REGIONAL CORPORATE AND COMMUNITY GREENHOUSE GAS INVENTORY

WEST HANTS REGIONAL MUNICIPALITY

WEST HANTS, NOVA SCOTIA

OCTOBER 2020

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76 MORISON DRIVE

WINDSOR, NS

CANADA

ACKNOWLEDGEMENTS

This project was conducted at the West Hants Regional Municipality, under direct guidance of Planner, Saira Shah. The development of the West Hants and Windsor Inventories was completed by two Dalhousie University students and aided by consultants at WSP, in order to meet the requirements of the Partners for Climate Protection (PCP) program. The results of the inventories were merged to create a Regional Inventory. The corporate inventory was achievable due to the contributions from various municipal departments. The community inventory was achievable due to the contributions from Statistics Canada, Access Nova Scotia, and numerous agriculture organizations.

PRODUCTION TEAM

WEST HANTS REGIONAL MUNICIPALITY, NOVA SCOTIA

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SUMMARY

This report highlights the result of the Corporate and Community Emissions Inventories for the West Hants Regional Municipality. The Inventories were developed in order to meet the requirements of Milestone 1 of the Partners for Climate Protection Program. The Corporate Inventory is for the 2018/2019 fiscal year, which spans from April 1st, 2018 to March 31st, 2019. It encompasses all emissions resulting from municipal services and operations, in which the Municipality has direct control over. The Community Inventory is for the 2016 calendar year and encompasses all emissions resulting from key activity sectors within the municipalities boundaries. The results are summarized in Table 1, below, where the Corporate Inventory resulted in 3,530 tCO_2 eq (tonnes of carbon dioxide equivalent). and the Community Inventory, 286,480 tCO_2 eq. Based on the results of the Inventories, an emissions forecast for 2030 was developed. This business-as-usual forecast showed a 44% reduction of corporate emissions and 41% reduction of community emissions.

Table 1 - Summary of Emissions from the Corporate and Community Inventory

REGIONAL CORPORATE INVENTORY (2018/2019)		**REGIONAL COMMUNITY INVENTORY (2016)**	
Activity Sector	**GHG Emissions (tCO_2 eq.)**	**Activity Sector**	**GHG Emissions (tCO_2 eq.)**
Water & Wastewater Treatment	1,772	*Residential*	90,502
Buildings	1,387	*Transportation*	87,189
Vehicle Fleet	192	*Commercial & Institutional*	59,562
Lighting	100	*Industrial*	32,657
Solid Waste	53	*Agricultural*	12,782
Staff Business Travel	26	*Solid Waste*	3,787
Total	**3,530**	***Total***	**286,480**

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1.0 INTRODUCTION

Municipalities are responsible for approximately 44% of Canada's greenhouse gas emissions. This comes as a result of providing daily and weekly services such as water, transit, waste management, streetlighting and infrastructure[1]. In order to combat this, municipalities across the country are undergoing the Partner's for Climate Protection (PCP) Program to take action to reduce these emissions by developing and implementing local action plans and establishing emissions reduction targets[2]. The PCP Program is managed and delivered by FCM (Federation of Canadian Municipalities) and ICLEI (Local Governments for Sustainability Canada) and has an active national network of over 350 municipalities[3].

The development of a greenhouse gas emissions inventory is the foundation of a local action plan, as it allows the municipalities to effectively quantify their emissions. This is essential in the identification of energy-intensive activities and sectors, as well as the determination of action items with the purpose of offsetting emissions. In September 2018, the West Hants Regional Municipality joined the PCP Program. In order to meet the first milestone of the program, a corporate and community inventory was developed for Municipality of the District of West Hants (West Hants) by Courtney Smith, Casey Parker, and WSP in 2019. WSP produced an Inventory Report on the West Hants results in February 2020. Due to the consolidation of the Town of Windsor (Windsor) and West Hants, a regional inventory could not be completed until after April 1, 2020. This report explores the results of the Regional inventories, while following the general outline used in the WSP Inventory Report for West Hants.

The following sub-sections provide an overview of the West Hants Regional Municipality and the Partner's for Climate Protection Program.

1.1 WEST HANTS REGIONAL MUNICIPALITY

The Planning and Development Department of the West Hants Regional Municipality developed a series of nine (9) background reports that cover West Hants and Windsor. The background reports were prepared for the Municipal Planning Strategy review and provide a solid overview of the Regional Municipality. The results from the reports are summarized below.

[1] (Union of Nova Scotia Municipalities, 2011)
[2] (WSP, 2020)
[3] (Federation of Canadian Municipalities, n.d.)

Location

The West Hants Regional Municipality is a rural municipality located in Nova Scotia, approximately 50 minutes north-west of Halifax. The Municipality is composed of three (3) former municipal units: West Hants, The Town of Hantsport (Hantsport), and Windsor. Hantsport became a part of West Hants in 2015, and Windsor and West Hants consolidated in 2020.

Population

Hants County has experienced an average population growth of 4.7%/year from 1966 to 2016 (Census). Hants County is composed of four Census regions: East Hants, West Hants, Windsor and Hantsport. Of the total annual population growth, West Hants has seen an increase of 4% per year, Windsor has had several periods of population decline but has ultimately remained constant, and Hantsport has experienced population decline since 1976. In 2016, the populations of West Hants and Windsor were 15,368 and 3,648, respectively.

Population projections for the next 35 years were made based on the historic populations for both West Hants and Windsor. Three different scenarios were analyzed: low migration, average migration and high migration. The average scenario projects a population increase in West Hants to 18,120 in 2036 before declining to 14,117 in 2056. The average scenario for Windsor projects an insignificant decrease over time, with a population of 2,362 in 2056.

Housing

The predominant type of housing in West Hants is single unit dwellings. In 2016, this style of housing was the choice of 89% of the residents. The Town of Windsor is slightly more diverse, with a significant number of apartment complexes.

In West Hants, approximately 67 permits are issued each year for new residential development. Most residential development between 2009 and 2016 was single unit dwellings (65%). The second largest category was mini and mobile homes, at 26% of the total residential development.

Agriculture

The agriculture industry provides great land-use and economic opportunity within the Municipality. On average, West Hants issues approximately 18 permits for agriculture uses each year. Between 2007 and 2016, it appeared that agriculture development was focused in five main locations: Upper Burlington, Scotch Village, Falmouth, Upper Falmouth, and Windsor Forks. Agricultural development in Windsor is much less significant, with an average of one (1) permit issued per year.

Economic Development

Nova Scotia is considered a service-based economy, with 81% of the population working in the service sector in 2012. The remaining 19% consists of other primary industries, utilities, construction and manufacturing. In 2011 the largest industries in West Hants were construction, retail trade, and health care. Combined, these three (3) industries made up 39% of employment. Additionally, in West Hants, the forestry and gypsum industries have been profitable, despite sales declining over the past few years. However, this is not the case in Windsor. Industrial development is not the main economic driver for the former Town. Instead, the economic drivers are the retail trade and health care industries.

Public Transportation

There are three (3) public transportation options available in the region: dial-a-ride, The Windsor Senior Citizen Bus Society, and Kings Transit. Dial-a-ride provides door-to-door transportation on an as-needed basis to residents that do not have access to a vehicle or may be unable to drive. Their organization consists of eight (8) volunteers that use their personal vehicles, however they also have access to two wheelchair accessible vans. Lastly, the Windsor Senior Citizen Bus Society provides days trips for residents of local senior homes with a 36-passenger bus.

