The Sokaogon Chippewa Community is governed by a six-member council that meets monthly or as required. Decision making authority is done by majority rule. Elections are held annually for council members and bi-annually for officer members.

4 Next Steps

4.1 Stakeholders

SEH will work with the SCC Environmental Department to identify additional stakeholders to be involved in the engagement plan for the PCAP detailed below. Some of the additional stakeholders may be individual SCC members, representatives of the adjoining farm and the Forest County Potawatomi, who are also working on a CPRG.

4.2 Engagement Plan

Upon EPA approval of the PCAP, the PCAP will be posted online and provided to stakeholders. In addition, the information in Attachment B explaining the CPRG process and next steps will be posted online and provided to stakeholders.

Two (2) stakeholder meetings (one virtual and one in person) will be performed while preparing the CCAP. Feedback from the engagement will be utilized to inform the proposed GHG reduction measures and targets.

In addition, SCC will engage with Forest County Potawatomi, Forest County, City of Crandon, and School District of Crandon to discuss the potential to partner on a multi-use path that would allow students to bike to school. This would increase the impact that could be made by use of e-bikes.

4.3 Additional Emissions Sectors and Refinement

4.3.1 Waste Generation

For the CCAP, SEH will work with the SCC Environmental Department to identify solid waste hauler and landfill contacts to refine GHG emission estimations.

4.3.2 Agriculture and Land Management

For the CCAP, SEH will work with the SCC Environmental Department to contact the farm adjoining the SCC land. If available for interview, we will work with the contact to get operation

specific information to utilize in the EPA tool. If specific information cannot be obtained, SEH will use estimates, based on size and general type of operations to complete the EPA tool.

Upon completion of the estimate, SEH will provide potential opportunities for GHG reductions for the farm. We will work with the SCC and the farm (if available) to refine these opportunities.

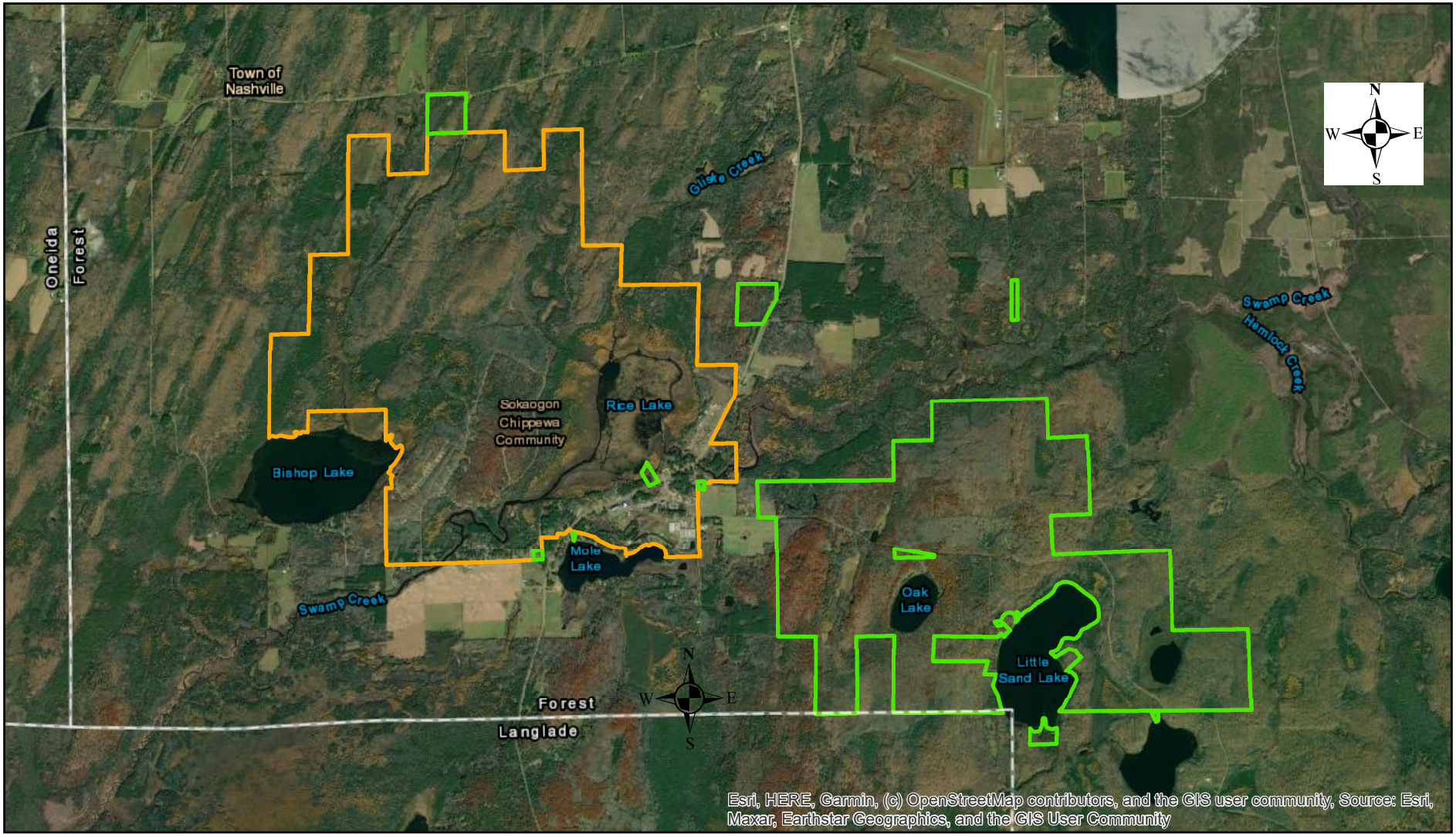
4.5 Identification of Other Funding Options

SEH's funding experts will work with the SCC Environmental Department to determine additional funding opportunities and present them in the CCAP.

4.6 Workforce Planning Analysis

SEH will provide the SCC with regional and state workforce projections and work with them to prepare a workforce planning analysis.

Figures



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Legend

- Reservation
- Fee Lands

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SEH

Project: SOKAO 177550
Print Date: 3/15/2024

Map by: crivette
Projection:
Source: SCC

Sokaogon Chippewa Community Lands

Priority Climate Action Plan
Forest County, Wisconsin

Figure 1

Appendix A

Emission Calculations

A-1 – Community Stationary Sources

Stationary Units - Calculation & Summary

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Sector Summary

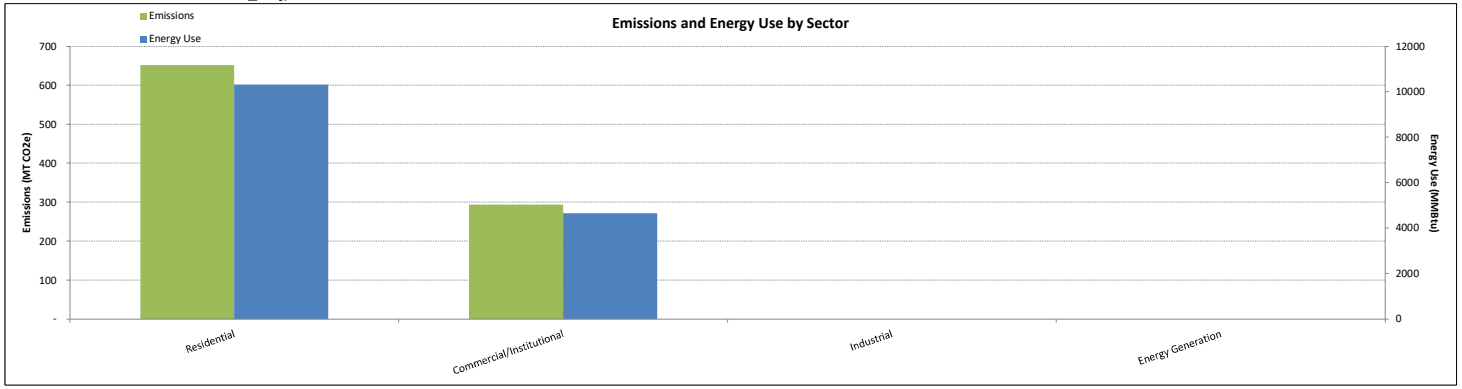
Emissions by Sector (MT CO_2e)

Sector	CO_2	CH_4	N_2O	Total
Residential	649	1	2	651
Commercial/Institutional	293	0	1	294
Industrial	-	-	-	-
Energy Generation	-	-	-	-
Total Stationary Combustion Emissions	**942**	**1**	**2**	**945**

Fuel and Energy (MMBtu) Use by Sector

Sector	mcf	gal	tons	Energy Use
Residential	-	113,397	-	10,319
Commercial/Institutional	-	51,168	-	4,656
Industrial	-	-	-	-
Energy Generation	-	-	-	-
Total Stationary Combustion Energy Use	-	164,565	-	**14,975**

