

Town of Stratford 2015 Greenhouse Gas Emission Inventory



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This document outlines the methodology, calculations results, quality control methods and the primary sources used to create the 2015 Greenhouse Gas Inventory for the Town of Stratford. The PCP Protocol: Canadian Supplement to International Emission Analysis Protocol was used as a guiding document throughout the creation of this inventory. All required fields of data collection were completed along with some optional fields included in the Corporate Inventory. Appendix items included in this document will help guide the creation of future inventories that occur in the Town of Stratford.

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Definitions

CO₂E: Represents the accumulated total of Methane, Nitrous Oxide and Carbon Dioxide emissions. A simple mathematical process of using Global Warming Potentials (GWP) to convert Methane and Nitrous Oxide calculated emissions to Equivalent (“E”) Carbon Dioxide Emissions was undertaken to provide this total.

Greenhouse Gas (GHG) Emissions: In this instance, this term only refers to the gasses that were quantified in this inventory and includes Methane (CH₄), Nitrous Oxide (N₂O), and Carbon Dioxide (CO₂).

Intergovernmental Panel on Climate Change (IPCC): Is a collection of hundreds of scientists and researchers around the world who work to monitor the effects of climate change. Every five –six years they release assessments on which gasses are making an impact on climate change and how to measure the effect of those gasses.

Partners for Climate Protection (PCP): Is a network of municipalities that are working to reduce their GHG emissions in Canada. The Town of Stratford is a member of this organization.

Tier 1 measurements: The broadest, least accurate and highly precise form of data that can be used in greenhouse gas inventories. This kind of data is often sourced from the IPCC online resources and provides country specific data based on international reporting.

Tier 2 measurements: This method is more accurate than Tier 1 data but less accurate than Tier 3 data and often uses less precise information. Tier 2 data is based on country specific emission factors and can include engineering estimates, calculating a quantity of fuel based on prices and paid amounts, and fuel use estimated from VKT multiplied by average fuel efficiencies.

Tier 3 measurements: This is the most accurate and precise data that can be used in GHG emission inventories and is the most recommended method by the PCP protocol. This method takes into account the type of fuel that can be combusted, combustion technology, age of equipment used to burn fuel, quality of maintenance, control technology, operating conditions, metered energy use and metered methane recovery.

VKT (Vehicle Kilometres Travelled): Is a form of measurement that takes into account the amount of kilometres a vehicle has travelled in one year.

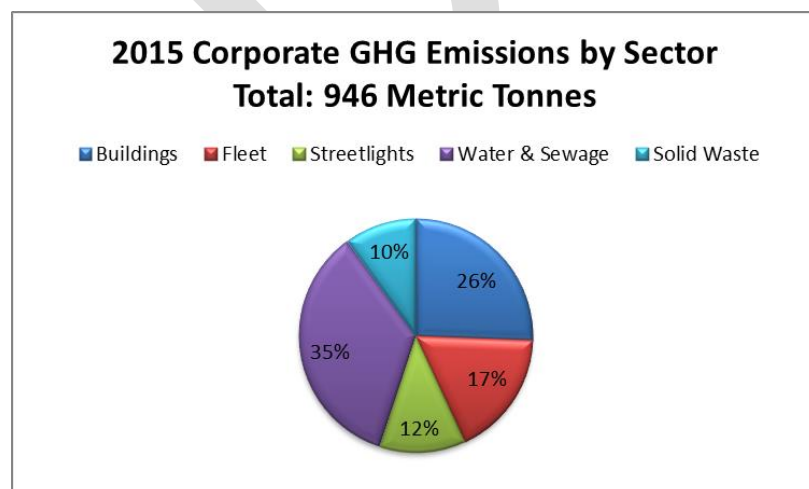
Executive Summary

This Greenhouse Gas (GHG) emission inventory was performed as part of the process of making Stratford's first Community Energy Plan. This inventory also complies with the first Milestone of the Partners for Climate Protection (PCP) commitment, a program that Stratford joined in 2008. This inventory was completed with funding from the Federation of Canadian Municipalities (FCM) as part of a one year grant for developing Stratford Community Energy Plan.

It was determined that 2015 was the best year to establish a baseline inventory due to factors involving population growth, access to information and to ensure that this document had recent information to aid the development of Stratford's Community Energy Plan. According to the PCP Protocol: Canadian Supplement International Emission Analysis Protocol, the Town of Stratford boundaries in 2015 were used to establish physical and geographical boundaries for both the Corporate and Community GHG emission inventories. Two inventories were completed with municipal buildings and services being accounted for in the Corporate Inventory; residential housing, commercial and provincial services, industrial services, residential transportation and solid waste were accounted for in the Community Inventory.

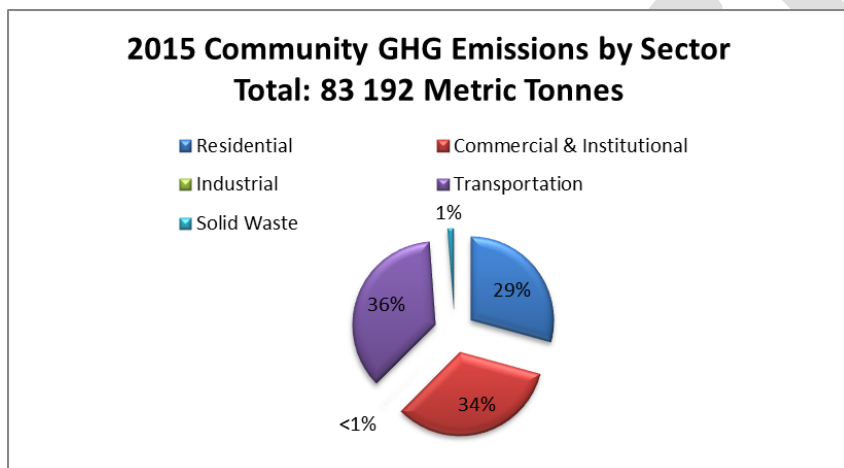
The Corporate Inventory largely consisted of Tier 3 data collected from hard copy municipal records (Figure 1.). The total GHG emissions for the municipal buildings in 2015 was 242.07 tonnes. The buildings and facilities that were included in this inventory were largely administrative and recreational in nature. The total GHG emissions for the Fleet category was 165.18 metric tonnes and included municipal fleet vehicles, staff commuting, fire fleet services, T3 Stratford Bus Transport and recorded travel kilometres for staff conferences. In total, the streetlight category had a recorded sum of 113.78 tonnes of GHG emissions. Total GHG Emissions from Stratford's Water and Sewage operations in 2015 were 330.24 metric tonnes. The total GHG Emissions from municipal waste in 2015 was 94.75 tonnes.

Figure 1. Overview of Corporate GHG Emissions.



The Community Inventory relied on electricity information from Maritime Electric, Waste Information from the Island Waste Management Corporation (IWMC) and statistical information from Statistics Canada, Natural Resources Canada and the Town of Stratford (Figure 4.). The total GHG emissions for the residential category in 2015 was 24, 311.34 tonnes. The total Commercial & Institutional GHG emissions for 2015 was 27, 720.37 tonnes. The total GHG emissions for the Industrial category in 2015 was 61.79 metric tonnes. The total GHG emission for the Transportation category in 2015 was 30, 142.68 tonnes. The total GHG emission for the Solid waste category in 2015 was 956.21 tonnes.

Figure 4. Overview of Community GHG Emission Inventory by Sector.



Specific Quality Control methods were used to create this inventory and a list of recommended Quality Assurance practices was created to maintain the quality of information for future GHG emission inventories. Three other municipalities who are PCP members and have conducted GHG emission inventories were studied to compare Stratford's inventory results. Using the results of this inventory, GHG emission projections will need to be created and studied so that the Town of Stratford can agree on GHG emission reduction targets for the next five years. These reduction targets can then be used to prioritize strategies and actions that are recommended within the Community Energy Plan.

Establishing Operational Boundaries

It was determined that 2015 was the best year to establish a baseline inventory due to factors involving population growth, access to information and to ensure that this document had recent information to aid the development of Stratford's Community Energy Plan. Both a Corporate and Community inventory were created so that the maximum amount of GHG emissions could be accounted for. The population growth rate of Stratford steadily increased between 2009 and 2012 where it then started dropping. Stratford's growth rate for 2015 was 1.2%, which was lower than 2009 levels, making it a good year to establish a baseline of information due to the small change in population growth. Based on information from the Stratford 2016 Budget document, Stratford's estimated population for 2015 was 9 860 people. There were certain review documents completed in 2015 on streetlight fixtures, and heating oil consumption that also made it more imperative to establish a baseline inventory in 2015.

