City of Peterborough

To:	**Members of the General Committee**
From:	**Blair Nelson, Commissioner, Infrastructure, Planning and Growth Management**
Meeting Date:	**December 2, 2024**
Report:	**Corporate Sector Greenhouse Gas Emission Inventory and Update, Report IPGACP24-028**

Subject

A report to provide the General Committee with the findings of the Corporate Sector Greenhouse Gas Emission Inventory and Update report.

Recommendation

That Council approve the recommendation outlined in Report IPGACP24-028, dated December 2, 2024, of the Commissioner, Infrastructure, Planning and Growth Management as follows:

That the presentation be received for information.

Background

The City of Peterborough completed its annual inventory of Corporate Sector greenhouse gas (GHG) emissions generated from municipal sources in 2022 compared against the 2011 baseline year (see Appendix A). Corporate Sector emission sources are comprised of the following City assets:

- Facilities
- Fleet vehicles
- Exterior lighting fixtures
- Wastewater pumping stations
- Wastewater Treatment Plant
- Waste Management Facility

Corporate GHG emission sources also include non-fleet vehicles driven by City staff while in the service of the City. Greenhouse gas emissions are derived from the combustion of fossil fuels or purchased grid electricity during the operation of corporate assets. Methane and nitrous oxide biogases generated from the Waste Management Facility and the Wastewater Treatment Plant are both incorporated into the Corporate Sector inventory.

The assessment revealed that Corporate Sector emissions declined by 13 percent or 3,341 tCO_2e in 2022 from 2011 levels. However, emissions grew by 2 percent or 541 tCO_2e in 2022 from 2021 levels. Emissions were primarily impacted by the tail end of the COVID-19 pandemic modifying service levels, increase in grid electricity emission factor, and biogas production at the Wastewater Treatment Plant.

Corporate Sector emissions are projected to decline by 32 percent or 8,476 tCO_2e from 2011 levels by 2030. The City is developing key projects that will facilitate mitigation, such as from the implementation of the Source Separated Organics program, the Alternative Fuels Study for Transit, and the Community Buildings Retrofit program.

Strategic Plan

Strategic Pillar: Community & Well-being

Strategic Initiative: Demonstrate strong leadership in environmental stewardship by proactively addressing issues and challenges of climate change and the environment.

In 2019, City Council approved the Climate Emergency Declaration that requires City staff to report back to Council on climate action. The Declaration also requires that City staff "greatly accelerate timelines for our existing actions to reduce the effects of climate change; add new actions and proposals to reduce greatly our GHG emissions" by 45 percent in 2030 and net zero emissions by 2050.

Engagement and Consultation

The Corporate Sector Greenhouse Gas Emission Inventory and Update was presented to the Peterborough Environmental Advisory Committee on September 18, 2024 by the Climate Change Project Manager.

The Committee passed the following motion:

"That the Peterborough Environmental Advisory Committee recommends that staff present the Greenhouse Gas Emission Inventory and Updates Reports to Council; and

That the Peterborough Environmental Advisory Committee encourages aggressive action on major emission categories, such as transit and facilities."

Budget and Financial Implications

There are no budgetary or financial implications associated with the recommendation.

Attachments

Appendix A: Corporate Sector Greenhouse Gas Emission Inventory and Update Report

Submitted by,

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Commissioner, Infrastructure, Planning and Growth Management

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Appendix A

Corporate Sector Greenhouse Gas Emission Inventory and Update Report

Background

The City of Peterborough is continuing its annual Corporate Sector reporting as recommended by the Climate Emergency Declaration. Monitoring Corporate Sector greenhouse gas (GHG) emissions supports City staff in assessing the impact of corporate mitigation policies and projects. Corporate GHG reporting demonstrates a commitment to transparency and climate leadership by the City and provides Council with information to make informed decisions.

In 2023, the City published Report IPSACP23-028, which presented the Corporate Sector trends from 2018 to 2021 compared to the 2011 baseline year. That investigation revealed that corporate GHG emissions decreased by 18 percent or 4,079 tCO_2e in 2021 from 2011 levels, primarily a result of the COVID-19 Pandemic (March 2020 to April 2022), which modified corporate operations and the delivery of City services.

This report is intended to provide an update for 2022 Corporate Sector GHG emission trends with respect to the 2011 base year.

