City of Kingston
Report to Council
Report Number 25-152

To:	**Mayor and Members of Council**
From:	**Paige Agnew, Commissioner, Growth & Development Services**
Resource Staff:	**Julie Salter-Keane, Manager, Climate Leadership Division**
Date of Meeting:	**June 17, 2025**
Subject:	**2024 Corporate GHG Emissions Inventory Report**

Council Strategic Plan Alignment:

Theme: 2. Lead Environmental Stewardship and Climate Action

Goal: 2.1 Reduce carbon footprint of City operations.

Executive Summary:

This report provides a summary of the 2024 Corporate Greenhouse Gas (GHG) Emissions Inventory report. Corporate emissions are those created by municipal operations, including facilities, transportation, transit, wastewater treatment, water management, and corporate waste. Community emissions are those created from our entire community, including the City of Kingston's municipal operations.

An inventory of estimated corporate GHG emissions for 2024(Exhibit A) has been completed for the City of Kingston by a specialist consulting firm using 2018 data as the baseline year. Graphs and tables that illustrate the sources of emissions by municipal sector and energy source are provided within an Executive Summary of the consultant's inventory report (Exhibit A). Information on the methods used for reporting and future methodological recommendations are contained in the supplemental information report for 2024 (Exhibit B). The corporate emissions inventory includes the impact of water and wastewater operations, conducted by Utilities Kingston on the City's behalf.

The 2024 update incorporates increased building area data for facilities and wastewater infrastructure, as well as expanded transit route coverage, enabling a more accurate assessment of emissions intensity in the context of service growth. Updates were also made to

biodiesel emissions estimates, reflecting revised emission factors for B5 and B20 blends introduced in last year's reporting. In addition, a correction was made to the 2018 baseline inventory to remove double-counting of biodiesel, which had previously overstated transit fuel use, impacting total reductions for former reporting years.

For the 2024 reporting year, corporate annual GHG emissions totalled 22,188 tonnes of carbon dioxide equivalent (CO2e), marking a decrease of 713 tonnes (CO2e) or 3.1% from 2018. When accounting for population changes, per capita GHG emissions decreased by 11% from 2018 to 2024.

Total facilities emissions increased by 2% from 2018 to 2024, however, per square foot emissions decreased by 21.0% from 2018 to 2024, despite an increase in total square footage of 28.5% in the same period, with per square foot energy use declining by 28.5%, emphasizing the progression of energy efficiency and decarbonization within City facilities. The increase in total emissions is largely attributable to Ontario's electrical grid emissions factor (EFs), which have steadily increased and are now double the 2018 levels. This continues to disproportionately minimize emissions reduction efforts at the Municipal level, where facilities and fleet electrification are critical strategic decarbonization actions.

Transportation emissions from Municipal fleet vehicles (comprising Utilities Kingston, City Operations, Kingston Police, & Kingston Fire) decreased by 9.9%, with Transit emissions down by 14.2%, even as transit route kilometres expanded by 2.5%. These reductions were driven by changes in fuel mix and vehicle efficiency.

A significant increase was observed in wastewater emissions largely attributable to recent upgrades at the Cataraqui Bay Wastewater Treatment Plant, with total emissions rising by 545 tonnes or 31% over 2018 levels, while energy use per square metre dropped by 65.9% and emissions per square metre declined by 55.7%. Finally, water-related emissions increased by 251 tonnes or 44.5% from 2018 levels, with 1.5% decrease in energy use, which can be attributed to the increased carbon intensity of electricity in 2024.

These results confirm that operational efficiency efforts are making a measurable impact and should continue. However, current measures in isolation, are not enough to offset service growth and external factors – particularly grid emissions factors. Deeper, sustained reductions would require scaling up through targeted investments, equipment upgrades, and broader system improvements.

Provincial advocacy must remain a significant focus to address these upstream factors, reducing the impact of the City's decarbonization efforts. If electricity EFs had remained the same as 2018 levels, the overall Corporate GHG emissions would be 813 tonnes lower, representing a 7% reduction in total corporate emissions, equivalent to a 24.84% per capita reduction compared to the 3.1% decreased observed, equivalent to only an 11% per capita reduction.

As directed by Council on January 23, 2024 (Report Number 24-010), staff will report back in mid 2025 on the feasibility of increasing the carbon budget to 40-50% by 2030 upon the

completion of the reports by Facilities Management & Construction Services, Corporate Asset Management & Fleet, Transportation & Transit.

Recommendation:

This report is for information only.

Authorizing Signatures:

ORIGINAL SIGNED BY COMMISSIONER

Paige Agnew, Commissioner,
Growth & Development Services

ORIGINAL SIGNED BY CHIEF

ADMINISTRATIVE OFFICER

Lanie Hurdle, Chief
Administrative Officer

Consultation with the following Members of the Corporate Management Team:

Jennifer Campbell, Commissioner, Community Services	Not required
Neil Carbone, Commissioner, Corporate & Emergency Services	
David Fell, President & CEO, Utilities Kingston	
Desirée Kennedy, Chief Financial Officer & City Treasurer	
Ian Semple, Acting Commissioner, Transportation & Infrastructure Services	

Options/Discussion:

2024 Corporate GHG Emissions Inventory and 2030 Reduction Targets

An inventory of estimated GHG emissions from municipal operations for 2024 has been completed for the City of Kingston by a local consulting firm, Greenscale Inc., who specializes in carbon accounting. Energy and emissions are measured in the report as total energy consumption (GJ), total GHG emissions (tCO2e) and energy expenditures ($). Graphs and tables that illustrate the sources of emissions by service area and energy types are provided within the consultant's inventory report (Exhibit A), with further details in the supplementary report (Exhibit B).

The 2024 inventory reflects modest but meaningful progress in reducing corporate GHG emissions, especially when viewed in the context of population and service growth. Between 2018 and 2024, total emissions declined by 713 tonnes CO_2e, a 3.1% reduction, while per capita emissions fell by 11.0%. Although the reductions are smaller than previously reported, emissions are now 7% lower than 2023, and the City's total annual corporate carbon footprint has dropped from 23,886 to 22,188 tonnes CO_2e. These outcomes occurred alongside substantial increases in building area, expanded transit service, and rising infrastructure demands.

Looking forward to the next interim GHG emissions reduction target identified in the Climate Leadership Plan (2021), a 30% reduction in corporate emissions by 2030 from 2018 levels is set. One of the challenges to achieving this target is the increase in EF from Ontario's electricity generation, however a shift to renewable energy Power Purchase Agreements (PPAs), whereby the Municipality directly procures renewable energy to operate its facilities, as well as scaling renewable energy production, fuel switching of fossil fuel heating systems, and electrification of vehicles, may contribute to achieving the next interim target at the Municipal level. Staff note that a dollar cost per tonne of GHG emissions reduced will continue to be used to evaluate and prioritize the feasibility of all emissions reduction projects, to ensure ongoing financial responsibility. Typically, decarbonization investments come at an increased capital and operating cost and will need to be weighed relative to other Municipal priorities.