According to the *PCP Protocol: Canadian Supplement International Emission Analysis Protocol*, the Town of Stratford boundaries in 2015 were used to establish physical and geographical boundaries for both the Corporate and Community GHG emission inventories. These boundaries led to certain GHG accounting methods being used over others. For example, instead of accounting for all GHG emissions originating from the T3 Transit system services, only GHG emissions from T3 services that operated within the Town of Stratford boundaries were accounted for. It is important to note that due to the physical restrictions of the town boundaries, only local vehicle traffic originating from Stratford residential areas were included in the Community Inventory. All traffic that occurs on Highway 1, would fall under provincial jurisdiction and would never be included in Stratford's GHG emission inventories.

Corporate Inventory

This inventory includes services and utilities that the municipality has a significant financial control over and/or has 100% operational control. Services that were included in this inventory due to financial control includes Fire Services, and Library Services. Solid Waste collection was not included in the Corporate Inventory since the Island Waste Management Corporation provides these services through financial support from the Provincial Government. The Town of Stratford does not maintain its own roads and has an agreement with the Provincial department of Transportation, Infrastructure and Energy. Due to this agreement all emissions relating to road maintenance and traffic operations were excluded from the Corporate Inventory.

Contracted services were included if¹:

1. The service provided by the contractor is a service that is traditionally provided by local government;
2. Emissions from the contracted service were reported in an earlier local government GHG inventory; and/or
3. Emissions generated by the contractor are a source over which the local government exerts significant influence.

¹ PCP Protocol: Canadian Supplement International Emissions Analysis Protocol; p.7.

Traditional Local government Services:

- Administration and Governance;
- Drinking, Storm and Waste Water;
- Solid Waste Collection, Transportation and Diversion;
- Roads and Traffic Operations;
- Arts, Recreation and Cultural Services;
- Fire Protection.

The traditional serviced model was broken down even further in “The Workbook: Helping Local Governments Understand How to be Carbon Neutral in their Corporate Operations.” This workbook was used to determine the traditional services that are offered by Stratford’s local government services:

- Administration and Governance;
- Drinking, and some Storm and Waste Water conduits;
- Arts, Recreation and Cultural Services;
- Local public transportation;
- Fire Protection.

Community Inventory

The community inventory was limited in some respects as to the kind of data available and focused on key areas of measurement:

- Energy consumption in buildings;
- Heating fuel consumption based on Statistics Canada information;
- Institutional energy consumption and heating fuel consumption;
- On-road transportation;
- Solid Waste Generation.

Due to the established boundaries of both inventories, many municipal services that are offered by other municipalities in Canada were not included in the Community Inventory. Examples of excluded services include waste pick-up, waste storage/processing, and road construction and repair. It is also important to note that Stratford has only been incorporated as a municipality for 21 years and has had less time to grow as a community compared to other municipalities in Prince Edward Island (PEI).

Quantification of Corporate GHG Emission Inventory

Five activity sectors were investigated for the Corporate Inventory (Figures 1, 2.):

- Buildings and Facilities;
- Fleet Vehicles;
- Streetlights (but not traffic lights);
- Water and Wastewater;
- Solid waste.

Figure 1. Overview of Corporate GHG Emissions.

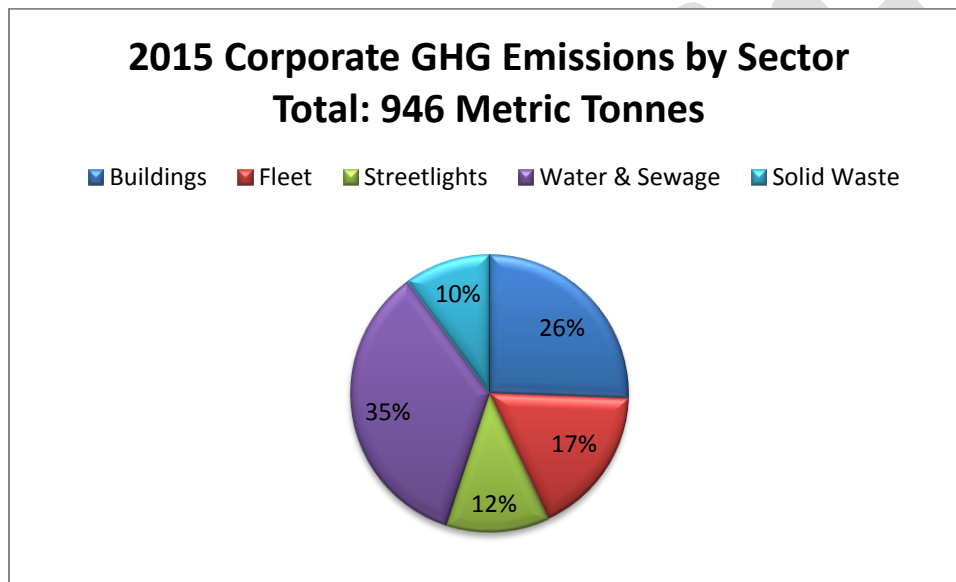
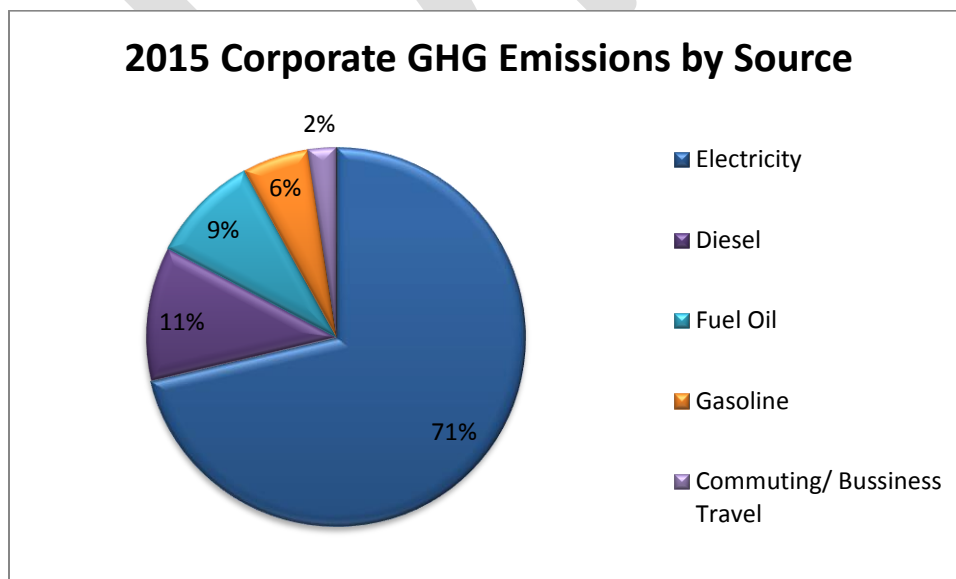


Figure 2. Overview of Corporate GHG Emissions.



Buildings and Facilities

The total GHG emissions for the municipal buildings in 2015 were 242.07 tonnes. The buildings and facilities that were included in this inventory were largely administrative and recreational in nature. Tier 3 data collection methods were used and most buildings were heated by heat pumps. Some municipal buildings still use oil heat and those heating oil consumption records were included in this inventory.

- Bunbury Rink (Table A2.);
- Youth/Senior Complex (Table A3.);
- Art Community Centre;
- Cross Roads Community Centre (Table A4.);
- Tea Hill Park Facility (Table A5.);
- Pondside Park Shelter (Table A6.);
- Stratford Library (Table A7.);
- Soccer Field House (Table A8.);
- Town Hall Offices/Gym (Table 9.).