1.2 PARTNERS FOR CLIMATE PROTECTION

Partners for Climate Protection works with a network of over 350 Canadian municipalities to reduce greenhouse gas emissions and take action to fight climate change. The program is administered by FCM and ICLEI. The program guides municipalities to take action through a five-step Milestone Framework, as seen below:

Milestone 1: Create a Baseline Emissions Inventory and Forecast

Milestone 2: Set Emissions Reduction Targets

Milestone 3: Develop a Local Action Plan

Milestone 4: Implement the Local Action Plan

Milestone 5: Monitor Progress and Report Results

In order to fulfill the requirements of Milestone 1, a Corporate and Community Emissions Inventory must be developed. The Corporate Inventory highlights the emissions resulting from municipal services. This includes facilities and operations such as buildings, lighting, water and wastewater, solid waste and transportation. The Community Inventory highlights the emissions within the Municipality from residential, commercial, and industrial buildings, solid waste, and transportation..

2.0 METHODOLOGY

2.1 STANDARDS AND GUIDING DOCUMENTS

Various standards and guiding documents were utilized to develop the Corporate and Community Inventory. Some of the key documents include the following:

- *PCP Protocol: Canadian Supplement to the International Emissions Analysis Protocol* (2014);
- *Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories* (2014);
- *IPCC: Guidelines for National Greenhouse Gas Inventories* (2006);

2.2 BASELINE YEAR

The baseline year for the Corporate Inventory was chosen to be the 2018/2019 fiscal year. This was selected due to increased data availability and accuracy compared to previous years. Therefore, it would ensure that the inventory results would paint a more realistic portrait of the emissions within the West Hants Regional Municipality.

The baseline year for the Community Inventory was chosen to be the 2016 calendar year. This year was chosen because the development of the inventory relied heavily on data collected from government sources, such as Statistics Canada's Census data, with the most recent data coming from 2016.

2.3 GEOGRAPHIC BOUNDARIES

The inventories encompass all emissions within the West Hants Regional Municipality. As of April 1st, 2020, the Municipality consists of West Hants, Hantsport, and Windsor.

2.4 OPERATIONAL BOUNDARIES

As previously mentioned, the Corporate Emissions Inventory encompasses all emissions resulting from municipal services and operation. All operations and services are under the direct influence of the municipal government. The purpose of the inventory is to help identify the energy-intensive sectors. The municipal government will then be able to develop action items (these could include measures such as equipment upgrades or policies) to reduce their negative impact on the environment. However, it is important to note that not all services provided within the West Hants Regional Municipality are under the Municipality's' direct control. Some of the frequently contracted services that the Municipality has limited influence over includes police services, fire protection services, solid waste collection and management, and winter road maintenance. The Municipality has slightly more influence on waste management services which is why it is required for the Corporate and Community Inventories (despite the landfill being owned and operated by GFL Environmental Inc.).

The Community Emissions Inventory encompasses the emissions resulting from significant activities within the West Hants Regional Municipality. The Municipality has very limited influence over said significant activities as they are not carried out by the municipal unit. However, the purpose of the community inventory is to understand the contribution that the region as a whole is making to climate change. This insight will allow the local government to engage the community in plans and policies to encourage residents to lessen their negative impacts on the environment.

2.5 GREENHOUSE GASES

The resulting emissions from the Corporate and Community Inventories are expressed in units of tCO_2 equivalent (eq.). This represents a combination of the three principal greenhouse gases: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). The Global Warming Potential (GWP) for each individual greenhouse gas was used to assess their individual impacts. The GWP's were obtained from the *National Inventory Report 1990-2018 – Greenhouse Gas Sources and Sinks in Canada* and are summarized in Table 2.

Table 2 - Global Warming Potentials for the Greenhouse Gases Included in the Inventories

Greenhouse Gas	Formula	100-Year GWP
Carbon Dioxide	CO_2	1
Methane	CH_4	25
Nitrous Oxide	N_2O	298

2.6 REPORTING REQUIREMENTS

In order to meet the requirements of the PCP Protocol for the Corporate Inventory, the inventory must contain the five (5) main activity sectors. However, additional activity sectors may be included to provide a stronger representation. The inclusion of additional sectors is considered optional and is solely based on the availability of data. The activity sectors incorporated in the West Hants Regional Municipalities' Corporate Inventory are highlighted in Table 3. It can be seen that the five main activity sectors were included, with the addition of one optional activity sector. Staff business travel was incorporated into the inventory due to the fact that the data was available and easy to access.

Similarly, the PCP Protocol requires the inclusion of the five (5) main activity sectors for the Community Inventory. These activity sectors are slightly different as the inventory analyzes the community as a whole. The activity sectors incorporated in the West Hants Regional Municipality's Community Inventory are highlighted in Table 4. Here, agriculture was included as an optional activity sector due to the prevalence of farming in the Municipality.

Table 3 - Summary of Activity Sectors Included in the Corporate Emissions Inventory

Corporate Activity Sector	PCP Requirements
Buildings	Required
Street Lighting	Required
Vehicle Fleet	Required
Water & Wastewater Treatment	Required
Solid Waste	Required
Staff Business Travel	Optional

Table 4 - Summary of Activity Sectors Included in the Community Emissions Inventory

Community Activity Sector	PCP Requirements
Residential Energy Consumption	Required
Commercial/Institutional Energy Consumption	Required
Industrial Energy Consumption	Required
Road Transportation	Required
Solid Waste	Required
Agriculture	Optional

2.7 DATA COLLECTION & QUANTIFICATION

The Corporate Emissions Inventory was developed using the *UNSM Corporate Energy and Emissions Spreadsheet*. Various updates were made to the document since its original version in 2007. This includes updates made by WSP in 2019, during the development of the initial Corporate Inventory for West Hants. The original version was created by Stantec Inc. and was based on the International Council for Local Environmental Initiative's (ICLEI) *Inventory Quantification Support Spreadsheet.*

The Community Emissions Inventory was developed using the *Community Quantification Support Spreadsheet*. This document was built by WSP in 2019. It was also highly influenced by ICLEI's *Inventory Quantification Support Spreadsheet*, of which was designed specifically for members of the Partners for Climate Protection program.