Check to display: ☑ Emissions ☑ Energy Use



Fuel Summary

Emissions by Fuel Type

Fuel Type	CO_2	CH_4	N_2O	TOTAL
Natural Gas	-	-	-	-
Diesel	-	-	-	-
Gasoline	-	-	-	-
LPG	-	-	-	-
Propane	942	1	2	945
Butane	-	-	-	-
Residual Fuel Oil No. 5	-	-	-	-
Residual Fuel Oil No. 6	-	-	-	-
Jet Fuel	-	-	-	-
Residential Coal	-	-	-	-
Commercial Coal	-	-	-	-
Industrial Coal	-	-	-	-
Electric Power Coal	-	-	-	-
Digester Gas	-	-	-	-
Distillate Fuel Oil	-	-	-	-
Kerosene	-	-	-	-
Total Emissions from Stationary Fuel Combustion	**942**	**1**	**2**	**945**

Fuel and Energy Use by Type

Fuel Type	Fuel Consumed		Energy Use (MMBtu)
Natural Gas	0	mcf	-
Diesel	0	gal	-
Gasoline	0	gal	-
LPG	0	gal	-
Propane	164,565	gal	14,975.41
Butane	0	gal	-
Residual Fuel Oil No. 5	0	gal	-
Residual Fuel Oil No. 6	0	gal	-
Jet Fuel	0	gal	-
Residential Coal	0	tons	-
Commercial Coal	0	tons	-
Industrial Coal	0	tons	-
Electric Power Coal	0	tons	-
Digester Gas	0	tons	-
Distillate Fuel Oil	0	gal	-
Kerosene	0	gal	-
Total Stationary Fuel Consumed			**14,975.41**

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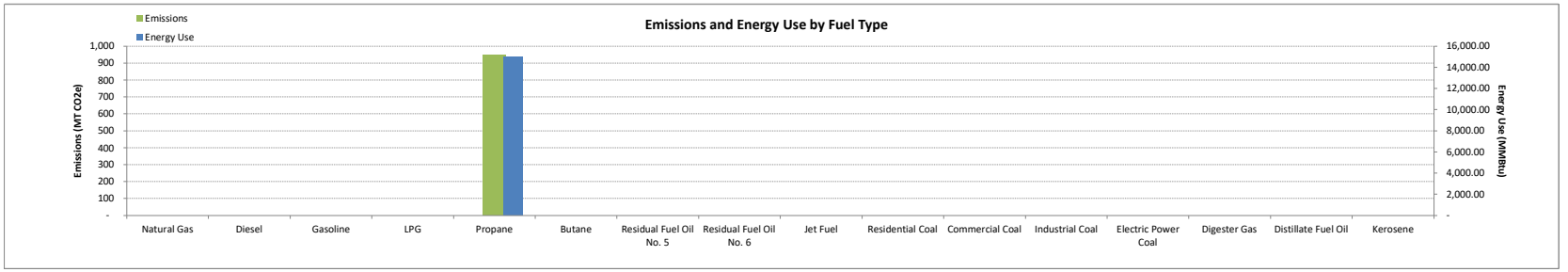

Background Calculations

CO_2 Emissions by Fuel Type

CO_2 Emissions = Fuel use × CO_2 Emission Factor (kg CO_2/unit of fuel) × MT/kg

	Fuel Use	Unit	kg CO_2/unit	MT/kg	MT CO_2	× GWP =	MT CO_2e
Natural Gas	0	mcf	54.82	0.001	0.00	1	-
Diesel	0	gal	10.21	0.001	0.00	1	-
Gasoline	0	gal	8.49	0.001	0.00	1	-
LPG	0	gal	5.98	0.001	0.00	1	-
Propane	164564.9	gal	5.72	0.001	941.50	1	941.50
Butane	0	gal	6.67	0.001	0.00	1	-
Residual Fuel Oil No. 5	0	gal	10.21	0.001	0.00	1	-
Residual Fuel Oil No. 6	0	gal	11.27	0.001	0.00	1	-
Jet Fuel	0	gal	9.75	0.001	0.00	1	-
Residential Coal	0	tons	2390.90	0.001	0.00	1	-
Commercial Coal	0	tons	2051.40	0.001	0.00	1	-
Industrial Coal	0	tons	2138.58	0.001	0.00	1	-
Electric Power Coal	0	tons	1890.52	0.001	0.00	1	-
Digester Gas	0	mcf	34.11	0.001	0.00	1	-
Distillate Fuel Oil	0	gal	10.28	0.001	0.00	1	-
Kerosene	0	gal	10.15	0.001	0.00	1	-

CH_4 Emissions by Fuel Type

CH_4 Emissions = Fuel use × CH_4 Emission Factor (kg CH_4/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT CH_4 × Global Warming Potential of CH_4

	Fuel Use	Unit	kg CH_4/unit	MT/kg	MT CH_4	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00487	0.001	0.00E+00	28	-
Diesel	0	gal	0.00041	0.001	0.00E+00	28	-
Gasoline	0	gal	0.00036	0.001	0.00E+00	28	-
LPG	0	gal	0.00028	0.001	0.00E+00	28	-
Propane	164564.9	gal	0.00027	0.001	4.49E-02	28	1.26
Butane	0	gal	0.00031	0.001	0.00E+00	28	-
Residual Fuel Oil No. 5	0	gal	0.00042	0.001	0.00E+00	28	-
Residual Fuel Oil No. 6	0	gal	0.00045	0.001	0.00E+00	28	-
Jet Fuel	0	gal	0.00041	0.001	0.00E+00	28	-
Residential Coal	0	tons	0.27423	0.001	0.00E+00	28	-
Commercial Coal	0	tons	0.23529	0.001	0.00E+00	28	-
Industrial Coal	0	tons	0.24585	0.001	0.00E+00	28	-
Electric Power Coal	0	tons	0.21703	0.001	0.00E+00	28	-
Digester Gas	0	mcf	0.00210	0.001	0.00E+00	28	-
Distillate Fuel Oil	0	gal	0.00042	0.001	0.00E+00	28	-
Kerosene	0	gal	0.00041	0.001	0.00E+00	28	-

N_2O Emissions by Fuel Type

N_2O Emissions = Fuel use × N_2O Emission Factor (kg N_2O/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT N_2O × Global Warming Potential of N_2O

	Fuel Use	Unit	kg N_2O/unit	MT/kg	MT N_2O	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00010	0.001	0.0000	265	-
Diesel	0	gal	0.00008	0.001	0	265	-
Gasoline	0	gal	0.00007	0.001	0	265	-
LPG	0	gal	0.00006	0.001	0	265	-
Propane	164564.9	gal	0.00005	0.001	0.00898524	265	2.38
Butane	0	gal	0.00006	0.001	0	265	-
Residual Fuel Oil No. 5	0	gal	0.00008	0.001	0	265	-
Residual Fuel Oil No. 6	0	gal	0.00009	0.001	0	265	-
Jet Fuel	0	gal	0.00008	0.001	0	265	-
Residential Coal	0	tons	0.03989	0.001	0	265	-
Commercial Coal	0	tons	0.03422	0.001	0	265	-
Industrial Coal	0	tons	0.03576	0.001	0	265	-
Electric Power Coal	0	tons	0.03157	0.001	0	265	-
Digester Gas	0	mcf	0.00041	0.001	0	265	-
Distillate Fuel Oil	0	gal	0.00008	0.001	0	265	-
Kerosene	0	gal	0.00008	0.001	0	265	-

Activity Data by Sector and Fuel Type

Fuel use data by sector and fuel type. Units: Natural Gas and Digester Gas (mcf), Bituminous Coal (short tons), all other (gallons)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel Oil No. 6	Jet Fuel	Residential Coal	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	Gas Products (mcf)	Petroleum Products (gal)	Coal (tons)
Residential	-	-	-	-	113,397	-	-	-	-	-	-	-	-	-	-	-	-	113,397	-
Commercial/Institutional	-	-	-	-	51,168	-	-	-	-	-	-	-	-	-	-	-	-	51,168	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	164,565	-	-	-	-	-	-	-	-	-	-	-	-	164,565	-

Emissions by Sector and Fuel Type

CO_2 *Emissions = Units of Fuel Consumed × kg CO2 / unit × MT/kg*

CO_2	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel (Jet Fuel	Residential Co	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	**TOTAL**
Residential	-	-	-	-	649	-	-	-	-	-	-	-	-	-	-	649
Commercial/Institutional	-	-	-	-	293	-	-	-	-	-	-	-	-	-	-	293
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	942	-	-	-	-	-	-	-	-	-	-	**942**

CH_4 *Emissions = Units of Fuel Consumed × kg CH_4 / unit × MT/kg × GWP CH_4*

CH_4	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel (Jet Fuel	Residential Co	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	**TOTAL**
Residential	-	-	-	-	0.87	-	-	-	-	-	-	-	-	-	-	0.87
Commercial/Institutional	-	-	-	-	0.39	-	-	-	-	-	-	-	-	-	-	0.39
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	1.26	-	-	-	-	-	-	-	-	-	-	**1.26**

N_2O *Emissions = Units of Fuel Consumed × kg N_2O / unit × MT/kg × GWP N_2O*

N_2O	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel (Jet Fuel	Residential Co	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	**TOTAL**
Residential	-	-	-	-	1.641	-	-	-	-	-	-	-	-	-	-	1.641
Commercial/Institutional	-	-	-	-	0.740	-	-	-	-	-	-	-	-	-	-	0.740
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	2.381	-	-	-	-	-	-	-	-	-	-	**2.381**