Despite growth in population and services, total and per capita emissions declined slightly. Efficiency improvements in fleet fuel use, building energy, and street lighting contributed to this progress. However, a near doubling of Ontario's electricity emission factor offset many of these gains. If the grid's carbon intensity had remained at 2018 levels, emissions would be about 3% lower, highlighting the influence of broader energy system dynamics.

More Buildings, But Less Energy Use and Emissions Per Square Foot

Municipal building space grew by nearly 29% since 2018, yet energy use fell by 7.6%, and emissions increased by only 2.1% in 2024 compared to 2018. Energy and emissions per square foot dropped by 28.5% and 21%, respectively, thanks to ongoing retrofits and system upgrades. If electricity emissions had not increased, facility emissions would have been 9.5% lower than in

2018, rather than increasing by 2.1%, and emissions per square foot would have dropped by 30%.

Combined Transportation and Transit Emissions Declined, Even as Service Expanded

Between 2018 and 2024, transportation and transit emissions decreased by 9.9% and 14.2%, respectively, despite population growth and expanded service delivery. Per capita emissions saw notable declines. These improvements were driven by reductions in energy consumption, with transportation energy use decreasing by 9.2% and transit energy by 10.3%.

During this period, Kingston Transit expanded its annual route kilometres by 2.5%, adding over 136,000 kilometres of service compared to 2018. Despite this growth, transit energy consumption and emissions intensity per kilometre both declined by more than 14%, demonstrating enhanced operational efficiency. These outcomes reflect the combined impact of fuel switching and vehicle upgrades. Future emissions reductions will depend on continued fleet modernization, access to low-carbon fuels, optimized route planning, and investments in zero-emission vehicle infrastructure.

Water and Wastewater Emissions Increased Due to Site-Level Operational Changes

Between 2018 and 2024, emissions from both water and wastewater systems increased, even though energy use across the two sectors remained largely unchanged. Wastewater emissions rose by 31.0%, and water emissions by 44.5%. Energy use increased by 0.9% in wastewater and declined by 1.5% in water. These changes were driven not by energy volume, but by higher grid emission factors and operational conditions at specific sites.

Lower Emissions Intensity Has Helped Offset Growth in Population and Infrastructure

Corporate energy use fell by 7.1%, while emissions dropped by 1.3%, reflecting the impact of a more carbon-intensive electricity grid. The gap between energy and emissions reductions reflects the impact of changing fuel and electricity emission factors—particularly the increase in the carbon intensity of Ontario's electricity grid. While fuel use declined, emissions did not fall at the same rate.

Over this same period, the City added more than 630,000 ft² of municipal facility space (a 28.7% increase), extended transit service coverage, and served a larger population. That total emissions remained stable through this period of growth points to successful reductions in emissions intensity across multiple services—whether measured per square foot, per person, or per kilometre travelled. These improvements in operational efficiency have helped offset the emissions impact of expansion and will remain essential as infrastructure and service demands continue to increase.

Summary

Between 2018 and 2024, the City reduced its corporate greenhouse gas (GHG) emissions by 3.1%, largely due to improvements in transportation, transit, and facilities. However, emissions

from water and wastewater services increased, driven by operational changes and the rising carbon intensity of electricity and fuels. While sectors with more direct energy management saw declines in emissions intensity, overall progress was tempered by population growth, expanded services, and a more carbon-intensive electricity grid. If grid intensity and population had remained at 2018 levels, emissions in 2024 would have been 18% lower than the 2018 baseline, highlighting the scale of the challenge, which is outside of the City's control.

To stay on track with climate goals, the City must adapt its climate action plans to address these broader pressures. This includes rethinking capital strategies, accelerating the transition to net-zero buildings, replacing high-emission systems, and expanding zero-emission vehicle infrastructure. Greater coordination with utilities and other levels of government will also be essential to influence the pace of energy system decarbonization. As the city grows, planning frameworks must ensure that emissions intensity continues to decline, aligning operational timelines and infrastructure investments with the scale of the climate challenge ahead.

The following table outlines factors which influence annual fluctuations in corporate GHG emissions. Note that **increased electricity generation from fossil fuels** has been updated to a **moderate** impact, based on the trend of rising electricity EFs.

Table 2. Annual Influences on CO2e Emissions and their Impact on Corporate GHGs (Greenhouse Gas)

Source of Influence	Impact on Emissions	Magnitude of Impact	Explanation
Hot summer	Increase	Low to Moderate	Increases electric energy consumption for air conditioning.
Cool summer	Decrease	Low	Decreases electric energy consumption for air conditioning.
Increased electricity generation from fossil fuels	Increase	Moderate	Higher carbon intensity of provincial electricity grid from more use of natural gas power plants. Increases emissions from electricity consumption and EV (Electric Vehicle) charging.
More EV charging (more EVs (Electric Vehicles) in fleet)	Decrease	Low to Moderate	Higher electricity consumption but lower fossil fuel use overall.

Source of Influence	Impact on Emissions	Magnitude of Impact	Explanation
Cold winter	Increase	Moderate	Increased use of fossil fuels for space heating.
Warm winter	Decrease	Moderate	Decreased use of fossil fuels for space heating.
New/expanded facilities	Increase	Moderate to High	Increase in electricity and natural gas consumption.
New additions to fleet of vehicles (non-EVs)	Increase	Moderate to High	More gasoline and diesel fuel consumption.

As directed by Council, Report Number 24-010, staff will report back in mid 2025 on the feasibility of increasing the carbon budget to 40-50% by 2030 upon the completion of the reports by Facilities Management & Construction Services, Corporate Asset Management & Fleet, Transportation & Transit.

Reporting for the 2025 Corporate GHG Emissions Inventory is expected by in 2026.

Financial Considerations

The creation of GHG emission inventory reports for future years is expected to require approximately $7,000 per reporting year which has been reflected within the capital budget of the Climate Leadership Division.

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Exhibits Attached:

Exhibit A City of Kingston Corporate GHG Inventory Report - 2024

Exhibit B City of Kingston Corporate GHG Inventory Report - 2024 – Supplemental Information

City of Kingston Corporate GHG Inventory Report – 2024

May 27, 2025

Prepared By:

Greenscale Inc.

Nathan C. Manion

Prepared For:

City of Kingston

Julie Salter-Keane, Manager, Climate Leadership

Executive Summary

This report summarizes the City of Kingston's 2024 corporate greenhouse gas (GHG) emissions inventory and assesses changes in energy use and emissions across municipal operations since the 2018 baseline year. The inventory covers emissions from facilities, transportation, transit, wastewater, water management, streetlighting, and corporate waste, and reports results in terms of total energy consumption (GJ), total GHG emissions (t CO_2e), and energy expenditures ($).

The 2024 update incorporates revised building area data for facilities and wastewater infrastructure, as well as expanded transit route coverage, enabling a more accurate assessment of emissions intensity in the context of service growth. Updates were also made to biodiesel emissions estimates, reflecting revised emission factors for B5 and B20 blends introduced last year. In addition, a correction was made to the 2018 baseline inventory to remove double-counting of biodiesel, which had previously overstated transit fuel use.

