City of Brantford

2021 and 2022 Corporate and Community Greenhouse Gas Emissions Inventory

Brantford.ca/ClimateAction

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1 PURPOSE

The purpose of this document is to provide an overview of:

- Energy consumption in Brantford (a high-level inventory of energy use) from 2018 to 2022;
- Associated greenhouse gas emissions (GHG);
- Progress towards meeting GHG emission reduction targets; and
- Further actions needed to meet GHG emission reduction targets.

In December 2019, the following was approved by Brantford City Council with respect to climate change:

That the City of Brantford declares that a climate emergency threatens our city, province, nation, civilization, humanity, and the natural world and that the City of Brantford further declares its commitment, in principle, to becoming net carbon neutral by 2050.

This document is a measurement tool to highlight Brantford’s progress towards meeting its GHG emissions reduction targets, along with other sustainability targets and directives.

Energy efficiency and conservation provides important opportunities to reduce costs and GHG emissions. Most of the money spent on energy leaves Brantford, but money spent on energy efficiency and conservation stays in the community. It supports local businesses offering these products and services, while the resulting money saved from energy efficiency and conservation can be used for more productively.

Many people benefit from the use of energy efficiency, renewable energy, and energy conservation products and services:

- Households can help the environment and typically save more money in the long run.
- Business owners and managers can reduce operating costs, become role models for corporate social responsibility, and position themselves with a competitive advantage.
- Students and teachers can benefit from learning about our current, unsustainable demand for energy and how energy conservation, energy efficiency, and renewable energy technologies can help our environment and replace fossil fuels that are being depleted.
- Using energy more efficiently and by using renewable energy can create healthier environments that are easier to live, work, and play in.

Many of Brantford’s inventory reports have a similar look and feel by design. The data may change annually, but the rationale and dialogue remain similar. Inventory reports are updated every two years to report on progress and future plans to meet targets.

2 BACKGROUND

The City of Brantford's 2021 and 2022 corporate and community greenhouse gas (GHG) emissions inventory presents the quantity and sources of Brantford's emissions over the two years. It allows the City to track its progress towards meeting its GHG emissions reduction targets. It also helps to inform City-led climate programs and initiatives, as well as provides benchmarks against which success of these activities can be measured.

Baseline emissions were measured in 2018 to understand the City of Brantford's current state of GHG emissions from both the Corporation and the community. Emissions data is now collected annually and consolidated into a report every second year for comparison and analysis against the baseline data.

The City relies on Environment Canada's National Inventory Report (NIR) as a primary source of its emission factors which are used for calculating GHG emissions (Appendix A: Methodology). Environment Canada releases the NIR two years after a given calendar year (i.e. the 2021 emission factors were released in 2023). The City updates its previously reported annual emission estimates by compiling its latest inventory using revised emission factors, including those from previous inventory years.

The City, just like all other municipal governments, does not have full control over all GHG emissions generated within Brantford's territorial boundary. However, the City can influence community-wide emissions through the prioritization of strategies that are actionable at a municipal level.

Brantford's Corporate Climate Change Action Plan (CCAP) was approved by Council in November 2020 and the Community CCAP was approved by Council in July 2022. Both the Corporate and Community CCAPs contain a list of emission reduction tools and strategies to meet targets. The Plans outline the necessity to provide up-to-date information on Brantford's progress towards its GHG emission reduction targets. As shown in Table 1, emission reduction targets are 30% reduction by 2030, 80% reduction by 2040, and net-zero carbon emissions by 2050. These values indicate a percentage reduction from the 2018 baseline emission levels.

Table 1: Council-adopted GHG emissions targets and 2022 status

Year	GHG reduction target from 2018 baseline	GHG emissions target (T of CO_2e)	Progress as of 2022
Corporate			
2022	10%	13,937	The City did not meet its annual GHG reduction target. In 2022, Brantford's Corporate emissions were 15,158 tonnes, which is 2% lower than in 2018.
2030	30%	10,840	Brantford must reduce annual emissions by about 4,500 tonnes within eight years to meet the 2030 target. Brantford must rapidly increase its current annual emissions reduction rate.
2040	40%	3,097	Over 12,000 tonnes must be eliminated to meet the 2040 target.
2050	Net-zero	Net-zero	Over 15,000 tonnes must be eliminated to meet the 2050 target.
Community			
2022	10%	709,145	The City did not meet its annual GHG reduction target. In 2022, Brantford's community emissions were 771,393 tonnes, which is 2% lower than in 2018.
2030	30%	551,557	Brantford must reduce annual emissions by about 230,000 tonnes to meet the 2030 target. Brantford must rapidly increase its current annual emission reduction rate.
2040	40%	157,588	Over 600,000 tonnes must be eliminated to meet the 2040 target.
2050	Net-zero	Net-zero	Over 700,000 tonnes must be eliminated to meet the 2050 target.

There are many factors that influence how much energy a city uses to function and thrive:

Land use and urban development – Planning City growth sets the framework for how much energy is needed for a city to function. As a city grows, more energy is needed for that city to function. Mixed density balances the energy-efficiency of higher-density and social demand for living space. Mixed land use reduces the distance people and goods need to travel.

Urban design – Urban design can either negate or enhance the energy efficiency benefits of good functional planning (mixed land use and mixed density). This includes design factors such as connectivity between city blocks, streetscape design, and street orientation.

Transportation – Transportation planning accounts for the movement of people and goods, ideally minimizing the interactions between the two. However, a city's transportation network must often serve both needs at the same time. An energy-efficient transportation system is one that provides several competitive choices for the movement of people and goods.

Buildings – The design, construction, and maintenance of all building types (homes, office buildings, industrial buildings) has a significant impact on the energy consumed by that building. New buildings can be designed that approach net-zero energy use, but most of Brantford's buildings are old, with inefficient designs that often have unseen problems with their insulation and draft-proofing. Building type can also affect energy use and associated emissions.

Personal choice and actions – Design and technology has its limits. For example, a programmable thermostat has no energy conservation benefit if its user does not program it. Social norms are a powerful influence on people's behavior.

Local economy – The nature of the economic base will influence how much energy it will use. For some businesses, energy use is a minor cost. For others, energy bills can make the difference between profit and loss. For many local employers, there are opportunities for energy conservation, energy efficiency, and renewable energy generation ready to be developed.

Leadership – The words spoken, commitments made, and actions taken by leaders in the local business, institutional, government, and non-governmental sectors can make a difference with respect to energy conservation, sustainable energy, reducing the use of fossil fuels, reducing GHG emissions, and adapting to climate change.

Seasonal weather variations can affect energy use and associated emissions. Brantford's climate results in energy use and emissions primarily coming from heating demand during cold weather months. On average, the heating season starts in late September and ends in early May. With climate change's impact on steadily rising temperatures across all seasons, the energy demand for heating is expected to decrease.

The energy demand for space cooling (i.e. air conditioning) in Brantford is relatively small compared to space heating. However, on a hot summer day, a typical household's electricity demand will be three times greater than a cool summer day. This short term peak demand places strain on Ontario's electricity generation and supply system. With climate change's impact on higher summer temperatures, the energy demand for all air conditioning is expected to increase.

3 CITY OF BRANTFORD CORPORATE EMISSIONS

Corporate greenhouse gas emissions include all municipally-owned and operated assets. The majority of these assets are geographically located within the boundaries of the City of Brantford but also include five areas within the neighbouring County of Brant. These areas include four residential housing complexes and the municipal airport buildings. The areas outside of the City boundaries were included in the corporate emissions inventory to understand the full impact of the Corporation's carbon footprint.

The emissions data calculated within the corporate inventory are a subsection of the community inventory and were not subtracted from the community inventory totals in Section 4. Emissions produced by the Corporation of the City of Brantford accounts for approximately 2% of the emissions in the community inventory.

Section 3 of this document provides details of Brantford's corporate-wide sector-based emissions for the 2021 and 2022 calendar years.

3.1 KEY DRIVERS OF GHG EMISSIONS

The key drivers of GHG emissions for the City of Brantford are outlined in Figure 1.

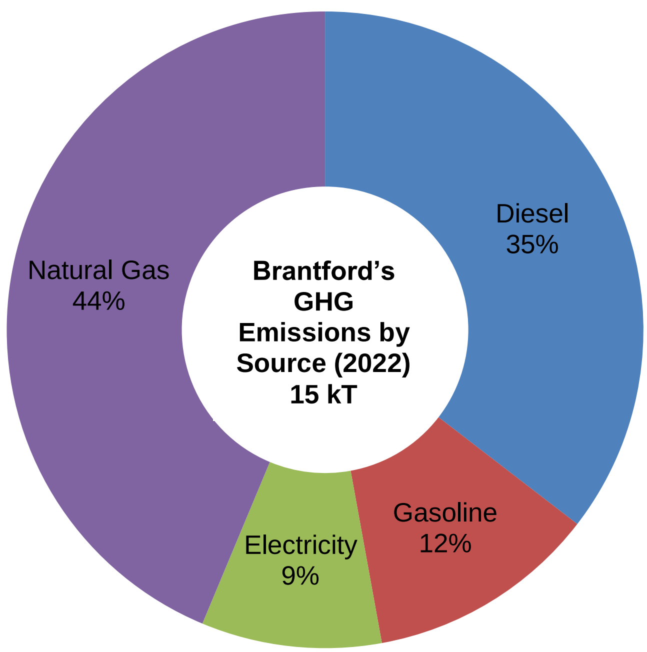

Figure 1: Key drivers of corporate-wide GHG emissions (2022) expressed in kilotonnes (kT) and percent of total emissions.

Natural gas consumption to heat buildings continued to be the largest source of corporate-wide GHG emissions in 2022 at approximately 6.6 kT, accounting for about 44% of all emissions. Most of the natural gas is used for space and water heating. Compared to the 2018 baseline, emissions from natural gas have decreased by about 9% due to warmer winter and autumn weather that reduced the demand for space heating (Appendix B: Brantford Climate Profile).

Diesel used for transit buses and City operation and maintenance vehicles accounted for approximately 35% of corporate-wide emissions in Brantford. It is the second largest emissions source at about 5.4 kT.

Gasoline used for para-transit buses and City operations and maintenance vehicles and equipment accounted for approximately 12% of corporate-wide emissions at about 1.8 kT. Compared to the baseline year of 2018, emissions from gasoline have decreased by 9% due to the growing transition of City fleet vehicles to electric.