Energy Use by Sector and Fuel Type

Energy Consumed (MMbtu) = Units of Fuel Consumed × Heat Content of Fuel (MMBtu/unit)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel (Jet Fuel	Residential Co	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	**TOTAL**
Residential	-	-	-	-	10,319	-	-	-	-	-	-	-	-	-	-	10,319
Commercial/Institutional	-	-	-	-	4,656	-	-	-	-	-	-	-	-	-	-	4,656
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	14,975	-	-	-	-	-	-	-	-	-	-	**14,975**

A-2 - Government Operations Stationary Sources

Stationary Combustion - Calculation & Summary

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Department Summary

Emissions by Department (MT CO_2e)

Department	CO_2	CH_4	N_2O	Total
Total Stationary Combustion Emissions	**293**	**0**	**1**	**294**

Fuel and Energy (MMBtu) Use by Department

Department	mcf	gal	tons	Energy Use
Total Stationary Combustion Energy Use	-	51,168	-	**4,656**

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Fuel Summary

Emissions by Fuel Type (MT CO_2e)

Fuel Type	CO_2	CH_4	N_2O	TOTAL
Natural Gas	-	-	-	-
Diesel	-	-	-	-
Gasoline	-	-	-	-
LPG	-	-	-	-
Propane	293	0	1	294
Butane	-	-	-	-
Residual Fuel Oil No. 5	-	-	-	-
Residual Fuel Oil No. 6	-	-	-	-
Jet Fuel	-	-	-	-
Residential Coal	-	-	-	-
Commercial Coal	-	-	-	-
Industrial Coal	-	-	-	-
Electric Power Coal	-	-	-	-
Distillate Fuel Oil	-	-	-	-
Kerosene	-	-	-	-
Digester Gas	-	-	-	-
Total Emissions from Stationary Fuel Combustion	**293**	**0**	**1**	**294**

Fuel and Energy Use by Type

Fuel Type	Fuel Used		Energy Use (MMBtu)
Natural Gas	0	mcf	-
Diesel	0	gal	-
Gasoline	0	gal	-
LPG	0	gal	-
Propane	51,168	gal	4,656.29
Butane	0	gal	-
Residual Fuel Oil No. 5	0	gal	-
Residual Fuel Oil No. 6	0	gal	-
Jet Fuel	0	gal	-
Residential Coal	0	tons	-
Commercial Coal	0	tons	-
Industrial Coal	0	tons	-
Electric Power Coal	0	tons	-
Distillate Fuel Oil	0	gal	-
Kerosene	0	gal	-
Digester Gas	0	mcf	-
Total Stationary Fuel Consumed			**4,656.29**

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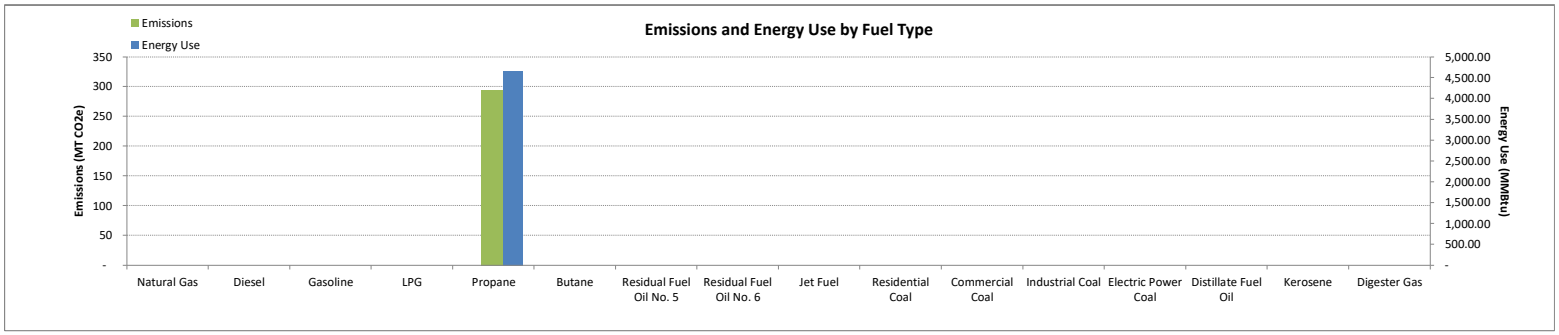

Background Calculations

CO_2 Emissions by Fuel Type

CO_2 Emissions = Fuel use × CO_2 Emission Factor (kg CO_2/unit of fuel) × MT/kg

	Fuel Use	Unit	kg CO_2/unit	MT/kg	MT CO_2	× GWP =	MT CO_2e
Natural Gas	0	mcf	54.82	0.001	0.00	1	-
Diesel	0	gal	10.21	0.001	0.00	1	-
Gasoline	0	gal	8.49	0.001	0.00	1	-
LPG	0	gal	5.98	0.001	0.00	1	-
Propane	51168	gal	5.72	0.001	292.74	1	292.74
Butane	0	gal	6.67	0.001	0.00	1	-
Residual Fuel Oil No. 5	0	gal	10.21	0.001	0.00	1	-
Residual Fuel Oil No. 6	0	gal	11.27	0.001	0.00	1	-
Jet Fuel	0	gal	9.75	0.001	0.00	1	-
Residential Coal	0	tons	2390.90	0.001	0.00	1	-
Commercial Coal	0	tons	2051.40	0.001	0.00	1	-
Industrial Coal	0	tons	2138.58	0.001	0.00	1	-
Electric Power Coal	0	tons	1890.52	0.001	0.00	1	-
Distillate Fuel Oil	0	gal	10.28	0.001	0.00	1	-
Kerosene	0	gal	10.15	0.001	0.00	1	-
Digester Gas	0	mcf	34.66	0.001	0.00	1	-

CH_4 Emissions by Fuel Type

CH_4 Emissions = Fuel use × CH_4 Emission Factor (kg CH_4/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT CH_4 × Global Warming Potential of CH_4

	Fuel Use	Unit	kg CH_4/unit	MT/kg	MT CH_4	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00487	0.001	0.00	28	-
Diesel	0	gal	0.00041	0.001	0.00	28	-
Gasoline	0	gal	0.00036	0.001	0.00	28	-
LPG	0	gal	0.00028	0.001	0.00	28	-
Propane	51168	gal	0.00027	0.001	0.01	28	0.39
Butane	0	gal	0.00031	0.001	0.00	28	-
Residual Fuel Oil No. 5	0	gal	0.00042	0.001	0.00	28	-
Residual Fuel Oil No. 6	0	gal	0.00045	0.001	0.00	28	-
Jet Fuel	0	gal	0.00041	0.001	0.00	28	-
Residential Coal	0	tons	0.27423	0.001	0.00	28	-
Commercial Coal	0	tons	0.23529	0.001	0.00	28	-
Industrial Coal	0	tons	0.24585	0.001	0.00	28	-
Electric Power Coal	0	tons	0.21703	0.001	0.00	28	-
Distillate Fuel Oil	0	gal	0.00042	0.001	0.00	28	-
Kerosene	0	gal	0.00041	0.001	0.00	28	-
Digester Gas	0	mcf	0.00308	0.001	0.00	28	-

N_2O Emissions by Fuel Type

N_2O Emissions = Fuel use × N_2O Emission Factor (kg N_2O/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT N_2O × Global Warming Potential of N_2O

	Fuel Use	Unit	kg N_2O/unit	MT/kg	MT N_2O	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00010	0.001	0.00	265	-
Diesel	0	gal	0.00008	0.001	0.00	265	-
Gasoline	0	gal	0.00007	0.001	0.00	265	-
LPG	0	gal	0.00006	0.001	0.00	265	-
Propane	51168	gal	0.00005	0.001	0.00	265	0.74
Butane	0	gal	0.00006	0.001	0.00	265	-
Residual Fuel Oil No. 5	0	gal	0.00008	0.001	0.00	265	-
Residual Fuel Oil No. 6	0	gal	0.00009	0.001	0.00	265	-
Jet Fuel	0	gal	0.00008	0.001	0.00	265	-
Residential Coal	0	tons	0.03989	0.001	0.00	265	-
Commercial Coal	0	tons	0.03422	0.001	0.00	265	-
Industrial Coal	0	tons	0.03576	0.001	0.00	265	-
Electric Power Coal	0	tons	0.03157	0.001	0.00	265	-
Distillate Fuel Oil	0	gal	0.00008	0.001	0.00	265	-
Kerosene	0	gal	0.00008	0.001	0.00	265	-
Digester Gas	0	mcf	0.00007	0.001	0.00	265	-

Activity Data by Department and Fuel Type

Fuel use data by department and fuel type. Units: Natural Gas and Digester Gas (mcf), Bituminous Coal (short tons), all other (gallons)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel Oil No. 6	Jet Fuel	Residential Coal	Commercial Coal	Industrial Coal	Electric Power Coal	Distillate Fuel Oil	Kerosene	Digester Gas	Gas Products (mcf)	Petroleum Products (gal)	Coal (tons)
Total	0	0	0	0	51168	0	0	0	0	0	0	0	0	0	0	0	0	51168	0

Emissions by Department and Fuel Type (MT CO_2e)