Reductions in energy use and improvements in emissions intensity—measured per square foot, per capita, and per kilometre travelled—helped offset the impact of increased demand. Continued progress will depend on long-term fleet turnover, increased capital investment, and the City's capacity to respond to changing energy system dynamics.

Summary of Results

1. Corporate GHG emissions in 2024 were 713 tonnes lower than the 2018 baseline, representing a 3.1% reduction. When adjusted for population, per capita emissions declined by 11%

2. Facility floor area increased by 634,222 ft² between 2018 and 2024—a 28.7% increase. Over the same period, energy use per square foot declined by 28.5%, and emissions per square foot dropped by 21.0%.

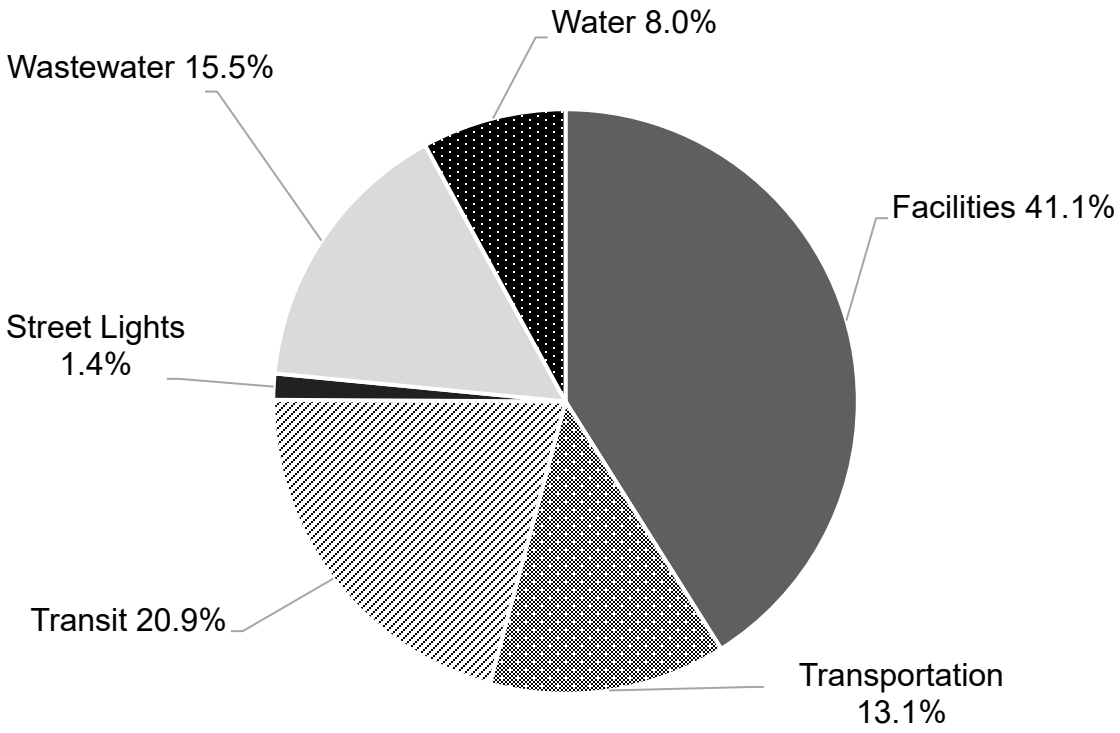
3. GHG emissions from transportation decreased by 9.9%, and transit emissions by 14%, even as transit route kilometres expanded by 2.5%. These reductions were driven by changes in fuel mix, vehicle efficiency, and service optimization.

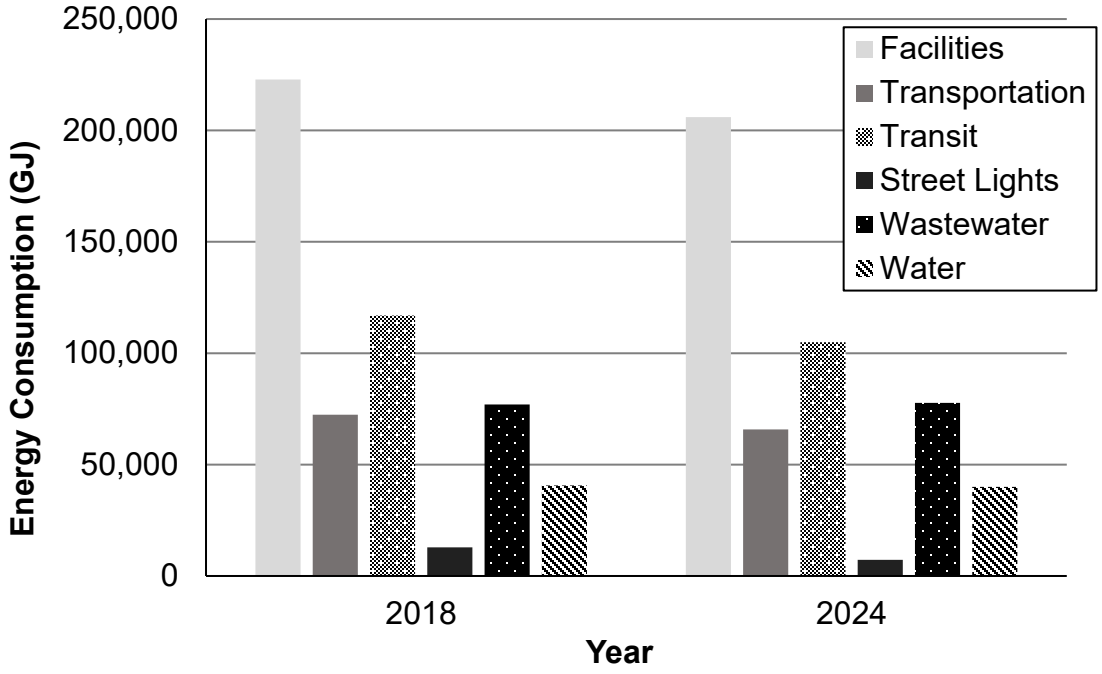
4. Total corporate energy use declined by 41,122 GJ, from 542,655 GJ in 2018 to 501,533 GJ in 2024—a 7.6% reduction. This reduction in energy demand reflects widespread efficiency improvements across sectors.

5. Increases in Ontario's electricity emission factor offset gains in several sectors. example, if electricity had maintained its 2018 emission factor, facility emissions would be 9.5% lower than 2018 levels, and total corporate emissions would be 7% lower.