Electricity emissions were measured at approximately 1.4 kT, which accounts for 9% of corporate-wide emissions. Compared to 2018, electricity emissions have decreased by 10% due to an overall decrease in electricity consumption from switching to higher energy efficiency equipment, LED lighting, etc. in buildings and streetlights.

3.2 DETAILS ON GHG EMISSIONS BY SECTOR

The tables below provide an overview of all the data collected for 2021 and 2022.

Table 2: Results of the 2021 Corporate GHG Emissions Inventory

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Buildings	23,195,672	693	2,985,230	5,769	6,462
Streetlights/ Traffic signals	5,787,156	174	-	-	174
Water/Wastewater	17,327,167	520	515,984	997	1,517
	Gas (L)	Gas Emiss. (T CO_2e)	Diesel (L)	Diesel Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Fleet	710,710	1,646	1,915,581	4,839	6,485
Total Corporate Greenhouse Gas Emissions					**14,637**

Table 3: Results of the 2022 Corporate GHG Emissions Inventory

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Buildings	23,703,475	711	2,973,547	5,746	6,457
Streetlights/ Traffic signals	4,676,222	140	-	-	140
Water/Wastewater	17,865,402	536	454,782	879	1,415
	Gas (L)	Gas Emiss. (T CO_2e)	Diesel (L)	Diesel Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Fleet	766,019	1,774	1,997,457	5,372	7,146
Total Corporate Greenhouse Gas Emissions					**15,158**

Table 4: Corporate emissions summary from the baseline

	Tonnes of CO_2e		
	2018	2021	2022
Buildings	7,192	6,462	6,457
Streetlights/Traffic signals	235	174	140
Water/Wastewater	1,436	1,517	1,415
Fleet	6,622	6,485	7,146
Total	**15,485**	**14,637**	**15,158**
Change from Baseline		**- 5%**	**- 2%**

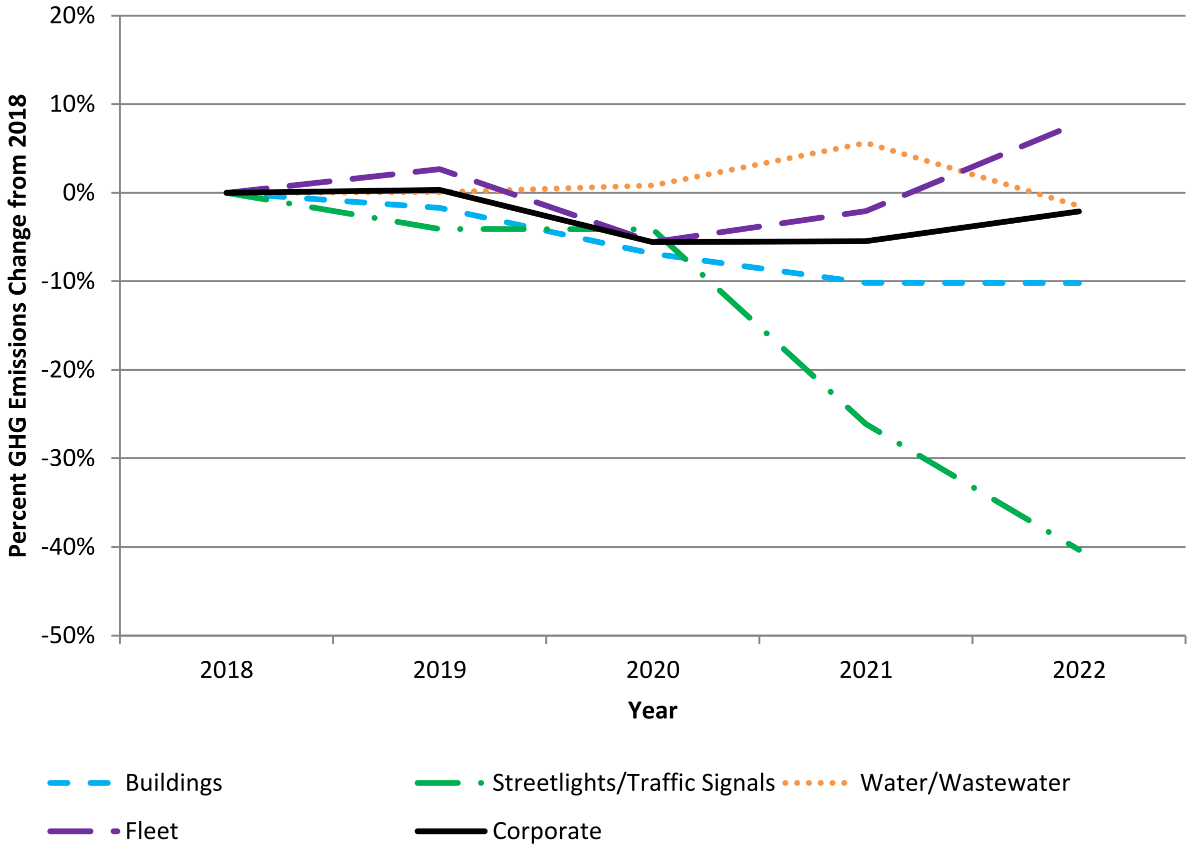

Figure 2: Annual percent change in emissions by sector relative to the 2018 baseline

3.2.1 BUILDINGS

The City of Brantford owns and manages over 100 stationary assets which are mostly single buildings, but also includes groups of buildings (i.e. row of townhouses, multi-unit residential) and other infrastructure (i.e. garages, cemeteries, greenhouses). This number excludes any stationary assets that are related to water and wastewater treatment, which are reflected in Section 3.2.3. This number also excludes assets that are owned by the municipality, but where the utility bills are fully paid by the tenant.

In total, the GHG emissions produced from all buildings owned and managed by the Corporation of the City of Brantford was 6,642 T of CO_2e in 2021 and 6,457 T of CO_2e in 2022, compared to 7,192 T of CO_2e in 2018. This is a decrease by 10% for 2021 and 2022, respectively. The decrease in building emissions is due to energy efficiency upgrades including installation of LED lights.

Buildings account for 44% (2021) and 43% (2022) of the total emissions from the Corporation. The emissions from corporate buildings are 89% due to natural gas consumption and 11% due to electricity consumption. The primary use of natural gas in these buildings is for space and water heating.

The following tables and figures provide a breakdown of the energy usage and emissions from buildings.

Table 5: 2021 Corporate GHG emissions from buildings by type

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Housing & Homelessness Services	7,793,492	234	1,106,029	2,137	2,371
Emergency Services	1,436,133	40	169,667	328	368
Community Centres & Arenas	8,681,492	260	1,028,411	1,987	2,248
Cultural & Tourism Facilities	1,537,074	46	99,884	193	239
Administration & Office	1,719,960	52	286,516	554	605
City Operations & Maintenance	1,654,780	50	268,896	520	569
Other	372,741	11	25,827	50	61
Total Buildings	**23,195,672**	**693**	**2,985,230**	**5,769**	**6,462**

Table 6: 2022 Corporate GHG emissions from buildings by type

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Housing & Homelessness Services	7,539,147	226	1,153,465	2,229	2,455
Emergency Services	1,423,999	43	189,972	367	410
Community Centres & Arenas	9,415,117	282	938,682	1,814	2,096
Cultural & Tourism Facilities	1,647,082	49	105,460	204	253
Administration & Office	1,715,131	51	288,554	558	609
City Operations & Maintenance	1,617,421	49	271,589	525	573
Other	345,578	10	25,825	50	60
Total Buildings	**23,703,475**	**711**	**2,973,547**	**5,746**	**6,457**

Table 7: Corporate GHG emissions from buildings summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Housing & Homelessness Services	2,609	2,371	2,455
Emergency Services	417	368	410
Community Centre & Arenas	2,719	2,248	2,096
Cultural & Tourism Facilities	246	239	253
Administration & Office	468	605	609
City Operations & Maintenance	670	569	573
Other	63	61	60
Total	**7,192**	**6,462**	**6,457**
Change from Baseline		**- 10%**	**- 10%**