Data collected for each of the previously identified activity sectors of the Corporate Inventory are highlighted in Table 5 and the Community Inventory in Table 6. The corresponding method of quantification and data source is also identified in the respective tables. The Inventories heavily relied on Canada's National Inventory Report (NIR) 1990-2018 for emission factors and Statistic Canada's 2016 Census Data to scale down various data requirements. The emission factors utilized for each activity sector are summarized in Appendix A. Additionally, all data sources can be found in the *Corporate Energy and Emissions Spreadsheet* and the *Community Quantification Support Spreadsheet.*

Table 5- Data Requirement and Quantification Methodology for the Corporate Inventory

Data Required by Activity Sector	Method of Quantification	Data Source
Buildings		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NS Power invoices *Emission Factor* – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Emissions from stationary fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – Fuel provider invoice *Emission Factor* – NIR Table A6-4 Emission Factors for Refined Petroleum Products
Street Lighting		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NS Power invoices *Emission Factor* – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Vehicle Fleet		
Emissions from motor fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – Fuel provider invoice *Emission Factor* – NIR Table A6-13 Emission Factors for Energy Mobile Combustion Sources
Water & Wastewater Treatment		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NS Power invoices *Emission Factor* – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Emissions from stationary fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – Fuel provider invoice *Emission Factor* – NIR Table A6-4 Emission Factors for Refined Petroleum Products
Solid Waste		
Emissions from disposal of corporate solid waste	Methane Commitment Model (using quantity of waste landfilled and composition of waste stream)	*Quantity of Waste Landfilled* – Estimated based on size of container, frequency of collection and typical size of load *Composition of Waste Stream* – Based on Divert NS waste audit in 2017
Emissions from composting of organics	Quantity of Organics x Emission Factor	*Quantity of Organics* – Estimated based on size of container, frequency of collection and typical size of load *Emission Factor* – 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste – Biological Treatment of Waste
Staff Business Travel		
Emissions from motor fuel consumption	Quantity of kilometers traveled x Fuel Rate x Emission Factor	*Quantity of KM travelled* – From employee expense forms *Fuel Rate* – Oak Ridge National Laboratory (2017), Transportation Energy Data Book: Edition 36, Table 4.1 Summary Statistics for Cars, 1970-2015 *Emission Factor* – NIR Table A6-13 Emission Factors for Energy Mobile Combustion Sources

Table 6 - Data Requirement and Quantification Methodology for the Community Inventory

Data Required by Activity Sector	Method of Quantification	Data Source
Residential		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NRCAN Comprehensive Energy Use Database, Residential Sector, Nova Scotia, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *# of Dwellings* – Statistics Canada 2016 Census Data, for Nova Scotia and West Hants Regional Municipality *Emission Factor* – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Emissions from stationary fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – NRCAN Comprehensive Energy Use Database, Residential Sector, Nova Scotia, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *# of Dwellings* – Statistics Canada 2016 Census Data, for Nova Scotia and West Hants Regional Municipality *Emission Factor* – NIR Table A6-4 Emission Factors for Refined Petroleum Products
Commercial/Institutional		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NRCAN Comprehensive Energy Use Database, Commercial/Institutional, Atlantic, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *Employment in Service Sector* – Statistics Canada 2016 Census Data, for Atlantic Region and West Hants Regional Municipality *Emission Factor* – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Emissions from stationary fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – NRCAN Comprehensive Energy Use Database, Commercial/Institutional, Atlantic, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *Employment in Service Sector* – Statistics Canada 2016 Census Data, for Atlantic Region and West Hants Regional Municipality *Emission Factor* – NIR Table A6-4 Emission Factors for Refined Petroleum Products
Industrial		
Emissions from electricity consumption	Quantity of electricity used (kWh) x Emission factor	*Quantity of Electricity* – NRCAN Comprehensive Energy Use Database, Industrial Sector – Aggregated Industries, Atlantic, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *Employment in Industry Sector* – Statistics Canada 2016 Census Data, for Atlantic Region and West Hants Regional Municipality

		Emission Factor – NIR Table A13-4 Electricity Generation and GHG Emission Details for Nova Scotia
Emissions from stationary fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – NRCAN Comprehensive Energy Use Database, Industrial Sector – Aggregated Industries, Atlantic, Table 1 – Secondary Energy Use and GHG Emissions by Energy Source *Employment in Industry Sector* – Statistics Canada 2016 Census Data, for Atlantic Region and West Hants Regional Municipality *Emission Factor* – NIR Table A6-4 Emission Factors for Refined Petroleum Products
Road Transportation		
Emissions from motor fuel consumption	Quantity of fuel used (L) x Emission factor	*Quantity of Fuel* – Statistics Canada. Table 23-10-066-01 Sales of Fuel Used for Road Motor Vehicles, Annual (x 1,000) *# of Registered Vehicles* – Access Nova Scotia *Emission Factor* – NIR Table A6-13 Emission Factors for Energy Mobile Combustion Sources
Solid Waste		
Emissions from disposal of community solid waste	Methane Commitment Model (using quantity of waste landfilled and composition of waste stream)	*Quantity of Waste Landfilled* – From Cogmagun Landfill records *Composition of Waste Stream* – Based on Divert NS waste audit in 2017
Emissions from composting of organics	Quantity of Organics x Emission Factor	*Quantity of Organics* – From composting facility records *Emission Factor* – 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Waste – Biological Treatment of Waste
Agriculture		
Emissions from Enteric Fermentation	Livestock Headcount x Emission Factor	*Cattle Headcount* – Statistics Canada. Table 32-10-0424-01 Cattle and calves on census day *Swine Headcount* – Statistics Canada. Table 32-10-0426-01 Pigs on census day *Emission Factor* – IPCC Volume 4 Chapter 10 – Tier 1 Method
Emissions from Manure Management	Livestock Headcount x Emission Factor	*Cattle Headcount* – Statistics Canada. Table 32-10-0424-01 Cattle and calves on census day *Swine Headcount* – Statistics Canada. Table 32-10-0426-01 Pigs on census day *Emission Factor* – IPCC Volume 4 Chapter 10 – Tier 1 Method

3.0 CORPORATE EMISSIONS INVENTORY

The following sub-sections summarize the results from the baseline Corporate Emissions Inventory for the West Hants Regional Municipality.

3.1 SUMMARY

The total corporate emissions for the 2018/2019 fiscal year were 3,530 tCO_2 eq. The total emissions were broken down by sector and can be seen in Figure 1. The majority of the emissions resulting from municipal operations come from the water and wastewater system. They make up 50.2% of the overall profile. The second largest emissions source is buildings, resulting in 39.3%. The solid waste, street lighting and staff business travel emissions are almost negligible, as together they make up exactly 5% of the overall profile.

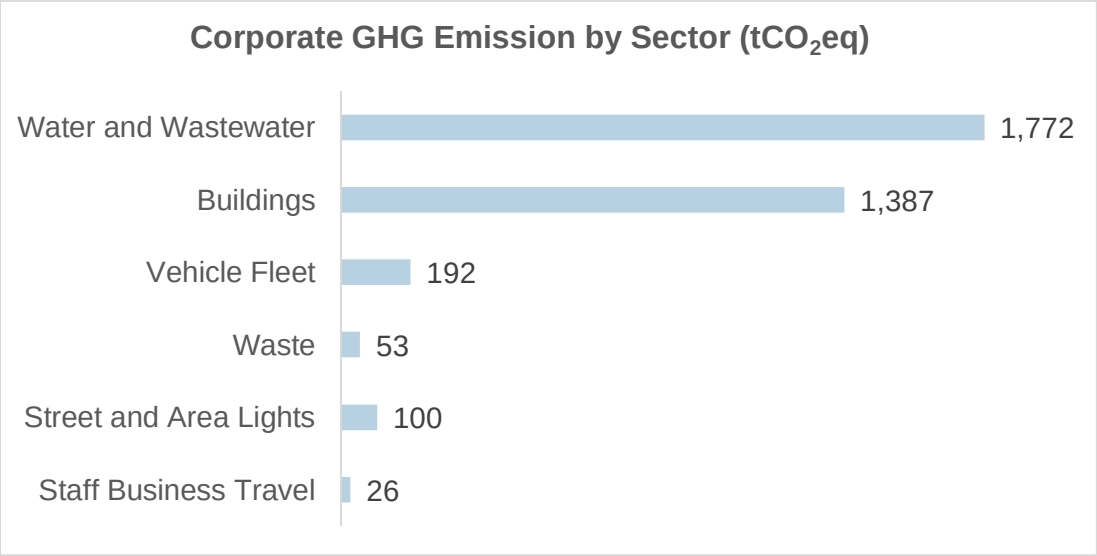

Figure 1 - Summary of Corporate GHG Emissions by Sector

The total emissions were also broken down by energy type, in Figure 2. However, this excludes the emissions from the solid waste section of the inventory, as it is the only sector where the method of quantification does not depend on an energy source. The energy source resulting in the largest amount of emissions was electricity (84.6%). This is largely due to the fact that the electricity in Nova Scotia comes mostly from natural gas and solid fuel, resulting in increased emissions factors. The remainder of energy sources used include propane, diesel, gasoline and light fuel oil. The resulting emissions from the light fuel oil make up 6.4% of the overall profile. The remainder of the energy sources each represent below 4% of emissions. The emissions for