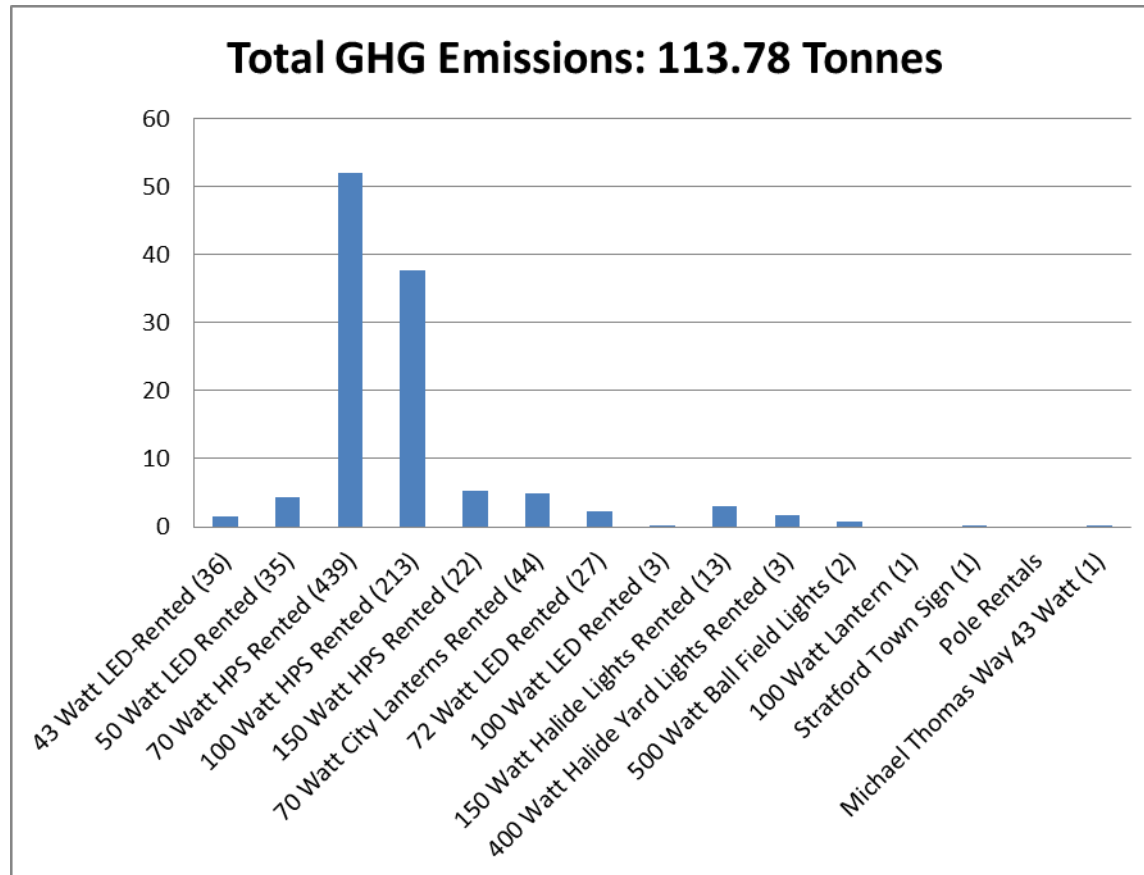
Municipal Inventory

The total GHG emissions for this category was 165.18 metric tonnes and included municipal fleet vehicles, staff commuting, fire fleet services, T3 Stratford Bus Transport and recorded travel kilometres for staff conferences. Using Tier 3 data collection methods, each vehicle in the municipal fleet was accounted for according to the monthly fuel records for the year 2015 (Tables A10, A11.). The electricity requirements for the vehicles could not be separated from the building electricity use and are therefore represented in the buildings and facilities category. According to the PCP Protocol, fire services are normally provided by a municipality and should be considered as part of the corporate inventory. Calculations were made on the GHG emission contributions of the fire hall fleet based on operational/financial control by Stratford, which was calculated to be 78.45% (Table A12.). Two optional data categories were also recorded for municipal fleet vehicles including staff commuting based on calculated VKT using Google Earth and the World Resources Institute transportation tool (Table A13.). Business travel fuel amounts were also included in this Fleet Vehicles category (Table A14.). GHG emissions from local bus transportation provided by the municipal government and contracted to T3 Transit were more difficult to quantify and Tier 1 methods were used instead of Tier 3 methods (Table A15.).

Street Lights

In total, the streetlight category had a recorded sum of 113.78 tonnes of GHG emissions (Figure 3.). The Town of Stratford does not own any streetlights within the town boundaries; Stratford does rent streetlights from the private utility Maritime Electric and through a contract agreement Stratford does have operational control over the majority of the lighting systems that it rents (Table A16.). For example, Stratford can request certain lights to be changed from HPS to LED if they are willing to pay for Maritime Electric to upgrade the streetlight. Tier 3 data collection methods were used to collect the electricity consumption for these streetlights.

Figure 3. Overview of Municipal Streetlights in 2015 and their GHG emissions.



Water and Sewage

The total GHG Emissions from Stratford's Water and Sewage operations in 2015 were 330.24 metric tonnes. Stratford has an extensive drinking water and sewage system that is constantly being expanded to accommodate new subdivisions every year. There are very few storm water systems that the municipal government has operational control over with the provincial government maintaining most of the storm water systems in Stratford. Electricity consumption and heating fuel were the two Tier 3 sources that were used to calculate the GHG emissions for this category (Table A17-A19.).

Waste

There is a standard sorting protocol for all municipalities and commercial enterprises in PEI with the Island Waste Management Corporation (IWMC) providing leadership, enforcement and education resources. The total GHG Emissions from municipal waste in 2015 was 94.75 tonnes. There has never been a waste audit done for municipal buildings in Stratford and therefore an alternate Tier 1 method of waste emission calculations was undertaken. After consulting with infrastructure staff and conducting some observational studies, certain calculations relating to waste bins were completed. Once bin capacities and average waste amounts were calculated, the total waste amounts for municipal buildings

were determined (Table 20.). Waste GHG emissions were low for 2015 and should be lower once a formal waste audit is performed in the future.

Quantification of Community GHG Emission Inventory

There are 5 areas that the PCP protocol requires a GHG inventory to provide records of (Figures 3, 4.):

- Residential
- Commercial & Institutional
- Industrial
- Transportation
- Solid Waste

This Community Inventory was completed to the fullest extent possible given that all the information was provided voluntarily. There are a number of data sets that could not be accessed due to a lack of accurate information at the municipal level and concerns of privacy in the commercial and industrial sectors. Electricity information provided by Maritime Electric formed the largest set of information accessed at the community level and is the only information represented by GHG emissions in the Industrial category (Table B1.). Online surveys were attempted through Facebook to gain additional information relating to the Residential, Commercial and Transportation Categories. Four surveys were sent out over the course of four weeks with a combined total of 79 responses. The response rate for these surveys was too low to be used in this inventory but will be used as supplemental information for Community Energy Planning in the future.

Figure 4. Overview of Community GHG Emission Inventory by Sector.

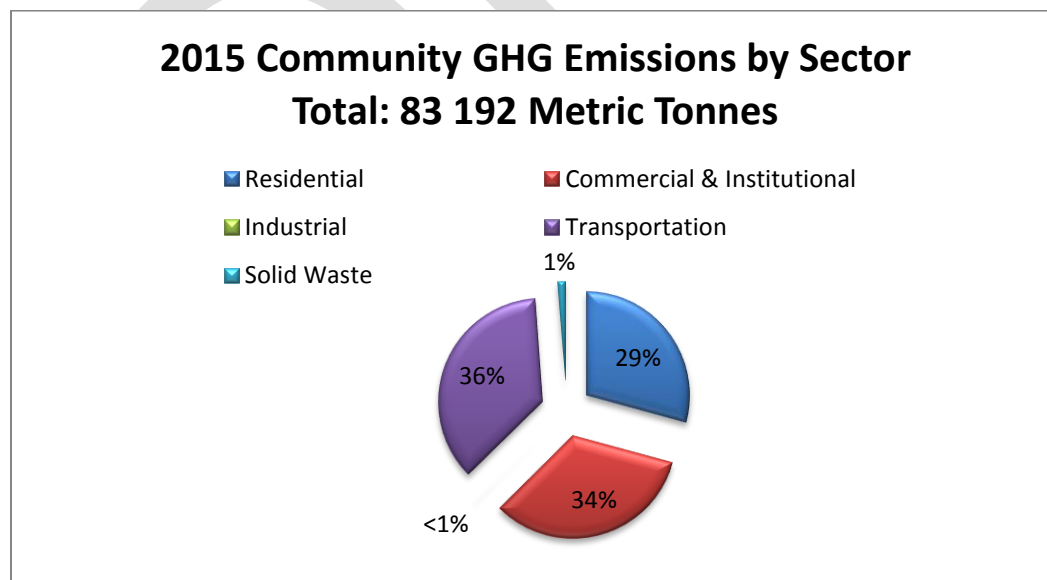
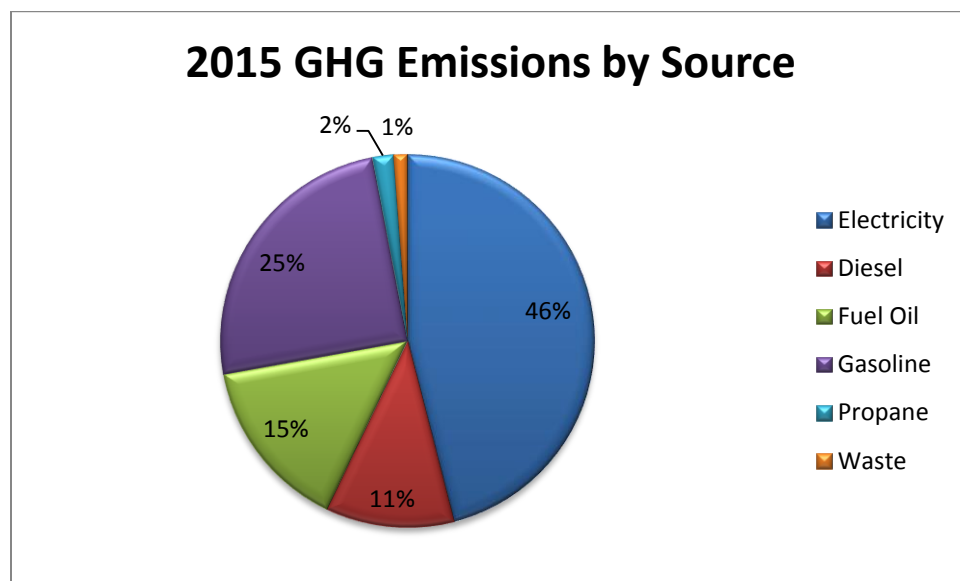