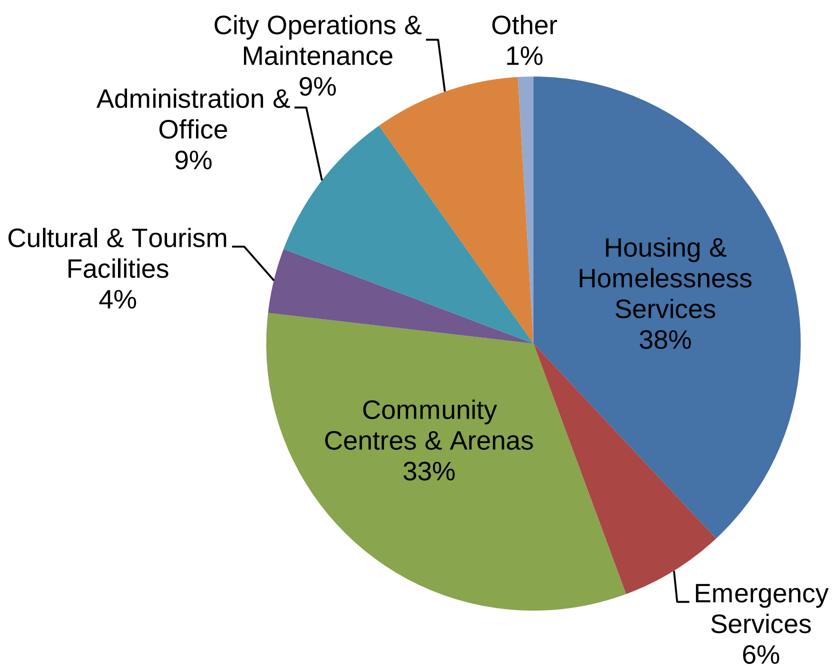

Figure 3: Corporate building GHG emissions by type in 2022

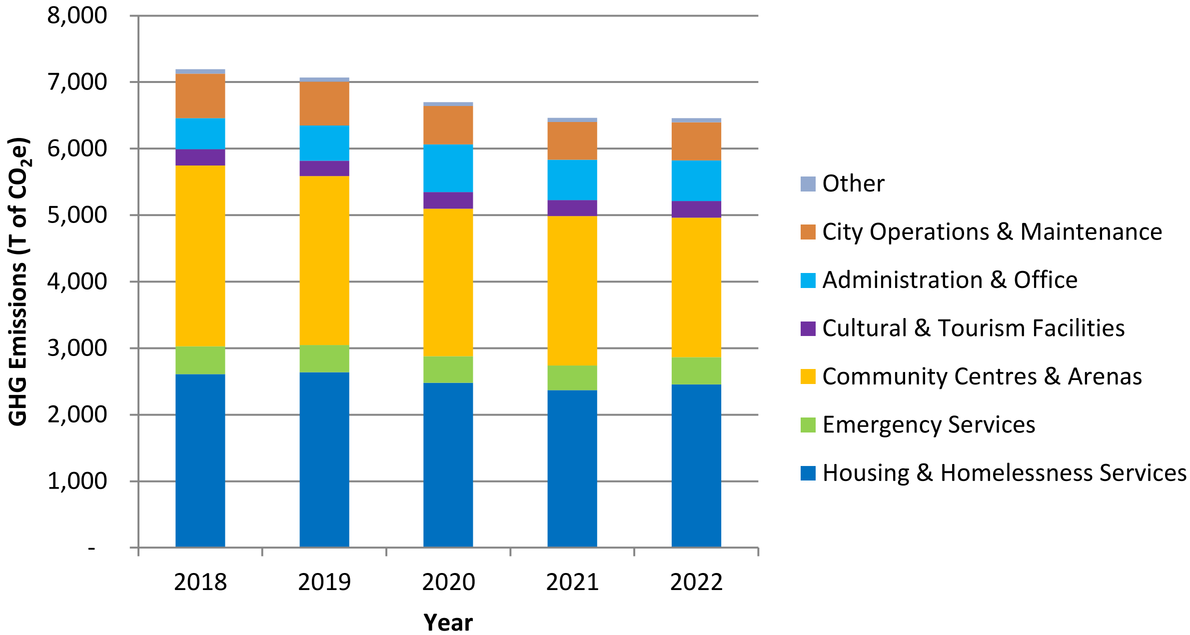

Figure 4: Corporate building emissions by type by year

3.2.2 FLEET

The City's corporate fleet is made up of several distinct components including Brantford Transit, Brantford Lift (para-transit), emergency services (ambulance, police, fire), and operational vehicles and equipment used across various departments. The City of Brantford owns and manages approximately 372 fleet assets which include heavy duty equipment (construction equipment, fire trucks, and buses), small equipment (lawnmowers), and vehicles such as trucks, SUVs, and cars. This number excludes handheld equipment such as chainsaws and leaf blowers, etc. that use a mixture of gasoline and oil as fuel.

In total, the emissions produced from the fleet owned and managed by the Corporation of the City of Brantford was 6,485 T of CO_2e in 2021 and 7,146 T of CO_2e in 2022 compared to 6,622 T of CO_2e in 2018. There was a decrease in fleet emissions by 2% in 2021, but an 8% increase in emissions in 2022 compared to the 2018 baseline. The decrease in 2021 was likely due to reduced operations during the COVID-19 pandemic. As restrictions lifted in 2022, operations returned to normal and emissions increased. Additionally, Fleet operations have expanded annually to ensure proper operations and maintenance of the City as it grows.

Fleet and transit account for approximately 44% (2021) and 47% (2022) of total emissions from the Corporation. Of these total emissions, approximately 75% of emissions are generated by diesel consumption while 25% are generated from gasoline consumption. During this period, the City owned nine electric vehicles, but the electricity used to charge these vehicles was captured in the building electricity consumption data.

The following tables and figures provide a breakdown of the emissions from the corporate fleet.

Table 8: 2021 Corporate GHG emissions from fleet by service type

	Gas Usage (L)	Gas Emissions (T CO_2e)	Diesel Usage (L)	Diesel Emissions (T CO_2e)	Total Emissions (T CO_2e)
Transit & Lift	77,770	180	1,060,992	2,854	3,034
Ambulance and Police Services	347,716	805	11,390	31	836
Fire Services	16,935	39	48,211	130	169
Environmental Services	42,941	99	648,832	1,160	1,259
Operational Services	130,557	302	121,254	455	757
Parks & Recreation	81,831	189	17,861	192	382
Remainder of Fleet	12,960	30	7,041	19	49
Total Fleet	**710,710**	**1,646**	**1,915,581**	**4,839**	**6,485**

Table 9: 2022 Corporate GHG emissions from fleet by service type

	Gas Usage (L)	Gas Emissions (T CO_2e)	Diesel Usage (L)	Diesel Emissions (T CO_2e)	Total Emissions (T CO_2e)
Transit & Lift	103,048	239	1,003,903	2,700	2,939
Ambulance and Police Services	355,927	824	21,344	57	882
Fire Services	18,962	44	57,412	154	198
Environmental Services	48,308	112	650,000	1,748	1,860
Operational Services	128,003	296	193,575	521	817
Parks & Recreation	84,015	195	61,981	167	361
Remainder of Fleet	27,757	64	9,243	25	89
Total Fleet	**766,019**	**1,774**	**1,997,457**	**5,372**	**7,146**

Table 10: Corporate fleet emissions summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Transit & Lift	3,358	3,034	2,939
Ambulance and Police Services	824	836	882
Fire Services	207	169	198
Environmental Services	975	1,259	1,860
Operational Services	825	757	817
Parks & Recreation	330	382	361
Remainder of Fleet	103	49	89
Total	**6,622**	**6,485**	**7,146**
Change from Baseline		**- 2%**	**+ 8%**

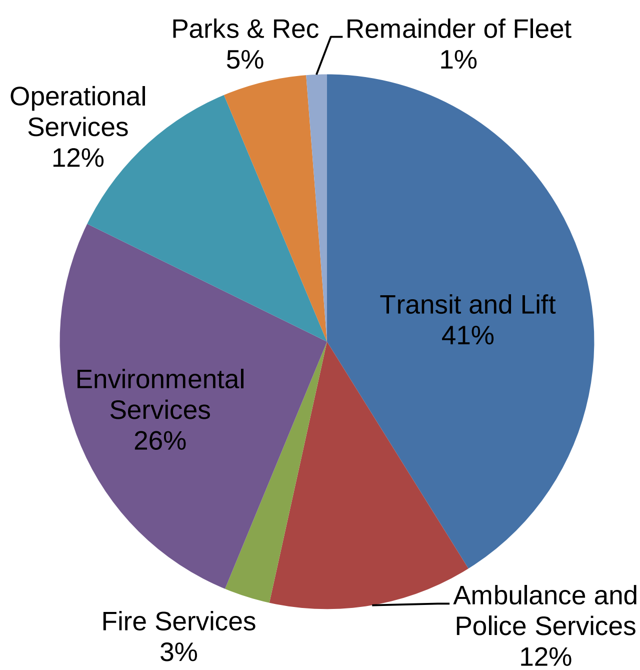

Figure 5: Breakdown of Corporate fleet emissions by service type in 2022

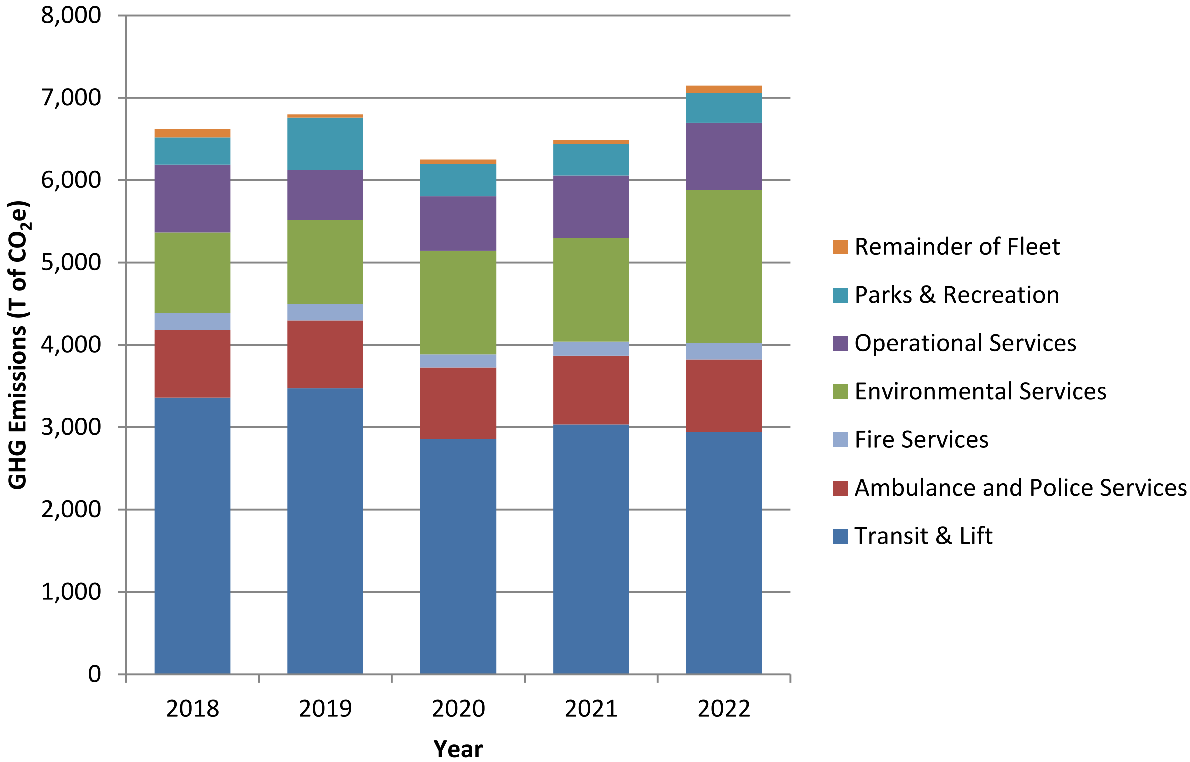

Figure 6: Corporate fleet emissions by service type by year

3.2.3 WATER AND WASTEWATER

The water and wastewater component of the corporate inventory is separated from other stationary energy uses because it focuses on a specific service that the municipality delivers that is a notably higher energy user.