natural gas, district energy, wood waste/pulp liquor and heavy fuel oil were all zero, as these types of energy were not used for municipal operations. Therefore, these sources were excluded from the graph.

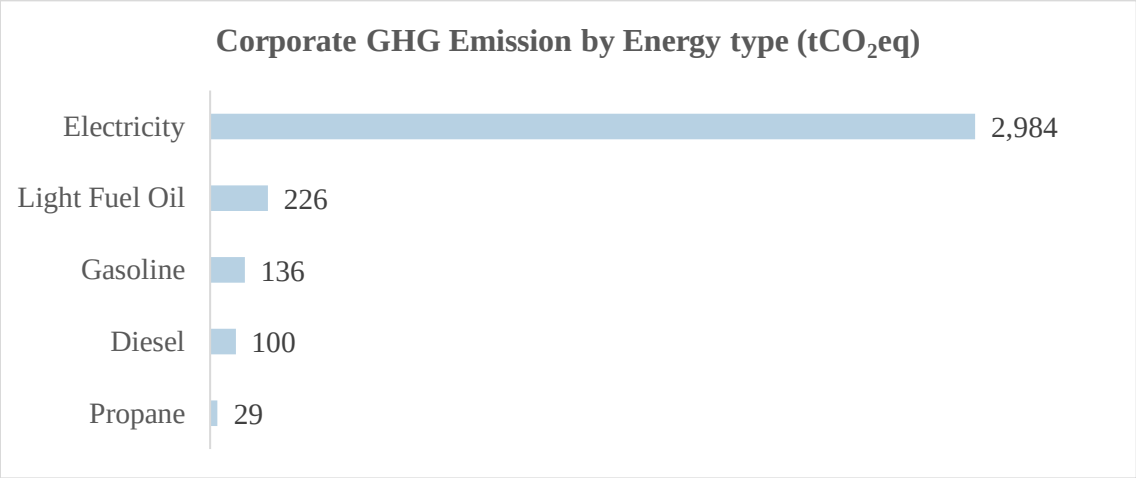

Figure 2 - Summary of Corporate GHG Emissions by Energy Type

3.2 BUILDINGS

The calculation of emissions resulting from municipally-owned buildings was based on electricity and fuel use. The required data was obtained from the energy provider bills. The one electricity provider was Nova Scotia Power. The fuel oil, however, was received from multiple providers: Irving Energy, West Nova Fuels and Oulton Fuel's Ltd. The energy use by source and the resulting emissions for each building owned and operated by the Municipality can be found in Table 7. The total emissions for the 2018/2019 fiscal year were 1,387 tCO_2 eq. The W.B. Stephens Building at 100 King St. in Windsor, results in the largest amount of emissions (19%). The building had the largest electricity consumption, at 285,060 kWh, and also required light fuel oil for heating purposes. The Municipal Building (76 Morison Drive) and Brooklyn Fire Station/Civic Centre are each responsible for the second largest contribution, at 12% of the overall emissions profile.

Table 7 - Summary of Energy Use and Emissions from Municipal Buildings

Building	Electricity Use (kWh)	Light Fuel Oil Use (L)	Gasoline Use (L)	Diesel Use (L)	Total GHG (tCO_2 eq)	% of Profile
W.B. Stephens Building – 100 King Street	285,060	18,154			267	19.2%
Brooklyn Fire Station & Civic Centre – 955 Highway 215	215,040				163	11.8%
Municipal Building – 76 Morison Drive	211,380			329	162	11.7%
Ice Plant - 239 Wentworth Road	164,400				125	9.0%
Hants County Courthouse – 240 King Street	26,160	22,250			81	5.9%
Arena – 239 Wentworth Road	103,200				78	5.7%
Hants Memorial Community Centre – 78 Thomas Street	55,400	10,450			71	5.1%
Town Hall – 20 Main Street	52,430		5,215	1,290	55	4.0%
Library – 195 A Albert Street	66,840				51	3.7%
Hantsport Fire Department – 5 Oak Street	39,086	7,689			51	3.7%
56 Park Drive	32,225	9,223			50	3.6%
Public Works Shed – 19 Chittick Avenue	18,597	11,876			47	3.4%
Hants Aquatic Centre – 306 Stannus Street	50,375				38	2.8%
Ball Field (Recreation Centre) – 54 Ball Park	28,274				21	1.5%
Hants Aquatic Centre Pumphouse – 306 Stannus Street	28,091				21	1.5%
Brooklyn Station 2 – 5984 Highway 14/Tongue Hill Garage	24,480				19	1.3%
Library – 10 Main Street	23,294				18	1.3%
Police Station – 3 Oak Street	12,222	2,020			15	1.1%
Park Drive	17,813				14	1.0%
Hantsport Music Fest – 10 Foundry Road	16,744				13	0.9%
Construction Trailer – 20 Pleasant Street	8,806				7	0.5%
Recreation Centre – 156 Eldridge	8,012				6	0.4%
Maplewood Cemetery	5,626				4	0.3%
Bandstand Walkway	3,709				3	0.2%
72 Ivey Lane	4,191				3	0.2%
Coach House – 6 King St Ext	4,148				3	0.2%
Total	**1,505,917**	**81,661**	**5,215**	**1,619**	**1,387**	**100%**

3.3 STREET LIGHTING

The lighting sector includes all streetlights, cameras and fire alarms owned and operated by the Municipality. The emissions resulting from the lighting sector were based on electricity consumption. While this information was not directly available from the electricity provider, Nova Scotia Power, it was estimated based on the wattage of each fixture, the hours of operation per day, and the days of operation per year. The electricity and resulting emissions for each lighting system are summarized in Table 8, with the total emissions being 100 tCO_2 eq.