CO_2 *Emissions = Units of Fuel Consumed × kg CO2 / unit × MT/kg*

CO_2	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel	Jet Fuel	Residential Coal	Commercial C	Industrial Coa	Electric Powe	Distillate Fuel	Kerosene	Digester Gas	**TOTAL**
Total	-	-	-	-	292.74	-	-	-	-	-	-	-	-	-	-	-	**292.74**

CH_4 *Emissions = Units of Fuel Consumed × kg CH_4 / unit × MT/kg × GWP CH_4*

CH_4	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel	Jet Fuel	Residential Coal	Commercial C	Industrial Coa	Electric Powe	Distillate Fuel	Kerosene	Digester Gas	**TOTAL**
Total	-	-	-	-	0.39	-	-	-	-	-	-	-	-	-	-	-	**0.39**

N_2O *Emissions = Units of Fuel Consumed × kg N_2O / unit × MT/kg × GWP N_2O*

N_2O	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel	Jet Fuel	Residential Coal	Commercial C	Industrial Coa	Electric Powe	Distillate Fuel	Kerosene	Digester Gas	**TOTAL**
Total	-	-	-	-	0.74	-	-	-	-	-	-	-	-	-	-	-	**0.74**

Energy Use by Department and Fuel Type

Energy Consumed (MMbtu) = Units of Fuel Consumed × Heat Content of Fuel (MMBtu/unit)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel	Jet Fuel	Residential Coal	Commercial C	Industrial Coa	Electric Powe	Distillate Fuel	Kerosene	Digester Gas	**TOTAL**
Total	-	-	-	-	4,656.29	-	-	-	-	-	-	-	-	-	-	-	**4,656.29**

A-3 – Community Electricity

Electricity Use - Calculation & Summary

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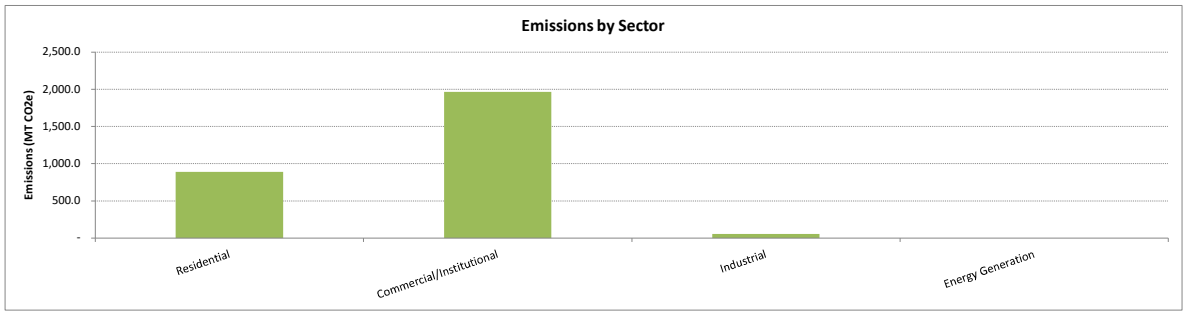
This sheet is where Scope 2 emissions from grid electricity usage using the **location-based method** are calculated.

Electricity use by sector shows the total amount of grid-purchased electricity usage and **does not** include kWh purchased through contractual instruments (e.g., RECs, PPAs). Emissions are calculated by each utility entered on the Electricity-Entry tab, by sector, using exclusively the eGRID emissions rate.

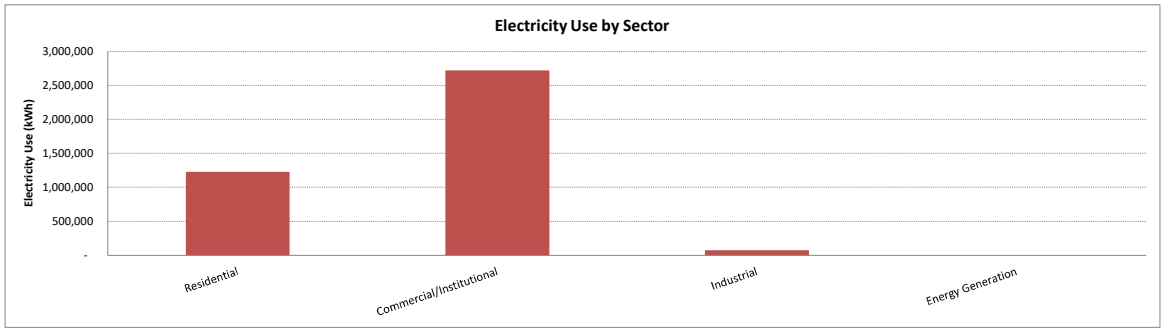
GHG Summary

Emissions by Sector (in CO_2e)				
	CO_2	CH_4	N_2O	Total
Residential	882.6	2.3	3.3	888.2
Commercial/Institutional	1,952.0	5.1	7.2	1,964.3
Industrial	53.1	0.1	0.2	53.5
Energy Generation	-	-	-	-
Total Emissions from Electricity Use	**2,887.8**	**7.6**	**10.6**	**2,906.0**



Electricity Summary

Electricity Use by Sector (in kWh)	
Sector	**kWh**
Residential	1,229,860
Commercial/Institutional	2,720,059
Industrial	74,029
Energy Generation	-
Total Electricity Use	**4,023,948**



Background Calculations

CO_2 Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Utility	kWh	eGRID Regional EF (lb CO_2/MWh)	MWh/kWh	MT/lb	MT CO_2	× GWP =	MT CO_2e
MROE eGRID subregion	4,023,948	1,582	0.001	0.000454	2,888	1	2,888
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-

CH_4 Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CH_4/MWh) × MWh/kWh × MT/lb × CH_4 GWP

Utility	kWh	eGRID Regional EF (lb CH_4/MWh)	MWh/kWh	MT/lb	MT CH_4	× GWP =	MT CO_2e
MROE eGRID subregion	4,023,948	0.1480	0.001	0.000453592	0	28	7.56
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-

N_2O Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb N_2O/MWh) × MWh/kWh × MT/lb × N_2O GWP

Utility	kWh	eGRID Regional EF (lb N_2O/MWh)	MWh/kWh	MT/lb	MT N_2O	× GWP =	MT CO_2e
MROE eGRID subregion	4,023,948	0.0220	0.001	0.000453592	0	265	10.64
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-

Activity Data by Sector and Utility

Electricity use data by sector and fuel type (kWh)

Sector	MROE eGRID subregion	-	-	-	-	-	TOTAL
Residential	1,229,860	-	-	-	-	-	1,229,860
Commercial/Institutional	2,720,059	-	-	-	-	-	2,720,059
Industrial	74,029	-	-	-	-	-	74,029
Energy Generation	-	-	-	-	-	-	-
Total	4,023,948	-	-	-	-	-	**4,023,948**

CO_2 Emissions by Sector and Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Sector	MROE eGRID subregion	-	-	-	-	-	TOTAL
Residential	883	-	-	-	-	-	883
Commercial/Institutional	1,952	-	-	-	-	-	1,952
Industrial	53	-	-	-	-	-	53
Energy Generation	-	-	-	-	-	-	-
Total	2,888	-	-	-	-	-	**2,888**

CH_4 emissions by sector and utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CH_4/kWh) × MWh/kWh × MT/lb × CH_4 GWP

Sector	MROE eGRID subregion	-	-	-	-	-	TOTAL
Residential	2.31	-	-	-	-	-	2.31
Commercial/Institutional	5.11	-	-	-	-	-	5.11
Industrial	0.14	-	-	-	-	-	0.14
Energy Generation	-	-	-	-	-	-	-
Total	7.56	-	-	-	-	-	**7.56**

N_2O emissions by sector and utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Sector	MROE eGRID subregion	-	-	-	-	-	TOTAL
Residential	3.25	-	-	-	-	-	3.25
Commercial/Institutional	7.19	-	-	-	-	-	7.19
Industrial	0.20	-	-	-	-	-	0.20
Energy Generation	-	-	-	-	-	-	-
Total	10.64	-	-	-	-	-	**10.64**

Market-based Electricity Use - Calculation & Summary

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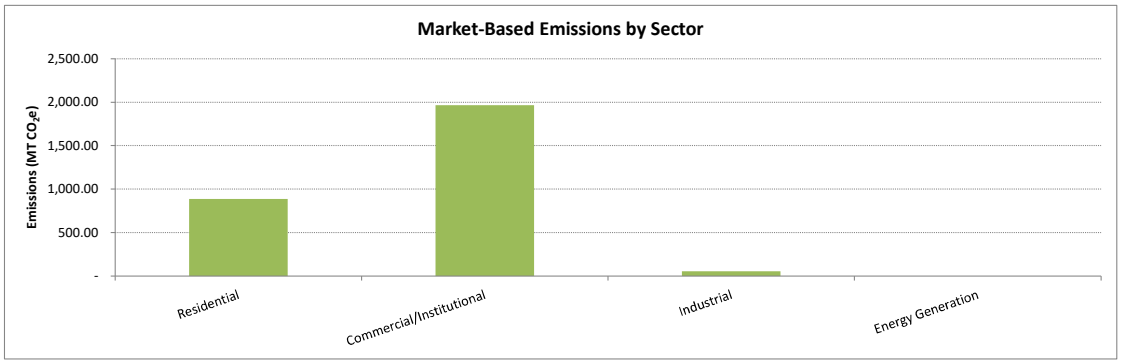
This sheet is where Scope 2 emissions from electricity usage using the **market-based method** are calculated.