Figure 5. Overview of Community GHG Emission Inventory by Source.



Residential

The total GHG emissions for the residential category in 2015 was 24, 311.34 tonnes. Two different submissions of electricity consumption information for the Stratford area from Maritime Electric were used to identify the Residential Electricity consumption for the 2015 year. These Tier 3 consumption results were given in Kilowatt Hour (KWH) units and converted to GHG emission totals using the PCP protocol conversion tools approved by the IPCC (Table B2.). Both the PCP Protocol calculator tool and the calculations made using the PCP Protocol guidelines were used to produce the Greenhouse gas emission results for the residential category of the community inventory.

A Tier 2 approach was taken to provide an estimation of energy consumption relating to Residential Heating in Single Family Dwellings based on Statistics Canada data and Municipal housing data. Data relating to average energy consumption per household was used from Statistics Canada while data relating to the number of households in Stratford was provided by the Town of Stratford (Table B3.). This tier 2 information was based on provincial statistics and was the most accurate information available when this inventory was being created.

Commercial & Institutional

The total Commercial & Institutional GHG emissions for 2015 was 27, 720.37 tonnes. Commercial Electricity data was provided by Maritime Electric as a General Service Category and was broken down even further by subtracting municipal building electricity consumption, municipal utility electricity consumption, fire hall service electricity consumption and provincial school board building electricity consumption (Table B4.). This tier three method used the total calculated commercial electricity data and was calculated into gigajoules of electricity using the PCP Protocol Milestone calculator (Table B5.).

Commercial Heating: Unable to quantify

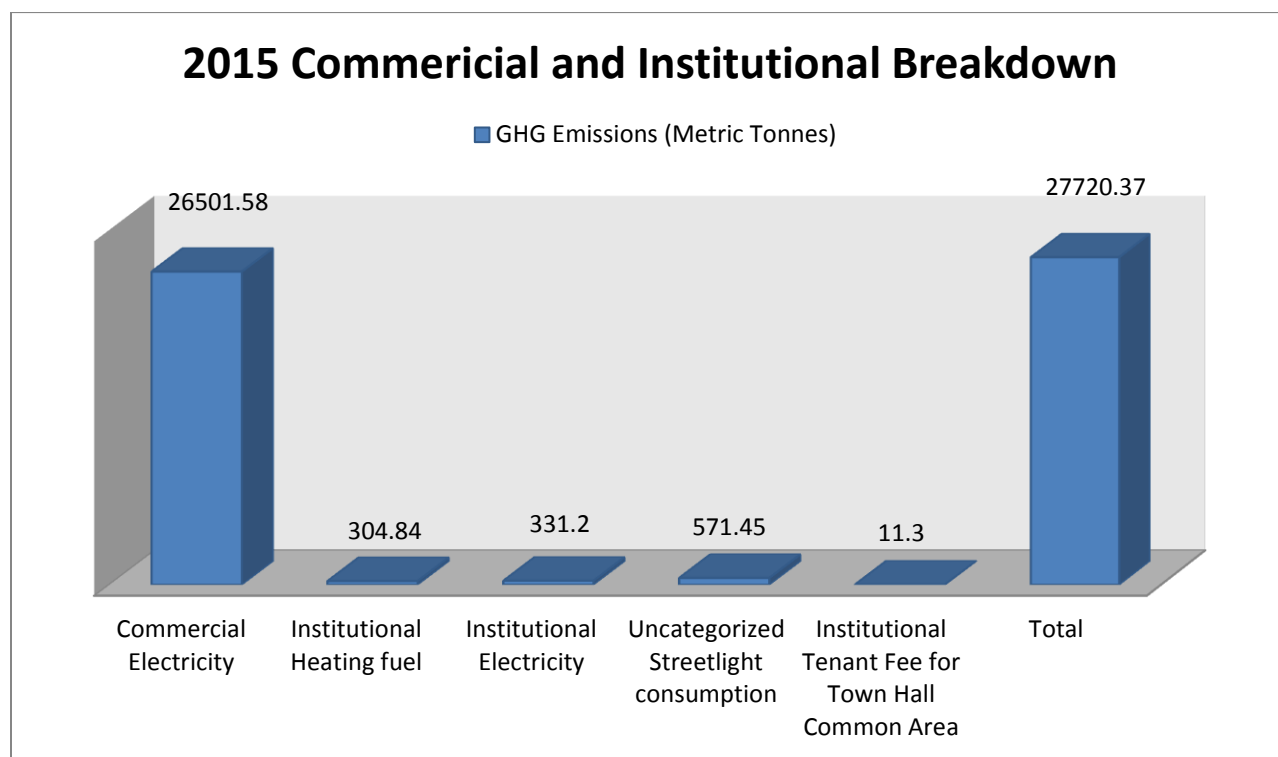
Due to a lack of quantifiable information, commercial heating was not calculated. The PCP Protocol recommends that direct heating fuel consumption be used to calculate the amount of greenhouse gas emissions produced by commercial heating. After contacting certain businesses and fuel providers, it became apparent that the recommended method could not be applied because of a vocalization of privacy concerns. An alternate method was reviewed but could not be applied which, would rely on tier 2 data collections from Statistics Canada and the provincial or municipal government. This alternate method relied on an average commercial heating fuel consumption number being applied to the total area of commercial space being used in the Town of Stratford; neither the provincial government nor the municipal government could provide the total area of commercial space being used in the town.

There are two schools and a public school board wing, previously called the English School board office building which is currently housed in Stratford that fall into this institutional category. There is also a tenant fee associated with the Common area of Town Hall which was also included in this category. The institutional electricity amounts were provided by the PEI public school board and contained Tier 3 level data (Table B6.).

Institutional heating takes into account the two public school buildings as well as the school board building that reside in Stratford. Both elementary schools use home heating oil for their heating requirements and that data contributed to the institutional GHG emissions. Tier 3 data collection methods were used to account for this category using information provided by the public school board (Table B7.).

A large amount of electricity consumption was represented in the streetlight system that was not controlled by the municipality. This remainder of energy consumption was named “Uncategorized Lighting” and included in the Commercial & Institutional category since it would be commercial development companies, Maritime Electric or the provincial government who would have operational control of these lights (Table B8.). Since there were a number of different data sets included in this Commercial & Institutional Category a further breakdown was created using a bar graph (Figure 5.).

Figure 6. Further Breakdown of 2015 Commercial & Institutional calculated GHG emissions.



Industrial

The total GHG emissions for the Industrial category in 2015 were 61.79 metric tonnes. Industrial Electricity Tier 3 level data provided by Maritime Electric was used to account for the GHG emissions being produced from this industry. Heating and other energy related emissions could not be accounted for due to a lack of accessible information on the industrial operations in the Stratford area (Table B9.).