Table 8 - Summary of Electricity Use and Emissions from Lighting

Lighting System Name	Type of Light	Electricity Use (kWh)	Total GHG (tCO_2 eq)
Streetlights Throughout Windsor	LED	63,273.48	48.08
Streetlights Throughout West Hants	LED	48,902.70	37.17
Wentworth Rd.	High Pressure Sodium	8,541.00	6.49
Clover Lane	Decorative	3,942.00	3.00
Wentworth Rd.	Metallic Additive	1,752.00	1.33
Falmouth Mini Park	LED	1,204.50	0.92
54 Ball Park	LED	963.60	0.73
Irishman Road	LED	240.90	0.18
Courthouse	LED	240.90	0.18
Brooklyn Fire Department	LED	240.90	0.18
2 Main St.	LED	240.90	0.18
10 Main St.	LED	240.90	0.18
Cottage Lane	40W Camera	175.20	0.13
Willow St.	40W Camera	175.20	0.13
Willow St. #cameras	40W Camera	175.20	0.13
Prince St.	40W Camera	175.20	0.13
Avon St.	40W Camera	175.20	0.13
Tannery Rd.	40W Camera	175.20	0.13
Main St. #cameras	40W Camera	175.20	0.13
School St.	40W Camera	175.20	0.13
Fire Alarm	N/A	13.61	0.01
Total		**131,199**	**100**

3.4 VEHICLE FLEET

The emissions from the municipal-owned vehicles were calculated based on the fuel used. The result also includes the quantification of tools and equipment. Fuel usage was obtained from the fuel receipts collected for each vehicle or piece of equipment. The results can be seen in Table 9. The gasoline usage was slightly higher than that of the diesel. The total corresponding emissions were 2,648 tCO_2 eq.

Table 9 - Summary of Fuel Use and Emissions from Vehicle Fleet

Vehicle Group Name / Department	Gasoline Use (L)	Diesel Use (L)	Total GHG (tCO_2 eq)
Public Works	25,642	27,244	135
Recreation	6,294	44	15
Water Utility	5,253	0	12
Other Tools[4]	114	3,189	9
Fire	0	2,662	7
Planning & Development	2,407	0	6
Recreation Other/Mowers/Trimmer	903	950	5
Administration	803	0	2
Cemetery	667	0	2
Total	**42,082**	**34,089**	**192**

3.5 STAFF BUSINESS TRAVEL

Similarly to the vehicle sector, the emissions for staff business travel were calculated based on the fuel use. This was determined through the employee expense forms, where staff are required to record the kilometers travelled for work purposes in personal vehicles. The kilometers were converted to fuel usage using the fuel efficiency for a light-duty gasoline vehicle. All staff-owned vehicles were assumed to be light-duty and fuelled by gasoline as this level of detail was not known. The gasoline usage and resulting emissions were organized by department, as seen in Table 10. The total gasoline used was 11,102 L, with the largest contribution coming from the

[4] The '*Other Tools'* category includes tools such as jugs, pressure washer, welder, plate tamper, lawnmowers, tractors, etc.

Public Works department. The total emissions resulting from staff business travel was 25.91 tCO_2 eq.

Table 10 - Summary of Fuel Use and Emissions from Staff Business Travel

Department	Gasoline Use (L)	Total GHG (tCO_2 eq)
Public Works	3,305.49	7.72
Region 6	2,012.94	4.70
Recreation	1,775.93	4.15
Councillors	1,254.92	2.93
Administration	931.20	2.17
Finance	747.13	1.74
Planning & Development	719.61	1.68
Summer Staff	354.82	0.83
Total	**11,102.00**	**25.91**

3.6 WATER & WASTEWATER TREATMENT

Similarly to the buildings sector, the emissions for water and wastewater facilities were based on the energy use. This information was obtained from energy provider invoices. The energy used to power the water and wastewater facilities were electricity, propane and an insignificant amount of diesel. This can be seen in Table 11, where the facilities are arranged by type: water treatment plant, wastewater treatment plant, and lift station. The three water treatment plants contributed 666 tCO_2 eq. The wastewater treatment plant at 48 Falmouth Connector made the largest individual contribution at 385 tCO_2 eq. The total emissions from all facilities was 1,772 tCO_2 eq.

Table 11 - Summary of Energy Use and Emissions from Water & Wastewater Treatment

Facility	Electricity Use (kWh)	Propane Use (L)	Diesel Use (L)	Total GHG (tCO_2 eq)
Water Treatment Plant				
786 Windsor Back Rd.	370,080			281
242 Eldridge Rd.	279,300			212
2160 Bishopville Rd.	187,440	18,955	324	173
Wastewater Treatment Plant				
48 Falmouth Connector	506,880			385

293 Wentworth Rd.	45,720		380	36
Lift Stations				
3 Lagoon Dr.	442,925			337
33 Colonial Dr.	123,700			94
Panuke Rd.	41,075			31
144 Water St.	34,375			26
124 Across Gabriel	25,200			19
99 Francis St.	22,460			17
905 Mountain Rd.	17,950			14
126 Halewood	17,575			13
708 Bowman Rd.	16,650			13
138 Payzant Dr.	15,550			12
1201 Hillcrest Dr.	14,250			11
422 Back Rd.	12,525			10
133 Dewolfe's Crossing	9,350			7
326 Ball Field	7,650			6
140 Meadow	6,850			5
33 Irven	6,800			5
Willow St.	6,270			5
531 College Rd.	5,975			5
Crossley Court	5,925			5
407 Windsor Back Rd.	5,375			4
2078 Highway 1 Falmouth	5,300			4
120 Green	5,200			4
115 Woodmans Corner	5,125			4
Tremain Crescent	5,075			4
22 Wilewood	4,515			3
19 Chittick Ave.	4,300			3
421 Windsor Back Rd.	3,750			3
96 Ivey Lane	3,591			3
152 Highway #1	3,550			3
Alexander Dr.	3,432			3
244 Wentworth Rd.	3,310			3
604 Green Lane	2,625			2
Prince St.	2,175			2
305 Town Rd.	1,980			2
126 Mapleton	1,925			1
Wentworth/Cole	1,758			1
Main St.	1,711			1
Palmeter Dr.	1,625			1
2 Main St.	314			0
20B Pleasant St.	217			0
Total	**2,289,328**	**18,955**	**876**	**1,772**

3.7 SOLID WASTE

Calculations for corporate waste emissions were based on the annual tonnage of waste. The amount of waste leaving all corporate-owned buildings was not available. Therefore, the quantity was estimated based on the garbage container capacity, frequency of pick up, and the typical filling rate at each site. For facilities that do not rent or own garbage containers, the estimate was based on the number of bags collected per pick up, the frequency of pick up, and the typical filling rate of each bag. The bag size and typical filling rate of each bag were assumed to be 90L (the average size of a large garbage bag) and 75%, respectively. This information was available for slightly over half of the corporate-owned buildings, leaving a large amount of uncertainty. The resulting emissions were 53 tCO_2 eq. and can be seen in Table 12. Compost tonnage information was unavailable as all organics are transported outside of the Municipality and building staff do not record tonnage.

Table 12 - Summary of Tonnage and Emissions for Corporate Waste

	Tonnage	**Emissions (tCO_2 eq)**
Solid Waste	38.35	53
Compost	Not Recorded	N/A

4.0 COMMUNITY INVENTORY

The following sub-sections summarize the results from the baseline Community Emissions Inventory for the West Hants Regional Municipality.

4.1 SUMMARY

The total reported community emissions for the 2016 calendar year was 286,480 tCO_2 eq. The total emissions by sector can be seen below in Figure 3. The residential sector makes up the largest majority of emissions, at 32%. The on-road transportation sector is a close second, at 30% of the total emissions. The emissions resulting from community waste only make up 1% of the emissions profile, making it nearly negligible.