The water component of this sector includes the treatment and distribution of municipal drinking water throughout the City. Drinking water is sourced from the Grand River, treated to ensure it is clean, and then pumped to homes and businesses across the City.

The wastewater component is for pumping wastewater (sewage, greywater, etc.) from homes and businesses to the wastewater treatment plant. Wastewater is treated, the water and sludge are separated, and the water is treated and returned to the river while the sludge is disposed of by a third party.

The data gathered in this section includes any building or other infrastructure associated with that service such as office space, treatment plant, and pumping stations.

The water and wastewater emissions make up 9-10% of the total emissions from the Corporation. Total emissions for this sector were 1,517 T of CO_2e in 2021 and 1,415 T of CO_2e in 2022. Emissions from this sector are largely dependent on the amount of water homes and businesses are using and wasting.

The following tables and figures provide a breakdown of the energy usage and emissions from water and wastewater facilities.

Table 11: 2021 Corporate GHG emissions for water and wastewater

	Electricity (kWh)	Elec Emissions (T CO_2e)	Natural Gas (m^3)	NG Emissions (T CO_2e)	Total Emissions (T CO_2e)
Water	9,987,266	300	263,435	509	809
Wastewater	7,339,901	220	252,549	488	708
Total	17,327,167	520	515,984	997	**1,517**

Table 12: 2022 Corporate GHG emissions for water and wastewater

	Electricity (kWh)	Elec Emissions (T CO_2e)	Natural Gas (m^3)	NG Emissions (T CO_2e)	Total Emissions (T CO_2e)
Water	10,068,968	302	238,914	462	764
Wastewater	7,796,434	234	215,868	417	651
Total	17,865,402	536	454,782	879	**1,415**

Table 13: Corporate water and wastewater emissions summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Water	745	809	764
Wastewater	691	708	651
Total	**1,436**	**1,517**	**1,415**
Change from Baseline		**+ 6%**	**- 1%**

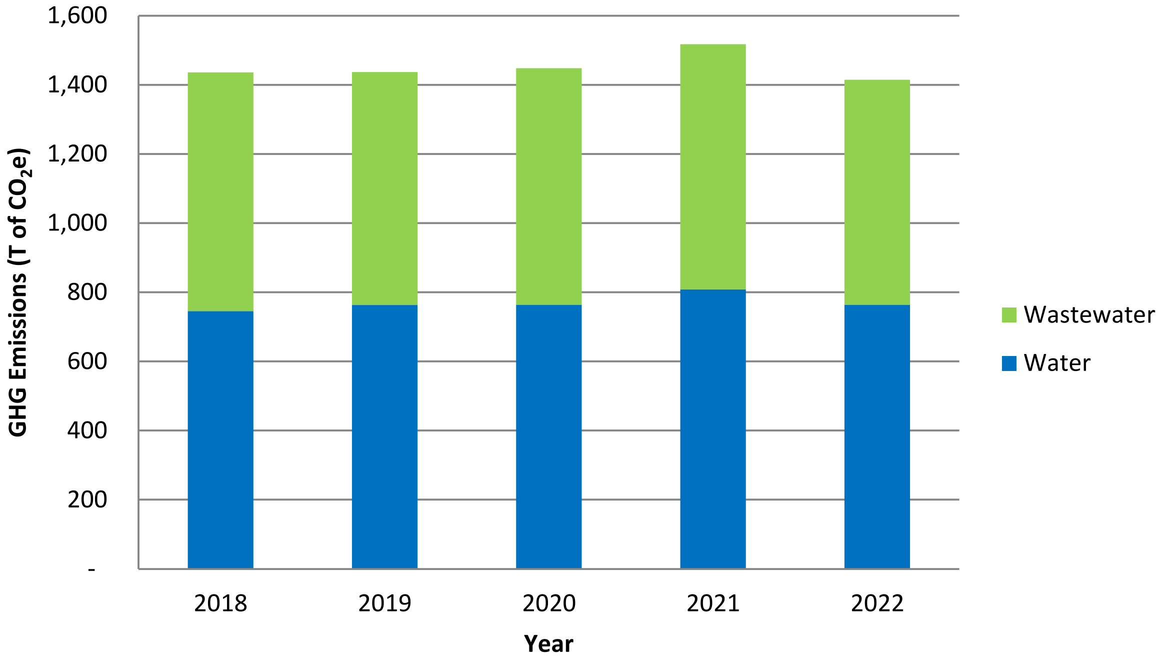

Figure 7: Corporate water and wastewater emissions by year

3.2.4 STREETLIGHTS AND TRAFFIC SIGNALS

Streetlights and traffic signals' energy use has been totaled city-wide. These are exclusively operated with electricity and do not contribute high emissions to the total corporate inventory.

The streetlight and traffic signal emissions make up 1% of the total emissions from the Corporation. Total emissions for this sector were 174 T of CO_2e in 2021 and 140 T of CO_2e in 2022, compared to 235 T of CO_2e in 2018. This is a decrease of 26% in 2021 and a decrease of 40% in 2022 compared to 2018. The decrease in streetlights and traffic signals emissions is due to the retrofitting of streetlights to LEDs.

The following tables and figures provide a breakdown of the energy usage and emissions from streetlights and traffic signals.

Table 14: 2021 Corporate GHG emissions for streetlights and traffic signals

	Electricity (kWh)	Electricity Emissions (T CO_2e)
Streetlights	5,543,724	166
Traffic Signals	243,432	7
Total	5,787,156	**174**

Table 15: 2022 Corporate GHG emissions for streetlights and traffic signals

	Electricity (kWh)	Electricity Emissions (T CO_2e)
Streetlights	4,432,790	133
Traffic Signals	243,432	7
Total	4,676,222	**140**

Table 16: Corporate streetlights and traffic signals emissions summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Streetlights	228	166	133
Traffic Signals	7	7	7
Total	**235**	**174**	**140**
Change from Baseline		**- 26%**	**- 40%**

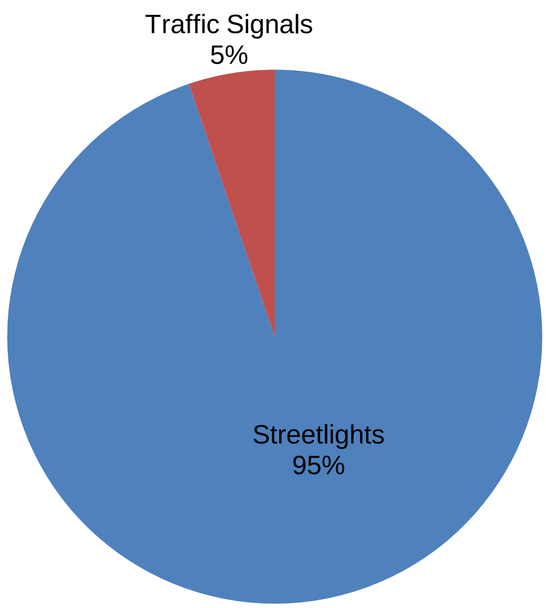

Figure 8: Breakdown of streetlights and traffic signals GHG emissions in 2022

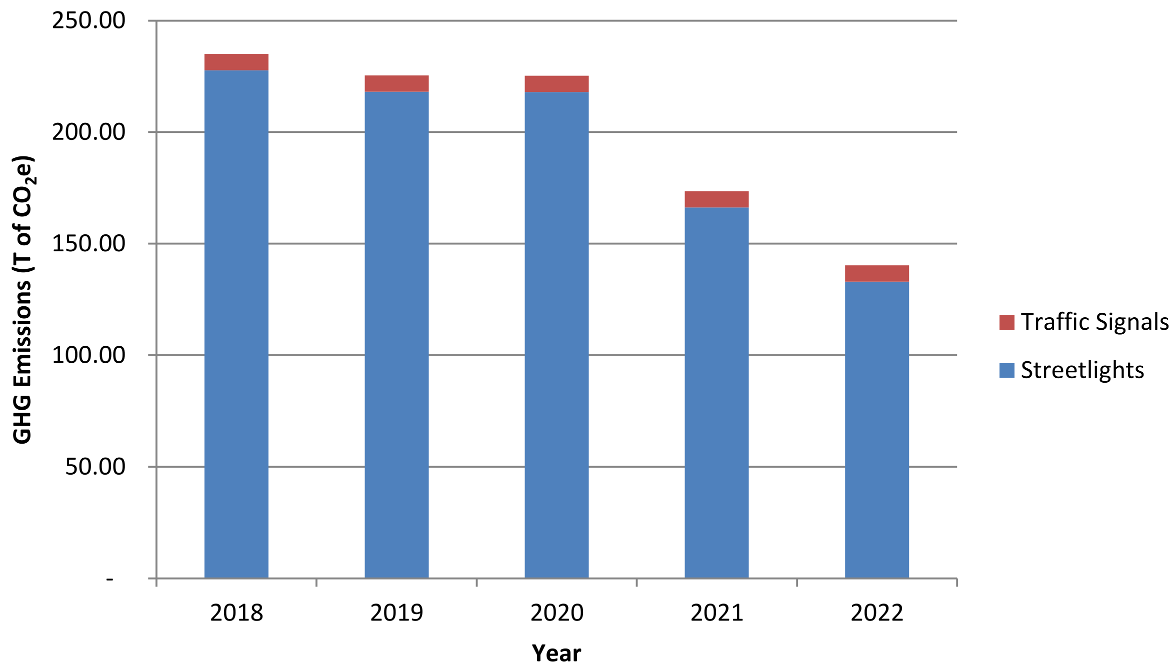

Figure 9: Streetlights and traffic signals emissions by year

4 CITY OF BRANTFORD COMMUNITY EMISSIONS

The City's sector-based community GHG emissions inventory includes community-wide emissions that can currently be estimated or measured by the City, including corporate emissions from local government operations. The community inventory gathers data on most sources of energy used inside the geographical boundaries of the City of Brantford. This section contains aggregated consumption data from the major energy suppliers in the City (i.e. GrandBridge Energy, Enbridge Gas, and fuel providers).

Section 4 of this document provides details of Brantford's community-wide sector-based emissions for the 2021 and 2022 calendar years.