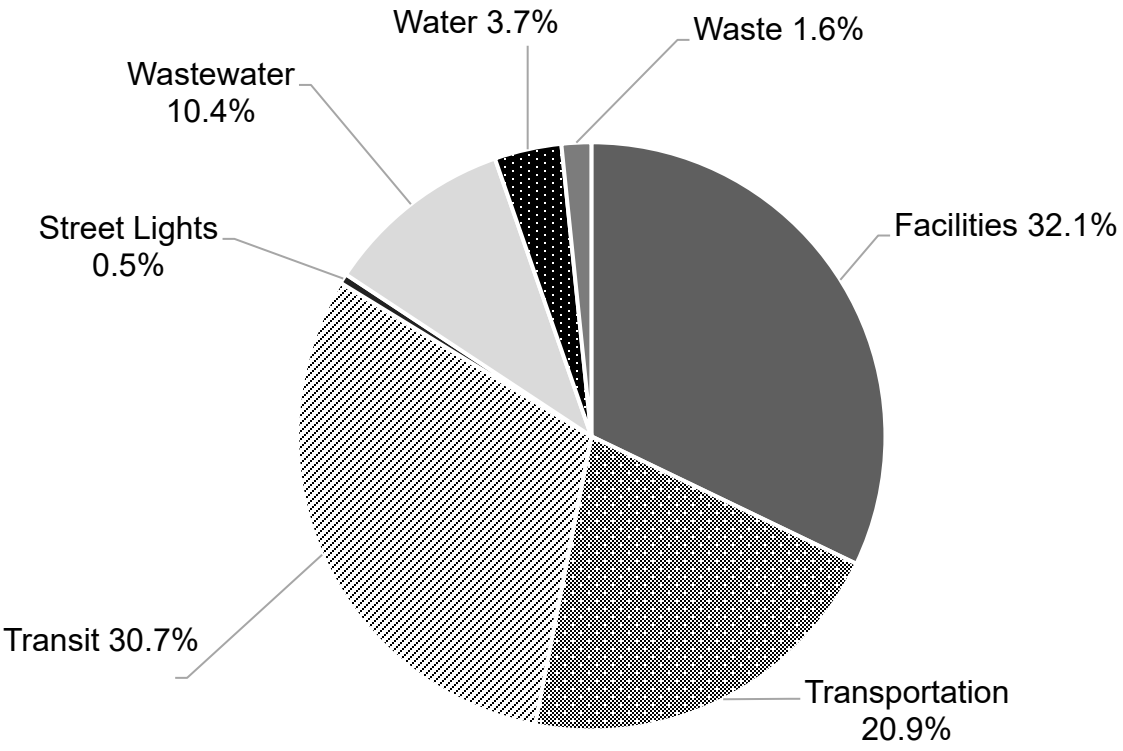
1. Inventory Trends

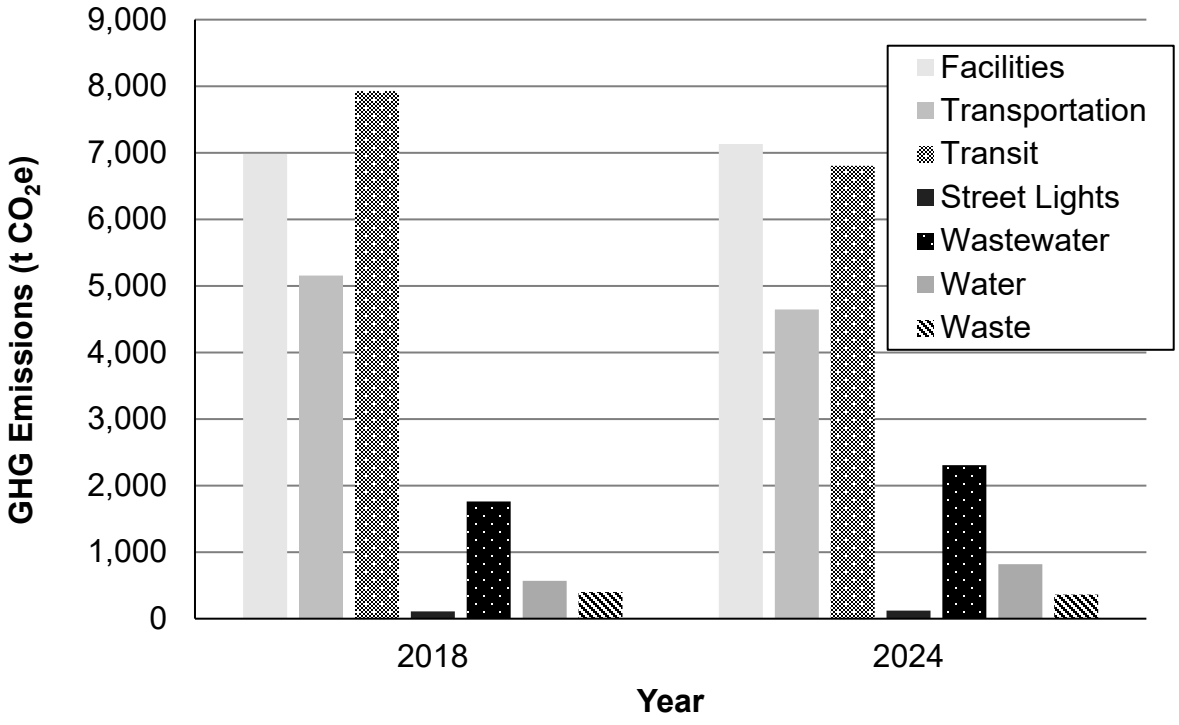
2024 Energy Consumption by sector (total: 501,533 GJ) and historical trend