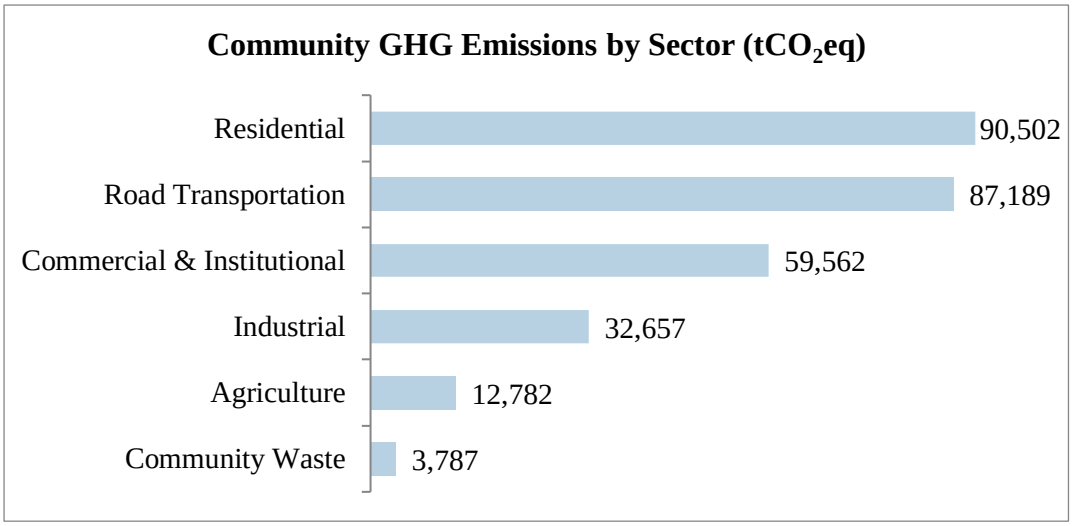

Figure 3 – Summary of Community GHG Emissions by Sector

The results from the inventory were further broken down by energy type. This can be seen in Figure 4. Electricity use in residential, commercial and industrial buildings resulted in the largest amount of emissions. It makes up 48% of the total emissions profile. Gasoline, light fuel oil and diesel also made significant contributions, making up 22%, 12% and 8% of the profile, respectively. The main uses of these three energy sources were for on-road transportation and building heating. Propane was the least-used type of fuel, with approximately negligible impacts on the overall greenhouse gas profile. It is also important to note that natural gas and district energy were excluded from the graph as they are not used in the region.

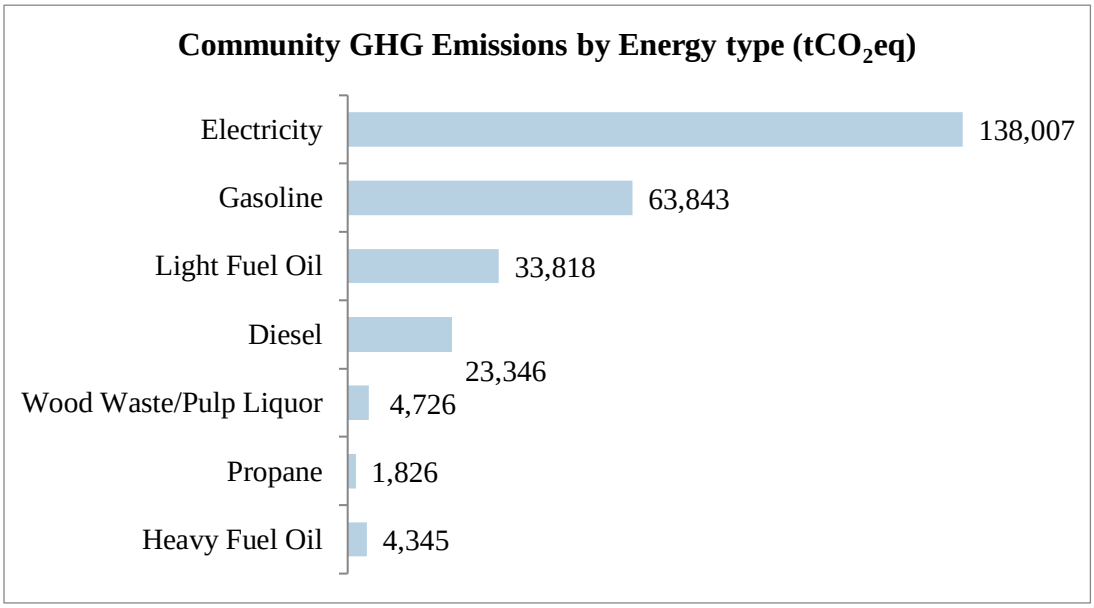

Figure 4 - Summary of Community GHG Emissions by Energy Type

4.2 RESIDENTIAL

In order to calculate the emissions, the energy use at all residential buildings within the West Hants Regional Municipality was required. This information was not available at the local level, so the Provincial energy use was scaled down using two methods. The first method used the number of private dwellings. The number of private dwellings occupied by usual residents in Nova Scotia and in West Hants Regional Municipality was obtained by Statistics Canada's local census data from 2016. In the second method, the Provincial energy use was scaled down by population. The population was also available from Statistics Canada. These values can be seen in Table 13. The ratios for both data sets are similar, with the Municipality's population making up 2.06% of the total Nova Scotia population and the number of private dwellings in the Municipality making up 1.99% of the total in Nova Scotia.

Table 13 - Population and Dwelling Statistics for the Residential Sector

Local Census Data (2016)	Nova Scotia	West Hants Regional Municipality	Ratio
Population	923,598	19,016	0.0206
Private dwellings occupied by usual residents	401,990	8,012	0.0199

The calculated energy use in West Hants Regional Municipality using the number of private dwellings was 839,089 GJ. This can be seen in Table 14. The energy use from each fuel type was multiplied by the appropriate emission factor in order to quantify the resulting emissions. The total emissions in the residential sector were 90,502 tCO_2 eq. Electricity usage made up 72.0% of the total emissions. The emissions calculated by scaling down energy use by population were slightly higher, at 93,491 tCO_2 eq. However, this result is not as accurate as the first method since it does not consider that many residents may not live alone.

Table 14 - Summary of Energy Use and Emissions from the Residential Sector

Fuel Type	Energy Use (GJ) – Nova Scotia	Energy Use (GJ) - WHRM	Total GHG (tCO_2 eq) - WHRM	Breakdown
Electricity	15,900,000	316,900	65,140.65	72.0%
Light Fuel Oil	13,900,000	281,025	20,192	22.3%
Wood Waste/Pulp Liquor	11,600,000	231,198	4,602	5.1%
Propane	500,000	9,965	569	0.6%
Natural Gas	200,000	0	0	0.0%
District Energy	0	0	0	0.0%
Total	**42,000,000**	**839,089**	**90,502**	**100.0%**

4.3 COMMERCIAL & INSTITUTIONAL

In order to calculate the emissions, the energy use at all commercial/institutional buildings within the West Hants Regional Municipality was required. This information was not available at the local level, so the Atlantic energy use was scaled down by the employment in the service sector. The employment in the service sector was obtained from Statistics Canada's 2016 census data. It was collected for each of the four provinces that make up the Atlantic Region and West Hants Regional Municipality, as seen in Table 15. The ratio for 'NS/Atlantic' shows that 41.19% of employment in the service sector in the Atlantic Region comes from Nova Scotia. This was used to calculate the total energy use in the Province. This was further scaled to reflect the energy use in West Hants Regional Municipality using the 'Regional/NS' ratio. However, this method of quantification does not provide an exact snapshot of the commercial and institutional emissions resulting within the Municipality as the employment data obtained from Statistics Canada does

not take into consideration that people employed within the Municipality may not be residents. Additionally, it does not take into consideration the percentage of each industry in the service sector or the local industry operations.