Inventory Boundaries

Corporate Sector GHG emissions are produced from the day-to-day operations of the municipality while delivering services to the community. The City directly controls Corporate Sector GHG emissions and can reduce sources of emission through municipal decision-making and planning. This report excludes Community Sector GHG emissions derived from residential and commercial buildings, vehicles, and industrial processes for which the municipality does not have direct control over mitigation.

Corporate Scope 1 and Scope 2 emission sources include fleet vehicles, buildings, landfill, wastewater pumping stations and treatment plant, and lighting assets. In addition, corporate Scope 3 emissions pertaining to non-fleet staff vehicles used while in the service of the City is also included in the inventory. Corporate assets not contained in the inventory include minor outbuildings not occupied by staff, leased buildings, park washrooms, water features, or The LINK contracted bus service for Selwyn Township.

Emissions resulting from direct energy consumption and by-product fugitive biogas emissions were utilized to calculate corporate emission sources. Activity data was collected using EnergyCAP utility bill aggregating software for facilities' electricity and natural gas consumption. Annual fleet fuel, non-fleet fuel, and landfill waste records were gathered directly from corporate divisions to assess fuel usage and waste-generated methane emissions. A customized Excel spreadsheet was used to calculate GHG

emissions from activity data as well as to plot and estimate emission trends. Biogas generated at the Wastewater Treatment Plant (WWTP) was calculated using the Biosolid Emissions Assessment Model utilizing WWTP operational data. As well, landfill biogas produced at the Waste Management Facility (WMF) was calculated using the Federation of Canadian Municipalities' Partners for Climate Protection (PCP) software.

Certified 2022 emission factors published in Canada's National Inventory Report were used. Specific annual emission factors for electricity, natural gas, gasoline, and diesel were used to calculate GHG emissions. Fleet vehicle engine class type was factored in to further refine calculations. Waste emissions from landfilled garbage utilized a distribution ratio of 60:40 split between the City of Peterborough and Peterborough County for GHG emissions generated from the shared WMF.

Corporate GHG emissions are represented as metric tons of carbon dioxide equivalent (tCO_2e).

New Corporate Sector Inventory Category

The Corporate Sector added biogas comprised of methane and nitrous oxide (N_2O) produced during the wastewater treatment process at the WWTP. The City did not previously have the ability to calculate GHGs from biogas with existing methods. In 2023, the City calculated 2011 and 2021 biogas emissions from the WWTP, reported in IPSACP23-028. In 2024, City staff completed the remaining inventory years using the Biosolid Emissions Assessment Model (Table 1).

Table 1. New Corporate Sector Inventory Category

Emission Source	2011 GHG (tCO_2e)	2018 GHG (tCO_2e)	2019 GHG (tCO_2e)	2020 GHG (tCO_2e)	2021 GHG (tCO_2e)	2022* GHG (tCO_2e)
WWTP Biogas	3,199	3,561	3,332	3,214	3,388	3,396
* Incomplete dataset						

The 2022 biogas inventory is incomplete due to one secondary WWTP dataset only available for January to May that limited the overall annual assessment. The 2022 reporting year will be updated once the dataset for the remaining months is available and will be published in the next corporate GHG inventory report.

The recalibrated 2011 Corporate Sector baseline with WWTP biogas is now 26,127 tCO_2e, up from 22,928 tCO_2e. All adjustments are performed according to GHG accounting methodologies outlined in the GHG Protocol for Cities.