4.1 KEY DRIVERS OF GHG EMISSIONS

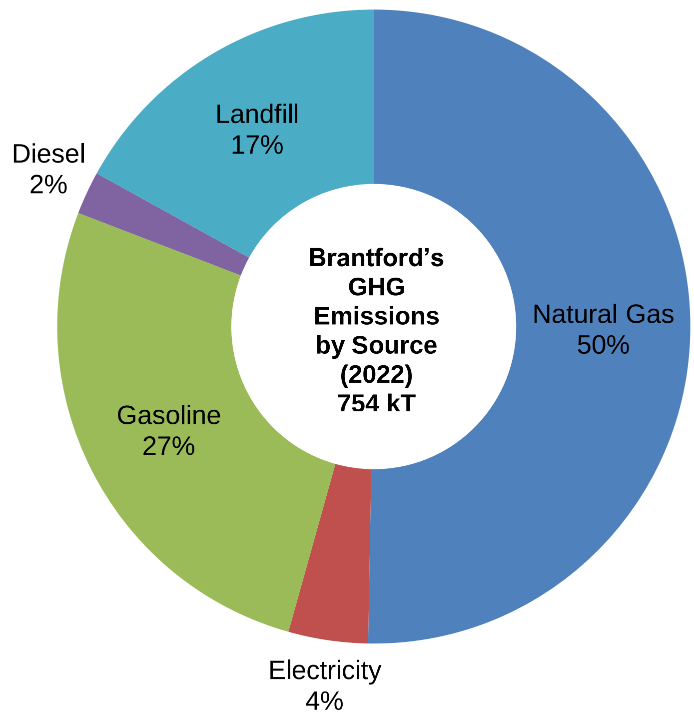

Figure 10: Key drivers of community-wide GHG emissions (2022) expressed in kilotonnes (kT) and percent of total emissions.

Natural gas consumption to heat buildings continued to be the largest source of community-wide GHG emissions in 2022 at approximately 380 kT, accounting for about 50% of all emissions. Most of the natural gas is used for space and water heating. Compared to the 2018 baseline, emissions from natural gas have decreased by about 3% due to warmer winter and autumn weather that reduced the demand for space heating (Appendix B: Brantford Climate Profile).

Gasoline used for passenger cars and trucks accounted for approximately 27% of community-wide emissions in Brantford. It is the second largest emissions source at about 200 kT.

Emissions from methane produced from waste at the landfill were 126 kT in 2022, making up about 17% of total emissions. Most methane emissions not associated with natural gas consumption originate from the City-managed landfill where methane gas is released directly into the atmosphere as fugitive emissions. Brantford's landfill has continuous active gas collection and flaring of methane which significantly reduces the methane emissions released into the atmosphere. Emissions from the landfill have decreased by 13% in 2022 compared to 2018.

Emissions from electricity were measured at approximately 31 kT, an increase of 6% compared with 2018. It should be noted that this increase is due to increased residential customers and a major shift to work/learn-from-home setups resulting from the COVID-19 pandemic.

Diesel consumption used for passenger vehicles and equipment accounted for 2% of community-wide emissions in Brantford at 17 kT.

4.2 DETAILS ON GHG EMISSIONS BY SECTOR

The tables below provide an overview of all the data collected for 2021 and 2022.

Table 17: 2021 results of the community emissions inventory

Stationary (Buildings)					
	Electricity (kWh)	Electricity emissions (T CO_2e)	Natural Gas (m^3)	Natural Gas emissions (T CO_2e)	Total emissions (T CO_2e)
Resi.	333,940,475	10,018	62,300,834	120,387	130,406
Inst./ Comm.	97,299,999	2,919	51,713,773	99,929	102,848
Industrial	555,136,469	17,480	66,775,497	129,034	146,514
Transportation					
	Gasoline purchased (L)	Gasoline emissions (T CO_2e)	Diesel purchased (L)	Diesel emissions (T CO_2e)	Total emissions (T CO_2e)
On-road	90,060,965	208,533	6,388,450	17,182	225,714
Waste					
Landfill					111,838
Emission Total					
Community Greenhouse Gas Emissions Total (T of CO_2e)					**716,494**

Table 18: 2022 results of the community emissions inventory

Stationary (Buildings)					
	Electricity (kWh)	Electricity emissions (T CO_2e)	Natural Gas (m^3)	Natural Gas emissions (T CO_2e)	Total emissions (T CO_2e)
Resi.	333,093,674	9,993	68,605,523	132,570	142,563
Inst./ Comm.	108,238,938	3,247	57,705,365	111,507	114,754
Industrial	582,670,684	17,480	70,445,012	136,125	153,605
Transportation					
	Gasoline purchased (L)	Gasoline emissions (T CO_2e)	Diesel purchased (L)	Diesel emissions (T CO_2e)	Total emissions (T CO_2e)
On-road	86,483,430	200,249	6,172,773	16,602	216,851
Waste					
Landfill					126,500
Emission Total					
Community Greenhouse Gas Emissions Total (T of CO_2e)					**754,273**

Table 19: Community emissions summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Transportation	220,669	225,714	216,851
Residential	146,801	130,406	142,563
Institutional/Commercial	142,049	102,848	114,754
Industrial	132,207	145,688	153,605
Landfill	146,213	111,838	126,500
Total	**787,939**	**716,494**	**754,273**
Change from Baseline		**- 9%**	**- 4%**

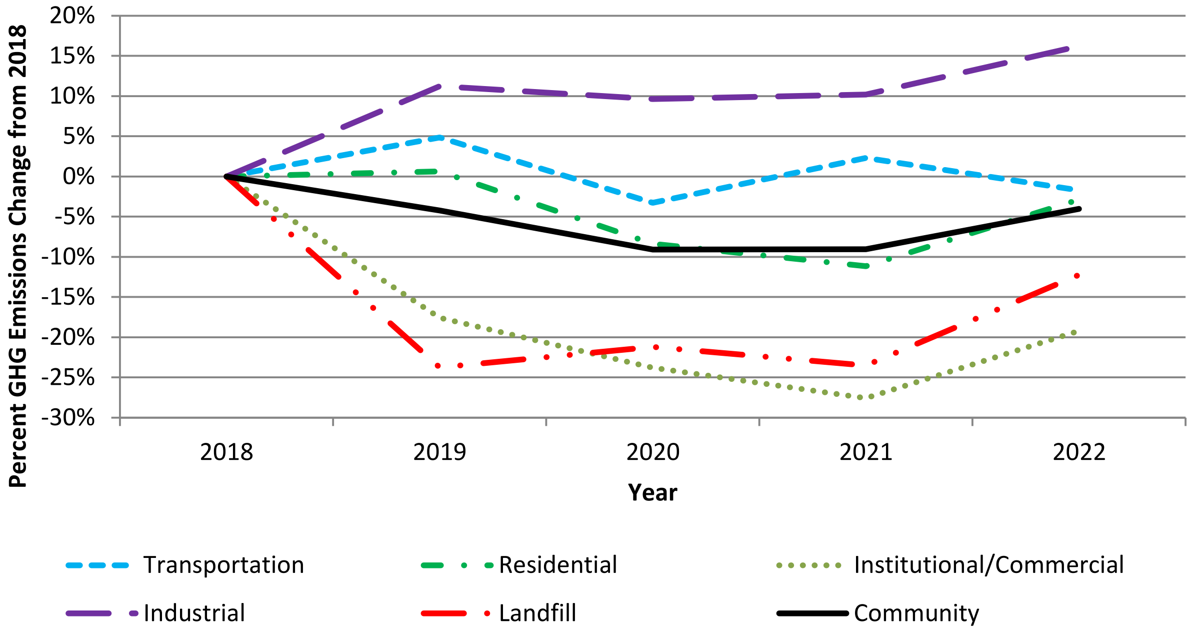

Figure 11: Annual percent change in emissions by sector relative to the 2018 baseline

4.2.1 BUILDINGS

In 2022, emissions from residential, commercial/institutional, and industrial buildings accounted for approximately 411 kT of the City's total inventory, making buildings the largest source of emissions at roughly 53% of community-wide emissions. Compared to 2018, overall building emissions decreased by about 2%.

Figure 12 breaks down the emissions contribution of each building type – residential, commercial/ institutional, and industrial. Tables 20 and 21 outline energy consumption and GHG emissions for each building type for 2021 and 2022.

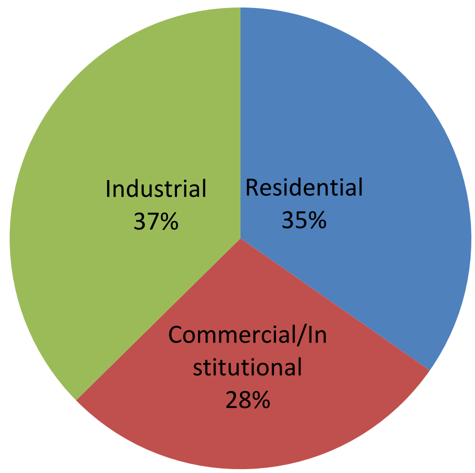

Figure 12: Percentage of building sector GHG emissions by building type (2022)

Table 20: 2021 GHG emissions from community buildings

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Residential	333,940,475	10,018	62,300,834	120,387	130,406
Comm./Instit.	97,299,999	2,919	51,713,773	99,929	102,848
Industrial	555,136,469	16,654	66,775,497	129,034	145,688
Total Buildings	**986,376,944**	**29,591**	**183,790,104**	**349,351**	**378,942**

Table 21: 2022 GHG emissions from community buildings

	Electricity (kWh)	Elec Emiss. (T CO_2e)	Natural Gas (m^3)	NG Emiss. (T CO_2e)	Total Emiss. (T CO_2e)
Residential	333,093,674	9,993	68,605,523	132,570	142,563
Comm./Instit.	108,238,938	3,247	57,705,365	111,507	114,754
Industrial	582,670,684	17,480	70,445,012	136,125	153,605
Total Buildings	**1,024,003,297**	**30,720**	**196,755,900**	**380,202**	**410,922**

Table 22: Community building emissions summary from baseline

	Tonnes of CO_2e		
	2018	2021	2022
Residential	146,801	130,406	142,563
Commercial/Institutional	142,049	102,848	114,754
Industrial	132,207	145,688	153,605
Total	**421,057**	**378,942**	**410,922**
Change from Baseline		**- 10%**	**- 2%**

Relative to 2018, total emissions from residential buildings and commercial/institutional buildings decreased by 3% and 19%, respectively. The decrease in emissions is partially due to warmer winters and cooler summers that reduced the need for space heating and cooling. However, emissions from industrial buildings increased by 16% in 2022 relative to 2018. This is partially due to varying types of industrial operations. Figure 13 below shows the change in emissions from the different building types relative to the baseline year.