Table 15 - Employment Statistics for the Commercial/Institutional Sector

Local Census Data (2016)	Employment in Service Sector	Ratio Regional/NS	Ratio NS/Atlantic
Nova Scotia	374,715	0.0162	0.4119
New Brunswick	291,445		
Prince Edward Island	57,160		
Newfoundland and Labrador	186,495		
West Hants Regional Municipality	6,075		

The calculated energy use in the Municipality in 2016 was 396,625 GJ. The energy use from each fuel type was multiplied by the appropriate emission factor in order to quantify the resulting emissions. The resulting emissions were 59,562 tCO_2 eq. Similarly to the Residential sector, electricity made up the majority of the resulting emissions. It contributed 80.9% of the total emissions profile. Light fuel oil was the second largest source, making up 16.2%. District energy and wood waste/pulp liquor were not present in neither West Hants Regional Municipality, nor the Atlantic Region. Natural gas was utilized in Nova Scotia, however, not within the Municipality.

Table 16 - Summary of Energy Use and Emissions from the Commercial/Institutional Sector

Fuel Type	Energy Use (GJ) – Atlantic	Energy Use (GJ) – Nova Scotia	Energy Use (GJ) - WHRM	Total GHG (tCO_2 eq) - WHRM	Breakdown
Electricity	35,100,000	14,500,000	234,369	48,175.87	80.9%
Light Fuel Oil	11,900,000	4,900,000	133,544	9,621	16.2%
Propane	3,300,000	1,400,000	22,035	1,275	2.1%
Heavy Fuel Oil	1,000,000	400,000	6,677	508	0.9%
Natural Gas	8,100,000	3,300,000	0	0	0.0%
District Energy	0	0	0	0	0.0%
Wood Waste/ Pulp Liquor	0	0	0	0	0.0%
Total	**59,000,000**	**24,000,000**	**396,625**	**59,562**	**100.0%**

4.4 INDUSTRIAL

In order to calculate the emissions, the energy use at all industrial buildings within the West Hants Regional Municipality was required. This information was not available at the local level, so the Atlantic energy use was scaled down by the employment in the industry sector. The employment in the industry sector was obtained from Statistics Canada's 2016 census data. It was collected for each of the four provinces that make up the Atlantic Region and for West Hants Regional Municipality, as seen in Table 17. The ratio for 'NS/Atlantic' shows that 35.2% of employment in the industry sector in the Atlantic Region comes from Nova Scotia. This was used to calculate the total energy use in the Province. This was further scaled to reflect the energy use in West Hants Regional Municipality using the 'Regional/NS' ratio.

Table 17 - Employment Statistics for the Industry Sector

Local Census Data	Employment in Service Sector	Ratio Regional/NS	Ratio NS/Atlantic
Nova Scotia	87,730	0.0087	0.352
New Brunswick	79,680		
Prince Edward Island	19,220		
Newfoundland and Labrador	62,595		
West Hants Regional Municipality	2,175		

Using this method, the total energy used by the industry sector in the Municipality in 2016 was 337,308 GJ, as seen in Table 18. The energy use from each fuel type was multiplied by the appropriate emission factor in order to quantify the resulting emissions. The total greenhouse gas emissions were determined to be 32,657 tCO_2 eq. Similarly to the residential and commercial sectors, electricity-use contributes the majority of the resulting emissions, at 75.6%. Light fuel and heavy fuel oil make the next largest contributions, at 12.3% and 11.7%, respectively.

Table 18 -Summary of Energy Use and Emissions from the Industry Sector

Fuel Type	Energy Use (GJ) – Atlantic	Energy Use (GJ) – Nova Scotia	Energy Use (GJ) - WHRM	Total GHG (tCO_2 eq) - WHRM	Breakdown
Electricity	39,100,000	13,800,000	120,116	24,690.52	75.6%
Light Fuel Oil	18,100,000	6,400,000	55,604	4,005	12.3%
Heavy Fuel Oil	16,400,000	5,800,000	50,381	3,837	11.7%
Wood Waste/ Pulp Liquor	36,200,000	12,700,000	111,207	124	0.4%
Natural Gas	0	0	0	0	0.0%
District Energy	0	0	0	0	0.0%
Propane	0	0	0	0	0.0%
Total	**110,000,000**	**39,000,000**	**337,308**	**32,657**	**100.0%**

4.5 TRANSPORTATION

The quantification method used to determine the emissions resulting from on-road transportation relied on the total amount of fuel used in West Hants Regional Municipality. This information was not available at the local level. Therefore, the provincial fuel use was scaled down by the number of registered vehicles. The number of registered vehicles by fuel type was obtained from Access Nova Scotia, however, for Hants County. This data was scaled by population to obtain the registered vehicles in Nova Scotia and West Hants Regional Municipality, as seen in Table 19. As a result, it was determined that West Hants Regional Municipality makes up approximately 2.21% of the total registered vehicles in the Province. This information was used to determine the total amount of fuel used. The result was 35,867,450 L, with 76.3% of the fuel used being gasoline. The remainder of fuel used was diesel oil, as petroleum gas/propane was considered negligible. The total emissions resulting from the calculated fuel usage was 87,189 tCO_2 eq.

Table 19 - Summary of Fuel Use and Emissions from On-Road Transportation

Fuel	Registered Vehicles in NS	Registered Vehicles in WHRM	Provincial Total Fuel Used (L)	WHRM Fuel Used (L)	WHRM Energy (GJ)	Total GHG (tCO_2 eq) - WHRM
Gasoline	557,223	12,317	1,237405,000	27,351,917	914,922	63,843
Diesel oil	102,130	2,261	384,649,000	8,515,533	326,571	23,346
Liquefied petroleum gas	Vehicles powered by propane are considered negligible		4,705,000	-	-	-
Total	**659,353**	**14,578**	**1,626,759,000**	**35,867,450**	**1,241,492**	**87,189**

4.6 SOLID WASTE

The emissions resulting from community waste were quantified by direct calculations based on the quantity of waste. The annual tonnage of solid waste sent to the landfill was 2,748. The tonnage of composted materials was 727. These amounts were determined from the Waste Services Coordinator. In order to accurately convert the tonnage of solid waste to emissions, the waste stream composition was determined. While this information was not available for the 2016 waste stream, the compositions were determined from a 2017 Waste Audit by Divert NS. The compositions from the audit can be found in Table 20.P

The total emissions resulting from the solid waste sent to the landfill were 3,787 tCO_2 eq., as seen in Table 21. Because the landfill operates within the Municipality, these emissions represent the complete scope of the community waste emissions. The 125 tCO_2 eq. resulting from composted materials were estimated but not included in the inventory results, as the composting facility lies outside of the Municipality's geographic boundaries.