Emissions are calculated for each electricity unit entered on the Electricity-Entry tab, by sector, using the utility-specific emissions rates, excluding the electricity purchased through contractual instruments. The Electricity Use by Sector table shows the total amount of kWh grid usage and purchased contractual instruments that are associated with direct electricity use (e.g., utility electricity purchases, RECs, PPAs). Emissions from electricity purchased through contractual instruments are calculated based on the emission factors entered for each contractual instrument (generally, emission factors for contractual instruments are zero). If electricity is purchased from more than one utility, then the total kWh from contractual instruments is divided based on proportion of total electricity purchased and subtracted from the utilities. Finally, to calculate the total emissions by sector, emissions from contractual instruments and emissions from other grid-supplied electricity are summed.

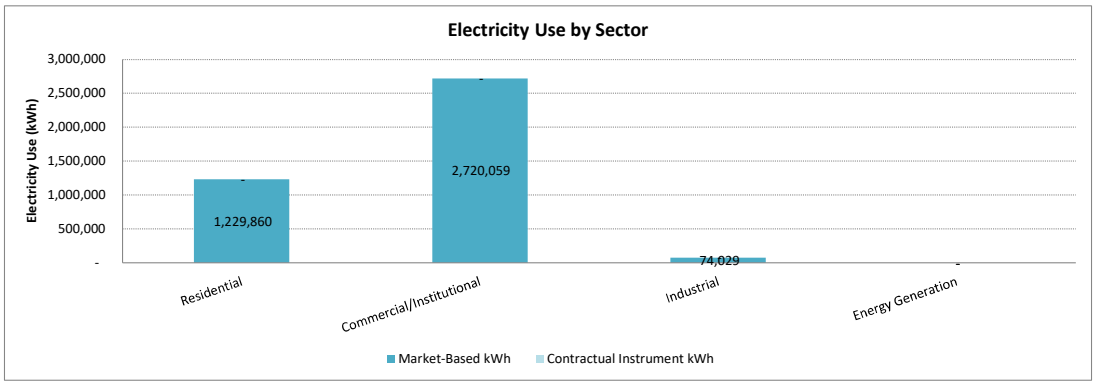
GHG Summary

Emissions by Sector (in MT CO_2e)				
	CO_2	CH_4	N_2O	Total
Residential	882.60	2.31	3.25	888.17
Commercial/Institutional	1,952.04	5.11	7.19	1,964.34
Industrial	53.13	0.14	0.20	53.46
Energy Generation	-	-	-	-
Total Emissions from Electricity Use	**2,887.76**	**7.56**	**10.64**	**2,905.97**



Electricity Summary

Electricity Use by Sector (in kWh)			
Sector	**Grid-Supplied kWh**	**Contractual Instrument kWh**	**Market-Based kWh**
Residential	1,229,860	-	1,229,860
Commercial/Institutional	2,720,059	-	2,720,059
Industrial	74,029	-	74,029
Energy Generation	-	-	-
Total Electricity Use	**4,023,948**	**-**	**4,023,948**



Background Calculations

Contractual Instrument Calculations

CO_2 Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Contractual Instrument	kWh	EF (lb CO_2/MWh)	MWh/kWh	MT/lb	MT CO_2	× GWP =	MT CO_2e
	-	-	0.001	0.000454	-	1	-
	-	-	0.001	0.000454	-	1	-
	-	-	0.001	0.000454	-	1	-
	-	-	0.001	0.000454	-	1	-
	-	-	0.001	0.000454	-	1	-
	-	-	0.001	0.000454	-	1	-

CH_4 Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb CH_4/MWh) × MWh/kWh × MT/lb × CH_4 GWP

Contractual Instrument	kWh	EF (lb CH_4/MWh)	MWh/kWh	MT/lb	MT CH_4	× GWP =	MT CO_2e
	-	-	0.001	0.000453592	-	28	-
	-	-	0.001	0.000453592	-	28	-
	-	-	0.001	0.000453592	-	28	-
	-	-	0.001	0.000453592	-	28	-
	-	-	0.001	0.000453592	-	28	-
	-	-	0.001	0.000453592	-	28	-

N_2O Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb N_2O/MWh) × MWh/kWh × MT/lb × N_2O GWP

Contractual Instrument	kWh	EF (lb N_2O/MWh)	MWh/kWh	MT/lb	MT N_2O	× GWP =	MT CO_2e
	-	-	0.001	0.000453592	-	265	-
	-	-	0.001	0.000453592	-	265	-
	-	-	0.001	0.000453592	-	265	-
	-	-	0.001	0.000453592	-	265	-
	-	-	0.001	0.000453592	-	265	-
	-	-	0.001	0.000453592	-	265	-

Activity Data by Sector and Contractual Instrument

Electricity use data by sector and fuel type (kWh)

Sector							TOTAL
Residential	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-

CO_2 Emissions by Sector and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Sector							TOTAL
Residential	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-

CH_4 emissions by Sector and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb CH_4/kWh) × MWh/kWh × MT/lb × CH_4 GWP

Sector							TOTAL
Residential	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-

N_2O emissions by Sector and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Sector							TOTAL
Residential	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-

Market-Based Calculations

Activity Data by Sector and Utility

Electricity use data by sector and fuel type (kWh) with electricity from contractual instruments removed

Sector	MROE eGRID sut	-	-	-	-	-	TOTAL
Residential	1,229,860	-	-	-	-	-	1,229,860
Commercial/Institutional	2,720,059	-	-	-	-	-	2,720,059
Industrial	74,029	-	-	-	-	-	74,029
Energy Generation	-	-	-	-	-	-	-
Total	4,023,948	-	-	-	-	-	**4,023,948**

CO_2 Emissions by Sector and Utility

Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Sector	MROE eGRID sut	-	-	-	-	-	TOTAL
Residential	882.6	-	-	-	-	-	882.6
Commercial/Institutional	1,952.0	-	-	-	-	-	1,952.0
Industrial	53.1	-	-	-	-	-	53.1
Energy Generation	-	-	-	-	-	-	-
Total	2,887.8	-	-	-	-	-	**2,887.8**

CH_4 emissions by Sector and Utility

Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb CH_4/kWh) × MWh/kWh × MT/lb × CH_4 GWP

Sector	MROE eGRID sut	-	-	-	-	-	TOTAL
Residential	2.3	-	-	-	-	-	2.31
Commercial/Institutional	5.1	-	-	-	-	-	5.11
Industrial	0.1	-	-	-	-	-	0.14
Energy Generation	-	-	-	-	-	-	-
Total	7.56	-	-	-	-	-	**7.56**

N_2O emissions by Sector and Utility

Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Sector	MROE eGRID sut	-	-	-	-	-	TOTAL
Residential	3.252	-	-	-	-	-	3.25
Commercial/Institutional	7.193	-	-	-	-	-	7.19
Industrial	0.196	-	-	-	-	-	0.20
Energy Generation	-	-	-	-	-	-	-
Total	10.64	-	-	-	-	-	**10.64**

A-4 – Government Operations - Electricity

Location-based Electricity Use - Calculation & Summary

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Jump to...

This sheet is where Scope 2 emissions from grid electricity usage using the **location-based method** are calculated.

Electricity use by department shows the total amount of grid-purchased electricity usage and **does not** include kWh purchased through contractual instruments (e.g., RECs, PPAs). Emissions are calculated by each utility entered on the Electricity-Entry tab, by department, using exclusively the eGRID emissions rate.

GHG Summary

Emissions by Department (in MT CO_2e)				
	CO_2	CH_4	N_2O	Total
Total Emissions from Electricity Use	2,028.93	5.31	7.48	2,041.72

Grid Electricity Summary

Electricity Use by Department (in kWh)	
Department	kWh
Total Electricity Use	2,827,204

Background Calculations

CO_2 Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Utility	kWh	eGRID Regional EF (lb CO_2/MWh)	MWh/kWh	MT/lb	MT CO_2	× GWP =	MT CO_2e
MROE eGRID subregion	2,827,204	1,582	0.001	0.000454	2,029	1	2,029
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-
-	-	-	0.001	0.000454	-	1	-

CH_4 Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CH_4/MWh) × MWh/kWh × MT/lb × CH_4 GWP

Utility	kWh	eGRID Regional EF (lb CH_4/MWh)	MWh/kWh	MT/lb	MT CH_4	× GWP =	MT CO_2e
MROE eGRID subregion	2,827,204	0.1480	0.001	0.000453592	0	28	5.31
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-
-	-	-	0.001	0.000453592	-	28	-

N_2O Emissions by Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb N_2O/MWh) × MWh/kWh × MT/lb × N_2O GWP

Utility	kWh	eGRID Regional EF (lb N_2O/MWh)	MWh/kWh	MT/lb	MT N_2O	× GWP =	MT CO_2e
MROE eGRID subregion	2,827,204	0.0220	0.001	0.000453592	0	265	7.48
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-
-	-	-	0.001	0.000453592	-	265	-

Activity Data by Department and Utility

Electricity use data by department and fuel type (kWh)

Department	ROE eGRID subregion	-	-	-	-	-	TOTAL
Total	2,827,204.00	-	-	-	-	-	**2,827,204**

CO_2 Emissions by Department and Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Department	ROE eGRID subregion	-	-	-	-	-	TOTAL
Total	2,029	-	-	-	-	-	**2,029**

CH_4 Emissions by Department and Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb CH_4/kWh) × MWh/kWh × MT/lb × CH_4 GWP

Department	ROE eGRID subregion	-	-	-	-	-	TOTAL
Total	5	-	-	-	-	-	**5.31**

N_2O Emissions by Department and Utility

Emissions = Electricity Consumed (kWh) × eGRID Regional Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Department	ROE eGRID subregion	-	-	-	-	-	TOTAL
Total	7	-	-	-	-	-	**7.48**

Market-based Electricity Use - Calculation & Summary

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Jump to…

This sheet is where Scope 2 emissions from electricity usage using the **market-based method** are calculated.