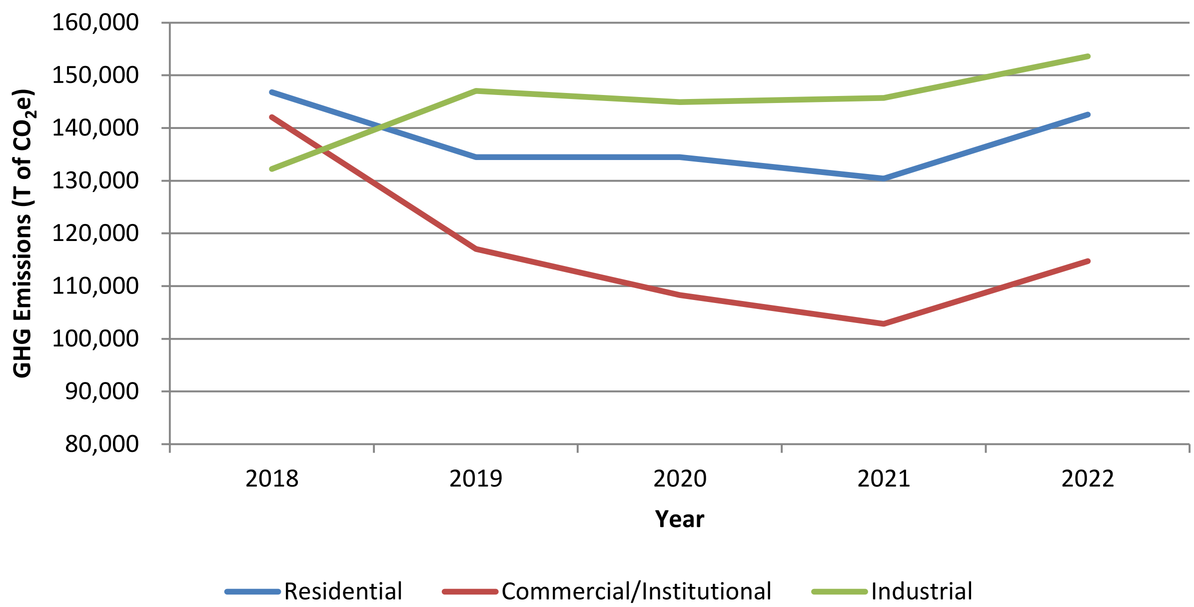

Figure 13: Relative community building emissions by building type by year

Relative to 2018, natural gas emissions from residential buildings and commercial/ institutional buildings decreased by 3% and 20%, respectively, in 2022. The decrease in natural gas consumption is partially due to warmer winter and autumn weather that reduced the demand for space heating. Aside from weather conditions, a decrease in natural gas consumption has also been driven by improved building efficiency. However, industrial buildings increased in natural gas consumption by 17% in 2022 compared to 2018. This increase is partially due to shifts in types of industrial operations.

Table 23: Percent change in natural gas emissions from community buildings from 2018 to 2022

Building Type	2018 natural gas emissions (T of CO2e)	2021 natural gas emissions (T of CO2e)	2022 natural gas emissions (T of CO2e)	Percent change 2018-2021	Percent change 2018-2022
Residential	137,205	120,387	132,570	- 12%	- 3%
Comm./Inst.	138,872	99,929	111,507	- 28%	- 20%
Industrial	116,058	129,034	136,125	+ 11%	+ 17%

The COVID-19 pandemic also impacted building sector emissions, especially for electricity consumption. As shown in Table 24, each building type's electricity emissions increased largely due to local population growth and businesses returning to normal operations.

Table 24: Percent change in electricity emissions from community buildings from 2018 to 2022

Building Type	2018 electricity emissions (T of CO2e)	2021 electricity emissions (T of CO2e)	2022 electricity emissions (T of CO2e)	Percent change 2018-2021	Percent change 2018-2022
Residential	9,596	10,018	9,993	+ 4%	+ 4%
Comm./Inst.	3,177	2,919	3,247	- 8%	+ 2%
Industrial	16,149	16,654	17,480	+ 3%	+ 8%

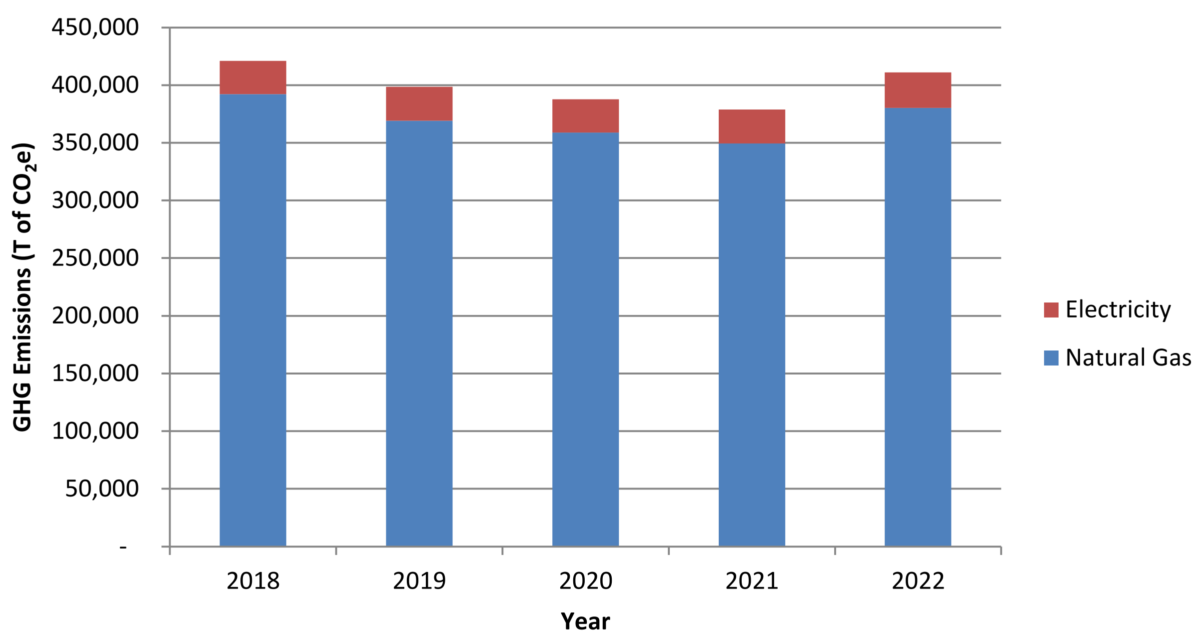

Figure 14: Relative emissions from community building sources by year

4.2.2 TRANSPORTATION

Calculating emissions from vehicle traffic generated within the City limits is complex due to the number of variables, such as the number of trips, distance and length of each trip, speed, vehicle type, vehicle maintenance, fuel type, etc. For the purposes of this document, the emissions from transportation are assumed to be equal to the burning of all fuel sold commercially within the City limits.

Transportation emissions in 2022 were approximately 217 kT, accounting for 28% of the community-wide inventory. In 2022, gasoline usage accounted for 92% of the total emissions and diesel usage accounted for 8%.

Table 25: GHG emissions produced by the community transportation sector in Brantford in 2021 and 2022

Year	Gasoline Purchased (L)	Gasoline emissions (T of CO2e)	Diesel Purchased (L)	Diesel emissions (T of CO2e)
2021	90,060,965	208,533	6,388,450	17,182
2022	86,483,430	200,249	6,172,773	16,602

Table 26: GHG emissions produced by community transportation in Brantford since the baseline

	GHG Emissions (Tonnes of CO_2e)		
	2018	2021	2022
Gasoline	205,236	208,533	200,249
Diesel	15,433	17,182	16,602
Total	**220,669**	**225,714**	**216,851**

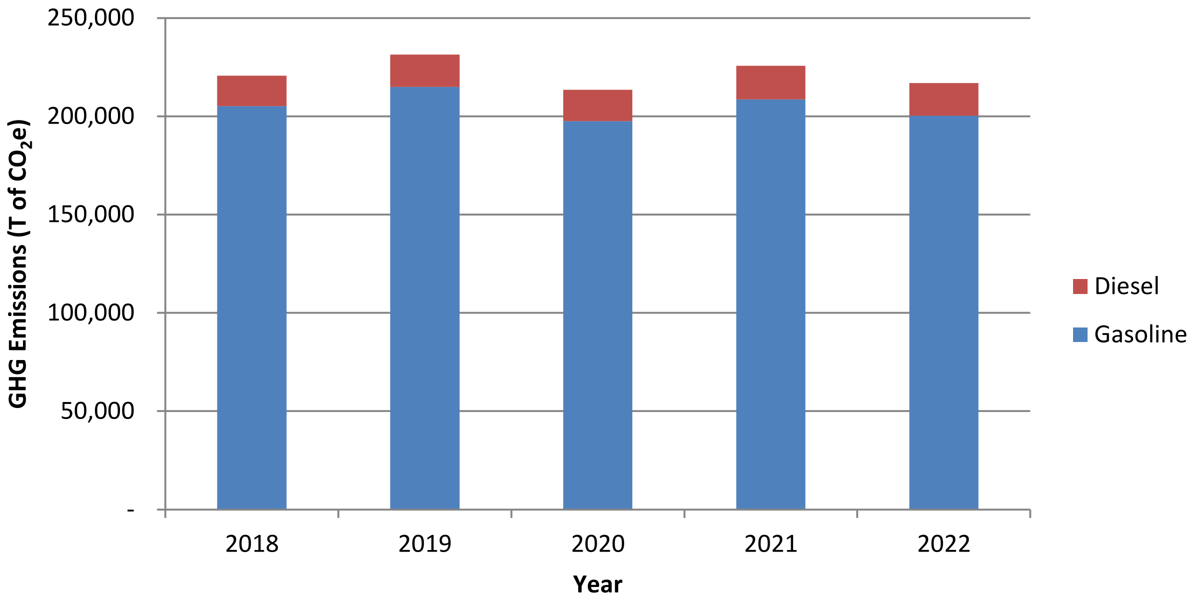

Figure 15: Relative emissions of transportation energy sources by year

4.2.3 LANDFILL

Landfill emissions in 2022 were approximately 126 kT, accounting for about 17% of the community-wide inventory. Landfills create GHG emissions though the anaerobic (without oxygen) decomposition of organic matter, primarily food waste, as well as paper products and other biodegradable materials. This process creates a gas which is primarily composed of methane which is 25 times more potent as a greenhouse gas than carbon dioxide.