Table 20 - Summary of Waste Stream Composition

Waste Stream Composition	
Paper, Cardboard	22.0%
Food	16.0%
Textiles	13.8%
Diapers	3.3%
Wood	1.9%
Garden Waste	1.4%
Leather, rubber	0.4%

Table 21 - Summary of Community Waste Tonnage and Emissions

	Tonnage	**Emissions (tCO2 eq)**
Solid Waste	2,748	3,787
Compost	727	125

4.7 AGRICULTURE

The quantification of emissions from the agriculture sector includes only enteric fermentation and manure management. Emissions from agricultural soils, field burning of

agricultural waste, liming, urea application and other carbon containing fertilizers were not included in the calculations as the required information was not available. Enteric fermentation and manure management were both dependent on the headcount of cattle and swine in West Hants Regional Municipality. The headcounts were determined from Statistics Canada. Emission factors were obtained from *IPCC Volume 4 Chapter 10* in order to calculate the resulting emissions. The resulting emissions from enteric fermentation were 12,603 tCO_2 eq. The emissions were composed of only methane. The emissions from manure management, however, were composed of both methane and nitrous oxide. The total resulting emissions were 6,312 tCO_2 eq. These results can be found in Table 22.

Table 22 - Summary of Emissions from Enteric Fermentation and Manure Management

Emissions Source	**WHRM Headcount**	**Total CH4 (t)**	**Total N2O (t)**	**Total GHG (tCO_2 eq) - WHRM**
Enteric Fermentation				
Cattle	3,934	503.6	-	12,589
Swine	343	0.5	-	14
Manure Management				
Cattle	3,934	247.8	0.014	6,200
Swine	343	4.5	0.001	112

5.0 EMISSIONS FORECAST

In addition to the development of a Corporate and Community Inventory, a business-as-usual emissions forecast was developed in order to meet PCP Program requirements. The forecast was required to be 10 years from the baseline year, therefore 2030 was chosen. The forecast was based on the a series of assumptions (of which are the same assumptions proposed in WSP's *2019 Inventory Report* for West Hants). These assumptions were developed based on research conducted by WSP on provincial and national trends in greenhouse gas emissions. Some provincial trends explored include the following:

- Approximately 95% of residents have access to curbside garbage collection.
- With the increased use of heat pumps in homes there has been a 38% reduction of light fuel oil use from 2008-2016.
- The transition to LED street lighting (of which is now mandatory) will reduce energy consumption by 30%.
- With the completion of the Muskrat Falls hydro power project, it is estimated that 40% of electricity will be renewable energy.
- The production of electricity is expected to see a 55% reduction in greenhouse gas emissions.
- The number of registered vehicles in the province increased 15% between 2008 and 2018.

The assumptions developed by WSP are the following:

- An emission factor reduction of 44% for electricity consumption;
- A 10% reduction in energy consumption;
- A 28% reduction in fuel rate;
- An increase of electricity used in the residential sector for charging electric vehicles;
- An increase of registered vehicles by 15%; and
- That 10% of vehicles on the road will be electric vehicles.

The results of the forecast can be seen in Table 23, where corporate emissions can expect to see a reduction of 44%, and community emissions can expect to see a reduction of 41%. An important thing to note is that the reduction of these emissions is not entirely under the direct control of West Hants Regional Municipality. Instead, it largely depends on the ability of Nova Scotia's power grid to become decarbonized.

Table 23 - Summary of the 2030 GHG Emissions Forecast

CORPORATE INVENTORY			***COMMUNITY INVENTORY***		
Sector	**GHG Emissions 2018/2019 (tCO2 eq)**	**GHG Emissions 2030 (tCO2 eq)**	**Sector**	**GHG Emissions 2016 (tCO2 eq)**	**GHG Emissions 2030 (tCO2 eq)**
Buildings	1,386	823	*Residential*	90,502	60,357
Lighting	100	51	*Commercial/ Institutional*	59,562	35,840
Vehicle Fleet	192	139	*Industrial*	32,657	12,701
Water & Wastewater Treatment	1,772	886	*Road Transportation*	87,189	43,700
Solid Waste	53	53	*Solid Waste*	3,787	3,787
Staff Business Travel	26	19	*Agriculture*	12,782	12,782
Total	**3,530**	**1,970**	***Total***	**286,480**	**169,168**
Reduction		*-44%*	*Reduction*		*-41%*

6.0 CONCLUSION

In conclusion, the main requirements of Milestone 1 of the PCP Program were successfully achieved with the development of a baseline Corporate and Community Emissions Inventory for the West Hants Regional Municipality. The baseline Corporate Inventory covered the 2018/2019 fiscal year, whereas the Community Inventory covered the 2016 calendar year. The emissions resulting from municipal operations and services, as highlighted in the Corporate Inventory, were 3,530 tCO_2 eq. Approximately 90% of emissions come from buildings and water and wastewater treatment facilities. The emissions resulting within the Municipality's geographical boundaries, as highlighted in the Community Inventory, were 286, 480 tCO_2 eq. The majority of emissions come from residential energy use and the combustion of fuels used for on-road transportation. By 2030, it is expected that the Corporate and Community emissions will see a reduction of 44% and 41%, respectively. This reduction of emissions is subject to change with the decision of West Hants Regional Municipality to develop and implement action items to help mitigate the effects of climate change.

7.0 REFERENCES

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APPENDIX A – EMISSION FACTORS AND COEFFICIENTS

CORPORATE EMISSIONS INVENTORY 2018/2019		
Activity Sector	**Energy Source**	**Emission Factor**
Buildings	Electricity	0.760 kg eCO_2/kWh
	Furnace Oil	2,762.90 g eCO_2/L
	Diesel	2,762.90 g eCO_2/L
	Gasoline	2,315.50 g eCO_2/L
Street Lighting	Electricity	0.760 kg eCO_2/kWh
Vehicle Fleet	Diesel	2,334.10 g eCO_2/L
	Gasoline	2,741.6 g eCO_2/L
Water & Wastewater Treatment	Electricity	0.760 kg eCO_2/kWh
	Diesel	2,762.90 g eCO_2/L
	Propane	1,547.80 g eCO_2/L
Staff Business Travel	Gasoline	2,741.6 g eCO_2/L

COMMUNITY EMISSIONS INVENTORY 2016		
Activity Sector	**Energy Source**	**Emission Factor**
Residential	Electricity	0.760 kg eCO_2/kWh
	Light Fuel Oil	2.755 kg eCO_2/L
	Wood	19,903,333 kg eCO_2/PJ
	Propane	1.548 kg eCO_2/L
Commercial/Institutional	Electricity	0.760 kg eCO_2/kWh
	Light Fuel Oil	2.763 kg eCO_2/L
	Heavy Fuel Oil	3.176 kg eCO_2/L
	Propane	1,547.80 g eCO_2/L
Industrial	Electricity	0.760 kg eCO_2/kWh
	Light Fuel Oil	2.762 kg eCO_2/L
	Heavy Fuel Oil	3.178 kg eCO_2/L
	Wood Waste/Pulp Liquor	1,118,333 kg eCO_2/PJ
Road Transportation	Diesel	2,334.10 g eCO_2/L
	Gasoline	2,741.6 g eCO_2/L
Agriculture	Cattle (Enteric Fermentation)	128 kg CH_4/head
	Swine (Enteric Fermentation)	1.6 kg CH_4/head
	Cattle (Manure Management)	63 kg CH_4/head
		0.005 kg N_2O/head
	Swine (Manure Management)	13 kg CH_4/head
		0.005 kg N_2O/head