Emissions are calculated for each electricity unit entered on the Electricity-Entry tab, by department, using the supplier or utility-specific emissions rates, excluding the electricity purchased through contractual instruments. The Electricity Use by Department table shows the total amount of kWh grid usage and purchased contractual instruments that are associated with direct electricity use (e.g., utility electricity purchases, RECs, PPAs). Emissions from electricity purchased through contractual instruments are calculated based on the emission factors entered for each contractual instrument (generally, emission factors for contractual instruments are zero). If electricity is purchased from more than one utility, then the total kWh from contractual instruments is divided based on proportion of total electricity purchased and subtracted from the utilities. Finally, to calculate the total emissions by department, emissions from contractual instruments and emissions from other grid-supplied electricity are summed.

GHG Summary

Emissions by Department (in MT CO_2e)				
	CO_2	CH_4	N_2O	Total
Total Emissions from Electricity Use	**(10,142.4)**	**(26.6)**	**(37.4)**	**(10,206.3)**

Electricity Summary

Electricity Use by Department (in kWh)			
Department	Grid-Supplied kWh	Contractual Instrument kWh	Market-Based kWh
Total Electricity Use	**2,827,204**	**-**	**2,827,204**

Background Calculations

Contractual Instrument Calculations

CO_2 Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Contractual Instrument	kWh	EF (lb CO_2/MWh)	MWh/kWh	MT/lb	MT CO_2	× GWP =	MT CO_2e
	2,826,683	-	0.001	0.000454	-	1	-
	2,826,683	-	0.001	0.000454	-	1	-
	2,826,683	-	0.001	0.000454	-	1	-
	2,826,683	-	0.001	0.000454	-	1	-
	2,826,683	-	0.001	0.000454	-	1	-
	2,826,683	-	0.001	0.000454	-	1	-

CH_4 Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb CH_4/MWh) × MWh/kWh × MT/lb × CH_4 GWP

Contractual Instrument	kWh	EF (lb CH_4/MWh)	MWh/kWh	MT/lb	MT CH_4	× GWP =	MT CO_2e
	2,826,683	-	0.001	0.000453592	-	28	-
	2,826,683	-	0.001	0.000453592	-	28	-
	2,826,683	-	0.001	0.000453592	-	28	-
	2,826,683	-	0.001	0.000453592	-	28	-
	2,826,683	-	0.001	0.000453592	-	28	-
	2,826,683	-	0.001	0.000453592	-	28	-

N_2O Emissions by Contractual Instrument

Emissions = Electricity Consumed (kWh) × Contractual Instrument Emissions Factor (lb N_2O/MWh) × MWh/kWh × MT/lb × N_2O GWP

Contractual Instrument	kWh	EF (lb N_2O/MWh)	MWh/kWh	MT/lb	MT N_2O	× GWP =	MT CO_2e
	2,826,683	-	0.001	0.000453592	-	265	-
	2,826,683	-	0.001	0.000453592	-	265	-
	2,826,683	-	0.001	0.000453592	-	265	-
	2,826,683	-	0.001	0.000453592	-	265	-
	2,826,683	-	0.001	0.000453592	-	265	-
	2,826,683	-	0.001	0.000453592	-	265	-

Activity Data by Department and Contractual Instrument

Electricity use data by department and fuel type (kWh)

Department							TOTAL
Total	2,826,683	2,826,683	2,826,683	2,826,683	2,826,683	2,826,683	**16,960,098**

CO_2 Emissions by Department and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Department							TOTAL
Total	-	-	-	-	-	-	**-**

CH_4 emissions by Department and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb CH_4/kWh) × MWh/kWh × MT/lb × CH_4 GWP

Department							TOTAL
Total	-	-	-	-	-	-	**-**

N_2O emissions by Department and Contractual Instrument

Emissions = Electricity Consumed (kWh) × Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Department							TOTAL
Total	-	-	-	-	-	-	**-**

Market-Based Calculations

Activity Data by Department and Utility

Electricity use data by department and fuel type (kWh) with electricity from contractual instruments removed

Department	MROE eGRID sut	-	-	-	-	-	TOTAL
Total	(14,132,894)	-	-	-	-	-	#########

CO_2 Emissions by Department and Utility

Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb CO_2/MWh) × MWh/kWh × MT/lb × CO_2 GWP

Department	MROE eGRID sut	-	-	-	-	-	TOTAL
Total	(10,142.39)	-	-	-	-	-	**(10,142.4)**

CH_4 emissions by Department and Utility

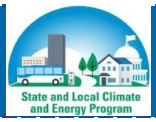
Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb CH_4 /kWh) × MWh/kWh × MT/lb × CH_4 GWP

Department	MROE eGRID sut	-	-	-	-	-	TOTAL
Total	(26.57)	-	-	-	-	-	**(26.57)**

N_2O emissions by Department and Utility

Emissions = Electricity Consumed (kWh) × Utility Emissions Factor (lb N_2O/kWh) × MWh/kWh × MT/lb × N_2O GWP

Department	MROE eGRID sut	-	-	-	-	-	TOTAL
Total	(37.37)	-	-	-	-	-	**(37.37)**



Tribal GHG Inventory Tool: Government Operations Module

A-5 – Wastewater Treatment

Wastewater - Calculation & Sumary

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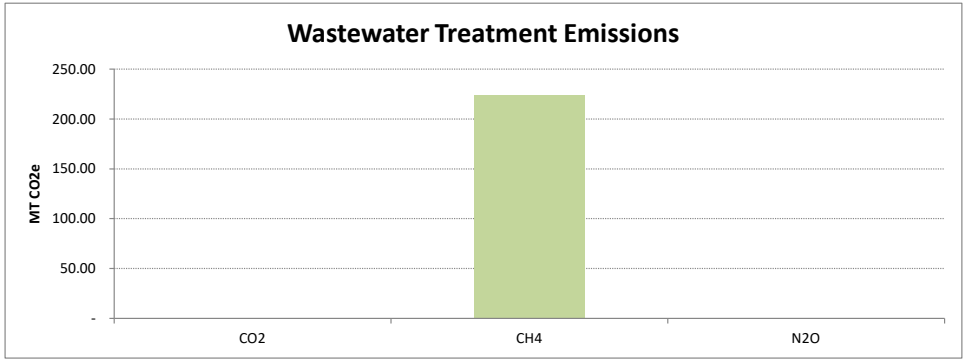
This sheet shows the formulas used to determine your tribe's emissions from wastewater treatment, using methodology from the Local Government Operations Protocol (2010). The yellow cells link to the values you entered on the previous sheet, "Wastewater-Entry."

Your total emissions are summarized in the table below. You may scroll down to view the detailed calculations, but **no action is required on this sheet.** If you would like to change any of the entered values, you may do so on the previous sheet.

GHG Emissions Summary	
	MT CO_2e
CO_2	-
CH_4	224.07
N_2O	0.64
Total Emissions from Wastewater Treatment	**224.70**



Background Calculations

LGOP Equation 10.2 - Stationary CH_4 from Incomplete Combustion of Digester Gas (anaerobic facilities only, default data)

Population Served by Anaerobic Digesters	× Default Digester Gas Production (ft^3/person/day)	× Default % CH_4 in Digester Gas	× Methane Density (g/m^3)	× 1- CH_4 Destruction Efficiency	× m^3/ft^3	× day/yr	× MT/g =	**MT CH_4**	× GWP =	**MT CO_2e**
600	1	35%	662	1%	0.028316847	365.25	0.000001	0.01438	28	**0.40**

LGOP Equation 10.4 - Process CH_4 from Wastewater Treatment Lagoons (default data)

Effective Population Served by Lagoons	× Factor for Industrial Discharge into System	× Default BOD_5 Load (kg BOD_5/day)	× 1 - Default BOD_5 Percentage Removed	× Maximum CH_4 Production Capacity (kg CH_4/kg BOD_5)	× Anaerobic CH_4 Correction Factor	× day/yr	× MT/kg =	**MT CH_4**	× GWP =	**MT CO_2e**
600	1.25	0.09	68%	0.6	0.8	365.25	0.001	7.98802	28	**223.66**

LGOP Equation 10.8 - Process N_2O Emissions from WWTP without Nitrification/Denitrification