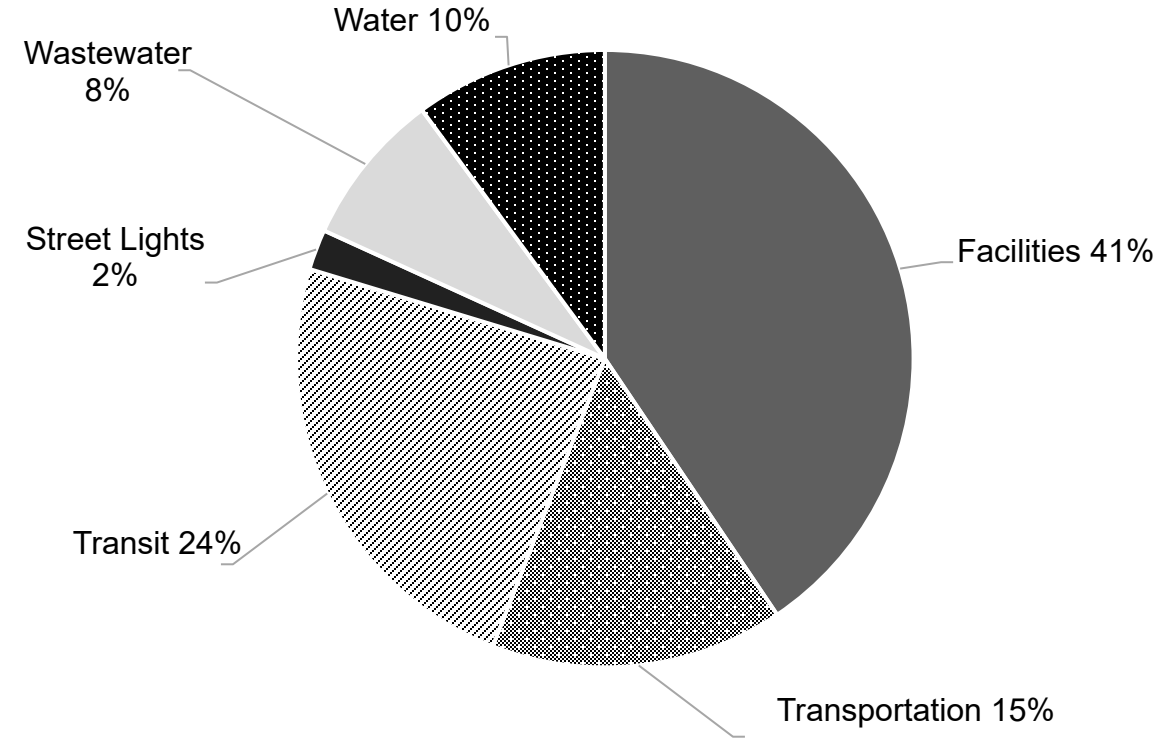


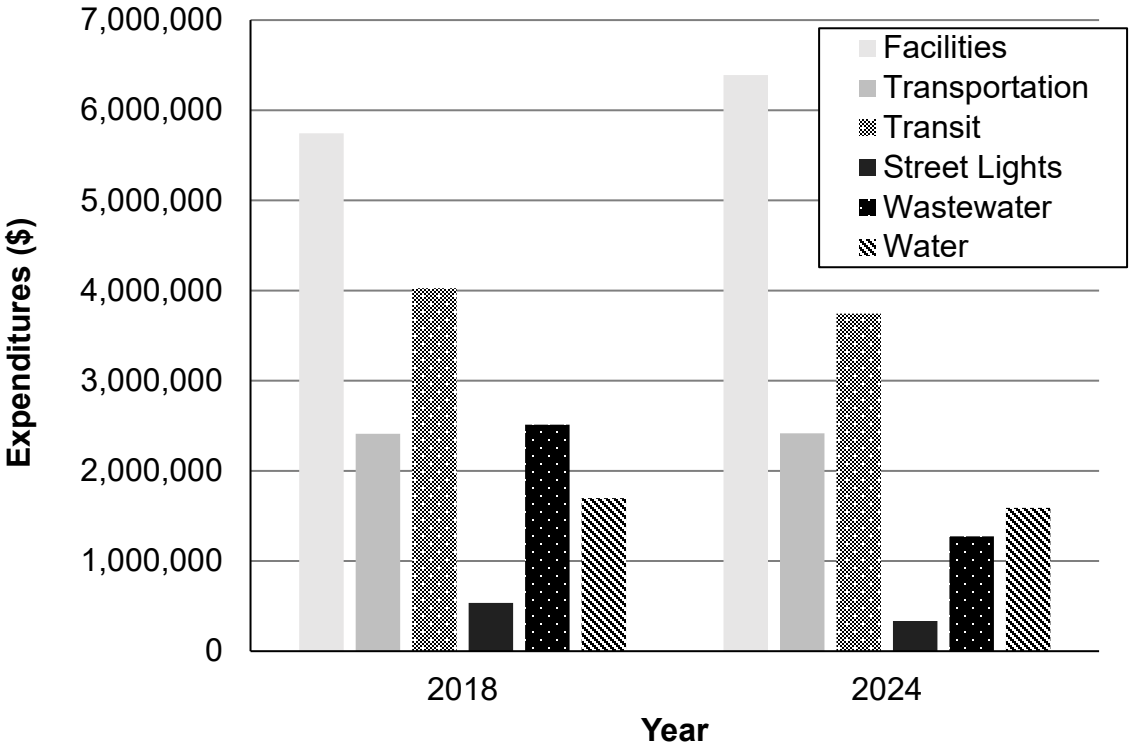
2024 GHG Emissions by sector (total: 22,188 tonnes CO_2e) and historical trend