Transportation

The total GHG emission for the Transportation category in 2015 was 30, 142.68 tonnes. This category includes data on average vehicles per household in PEI which was applied to the total number of dwellings in Stratford giving the total community VKT within the Stratford Town Boundaries (Table B10.). This was an alternate method prescribed by the PCP protocol that used Tier 2 level data from Natural Resources Canada. The recommended method of data collection for this transportation category was fuel sales data but that method could not be accomplished due to a lack of cooperation with local fuel stations residing in Stratford. An alternate approach using VKT could not be accomplished due to a lack of transportation measurement programs existing within the Stratford municipality. A household activity survey was done for as an alternate approach but the pool of participants was very low and could not be used for this category of data measurement. Another alternate approach using vehicle registration information from the PEI department of motor vehicles was attempted but could not be completed due to a lack of data manipulation ability within the department. The final approach that was used originated from conversations with government employees and combined both national and local data.

The final approach only taken into account residential vehicles relies on national averages and is the least accurate model that could be employed in this category.

Solid Waste

The total GHG emission for the Solid waste category in 2015 was 956.21 tonnes. The emissions total from solid waste was collected after discussion with representatives from the Island Waste Management Corporation (IWMC) and Veresen Incorporated. The emission data collected used a live computer monitoring program that reports the day to day emissions of the biomass/ waste incineration plant which produces heat for the local heating district in Charlottetown. This Tier 2 emissions data was calculated by taking the total weight of residential waste collected by IWMC across Prince Edward Island and dividing that weight by the total number of households that were registered for garbage pick-up in the 2015 year. That rate was then applied to the total number of applicable pick-up locations in Stratford creating the total mass of waste produced by residents in Stratford. This mass was then applied to the emissions monitoring system in the Veresen incineration facility (Table B11.). This Solid Waste data only accounts for residential waste that is collected on a regular basis and does not include two waste pick-up events that would be collected from residents in the spring and the fall (large item disposal days). Garbage pick-up from these two waste collection events would be sent to the IWMC Wellington Centre. Commercial and Industrial waste that would be brought to the Veresen Inc. company could not be quantified due an inability to separate Stratford waste from other provincial waste that is being brought to the Veresen Inc. incineration facility.

Quality Control and Quality Assurance

A set of technical activities to measure quality control of the data used for this inventory was established based on the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories example procedures chart². These activities helped establish routine and consistent checks on data and insured that all data collected did not omit information or have any errors.

Quality Control Measures:

- Check a sample of input data for transcription errors;
- Identify spread sheet modifications that could provide additional controls or checks on quality;
- Ensure that adequate version control procedures for electronic files have been implemented;
- Confirm that bibliographical data references are included in spreadsheets for all primary data;
- Check that copies of cited references have been archived;
- Check that assumptions and criteria for selection of boundaries, base years, methods, activity data, emission factors and other parameters are documented;
- Check whether emission units, parameters and conversion factors are appropriately labeled;
- Check if units are properly labeled and correctly carried through from beginning to end of calculations;
- Check that conversion factors are correct;

² Global Protocol for Community-Scale Greenhouse Gas Emission Inventories; p. 147.

- Check that data processing steps (e.g., equations) in the spreadsheets;
- Check that spreadsheet input data and calculated data are clearly differentiated;
- Check all calculations using the PCP Milestone Tool inventory calculator;
- Check consistency of time series inputs and calculations.

Recommended Quality Assurance measures

Within a year of the completion of the Stratford Community Energy Plan, a third-party verification of the 2015 GHG emission inventory should be completed. Verifying the 2015 inventory by an experienced GHG emissions inventory verifier will ensure the quality of data and ensure that the inventory represents the best estimates of both Corporate and Community emissions.

Whether or not Stratford chooses to verify its 2015 inventory, it should take steps to make future inventories more accurate and precise. Improved data storage and data collection methods can be instituted over time to improve the quality of information used in future inventories. The following recommendations would make the creation of future GHG emission inventories less time consuming and more accurate:

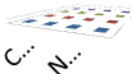
- Include electricity consumption (KWH) amounts on General Ledger (GL) records. These records already take note of the monthly payments from received electricity bills and could easily contain more information relating to energy consumption by adding an additional column of information.
- Include oil consumption (Litres) amounts on General Ledger (GL) records. These records can be updated with an extra column for the litres amount that would account for the already recorded billing amount.
- Include oil account numbers and Electricity Metre account numbers in the General Ledger (GL) description columns. This will help make it more efficient to account for oil and electricity consumption in the future.
- Collect VKT information from Stratford residents, businesses, and local industry on a biennial basis for future GHG emission inventories.
- There is currently no way to assess the total area of commercial space being used in Stratford. Collect information on residents and businesses through planning applications so that a data base of the total area of each sector can be determined on an annual basis. Natural Resources Canada already has national and provincial averages for energy consumption based on square feet or square metre measurements. This information could be used for various kinds of energy assessments and future GHG emission inventories.
- There is already information being collected on business travel and conference trips. This data should be expanded to include the total number of kilometres travelled, the type of travel (plane, car, bus, train) and the type of vehicle used (passenger vehicle, pick-up truck or heavy duty vehicle).
- Traffic Congestion surveys should be conducted in partnership with the provincial department of Infrastructure, Transportation and Energy to provide accurate transportation information in the Town of Stratford.

- If existing sewer infrastructure is moved, improved or replaced; new infrastructure should have GHG emission monitoring equipment installed. If monitoring equipment is not installed, staff should work to create reporting procedures for specific effluent measurements so that quantification of sewer GHG emissions can be calculated for future inventories.
- An official Waste Audit should be conducted on a biennial basis for municipal facilities using reporting models from Dalhousie University and/or Clean River Incorporated.
- A separate survey should be conducted by the municipality or in partnership with the department of Agriculture to assess the type of agriculture that is currently being conducted in Stratford. This survey should assess the types of chemicals being applied on an annual basis, the number and types of livestock that are raised and the estimated yield and types of crops being grown. This type of information is already being collected by the department of Agriculture but not in a way that allows that information to be shared with a municipality.
- Future GHG emission inventories may require information relating to carbon sinks and the amount of trees located in public and private areas of a municipality. Biodiversity assessments should be conducted to create an accessible database for these future requirements.
- If there are future developments on the Stratford waterfront, the amount of fuel used for boating purposes and the type & amount of boats using municipal infrastructure should be accounted for.

Case Study Analysis

Three other municipal inventories were reviewed and compared against Stratford's 2015 inventory. All inventories differ in some ways but all follow the same PCP format and are easily comparable to each other. In 2007, Campbell River had an estimated population of 30 039 people with a community GHG emission total of 204,265 metric tonnes³. Campbell River used a GHG emission report produced by the BC provincial government to provide most of their data inputs and therefore did not complete a corporate inventory. In 2005, The City of Stratford had an estimated population of 30 597 people with a community GHG emission total of 317,195 and a Corporate GHG emission total of 5875 metric tonnes⁴. The City of Stratford is a much larger municipality compared to the Town of Stratford which is the most likely reason that its Corporate GHG emission inventory total is substantially higher. In 2003, the Town of New Glasgow with an estimated population of 9 432 people produced 128, 172 tonnes of CO₂E at a community level with its Corporate GHG emission total of 5092 metric tonnes⁵. The town of New Glasgow's population is the most comparable to Stratford's. To better compare the four municipalities a comparison chart was created with a GHG Emissions Per person rate created using population and Community GHG Emission amounts (Figure 6.).

Figure 7. Comparison Chart of Stratford and three other municipalities that have conducted GHG emission inventories.

<div> <h3>Comparing GHG emissions</h3>  </div>				
	Campbell River, BC (2007)	City of Stratford, ON (2005)	New Glasgow, NS (2003)	Stratford, PEI (2015)
Population	30039	30597	9432	9860
Corporate GHG Emissions (Metric Tonnes)	0	5875	5092	946
Community GHG Emissions (Metric Tonnes)	204265	317195	128172	83192
GHG Emissions Per person	6.80	10.37	13.59	8.44

The Campbell River inventory had less specific categories and reported their largest energy consumption category as “buildings” while its largest GHG emitter was “vehicles”. Stratford's largest GHG emitter category was Transportation followed closely by Commercial & Institutional while its largest form of energy consumption was electricity.

³ Sustainable Campbell River: Community Energy & Emissions Plan; September 2011; P. 3-4.

⁴ City of Stratford GHG Inventory and Community Energy Plan; October, 2008; P.11-12

⁵ New Glasgow Corporate and Community Equivalent Carbon Dioxide Emissions for 1994 and 2003; March 10, 2004; P. 2-3.