Corporate Sector GHG Emissions Inventory Update

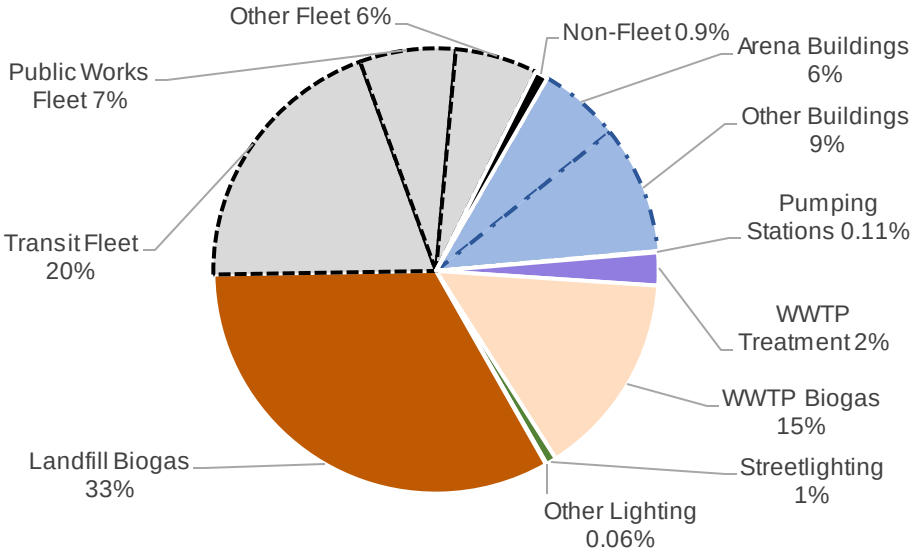
The assessment determined that the Corporate Sector GHG emissions decreased by 13 percent or 3,341 tCO_2e in 2022 from the rebaselined 2011 levels (Table 3). Emissions grew by 2 percent or 541 tCO_2e in 2022 from 2021 levels.

Table 2. Corporate Sector GHG Emissions Inventory

Corporate Sector	2011 GHG (tCO_2e)	2021 GHG (tCO_2e)	2022 GHG (tCO_2e)	% Change (2011 to 2022)	% Change (2021 to 2022)
Waste Biogas	10,223	7,643	7,513	-27%	-2%
Fleet	5,905	7,172	7,438	+26%	+4%
Buildings	4,747	3,305	3,467	-27%	+5%
WWTP Biogas	3,199	3,388	3,396	+6%	0%
WWTP Treatment	1,054	492	544	-48%	+11%
Streetlighting	531	69	172	-68%	150%
Non-Fleet	437	151	216	-51%	+43%
Pumping Stations	31	19	26	-16%	+37%
Other Lighting	-	7	14	-	+100%
Total	**26,127**	**22,245**	**22,786**	**-13%**	**2%**

The proportional GHG emission composition of each Corporate Sector category in 2022 is presented in Figure 1. Fleet is subdivided into three sub-categories comprising Transit, Public Works, and Other Fleet Vehicles while facilities is broken out into Arenas and Other Buildings. Biogas from the WWTP is also separated from the energy consumption of the treatment plant. The representation showcases the overall size of each sector category toward total Corporate emissions.

Figure 1. Proportion of Sectoral Corporate GHG Emission Categories in 2022



Impact of the COVID-19 Pandemic on Corporate Sector Emissions

The COVID-19 pandemic continued to disrupt City services and operations into 2022. On January 12, 2022, the Province implemented a lockdown to limit the spread of COVID-19. As a result, corporate buildings reduced in-person services to curb transmission, such as operating facilities at half capacity. The Province lifted the lockdown order on February 17. In April, the corporate work-from-home order was lifted for non-essential City staff. Staggered in-office staffing was implemented in the succeeding months for remaining staff. Most regular City service levels returned to pre-pandemic operations in the latter half of 2022.

Increasing Grid Electricity Emission Factors

Electricity emission factors increased due to the expanded utilization of natural gas power plants that provided more baseload electricity generation. In 2022, electricity emission factors rose to 37 gCO_2e per kWh[1] from 28 gCO_2e per kWh in 2021. Emission factors are projected to continue to trend upward as natural gas is used more predominantly to supplement the electricity grid this decade before decreasing in the 2030s because of more nuclear power and renewable energy coming on-line. The modification of the emission factor resulted in sectors that use electricity incurring higher GHG emissions despite relatively constant electricity usage. This circumstance is best showcased by the increase of GHG emissions at electricity intensive assets like Pumping Stations and Streetlighting.

Corporate Sector Trends

Energy consumption of electricity and natural gas at corporate facilities rose marginally by 1,299 GJ in 2022 from 2021 levels. This rise in building energy is considered to be a result of full City services being reinstated after COVID-19 restrictions were lifted. However, working from home remained an option for some staff which likely mitigated electricity plug loads and office lighting that curbed the growth in energy use.