The emissions from the City of Brantford landfill are provided in Table 27 including the baseline information from 2018. The landfill emissions data presented is the same data that is reported to Environment and Climate Change Canada (ECCC) for the Canadian Greenhouse Gas Reporting Program (GHGRP) and Ontario Ministry of the Environment, Conservation, and Parks (MECP) for Ontario Regulation 390/18 – Greenhouse Gas Emissions: Quantification, Reporting, and Verification.

Table 27: Landfill emissions from the baseline

	2018	2021	2022
Landfill Gas Emissions (T of CO2e)	131,750	111,250	127,750
Onsite Transportation Emissions (T of CO2e)	14,460*	576	567
Stationary Combustion Equipment Emissions (Electricity Generation) (T of CO2e)		12	842
Emissions from Combustion of Biomass (CO2)	4,176	12,000	7,430
Total Emissions (T of CO2e)	146,213	111,838	126,500**
Change in Emissions		**- 24%**	**- 13%**

* Since 2018, the NPRI reports have become more comprehensive and data from these areas has been expanded.
** Total landfill emissions in 2022 is an estimation provided by WSP Canada Inc. because the gas flow collection meter was inoperable between September 2021 to March 2022 and the new meter was calibrated incorrectly in April 2022.

Total landfill emissions calculations include emissions from the following areas:

- Landfill gas emissions – which is based on the annual mass of waste received by the site and fugitive methane emissions released to the atmosphere from the waste mound.
- On-site transportation combustion emissions – which is based on emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from releases from fuel combusted by heavy machinery for the purpose of moving and transporting material, equipment, or substances as well as vehicles used in the movement of waste at the landfill.
- Stationary combustion equipment emissions (electricity generation) – includes methane and nitrous oxide emissions and is based on the control efficiency of the electricity generation engines, emissions from landfill gas collected but not combusted, the collection efficiency of the landfill gas collection system, etc.

The emissions from the combustion of biomass are not included in the total emissions calculations because Environment and Climate Change Canada Guide indicates that CO_2 emissions from biomass must not be included in the threshold calculations for total emissions.

The City of Brantford's landfill has a comprehensive landfill gas collection system, which collects the majority of the methane released from within the landfill and pipes to a single location. Further, this landfill has a generator which ignites the methane, creating energy and carbon dioxide as a by-product. The energy is turned into electricity and sold to the provincial electricity grid. The benefits are two-fold; the methane is converted into CO_2, which is a less potent greenhouse gas, and the electricity created from this process which can be sold for extra revenue from a renewable source. The emissions from the landfill will be created regardless, so the creation of electricity from this energy is considered to be a carbon neutral energy source, as there are no additional emissions created. If the generator is not working or there is too much gas to send to the generator, the methane is simply flared (ignited and burned), which converts the methane to carbon dioxide, reducing its impact on climate change. Table 28 outlines the impact of the landfill gas collection system for methane emission reductions.

Table 28: Methane emissions reduced through the landfill gas collection system

	2018	2021	2022
Annual waste acceptance (Mg/yr)	82,018	82,400	81,000
Landfill gas collected (m3)	4,535,955	6,139,279	6,046,578
Methane content	56%	48%	47%
Gas collection efficiency	45%	29%	29%
Combustion engine destruction efficiency	99%	97.2%	97.2%

LFG combusted (m3)	4,490,595	5,967,380	5,877,274
Methane combusted (tonnes)	1,524	1,879	1,809
Reduction in methane (T of CO2e)	38,101	46,975	46,285
Electricity sold (kWh)	7,585,006	10,002,699	10,076,355
Change in methane reductions		**+ 23%**	**+ 21%**
Change in electricity generated		**+ 32%**	**+ 33%**

It should be noted that the total emissions from the landfill does take into account the amount of methane that was combusted. Therefore, in 2022, methane emissions were reduced by 46,285 T of CO_2e but total landfill emissions from other sources was still 126,500 T of CO_2e, which accounted for 17% of total community emissions. If methane was not captured and combusted to produce electricity then landfill emissions would have been much higher.

Additionally, the Mohawk Street Landfill is a living being and there are many factors that can cause fluctuations in the amount of landfill emissions and methane captured and combusted. Some of these factors include:

- Road dust created from trucks travelling within the landfill
- Length of gravel roadways in the landfill
- Number of trucks and their weight
- The amount of fuel used by the vehicles and equipment
- The electricity generation engines' setpoints which determines how much methane gas goes into the system
- Old methane gas vs new methane gas
- The time of year and wet vs. dry conditions
- The amount of air being captured
- The type of material coming into the landfill

An additional metric to be considered in the community inventory is the amount of waste received at the landfill over the course of the year as well as the amount of recycling collected from curbside pickup. This is another way to track progress of any waste diversion programs that may be implemented in the future. Waste received at the landfill comes from three sources: industrial/commercial/institutional waste, curbside pickup, and drop-offs at the landfill. The totals are shown in Table 28.

Table 29: Total waste and recycling received at Brantford's landfill

Source	Weight of waste received (metric tonnes)		
	2018	2021	2022
Industrial/Commercial/Institutional	51,778	49,718	51,145
Curbside Pick-up	24,816	25,590	24,516
Drop-offs at Landfill	5,424	7,050	6,044
Total	**82,018**	**88,357**	**81,705**
Recycling Collected	**5,618**	**5,152**	**4,944**

5 CARBON OFFSETS

To help offset GHG emissions from corporate and community sources, the City of Brantford utilizes trees on City parcels of land, right-of-ways (ROW), and private parcels of land. For the purpose of this inventory, trees on City parcels and ROW will be used to offset Corporate emissions and trees on private parcels will be used to offset community emissions.

Currently, the City of Brantford contains 675,975 trees on City parcels, ROW, and private parcels. The canopy cover provided by these trees ranges from 18% to 25% of the City's total land area, for a City-wide average canopy coverage of 21.5%. Table 29 outlines a summary of the carbons offsets provided by these trees.

Table 30: Carbon offset summary for 2022

	Corporate	Community
Total Emissions (T of CO_2e)	15,158	754,273
Number of Trees (2022)	174,156	500,819
Carbon Offsets (T of CO_2e)	3,831	11,018
Difference in Emissions (T of CO_2e)	11,327	743,255
Number of Trees needed to reach net-zero	**514,842**	**33,784,318**

Trees are a very important part of both mitigation and adaptation solutions for climate change. Every year the City of Brantford plants trees throughout the City as a corporate initiative as well as through community partnerships. Table 30 outlines a summary of the trees planted in 2021 and 2022. It should be noted that the carbon absorption value of trees increases with age, therefore the table also outlines how much carbon can be sequestered once the trees have reached a mature age (i.e. 10+ years).

Table 31: Number of trees planted in 2021 and 2022

Year	**2021**	**2022**
Number of Trees Planted	5,947	12,240
Carbon Sequestered Annually (T of CO_2)	35	72
Carbon Sequestered Annually after 10 years (T of CO_2)	131	269

6 AVOIDED EMISSIONS

The City of Brantford has already taken actions to reduce its corporate footprint, resulting in some emission savings. Without these actions, GHG emissions would have been higher. Table 31 below outlines the actions taken and the GHG emissions savings.

Table 32: Emission reduction actions taken in 2021 and 2022

Actions Taken	Annual GHG Emissions Savings
Electric ice resurfacers (2021)	27 T of CO_2e
Convert light duty autos to electric (2021 & 2022)	36 T of CO_2e
Convert HPS streetlights to LED (2021 & 2022)	99 T of CO_2e
Total	**162 T of CO_2e**

7 CURRENT EMISSION PROJECTIONS

The City of Brantford is continuing to take steps to reduce its corporate footprint which will result in additional GHG emission reductions. Table 32 outlines emission reduction projects that have been approved by Brantford's City Council.

Table 33: Emission reduction projects approved by Brantford City Council

Project	Implementation Year	Emission Reductions (T of CO_2e)
Covert HPS Streetlights to LED	2023	11
Implement a Green Bin Program	2023	No new emissions*
Net-Zero Building Standard for New Buildings	2023	No new emissions**
Convert all transit buses to EV	2024-2037	3,228
Net-zero Retrofit and Expansion of the Police Building	2026	242
Total Reductions		**3,541**
Emissions Remaining		**12,695**

*The Green Bin program will divert organics from the landfill and will therefore not cause an increase in emissions at the landfill.
**The Net-Zero Building Standard requires all new municipal buildings to be built net-zero and will therefore not cause an increase in corporate building emissions.

The approved projects will result in an 18% reduction in emissions compared to the baseline. The graph below shows the City of Brantford's current emission projections compared to the targets.