The City of Stratford's two largest GHG emitter categories were Energy and Transportation. The city's two main sources of energy were natural gas and electricity. It is important to keep in mind that the city of Stratford would have larger emissions per person compared to Stratford, PEI due to their larger responsibility relating to infrastructure. The city of Stratford would have to take into account local traffic and traffic light energy consumption as well as other services such as fire, policing and waste services (the City of Stratford has its own landfill for its residents).

The Town of New Glasgow's two largest emitter categories were Residential followed closely by Commercial & Institutional with their two largest energy sources being electricity followed by fuel oil. Transportation was the third largest emitter for New Glasgow with its overall spread of emissions being similar to Stratford's (almost 1/3 for residential, transportation & commercial). When comparing New Glasgow's Corporate Inventory to Stratford's, the largest difference in emissions stems from the town's Buildings and Streetlights. What is most interesting is that despite the similar size in population, Stratford has less municipal buildings to account for, less vehicles to account for in its vehicle fleet, and less departments to account for which, amounts to a much smaller GHG emission total compared to New Glasgow.

Next Steps

Now that Stratford has completed this inventory, it can officially be recognized for completing Milestone 1 of 5 in the PCP Milestone Program. The second milestone for this program would be to set emission reduction targets which, is currently being reviewed as part of the Community Energy Plan process. The third Milestone for this PCP Program would be the adoption of the Community Energy Plan which, should occur in June, 2017.

Over the next couple of months strategies to achieve GHG emission reduction targets will be created and reviewed using public feedback from past public engagement events. Specific groups from the business and development industries as well as residents will be consulted as each Community Energy Plan draft is completed.

The results of this inventory will be used to focus on strategies that will help reduce GHG emissions in the categories that have the highest emission totals. For the Corporate inventory that would be Water & Sewage followed by Buildings followed by the municipal fleet (which includes public transit). Areas that need to be focused on concerning the community inventory would be Transportation, Commercial & Institutional followed by Residential. Another inventory should be conducted for the 2017 year to assess the progress of the Community Energy Plan Strategies and to provide further focused attention for strategies that lower high GHG emission activates within Stratford.

Resources used:

- PCP Protocol: Canadian Supplement International Emissions Analysis Protocol;
- Global Protocol for Community-Scale Greenhouse Gas Emission Inventories;
- International Local Government Emissions Analysis Protocol (IEAP);
- The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard Revised Edition;
- Online PCP Milestone Tool;
- Maritime Electric;
- Efficiency PEI;
- PEI Energy Corporation;
- Island Waste Management Corporation (IWMC);
- Veresen Incorporated;
- Natural Resources Canada;
- Statistics Canada;
- Prince Edward Island Department of Agriculture
- Sustainable Campbell River: Community Energy & Emissions Plan;
- City of Stratford GHG Inventory and Community Energy Plan;
- New Glasgow Corporate and Community Equivalent Carbon Dioxide Emissions for 1994 and 2003 Report;
- Town of Stratford.

Appendix A

Table A1. Summary of 2015 Corporate Energy Consumption, Expenditure, and GHG Emissions.

Corporate GHG Emissions by Sector			
Sector	Energy Consumption	Expenditure	GHG Emissions (Tonnes)
Buildings	3,062 GJ	\$103,972	242
Fleet	2,101 GJ	\$13,015	165
Streetlights	1,365 GJ	\$179,715	114
Water & Sewage	3,975 GJ	\$187,851	330
Solid Waste	0 GJ	\$14,160	95
Total	10,503 GJ	\$498,713	946 t

Table A2. Bunbury Rink Electricity Consumption data and associated GHG emission calculations.

Outdoor Rink Change Room					
Electricity Meter	kwh	Cost			
90 Clifton Road	9240	3105.19			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	9240	x	0.0003	equals	2.77

Table A3. Electricity consumption, heating oil consumption and GHG emission calculations for buildings located at 57 Bunbury Road, Stratford.

Cotton Centre 2015									
2 Electricity Meters	kwh	cost							
Arts and Culture Centre	10722	2217.655		0.336725					
Youth/Senior Complex	21120	4368.295		0.663275					
	31842	Cost: \$6585.95							
Building Oil Use 2015									
2 Oil Storage units	Litres	Cost							
Cotton Park Arts Centre	2352	1816.26							
Cotton Park Youth Centre	8433	6370.72							
	10785								
GHG Emissions (Electricity)									
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions				
CO2 E	31842 x		0.0003 equals		9.55				
GHG Emissions (Fuel oil heating)									
	Fuel Oil Consumption		Emission factor		GWP Value	Conversion factor			Total Tonnes of CO2e emissions
CO2	10785 x		2725 x		1 (/)	1000000 equals			29.39
NH4	10785 x		0.026 x		21 (/)	1000000 equals			0.01
N2O	10785 x		0.031 x		310 (/)	1000000 equals			0.10
Total									29.50
GHG Emission CO2E Total (Heat and Electricity):									
	39.05								

Table A4. Electricity consumption, heating oil consumption and GHG emission calculations for the Crossroads Community Centre.

Cross Roads Community Centre Energy use 2015						
1 Electricity Meter	kwh	Cost				
88 Georgetown Road	6942	2290.18				
Building Oil use						
	Litres	Cost				
Cross Roads Community Centre	2153	1684.96				
GHG Emissions						
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions	
CO2 E	6942 x		0.0003	equals	2.08	
GHG Emissions (Fuel oil heating)						
	Fuel Oil Consumption		Emission factor	GWP Value	Conversion factor	Total Tonnes of CO2e emissions
CO2	2153 x		2725 x	1 (/)	1000000 equals	5.87
NH4	2153 x		0.026 x	21 (/)	1000000 equals	0.00
N2O	2153 x		0.031 x	310 (/)	1000000 equals	0.02
Total						5.89
GHG Emission CO2E Total (Heating and Electricity):						
	7.97					

Table A5. Electricity consumption and GHG emission calculations for the Tea Hill Park Facility.

Tea Hill Park Facility					
1 Electricity Meter	kwh	Cost			
492 Keppoch road	4594	1132.96			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	4594	x	0.0003	equals	1.38

Table A6. Electricity consumption and GHG emission calculations for the Ponside Park Shelter.

Ponside Park shelter					
Electricity Meter	kwh	Cost			
16 Keppoch Road	525	1132.96			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2E	525	x	0.0003	equals	0.16

Table A7. Electricity consumption and GHG emission calculations for the Stratford Town Library.

Library					
Electricity Meter	kwh	Cost			
20 Bunbury Road	17156	3351.5			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	17156	x	0.0003	equals	5.15

Table A8. Electricity consumption and GHG emission calculations for the Soccer Field House.

Soccer Field House					
Electricity Meter	kwh	Cost			
34 Myrtle Street	4702	2505.39			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	4702	x	0.0003	equals	1.41

Table A9. Electricity consumption and GHG emission calculations for the Town Hall/Gym and Common Area.

Town Hall/Gym and Common Area					
2 Electricity Meters	kwh total	Cost (\$)			
Common Area	110113	17087.53			
Town Hall offices/Gym	379080	57182.32			
Total	489193	74269.85			
GHG Emissions					
	Electricity consumption (kwh)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	489193	x	0.0003	equals	146.76

Table A10. Summary of vehicles owned and operated by the Town of Stratford in 2015.

Light-Duty Gas Trucks	
Code	Type
B301	2007 F150
B302	2011 GMC Sierra
B306	1992 Tohatsu Mini Truck
B310	2008 GMC Sierra
B311	2015 Ford F250
78002	Billy's Truck
Hybrid Vehicles	
B309	2010 Honda Insight
Heavy Duty Diesel Trucks/Tractors	
B304	1999 International Heavy Duty Truck
B307	John Deer Tractor
78002	Jerry's Ford F350 Truck
Ford Tractor	Ford Tractor
Off-road Vehicles	
R192	Snowmobile-Rec. Dept.

Table A11. Fleet consumption total and GHG emission calculations.

GHG Emissions					
Light-Duty Gas Trucks					
Category	Total Litres consumed		Emission Factor		Total Tonnes of CO2E emissions
CO2E	13883.334	x	0.002299	equals	31.92
Hybrid Vehicles					
Category	Total Litres consumed		Emission Factor		Total Tonnes of CO2E emissions
CO2E	162.14	x	0.002299	equals	0.37
Heavy-Duty Diesel Trucks/Tractors					
Category	Total Litres consumed		Emission Factor		Total Tonnes of CO2E emissions
CO2E	6829.38	x	0.002712	equals	18.52
Off-Road Vehicles					
Category	Total Litres consumed		Emission Factor		Total Tonnes of CO2E emissions
CO2E	52.55	x	0.002361	equals	0.12
Total CO2E Emissions					50.94

Table A12. GHG emission calculations relating to fire services that are provided to Stratford.