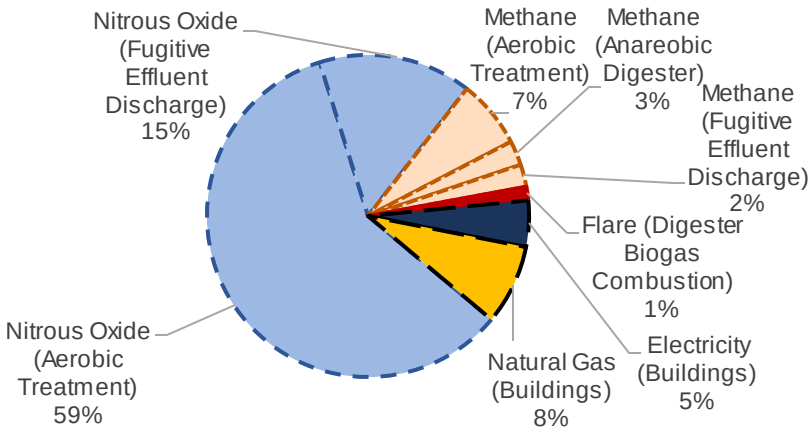
Conversely, fleet activity remained relatively unaltered during the latter stages of the pandemic with Public Works and Other Fleet continuing to provide city services that did not significantly change from pre-pandemic levels. In 2022, fleet fuel consumption increased by 4 percent or 102,000 litres from 2021 levels, likely due to the addition of more vehicles to the overall fleet. Increased service activity was noted for Transit because of enhanced routing and frequency of buses. Public Works heightened fuel use is consistent with providing community services like snowplowing which resulted in more activity in 2022 due to Peterborough receiving higher snowfall amounts that year than in 2021.

The enhanced GHG reporting capabilities at the WWTP enabled the inventory to capture a more accurate description of wastewater treatment that previous inventories were not able to obtain. The analysis determined that N_2O produced at the WWTP is the primary emission source comprising 74 percent of wastewater treatment emissions, outpacing fugitive methane emissions and energy-related emissions from electricity and natural gas

[1] grams of carbon dioxide equivalent per kilowatt hour

combustion (Figure 2). Nitrous oxide is a GHG and a by-product of treating wastewater that is released into the atmosphere. The global warming potential of N_2O is significant since each molecule is 273 times more impactful than one equivalent molecule of carbon dioxide. With this new information, the City will be determining what implementation measures are feasible to curb N_2O emissions from the WWTP in subsequent years.

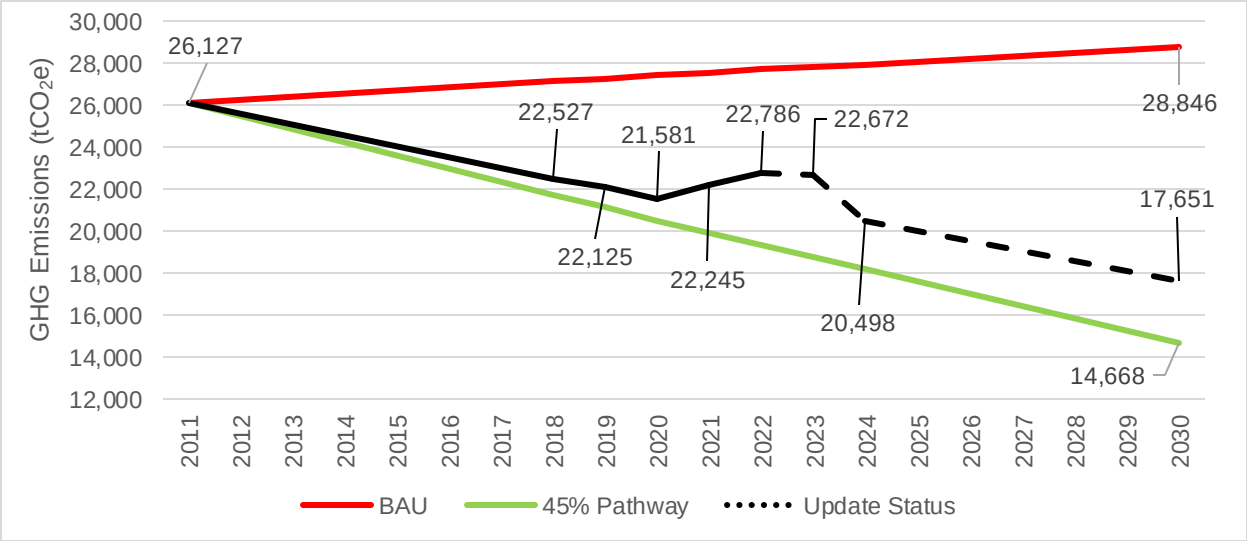
Figure 2. Proportion of Emission Sources at the WWTP in 2021