Effective Population Served without Nit/Denit	× Factor for Industrial Discharge into System	× No Nit/Denit Emissions Factor (g N_2O/person/yr)	× MT/g =	**MT N_2O**	× GWP =	**MT CO_2e**
600	1.25	3.2	0.000001	0.00	265	**0.64**

LGOP Equation 10.9 - Process N_2O Emissions from Effluent Discharge (site-specific N load data)

Measured Average Total N Discharged (kg N/day)	× Effluent Emission Factor (kg N_2O-N/kg sewage)	× day/yr	× MT/kg	× N_2O/N_2 Molecular Weight Ratio =	**MT N_2O**	× GWP =	**MT CO_2e**
0	0.005	365.25	0.001	1.571428571	0.00	265	**0.00**

Cell Color Codes

Data entered on previous sheet
Calculated or Entered Data
CH_4 Emissions
N_2O Emissions
Value depends on system type

Wastewater - Calculation & Summary

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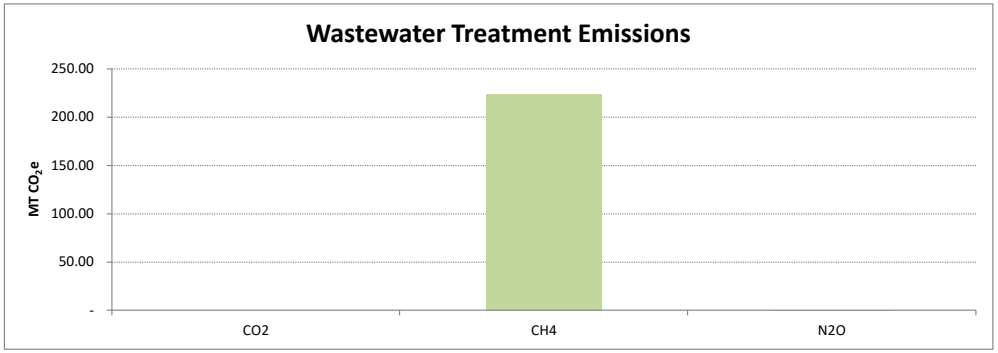
This sheet shows the formulas used to determine your tribe's emissions from wastewater treatment, using methodology from the Local Government Operations Protocol (2010). The yellow cells link to the values you entered on the previous sheet, "Wastewater-Entry."

Your total emissions are summarized in the table below. You may scroll down to view the detailed calculations, but **no action is required on this sheet.** If you would like to change any of the entered values, you may do so on the previous

GHG Emissions Summary	
	MT CO_2e
CO_2	-
CH_4	224.07
N_2O	0.64
Total Emissions from Wastewater Treatment	**224.70**



Background Calculations

LGOP Equation 10.2 - Stationary CH_4 from Incomplete Combustion of Digester Gas (anaerobic facilities only, default data)

Population Served by Anaerobic Digesters	× Default Digester Gas Production (ft^3/person/day)	× Default % CH_4 in Digester Gas	× Methane Density (g/m^3)	× 1- CH_4 Destruction Efficiency	× m^3/ft^3	× day/yr	× MT/g =	**MT CH_4**	× GWP =	**MT CO_2e**
600	1	35%	662	1%	0.028	365.25	0.000001	0.014	28	**0.40**

LGOP Equation 10.4 - Process CH_4 from Wastewater Treatment Lagoons (default data)

Effective Population Served by Lagoons	× Factor for Industrial Discharge into System	× Default BOD_5 Load (kg BOD_5/day)	× 1 - Default BOD_5 Percentage Removed	× Maximum CH_4 Production Capacity (kg CH_4/kg BOD_5)	× Anaerobic CH_4 Correction Factor	× day/yr	× MT/kg =	**MT CH_4**	× GWP =	**MT CO_2e**
600	1.25	0.09	68%	0.6	0.8	365.25	0.001	7.988	28	**223.66**

LGOP Equation 10.8 - Process N2O Emissions from WWTP without Nitrification/Denitrification

Effective Population Served without Nit/Denit	× Factor for Industrial Discharge into System	× No Nit/Denit Emissions Factor (g N_2O/person/yr)	× MT/g =	**MT N_2O**	× GWP =	**MT CO_2e**
600	1.25	3.2	0.000001	0.0024	265	**0.64**

LGOP Equation 10.9 - Process N_2O Emissions from Effluent Discharge (site-specific N load data)

Measured Average Total N Discharged (kg N/day)	× Effluent Emission Factor (kg N_2O-N/kg sewage)	× day/yr	× MT/kg	× N_2O/N_2 Molecular Weight Ratio =	**MT N_2O**	× GWP =	**MT CO_2e**
0	0.005	365.25	0.001	1.571	0	265	**0.00**

Cell Color Codes

Data entered on previous sheet
Calculated or Entered Data
CH_4 Emissions
N_2O Emissions
Value depends on system type

A-6 - Forestry

Urban Forestry

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Check if you have completed this sheet.

This sheet is where you will estimate the Scope 3 carbon dioxide sequestration associated with urban trees located within the borders of your tribe. Changes in carbon stocks in urban trees are equivalent to tree growth minus biomass losses resulting from pruning and mortality. Net carbon sequestration can be calculated using data on crown cover area or number of trees.

1. Enter Forestry Data

Please enter the total urban area and percent of that area with tree cover below in your locality.

Sector	Total Urban Area (km^2)	% Urban Area with Tree Cover
Residential	3.56	80%
Commercial/Institutional	0.89	63%
Industrial	0.29	43%
Energy Generation		

Helpful Hints -- Potentially Useful Conversions

Urban Area Conversions
1 km^2 = 247.1 acres
1 km^2 = 0.39 square miles

Urban Forestry Carbon Sequestration Summary

Carbon Sequestered (MT CO_2e)		
	Carbon Sequestration	**TOTAL**
Residential	2,328.04	2,328.04
Commercial/Institutional	456.45	456.45
Industrial	101.59	101.59
Energy Generation	-	-
Total Sequestration from Urban Trees	**2,886.08**	**2,886.08**

A-7 – Community Mobile Combustion

Mobile Combustion - Summary

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GHG Summary

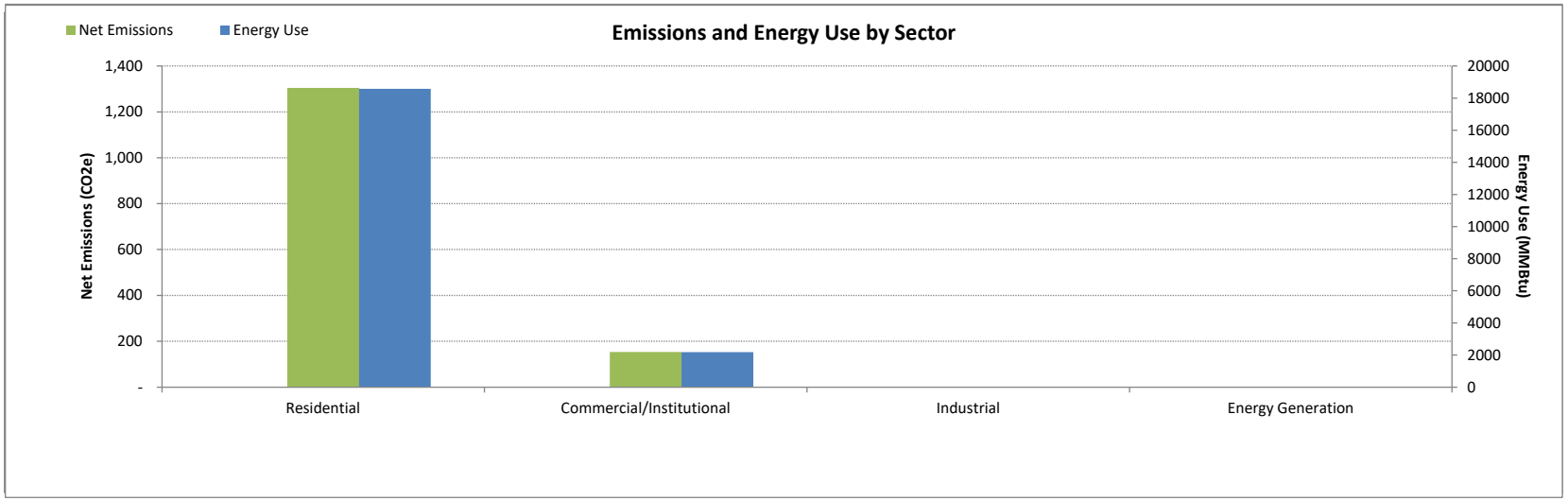
Net Emissions by Sector (CO_2e)				
	CO_2	CH_4	N_2O	TOTAL
Residential	1,304.88	-	-	1,305
Commercial/Institutional	153.05	-	-	153
Industrial	-	-	-	-
Energy Generation	-	-	-	-
Total Mobile Emissions	1,457.92	-	-	**1,458**

CO_2 Detail Emissions		
Gross CO_2	- Biogenic =	Net CO_2
1,305	-	1,305
153	-	153
-	-	-
-	-	-
1,458	-	1,458

Energy Use Summary

Energy Use by Sector and Fuel Type (MMBtu)												
	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Residential	18,577	-	-	-	-	-	-	-	-	-	-	18,577
Commercial/Institutional	2,108	67	-	-	-	-	-	-	-	-	-	2,175
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	20,686	67	-	-	-	-	-	-	-	-	-	**20,753**

Check to display: ☑ Emissions ☑ Energy Use



Mobile Combustion - Calculation

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Jump to...