Fire Hall Fleet GHG emissions that the Town of Stratford Is Accountable for.						
GHG emission calculations	Type	Equation	Fuel Consumption Amount (Litres)	Total Emissions (grams)	Total Emission in Tonnes (g/1000000)	Break down of emissions per GHG emission (Tonnes) amount*78.45 %
CO2	For Diesel Fuel (Trucks & Equipment)	Diesel amount*CO2 Emission Factor	10223.1	7218061.5	7.2180615	5.662569
CH4	For Diesel Fuel (Trucks & Equipment)	Diesel amount*CH4 Emission Factor*GWP	10223.1	7570.4265	0.007570427	0.005939
N2O	For Diesel Fuel (Trucks & Equipment)	Diesel amount*N2O emission factor *GWP	10223.1	336102	0.336102	0.263672
Total emissions	Emissions that Stratford is accountable for	total*78.45%		27868191.42	27.86980161	27.8698
Note: All personal calculations done in this excel sheet were completed using IPCC 2nd assessment values provided by the PCP Protocol Handbook. Updated 5th assessment values (most up-to-date values) were used in the PCP Milestone Calculator and those values are the most accurate.						

Table A13. Summary of Staff Commuter Kilometres travelled using the World Resources Institute (2015). GHG Protocol tool for mobile combustion. Version 2.6.

Mode of Transport	Scope	Fossil Fuel Emissions			Biofuel CO2 Emission (metric tonnes)
		Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	
Road	Scope 1	0	0	0	0
	Scope 3	1.220	0	0	
Rail	Scope 1	0	0	0	0
	Scope 3	0	0	0	
Water	Scope 1	0	0	0	0
	Scope 3	0	0	0	
AirCraft	Scope 1	0	0	0	0
	Scope 3	0	0	0	
Total Emissions		1.220	0	0	0
Total GHG Emission (metric tonnes CO2e)			1.220		

Table A14. Summary of Business Kilometres travelled using the World Resources Institute (2015). GHG Protocol tool for mobile combustion. Version 2.6.

Mode of Transport	Scope	Fossil Fuel Emissions			Biofuel CO2 Emission (metric tonnes)
		Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	
Road	Scope 1	0	0	0	0
	Scope 3	1.220	0	0	
Rail	Scope 1	0	0	0	0
	Scope 3	0	0	0	
Water	Scope 1	0	0	0	0
	Scope 3	0	0	0	
AirCraft	Scope 1	0	0	0	0
	Scope 3	0	0	0	
Total Emissions		1.220	0	0	0
Total GHG Emission (metric tonnes CO2e)			1.220		

Table A15. T3 Public Transit Bus Transportation Calculations.

Route	Amount km/trip	Type of Bus	Type of Fuel	# of times bus travels inside Stratford	# of day operation	Fuel Efficiency	Total Vkt
#7 Bunbury Road	9.6	Bus #507-2002 Thomas Dennis	Diesel	10	252	63.5 L/100km	24192
#7 Kinlock Road	11.4	Bus #508-2003 Thomas Dennis	Diesel	10	252	63.5/100km	28728
							52920
Note: Tier 1 Fuel Efficiency data provided by the greenhouse gas protocol transportation tool was used.							
GHG Emissions							
Category	Total VKT		Fuel Efficiency		Emission Factor		Total CO2E in Tonnes
CO2E	52920	x	0.64	x	0.002712	equals	91.13

Table A16. Municipal lighting that the Town of Stratford is billed for including GHG emission calculations.

Municipal Lighting that is accounted for in Corporate Inventory					
Year	Code	Description	Consumption in Kwh	Multiply by Emission Factor	CO2E Emissions Total
2015	610	Light Pole Rentals	0	0.0003	0.00
2015	619	43 Watt LED-Rented (36 fixtures)	4908		1.47
2015	625	50 Watt LED Rented (35 fixtures)	14244		4.27
2015	630	70 Watt HPS Rented (439 fixtures)	173091		51.93
2015	631	100 Watt HPS Rented (213 fixtures)	125443		37.63
2015	632	150 Watt HPS St. Lights Rented (22)	17704		5.31
2015	639	70 Watt City Lanterns Rented (44)	16576		4.97
2015	666	72 Watt LED Rented (27)	7799		2.34
2015	670	100 Watt LED Rented (3)	944		0.28
2015	756	400 Watt Halide Yard Lights Rented (3)	5616		1.68
2015	765	150 Watt Halide Lights Owned (13)	9828		2.95
2015		500 Watt Ball Field lights (2)	2385		0.72
2015		Stratford Town Sign (1)	552		0.17
2015		100 Watt Lantern (1) (no individual consumption record)			
2015		43 Watt Michael Thomas Way (1)	198		0.06
Total			379288		113.79

Table A17. Electricity consumption and GHG emissions from all water services in Stratford.

Water Services				
Meter #	Service Address	2015 Total (kwh)	Emission Factor	Total Tonnes of GHG emissions
98703	51 Dewar Dr. Stratford Reeves Estates	3663	0.0003	1.10
194121	61 Bonavista Ave Stratford Beacon hill Water StN	31598		9.48
189659	50 T Nottinghill Dr. Stratford	82018		24.61
135082	45 Georgetown Rd Stratford Reservoir	11902		3.57
193962	19 Keppoch Rd Stratford Pondsides PK Pump	133320		40.00
166824	20 Macintosh Dr. Stratford Subdivision Pump	1244		0.37
189645	41 T Macintosh Dr.	133160		39.95
178327	110 P Keppoch Rd Stratford Pumping Station	8135		2.44
134965	10 Park Lane Stratford	2202		0.66
Total		407242		122.17

Table A18. Electricity consumption and GHG emissions from all sewage services in Stratford.

	Sewage	2015 Total (kwh)	Emission Factor	Total Tonnes of GHG emissions
Meter Number	Service Address		0.0003	
137892	15 Horton Dr. Stratford Sewage LIGT Pump	1529		0.46
196291	57 Bunbury Rd. Stratford Plant Pumping Station	9237		2.77
189597	110 Mason Rd Stratford Pollution Control	10858		3.26
178253	110 S Bonavista Ave Stratford Sewer	2549		0.76
193343	10 Stratford Rd Stratford Sewage Treatment Plant	564216		169.26
189811	16 Bayside Dr. Stratford Pollution Control	12420		3.73
112067	26 Harbour View Dr. Stratford Sewer Lift	917		0.28
194714	32 Aptos Dr. Stratford	9717		2.92
105182	55 S Brandy Lane Stratford Sewer Lift Zakem Sub	2123		0.64
194754	158 Keppoch Rd Stratford Sewer Lift Pumps	3554		1.07
105819	21 T Creekside Dr. Stratford Sewer Lift Station	1085		0.33
194726	297 T Kinlock Rd Stratford	28542		8.56
189681	10861 T Trans Canada HWY Stratford Across from 10861	4629		1.39
179223	102 Mount Herbert Rd Stratford Across from CA 102	2039		0.61
112819	26 P Alexandra CRT	1233		0.37
137624	4 Callaway CL Stratford Lot Lines CA 2 & 6	1046		0.31
119092	146 T Spinnaker Dr. Stratford T Pump	1014		0.30
178321	20 P Battery Point Dr. Stratford Lift Pump	5446		1.63
134217	72 S Battery Point Dr. Stratford Sewer Extension	1263		0.38
119591	181 S Spinnaker Dr. Stratford Lift Station	5132		1.54
148217	15 S Lobster Point Lane Stratford Lift Station	352		0.11
178339	1 A Clearview Dr. Stratford Lockbox IS on Gate	656		0.20
194712	56 S Tuckers Way Stratford Stonington Station	2061		0.62
196466	143 Hollis Ave Stratford Sewer Lift STN	1596		0.48
179146	14 Carriage Lane Stratford Pump	1154		0.35
Total		674368		202.31

Table A19. Heating Oil consumption and GHG emissions from the Waste Water Treatment Plant in Stratford.

Oil consumption for 2015 year					
	Litres	Cost (Canadian Dollars)			
WWTP	2105	1631.64			
GHG Emission Calculations					
Gas	Litres of oil	Emission factor	GWP	Grams to Tonnes Conversion Factor	Total CO2E
CO2	2105	2725	1	/1000000	5.74
NH4	2105	0.026	21	/1000000	0.00
N2O	2105	0.031	310	/1000000	0.02
CO2E Total					5.76

Table A20. Municipal Solid Waste GHG emission calculations.