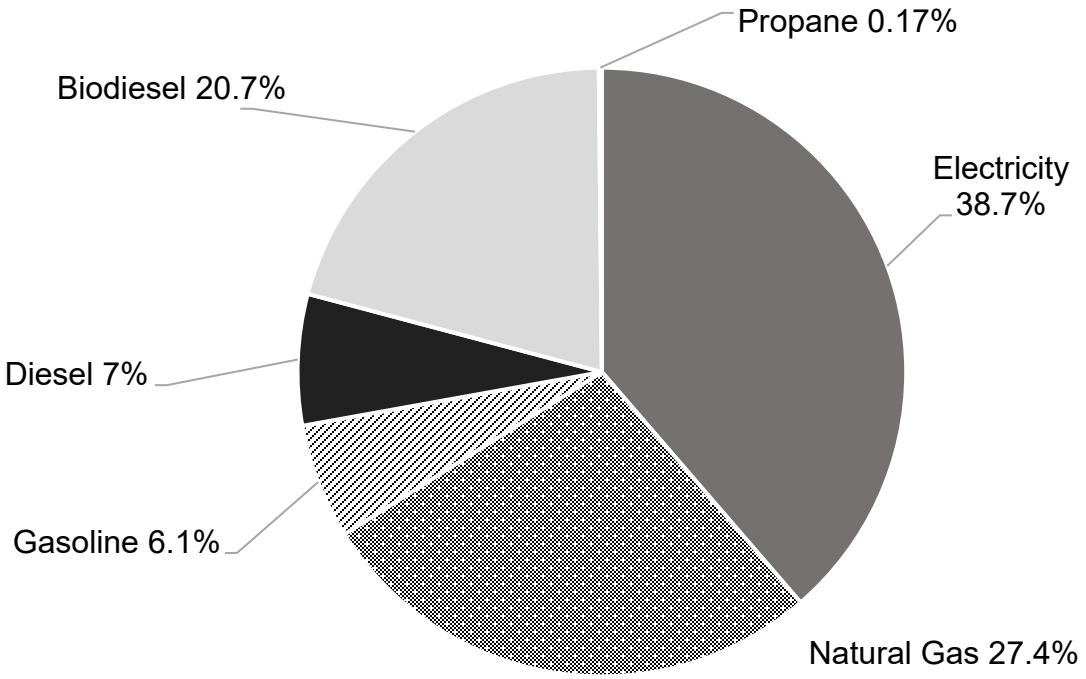


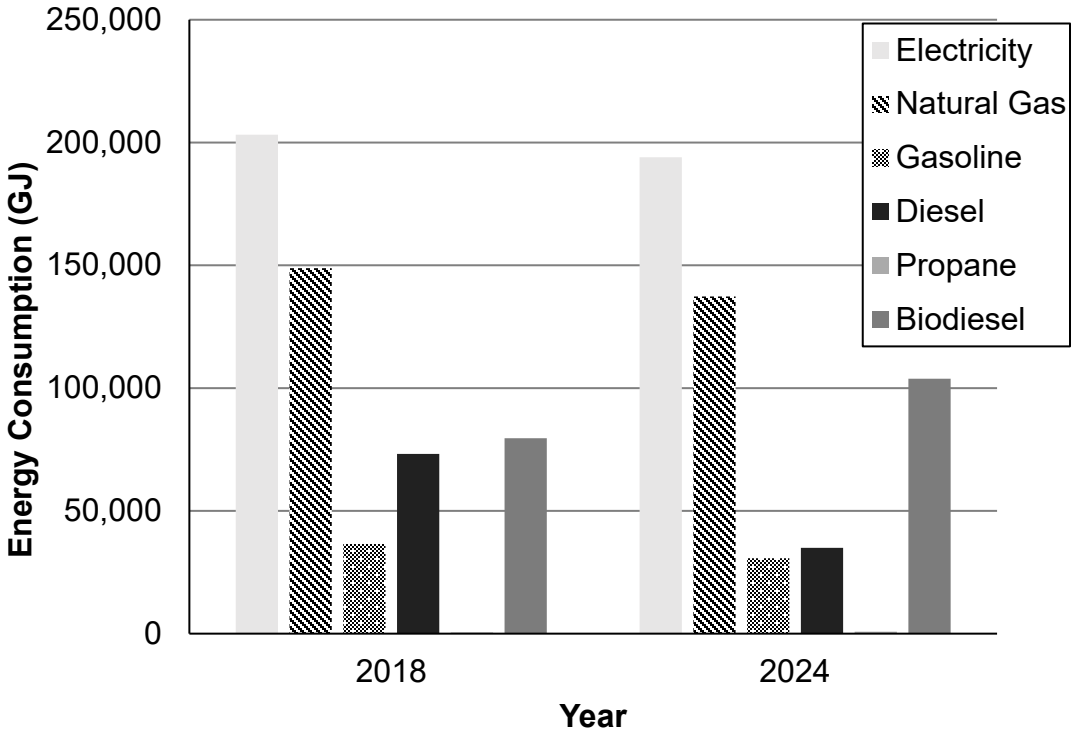
2024 Expenditures by sector (total: $15,747,681) and historical trend



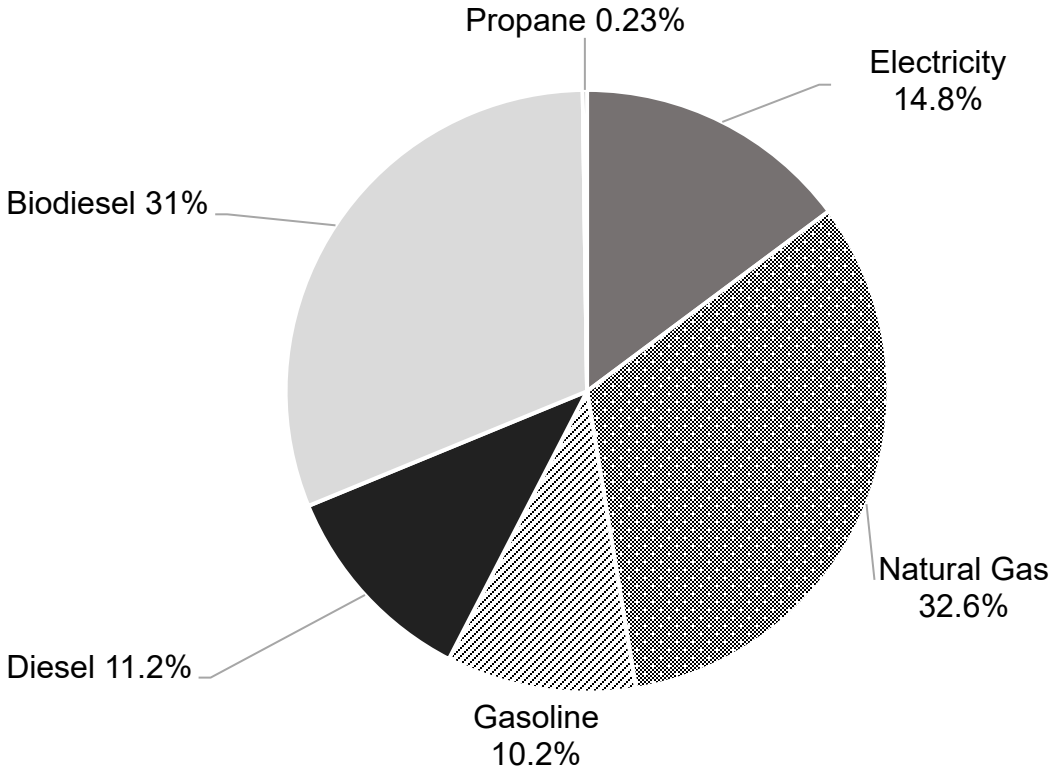


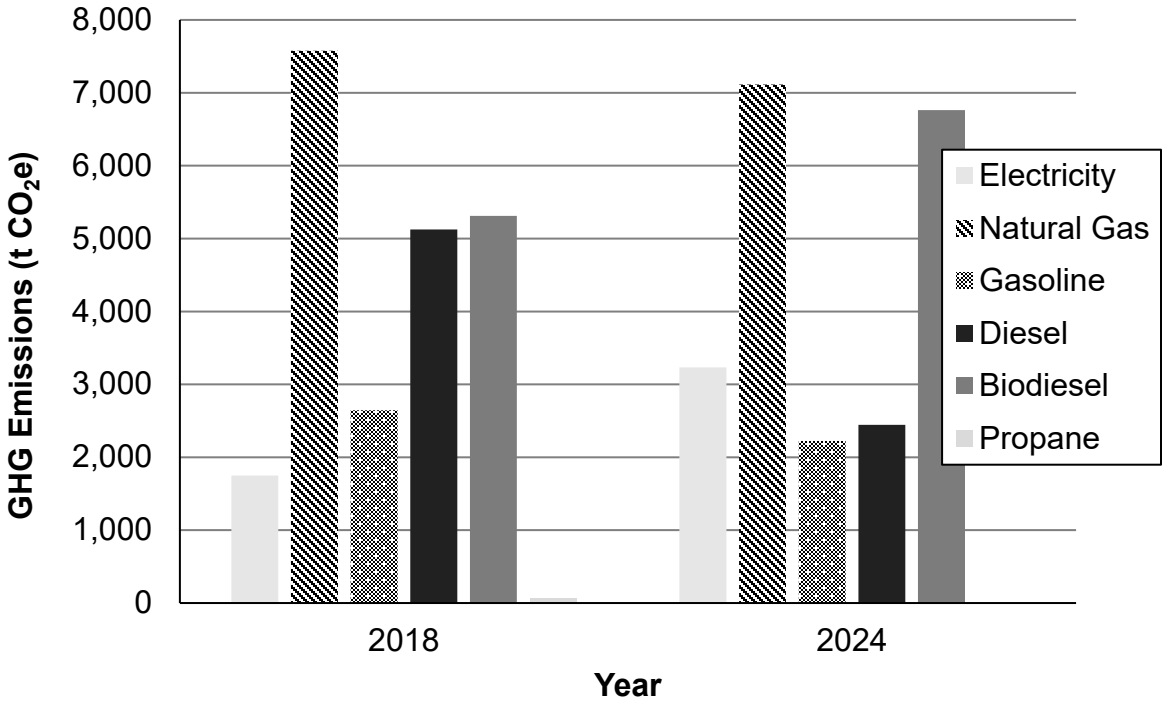
2024 Energy Consumption by source (total: 501,533 GJ) and historical trend