Activity Data

Fuel Use by Sector and Fuel Type

This table summarizes fuel consumption by sector. These are the activity data used to calculate CO_2 emissions.

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline
Units	Gallons	Gallons	Gallons	Gallons	Gallons	G.G.E.	Gallons	Gallons	Gallons	Gallons	Gallons
Residential	148,619	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	16,866	486	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-
Total	**165,485**	**486**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Energy Use by Sector and Fuel Type

This table summarizes energy use by sector (MMBtu).

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Residential	18,577	-	-	-	-	-	-	-	-	-	-	18,577
Commercial/Institutional	2,108	67	-	-	-	-	-	-	-	-	-	2,175
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	20,686	67	-	-	-	-	-	-	-	-	-	**20,753**

CO_2 Calculations

Gross CO_2 Emissions

CO_2 Emissions (MT) = Fuel use × kg CO_2/unit of fuel × MT/kg

	Gasoline	**Diesel**	**Biodiesel (B5)**	**Biodiesel (B20)**	**Ethanol (E85)**	**CNG**	**LNG**	**LPG**	**Residual Fuel**	**Jet Fuel**	**Aviation Gasoline**	**TOTAL**
EF: kg CO_2/gal (or g.g.e.)	8.78	10.21	10.17	10.06	6.20	6.84	4.46	5.79	11.80	9.57	8.31	
Residential	1,305	-	-	-	-	-	-	-	-	-	-	1,305
Commercial/Institutional	148	5	-	-	-	-	-	-	-	-	-	153
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,453**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,458**

Biogenic CO_2 Emissions

Biogenic CO_2 (MT) = Fuel use × Biogenic kg CO_2/unit of fuel × MT/kg

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
EF: kg CO_2/gal (or g.g.e.)	-	-	0.47	1.89	4.89	-	-	-	-	-	-	
Residential	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Net CO_2 Emissions

Net CO_2 Emissions (MT) = Gross CO_2 Emissions - Biogenic CO_2 Emissions

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Residential	1,305	-	-	-	-	-	-	-	-	-	-	1,305
Commercial/Institutional	148	5	-	-	-	-	-	-	-	-	-	153
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,453**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1,458**

Non-CO_2 Calculations

This sheet calculates non-CO_2 emissions from mobile sources one sector at a time. Please select each sector, and then click the "Update CH_4/N_2O" button at the top of the screen.

The calculations are separated into three vehicle categories: 1) highway vehicle, 2) alternate fuel highway vehicles, and 3) motorcycles and other non-highway vehicles. Each category has distinct CH_4 and N_2O emission factors that depend on vehicle miles traveled.

Current sector: Energy Generation

The "Update Calculations" function on the Mobile-Entry sheet automatically runs these calculations for each sector.
To view the calculations below for an individual sector, select the sector from the drop-down list in the shaded cell.

1) Highway Vehicles

VMT by Model Year and Vehicle Type

Vehicle activity data by Model Year and vehicle type for the selected sector (miles).

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
Model Year	Gasoline	Gasoline	Gasoline	Diesel	Diesel	Diesel	
1980 & earlier	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0
2020 & later	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	**0**

CH_4 Emissions by Model Year and Vehicle Type

CH_4 Emissions = VMT × Highway Emissions Factor (g/mi) × MT/g × GWP CH_4

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
MY	Gasoline	Gasoline	Gasoline	Diesel	Diesel	Diesel	
1980 & earlier	-	-	-	-	-	-	-
1981	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-
2019	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	**-**

N_2O Emissions by Model Year and Vehicle Type

N_2O emissions = VMT × Highway Emissions Factor (g/mi) × MT/g × GWP N_2O

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
MY	Gasoline	Gasoline	Gasoline	Diesel	Diesel	Diesel	
1980 & earlier	-	-	-	-	-	-	-
1981	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-
1987	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-
2008	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-
2018	-	-	-	-	-	-	-
2019	-	-	-	-	-	-	-
2020	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	**-**

2) AFVs, Highway

VMT by Fuel and Vehicle type

Vehicle activity data by fuel type and vehicle type for selected sector (miles)

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
CNG	0	0	0	0
LNG	NA	NA	0	0
LPG	0	0	0	0
Ethanol (E85)	0	0	0	0
Biodiesel (B5)	0	0	0	0
Biodiesel (B20)	0	0	0	0
Total	0	0	0	**0**

CH_4 Emissions by Fuel and Vehicle Type

CH_4 Emissions = VMT × AFV EF (g/mi) × MT/g × GWP CH_4

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
CNG	0.00	0.00	0.00	0.00
LNG	NA	NA	0.00	0.00
LPG	0.00	0.00	0.00	0.00
Ethanol (E85)	0.00	0.00	0.00	0.00
Biodiesel (B5)	0.00	0.00	0.00	0.00
Biodiesel (B20)	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	**0.00**

N_2O Emissions by Fuel and Vehicle Type

N_2O Emissions = VMT × AFV EF (g/mi) × MT/g × GWP N_2O

	Passenger Car	Light Truck (Vans, Pickup Trucks, SUVs)	Heavy-Duty Vehicle	TOTAL
CNG	0.00	0.00	0.00	0.00
LNG	NA	NA	0.00	0.00
LPG	0.00	0.00	0.00	0.00
Ethanol (E85)	0.00	0.00	0.00	0.00
Biodiesel (B5)	0.00	0.00	0.00	0.00
Biodiesel (B20)	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	**0.00**

3) Motorcycles and Non-Highway

Activity Summary by Vehicle and Fuel Type

Vehicle activity data by vehicle type and fuel type for selected sector. Units depend on vehicle type (gallons or miles).

Vehicle Types	Unit	Gasoline	Diesel	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Motorcycles (1996 +)	Miles	0					0
Motorcycles (- 1995)	Miles	0					0
Agricultural Equipment	Gallons	0	0				0
Construction Equipment	Gallons	0	0				0
Utility and Recreational Equipment	Gallons	0	0				0
Aircraft	Gallons				0	0	0
Ship or Boat	Gallons	0	0	0			0
Locomotive	Gallons		0				0

CH_4 Emissions by Vehicle and Fuel Type

CH_4 Emissions = Activity × EF (g/unit) × MT/g × GWP CH_4

Vehicle Types	Gasoline	Diesel	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Motorcycles (1996 +)	0.00					0.00
Motorcycles (- 1995)	0.00					0.00
Agricultural Equipment	0.00	0.00				0.00
Construction Equipment	0.00	0.00				0.00
Utility and Recreational Equipment	0.00	0.00				0.00
Aircraft				0.00	0.00	0.00
Ship or Boat	0.00	0.00	0.00			0.00
Locomotive		0.00				0.00
Total	0.00	0.00	0.00	0.00	0.00	**0.00**

N_2O Emissions by Vehicle and Fuel Type

N_2O Emissions = Activity × EF (g/unit) × MT/g × GWP N_2O

Vehicle Types	Gasoline	Diesel	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Motorcycles (1996 +)	0.00					0.00
Motorcycles (- 1995)	0.00					0.00
Agricultural Equipment	0.00	0.00				0.00
Construction Equipment	0.00	0.00				0.00
Utility and Recreational Equipment	0.00	0.00				0.00
Aircraft				0.00	0.00	0.00
Ship or Boat	0.00	0.00	0.00			0.00
Locomotive		0.00				0.00
Total	0.00	0.00	0.00	0.00	0.00	**0.00**

Totals

Non-CO_2 Emissions, Current Sector

Current sector: Energy Generation

	CH_4	N_2O	TOTAL
Highway Vehicles	-	-	-
AFVs	-	-	-
Non-highway/Motorcycles	-	-	-
Total	-	-	**-**

Note: Values may not sum due to rounding.

Non-CO_2 Emissions, All Sectors

	CH_4	N_2O	TOTAL
Residential	0.00	0.00	0.00
Commercial/Institutional	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Energy Generation	0.00	0.00	0.00
Total	0.00	0.00	**0.00**

Note: Values may not sum due to rounding.

A-8 - Government Operations Commute Mobile Combustion

Mobile Combustion - Summary

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GHG Summary

Net Emissions by Department (MT CO_2e)				
	CO_2	CH_4	N_2O	TOTAL
Total Mobile Emissions	153.79	-	-	**154**

CO_2 Detail Emissions (MT CO_2e)		
Gross CO_2	- Biogenic =	Net CO_2
154	-	154

Energy Use Summary

Energy Use by Department and Fuel Type (MMBtu)												
	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Total	2,043	139	-	-	-	-	-	-	-	-	-	**2,182**

Check to display:

☑ Emissions ☑ Energy Use

Appendix B

Climate Pollution Reduction Grant Fact Sheet

Building a Better World for All of Us®

Sustainable buildings, sound infrastructure, safe transportation systems, clean water, renewable energy, and a balanced environment. Building a Better World for All of Us communicates a company-wide commitment to act in the best interests of our clients and the world around us.

We're confident in our ability to balance these requirements.

JOIN OUR SOCIAL COMMUNITIES