PCP Approach 2: Emissions from Corporate Solid Waste Generation									
Estimated Quantity of solid waste generated at Corporate buildings:									
Step 1.									
M	Annual quantity of solid waste generated at a facility								
B	Garbage bin capacity (metres squared)								
F	How full the bin is at pickup (%)								
P	Frequency of pickup (time/month)								
	0.178 Volume to weight conversion factor								
	12 Months in one year								
M	(=)	B	x	f	x	P	x	0.178 x	Total annual solid waste in 12 tonnes
Library	(=)	0.43	x		1	x	4	x	0.178 x
Cotton Centre	(=)	4.59	x		1	x	4	x	0.178 x
RCMP/Fire Hall	(=)	0.43	x		1	x	4	x	0.178 x
WWTP	(=)	4.59	x		1	x	2	x	0.178 x
Town Hall	(=)	4.59	x		1	x	4	x	0.178 x
Total Waste									105.38
Step 2.									
No data was available on actual waste composition information from the Provincial government, the Town of Stratford or the Island Waste Management Corporation.									
Alternative waste composition values for North America (below) were used. Source: PCP Protocol; Canada Emissions supplement to the International Emissions Protocol.									
Waste Category	Percentage								
Food	34%								
Garden	0%								
Paper/Cardboard	23%								
Wood Products	6%								
Textiles	4%								
Plastics, other inert (e.g. glass, metal, etc.)	33%								
Step 3.									
DOC	Degradable organic carbon (t carbon/t waste)								
A	Fraction of solid waste stream that is food								
B	Fraction of solid waste stream that is garden waste and other plant debris								
C	Fraction of solid waste stream that is paper								
D	Fraction of solid waste stream that is wood								
E	Fraction of solid waste stream that is textiles								
DOC	add ->	0.15xA	0.2xB	0.4xC	0.43xD	0.24xE			
DOC	add ->	0.051	0	0.092	0.0258	0.0096			
DOC	(=)	0.1784							
Step 4.									
Methane Generation potential used.									
Managed methane	0.36								
Fraction of DOC	0.1784								
Fraction of methane	0.5								
Stoichiometric ratio	1.333333								
Methane Generation	0.042816	CH ₄ /t waste							
Step 5.									
Emissions of CO ₂ e using information from steps 1-4.									
CO ₂ e (tonnes)	(=21*105.38*B49*(1-0)*(1-0))								
Total	94.75								

Appendix B

Table B1. Total Energy Consumption and GHG Emissions produced by the Town of Stratford in 2015.

Sector	Energy Consumption	GHG Emissions (Tonnes)
Residential	323,640 GJ	24,311
Commercial & Institutional	333,298 GJ	27,720
Industrial	742 GJ	62
Transportation	448,778 GJ	30,143
Solid Waste	0 GJ	956
Total	1,106,457 GJ	83,192 t

Table B2. Residential Electricity Greenhouse Gas emission calculation using PCP Protocol Canadian Supplement to International Emissions Analysis Protocol.

Residential Electricity Greenhouse Gas emission calculations					
	Electricity Consumption (KWH)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	36014335	x	0.0003	equals	10804.30

Table B3. Residential Heating emissions calculated using 2011 Statistics Canada Residential Home Heating information for the province of PEI.

Residential Oil Emissions											
	Energy Consumption (litres of oil)		Emission Factor		GW P		Total Grams of CO2 emissions produced		Conversion factor of 1 million		Total Tonnes of CO2 emissions produced
CO2	4457016	x	2725	x	1	equ als	12145368600.00	/	1000000	equ als	12145.37
CH4	4457016	x	0.026	x	21	equ als	2433530.74	/	1000000	equ als	2.43
N2O	4457016	x	0.031	x	310	equ als	42831923.76	/	1000000	equ als	42.83
Total CO2E							12190634054				12190.63
Residential Propane Emissions											
	Energy Consumption (Litres of Propane)		Emission Factor		GW P		Total Grams of CO2 emissions produced		Conversion factor of 1 million		Total Tonnes of CO2 emissions produced
CO2	853043.48	x	1507	x	1	equ als	1285536521.74	/	1000000	equ als	1285.54
CH4	853043.48	x	0.024	x	21	equ als	429933.91	/	1000000	equ als	0.43
N2O	853043.48	x	0.108	x	310	equ als	28559895.65	/	1000000	equ als	28.56
Total CO2E							1314526351.30				1314.53
Total Residential Heating excluding electricity:											
Propane Emissions	(+)	Heating Fuel Oil emissions	equ als	13505.16							

Table B4. Total Electricity Consumption in the Town of Stratford.

2015 Electricity Consumption in KWH		
Category	Percentage of energy consumption in Stratford town limits	Consumption of Electricity in KWH
Residential	27.79%	36014335
Commercial	68.13%	88290403
Municipal Buildings	0.44%	570137.35
Municipal Utilities	0.83%	1081610
Industrial	0.16%	205977
Uncategorized Street Lights	1.47%	1904829
Municipal Lights	0.29%	379288
Institutional (Schools)	0.88%	1141541.65
Total		129588121

Table B5. Total electricity consumption used to calculate commercial greenhouse gas emissions.

Commercial					
	Electricity Consumption (KWH)		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	88290403	x	0.0003	equals	26487.12

Table B6. Total electricity consumption used to calculate Institutional greenhouse gas emissions.

Institutional (Provincial School buildings)					
	2015 Electricity Consumption		Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	1141542	x	0.0003	equals	342.46

Table B7. Total GHG Emissions relating to heating the Institutional school buildings in Stratford.

School 1 Heating Emissions						
	Energy Consumption (litres of Oil)	Emission Factor	GWP	Total Grams of CO2 emissions produced	Conversion factor of 1 million equals	Total Tonnes of CO2 emissions produced
CO2	67049.3 x	2725 x	1 equals	182709342.5 /	1000000 equals	182.71
CH4	67049.3 x	0.026 x	21 equals	36608.9178 /	1000000 equals	0.036608918
N2O	67049.3 x	0.031 x	310 equals	644343.773 /	1000000 equals	0.644343773
Total CO2E				183390295.2		183.39
School 2 Heating Emissions						
	Energy Consumption (litres of Oil)	Emission Factor	GWP	Total Grams of CO2 emissions produced	Conversion factor of 1 million equals	Total Tonnes of CO2 emissions produced
CO2	44410.5 x	2725 x	1 equals	121018612.5 /	1000000 equals	121.02
CH4	44410.5 x	0.026 x	21 equals	24248.133 /	1000000 equals	0.024248133
N2O	44410.5 x	0.031 x	310 equals	426784.905 /	1000000 equals	0.426784905
Total CO2E				121469645.5		121.47
Total CO2E Emissions for Both Schools						304.86
Note: Information provided by Blake Crockett, Financial Services Supervisor, PEI Public Schools Branch.						

Table B8. Total Energy Consumption and GHG emissions for the Uncategorized Streetlights.

Uncategorized Streetlights				
	2015 Electricity Consumption (KWH)	Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	1904829 x	0.0003	equals	571.45

Table B9. Total Energy Consumption and GHG emissions for the Industry located in Stratford.

Industrial				
	2015 Electricity Consumption (KWH)	Grid electricity emission factor		Total Tonnes of CO2e emissions
CO2 E	205977 x	0.0003	equals	61.79

Table B10. Total tonnes of CO2E in tonnes for Community Transportation in Stratford.

Community Transportation Summary	
Total Community VKT:	90039137
Total Tonnes of CO2E Emissions:	Tonnes
Car	10185.08
Light Duty Truck	10227.22
Heavy Duty Truck	9730.39
Total CO2E in Tonnes:	30142.68

Table B11. Solid Waste produced by residential population in Stratford in 2015.

2015 Community Solid Waste Emissions		
For 2015 930.2067 tonnes of Municipal Solid Waste delivered to PEI Energy Systems heating/incineration plant.		
	Tonnes	
CO2	956.21	(From continuous emissions monitoring system)
CH4	0.0558	(EF from link below)
N2O	0.0558	(EF from link below)
Total CO2E:	956.3216	
CH4, N2O Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf		
Source: Chris MacDougall, Operations Engineer - PEI, Vereson PEI Energy Systems Inc. Note: Two large item waste pick-up days in the Spring and Fall were excluded from these calculations due to a lack of available information.		