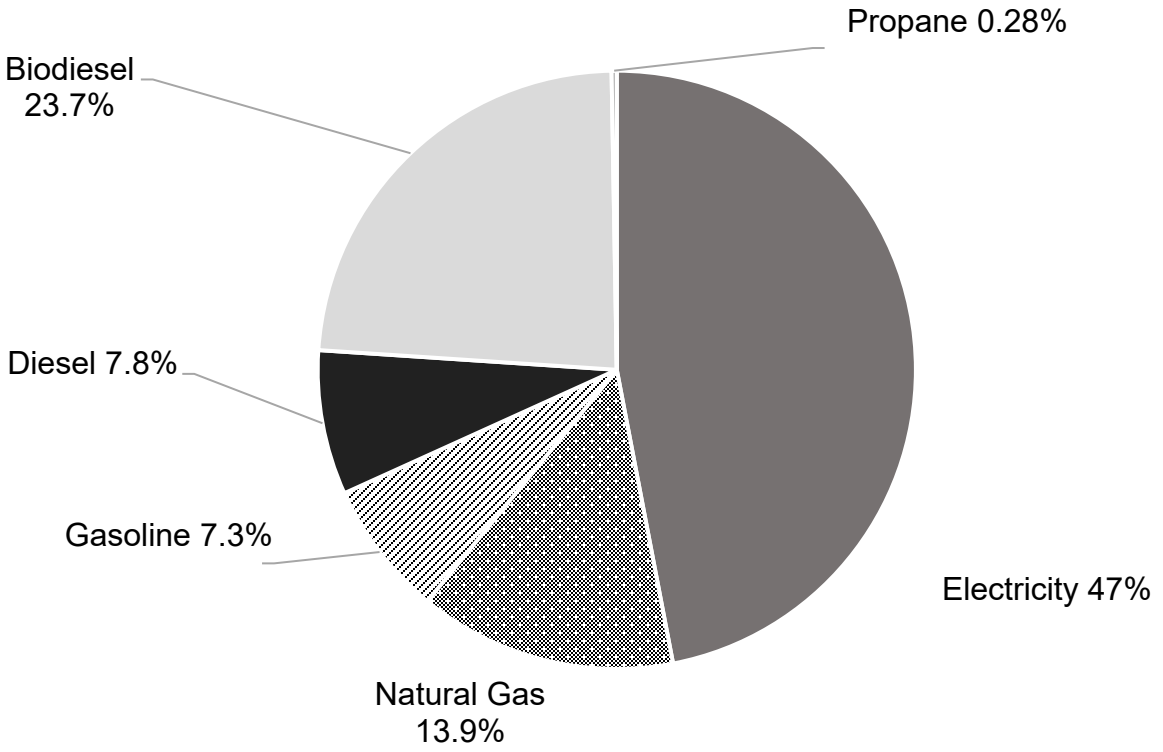


2024 GHG emissions by source (total: 21,826 tonnes CO_2e) and historical trend





2024 Expenditures by source (total: $15,747,681) and historical trend



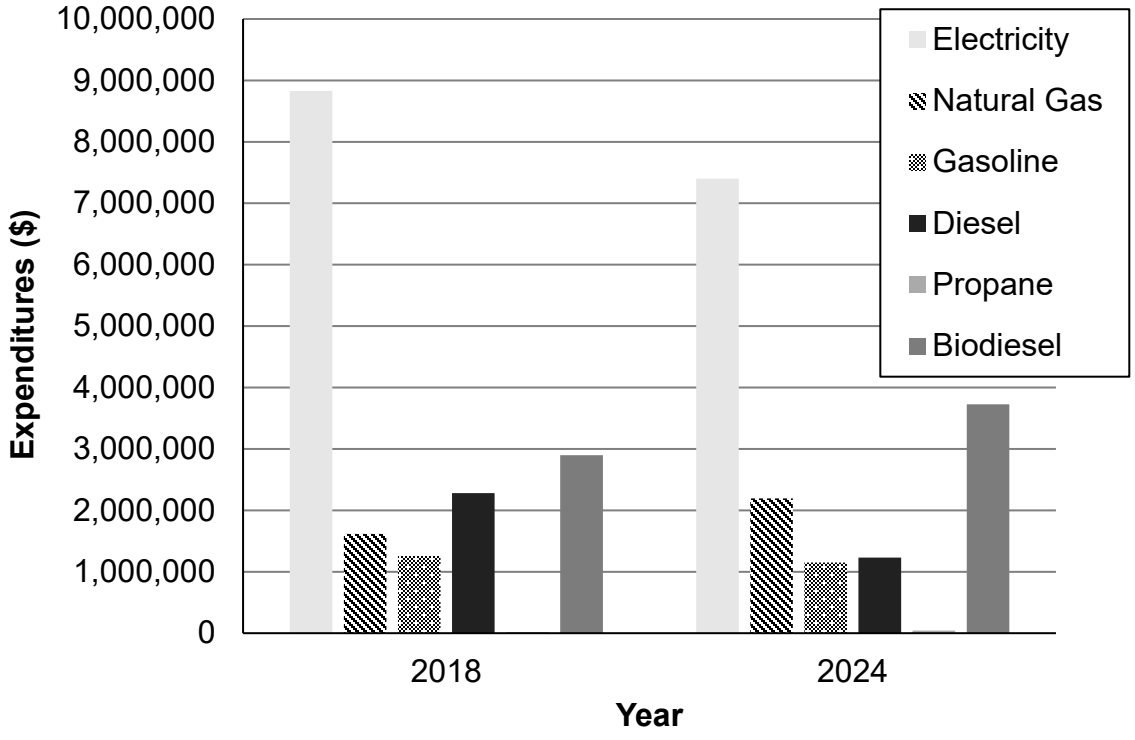


Table 1. Summary of energy consumption (GJ), GHG emissions (tCO_2e), & expenditures ($) for 2024 compared with the 2018 baseline year, for all sectors**.**

	2018			2024					
Sector Source	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption Change (GJ)**	**GHG Change (tCO_2e)**	**Change ($)**
Facilities	222,874	6,981	5,744,130	205,945	7,130	6,389,707	-16,929	148.7	645,577
Transportation	72,402	5,154	2,410,405	65,747	4,646	2,415,945	-6,655	-508.2	5,540
Transit	116,916	7,926	4,025,692	104,911	6,804	3,743,638	-12,005	-1,121.6	-282,055
Streetlights	12,838	111	534,929	7,223	120	334,305	-5,615	9.8	-200,624
Wastewater	76,983	1,761	2,512,121	77,685	2,306	1,274,372	702	545.6	-1,237,749
Water	40,642	567	1,698,320	40,022	819	1,589,714	-620	251.1	-108,606
Waste	0	400	0	0	362	0	0	-38.0	0
TOTAL	542,655	22,900	16,925,597	501,533	22,188	15,747,681	-41,122	-713	-1,177,917