Achieving Corporate Sector GHG Emissions Target by 2030

In 2022, the decarbonization trend revealed that the Corporate Sector steadily increased corporate emissions since 2020, trending back toward the Business-as-Usual (BAU) Pathway (Figure 3). Since the 2011 baseline year, 2022 was the highest reporting year which deviated from the 45% Reduction Pathway by 3,414 tCO_2e. By 2030 Corporate Sector emissions are projected to decline by 32 percent or 8,476 tCO_2e from 2011 levels due to several anticipated corporate initiatives. The projection is a conservative approximation and is subject to many variables that can impact the pace of decarbonization. Future corporate updates will continue to refine the long-term outlook as more data becomes available.

Figure 3. Corporate Sector GHG Emissions Update Compared to the Business-as-Usual and 45% Reduction Pathways



Note: Emission values may not align with Table 3 due to rounding.

Near-term projections forecast a marginal decline in 2023 and then a significant decrease in 2024 continuing till 2030. The following is a list of assumptions that were identified as influencing corporate GHG emissions by 2030:

- The main driver of GHG reduction is attributed to the launch of the Source Separated Organics program on October 31, 2023, diverting organic waste from the WMF to the Green Resource Organics Works (GROW) facility. Organic waste diversion rates are expected to improve yearly to potentially mitigate 4,500 tCO_2e of methane biogas in 2030. Textiles, wood, and some other organic waste sources will continue to be landfilled due to not being eligible for composting at the GROW. Commercial and multi-unit residential buildings are still slated to have organic waste sent to the landfill.

- Alternatively, WWTP methane and N_2O biogas emissions are not anticipated to deviate significantly from 2021 levels. Energy-related emissions will grow, especially for electricity due to escalating grid emission factors to 1,160 tCO_2e by 2030 if business-as-usual operations are maintained.

- Building emissions will stay near 2022 levels by 2030 due to the rise in electricity emission factors and additional facilities being added to the corporate inventory like the Miskin Law Community Centre. Buildings are estimated to mitigate at best a total of 900 tCO_2e through recommended energy conservation measures being implemented at select facilities, such as buildings identified in the Community Buildings Retrofit assessment. The Corporate Energy Management Plan Update 2024-2028 will also guide mitigation efforts through its enabling measures to reduce building emissions.

- Non-fleet staff travel will likely contain a portion of trips in personal low-carbon vehicles that will reduce the amount of gasoline combusted for this category. By 2030, potentially 20 percent of staff vehicles is assumed to be comprised of electric and plug-in hybrid vehicles.

- Corporate fleet vehicle GHG emissions are anticipated to be reduced due to the gradual transition of light-duty fleet vehicles converted to electric or hybrid during scheduled replacements. The heavy-duty fleet which includes snowplows and other specialized vehicle assets, is not likely to be replaced with low-carbon vehicle models in the near term due to limited commercially available options. Transit is forecasted to begin shifting some buses to low carbon powered buses by 2030 and that reduction is incorporated into the projection. The Alternative Fuel Study for Transit will provide direction as to the rate of transition and type of vehicle for which future corporate GHG projections will incorporate.

The forecast takes into account the rise in electricity emission factors projected to be 126 gCO_2e per kWh by 2030. Conversely, fossil fuel emission factors are maintained at 2022 levels due to consistent carbon intensity of natural gas, gasoline, and diesel fuels.

Achieving the 17,651 tCO_2e projected to be reduced in 2030 requires an annual abatement rate of 642 tCO_2e per year from 2022 levels. To realize the 45 percent Corporate Sector mitigation goal by 2030, a total of 8,118 tCO_2e is needed to be mitigated from 2022 levels. This would necessitate an annual abatement rate of 1,015 tCO_2e per year starting in 2023 to close the emission gap projected in Figure 3.

Summary

Corporate Sector GHG emissions declined by 13 percent or 3,341 tCO_2e in 2022 from the rebaselined 2011 levels. Currently, the City is not tracking toward the 45 percent reduction goal. Waste management initiatives via residential composting will reorient the corporate trendline toward the 45% Reduction Pathway in 2024. Other planned mitigation projects at corporate buildings and the fleet will be required to support lower GHG emissions and put the municipality within striking distance of the 45 percent reduction goal in 2030.