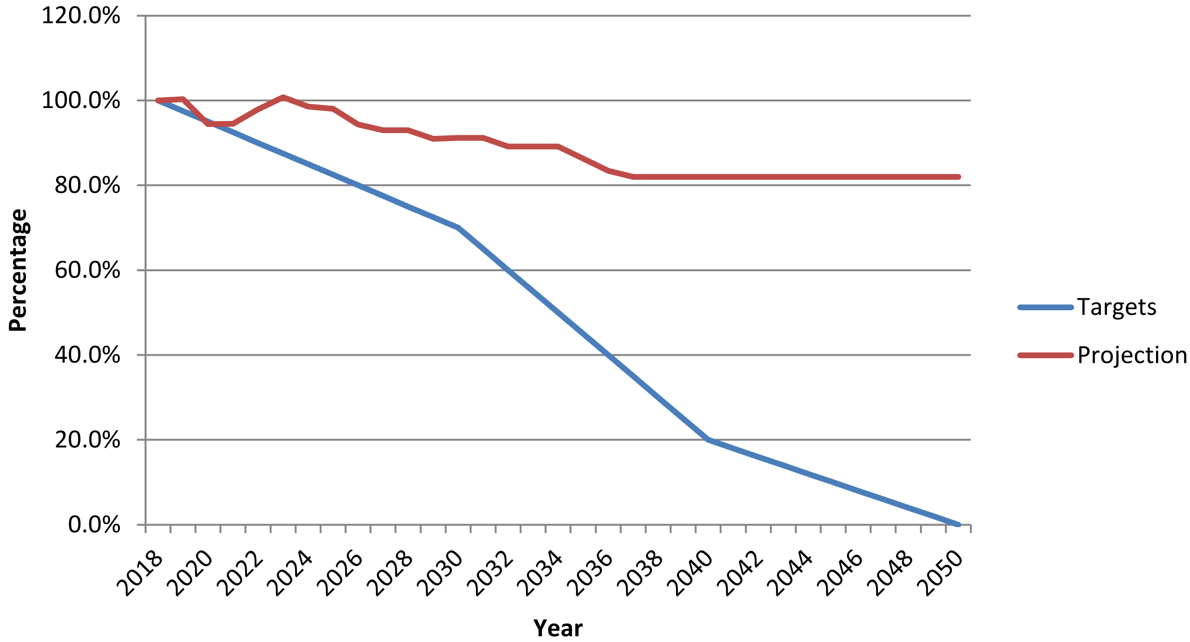

Figure 16: Corporate emission projections based on approved emission reduction projects compared to emission reduction targets

At this time, only corporate projects and projections are included. The Community Climate Change Action Plan was approved by Brantford's City Council in July 2022 and emission reduction projects had not yet been implemented during this reporting period. Current projects include a Climate Change Communications Strategy, development of a Sustainable Business Support Office to begin educating residents and businesses on climate action, and the implementation of a Green Bin Program and an Active Transportation Master Plan.

8 RECOMMENDATIONS AND NEXT STEPS

With the corporate and community emissions inventory now updated, the City of Brantford can begin to monitor trends and estimate the impact emission reduction projects will have on meeting emissions reduction targets. Within the scope of current projects, the City of Brantford is not on track to meet its targets of 30% reduction by 2030, 80% reduction by 2040, and net-zero by 2050.

In order to meet corporate targets, it is recommended that the City put a greater focus on reducing emissions from existing buildings and fleet, as well as increasing the amount of carbon offsets, such as planting and preserving more trees.

It is also recommended for the City to begin implementing action items outlined in the Community Climate Change Action Plan to assist community members with lowering their carbon footprints.

9 SUMMARY AND CONCLUSION

The City of Brantford is continuing to make strides on the journey to achieving carbon neutrality by 2050, both as a Corporation and a community. Since 2018, the City has continued to monitor greenhouse gas emissions to track Brantford's progress to achieve emission reduction targets.

In 2022, 15,158 tonnes of CO_2e were emitted from corporate activities, reflecting a decrease by 2% compared to the baseline year of 2018. With current emissions projections and emission reduction projects approved, this value will decrease to 12,695 tonnes of CO_2e by 2037, which is an 18% reduction compared to 2018.

In 2022, 754,273 tonnes of CO_2e were emitted from Community activities, a decrease by 4% compared to the baseline year of 2018.

The City has identified Brantford's top emissions sources for the inventory as a whole and on a sector-by-sector basis for both the Corporation and the community. This will allow efforts and resources to be focused on the most significant emission sources, where they can have the biggest impact.

The next step is to continue working with local stakeholders to implement more actions needed to meet the City's emission reduction targets.

APPENDICES

APPENDIX A: METHODOLOGY

The purpose of Appendix A is to provide a high-level overview of the methodology followed by the City of Brantford to estimate its annual sector-based GHG emissions, in alignment with the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.

For emissions inventory purposes, this report includes both Scope 1 and Scope 2 emissions. Scope 3 emissions were not included at this time. The different emissions categories are as follows:

- **Scope 1:** Emissions that physically occur within the municipality (tailpipe emissions from vehicles, natural gas usage, other fuel consumption).
- **Scope 2:** Emissions that occur from the use of electricity supplied by grids which may or may not cross municipal boundaries.
- **Scope 3:** Emissions from activities occurring outside of the municipality as a result of activities of residents and businesses within the municipality (e.g. emissions from the production, manufacturing, and distribution of goods).

The values reported in Brantford’s sector-based GHG inventory report do not exactly match those in previous inventories because of updates to various datasets that have taken place over time, including after publication of past inventories. The values reported in this document are the most up-to-date as of the publication of this 2022 sector-based GHG inventory.

Global Warming Potential

GHGs released into the atmosphere have different warming effects depending on the unique qualities of each gas. To enable comparisons of the global warming impacts of different GHGs, the concept of Global Warming Potential (GWP) was developed. The GWP measures how much a particular gas contributes to the global warming relative to CO_2 and is used to convert tonnes of GHG to tonnes of carbon dioxide equivalent (CO_2e) to calculate total emissions across multiple GHGs using a common unit. The larger the GWP, the more a given gas warms the earth’s atmosphere relative to CO_2 over a given period of time. The time period usually used to establish GWPs is 100 years. The GWPs used by the City of Brantford are listed in Table 33.

Table 34: Global Warming Potential (GWP) of major GHGs

GHG	GWP
Carbon dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Oxide (N_2O)	298

Activity Data and Emission Factors

The City uses the following equation, as prescribed by the GPC protocol, to estimate GHG emissions:

GHG emissions = Activity data x Emission factor

Activity data refers to the data associated with an activity that leads to GHG emissions. Examples of activity data are:

- Volume of natural gas consumed
- kWh of electricity consumed
- Volume of gasoline/diesel used
- Kilometres driven
- Tonnes of solid waste sent to landfill

An emission factor is a measure of the mass of GHG emissions relative to a unit of activity. The City of Brantford relies on Environment and Climate Change Canada's National Inventory Report (NIR) as a primary source of its emission factors. Environment and Climate Change Canada releases the NIR two years after a given calendar year (i.e. the 2021 emission factors were released in 2023). The City updates its previously reported annual emissions estimates when compiling its latest inventory upon revised emission factors becoming available for previous inventory years. The emission factors used by the City of Brantford are outlined in Table 34.

Table 35: GHG emission factors for energy sources

	Grams emitted				Tonnes
	CO_2	CH_4	N_2O	CO_2e	T of CO_2e
Gasoline (per L)	2307	0.100	0.02	2315.46	0.00231546
Diesel (per L)	2681	0.078	0.022	2689.51	0.00268951
Natural Gas (per m^3)	1921	0.037	0.035	1932.36	0.00193236
Electricity (per kWh)	30	0	0	30	0.00003

Data Collection

The data for the inventory was gathered from the sources listed in Table 35 for the Corporate inventory and Table 36 for the community inventory.

Table 36: Data sources for the 2021 and 2022 Corporate emissions inventory

Category	Data Source	Data Type
Buildings	City Buildings and Housing & Homelessness Services Buildings	Data collected from Energy Management System database, Housing and Homelessness Services Department, electricity and natural gas utility bills
Fleet	City Fleet	Data received from Fleet Services fuel records
	Emergency Services – Brant Paramedics	Fleet inventory and total fuel consumption from Brant Paramedics and service division for jurisdiction (City vs County)
	Emergency Services – Fire	Fleet inventory from Fire Department Fuel consumption data from City Fleet Services records
	Emergency Services - Police	Fleet inventory from Police Department Fuel consumption data from City Fleet Services records
Streetlights/ Traffic Signals	Streetlights	Consumption data from Traffic System Technologist based on kW installed and calculated run time
	Traffic Signals	Finance Department from utility bills
Water and Wastewater	Public Works	Data collected from Energy Management System database and utility bills

Table 37: Data sources for the 2021 and 2022 Community emissions inventory

Category	Data Source	Data Type
Transportation	Kalibrate	Fuel sales from commercial suppliers within Brantford (gasoline/diesel)
Buildings (residential, commercial, industrial)	Electricity: Ontario Energy Board Utility Yearbook 2021	Aggregated electricity consumption data for Brantford Power service area for each customer type (residential, <50 kW, >50 kW) and number of customers
	Electricity: GrandBridge Energy	Aggregated electricity consumption data for Brantford Power and Energy Plus service area for each customer type (residential, <50 kW, >50 kW) and number of customers
	Natural Gas: Enbridge	Gas consumption data for all customers within Brantford disaggregated by sector (residential/ commercial/industrial) and postal code
Solid Waste (Landfill)	Public Works: Environmental Services	Data from Solid Waste Technologist and NPRI report from WSP

APPENDIX B: BRANTFORD CLIMATE PROFILE

The impacts of climate change are already visible in Brantford. The City is experiencing increasing temperatures, increasing rainfall, and more frequent flooding. Trends and other metrics impacted by climate change in 2021 and 2022 are included in Table 37 below compared to the baseline year of 2018.

Table 38: Weather metrics for Brantford

	2018	2021	2022
Average annual temperature	7.8°C	9.3°C	8.2°C
Max. temperature	33.1°C	32.7°C	34.2°C
# of very hot days (>30C)	20	18	17
# of tropical nights (min temp >20C)	9	9	3
# of frost free days	196	217	214
Annual precipitation (mm)	882	852	614
Max 1 day rainfall (mm)	35	59.9	39.2
# of heavy precipitation days (>10mm)	27	22	16
Heating degree days (total)	3943	3438	3858
Cooling degree days (total)	363	337	297

Heating degree days (HDD) and cooling degree days (CDD) quantify the temperatures during the year that require heating or cooling. Heating and cooling require energy of some form, so these metrics can provide an indication of how much energy was required for indoor climate control. For HDD, a base temperature of 18°C was used, so the HDD for the year shows how many degree points dropped below this threshold and heating was required. For example, if the daily mean temperature is 12°C, the HDD value for that day s equal to 6 HDD. A higher number means a colder year and more energy was required to heat a building.

CDD follows a similar process as HDD, except it refers to the number of degrees Celsius a given day’s mean temperature is above 18°C. If indoor temperatures rise about this threshold, energy for cooling will be used to lower the temperature. A higher number for CDD means a hotter year and more energy was required for cooling.

Stay Involved

Stay informed about what the City of Brantford and its partners are doing to reduce greenhouse gas emissions in the City.

For more information visit us at Brantford.ca/ClimateAction

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