Table 2. Summary of energy consumption (GJ), GHG emissions (tCO_2e), & expenditures ($) for 2024 compared with the 2018 baseline year for energy sources**.**

	2018			2024					
Energy Source	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption (GJ)**	**GHG Emissions (t CO_2e)**	**Expenditure ($)**	**Energy Consumption Change (GJ)**	**GHG Change (tCO_2e)**	**Change ($)**
Electricity	203,146	1,749	8,826,920	193,963	3,233	7,399,261	-9,183	1,483.4	-1,427,659
Natural Gas	148,867	7,578	1,617,041	137,298	7,113	2,194,108	-11,568	-465.2	577,067
Gasoline	36,527	2,644	1,255,936	30,703	2,223	1,151,112	-5,824	-421.6	-104,824
Diesel	73,182	5,124	2,281,378	34,920	2,445	1,231,777	-38,262	-2,679.2	-1,049,602
Biodiesel	79,608	5,311	2,898,783	103,819	6,762	3,727,468	24,211	1,450.8	828,685
Heating Oil	874	66	26,201	0	0	0	-874	-65.6	-26,201
Propane	450	27	19,338	829	50	43,954	378	22.9	24,616
TOTAL	542,655	22,500	16,925,597	501,533	21,826	15,747,681	-41,122	-675	-1,177,917

2. Corporate GHG Inventory Results Overview (2024)

In 2024, total corporate GHG emissions were 22,188 tonnes CO_2e, a reduction of 713 tonnes or 3.1% compared to the 2018 baseline. When adjusted for population growth, per capita GHG emissions declined by 11% (Table 3). These reductions were achieved despite substantial growth in municipal infrastructure and service delivery, reflecting operational improvements in fleet efficiency, facility performance, and broader energy management practices across departments. Total energy consumption declined from 542,655 GJ in 2018 to 501,533 GJ in 2024—a 7.6% reduction—while energy expenditures dropped from $16.93 to $15.75 million.

Table 3. Corporate total and per capita GHG emissions in 2018 and 2024, and the percentage change in per capita emissions relative to the 2018 baseline year

Year	Total GHG Emissions (t CO_2e)	Per Capita GHG Emissions (t CO_2e/capita)	% change /capita compared to 2018
2018	22,900	0.193	N/A
2024	22,188	0.185	-11.1%

a) Facilities

In 2024, municipal facilities emitted 7,130 t CO_2e, up from 6,981 tonnes in 2018. Over the same period, total building area grew by 28%, from 2,173,724 ft² to 2,807,946 ft². Energy use per square foot declined by 28.5%, and emissions per square foot fell by 21%, reflecting improved performance from retrofits, system controls, and design standards (Figure 1).

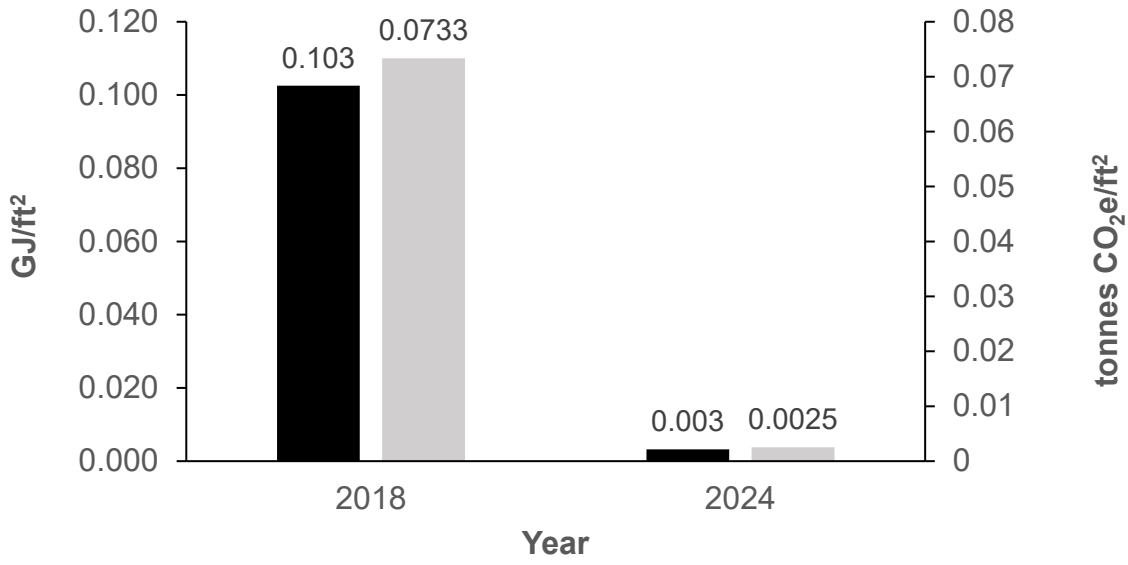


Figure 1. Energy and emissions per area of building managed by Facilities in 2018 vs 2024. Black bars represent changes in GJ/ft² and grey bars represent changes in tCO_2e/ft^2.

The increase in total emissions is largely attributable to Ontario's electricity emission factor, which doubled between 2018 and 2024. If emission factors had remained at 2018 levels, total facility emissions would be 813 tonnes lower. This would equate to a 9.5% overall reduction from the 2018 baseline and a 30% reduction in emissions per square foot.

b) Transportation & Transit

In 2024, transportation-related emissions were 4,646 tonnes CO_2e, a reduction of 508 tonnes or 9.9% compared to 2018. Over the same period, energy consumption declined from 72,402 GJ to 65,747 GJ, a 9.2% reduction, with gasoline use down 14.9% and diesel use down 5.2%. Per capita energy use decreased by 16.7%, from 0.4703 to 0.3920 GJ per person. Per capita GHG emissions fell by 17.3%, from 0.0335 to 0.0277 t CO_2e per person.

Transit emissions fell from 7,926 tonnes CO_2e in 2018 to 6,804 tonnes in 2024, a 14.2% reduction, while energy use declined by 14.1%, from 116,916 GJ to 104,911 GJ. These improvements occurred alongside a 2.5% increase in annual service kilometres, with Kingston Transit now delivering over 136,000 more kilometres of service each year than in 2018. As a result, energy and emissions per kilometre both dropped by more than 14% (Figure 2), highlighting gains in emissions intensity across the system. On a per capita basis, transit emissions decreased from 0.051 to 0.041 tonnes CO_2e per person, a 21.2% reduction. Together, these trends reflect operational changes — including fuel switching, fleet upgrades, and more efficient routing — that have reduced the emissions impact of transit service even as ridership coverage has expanded.

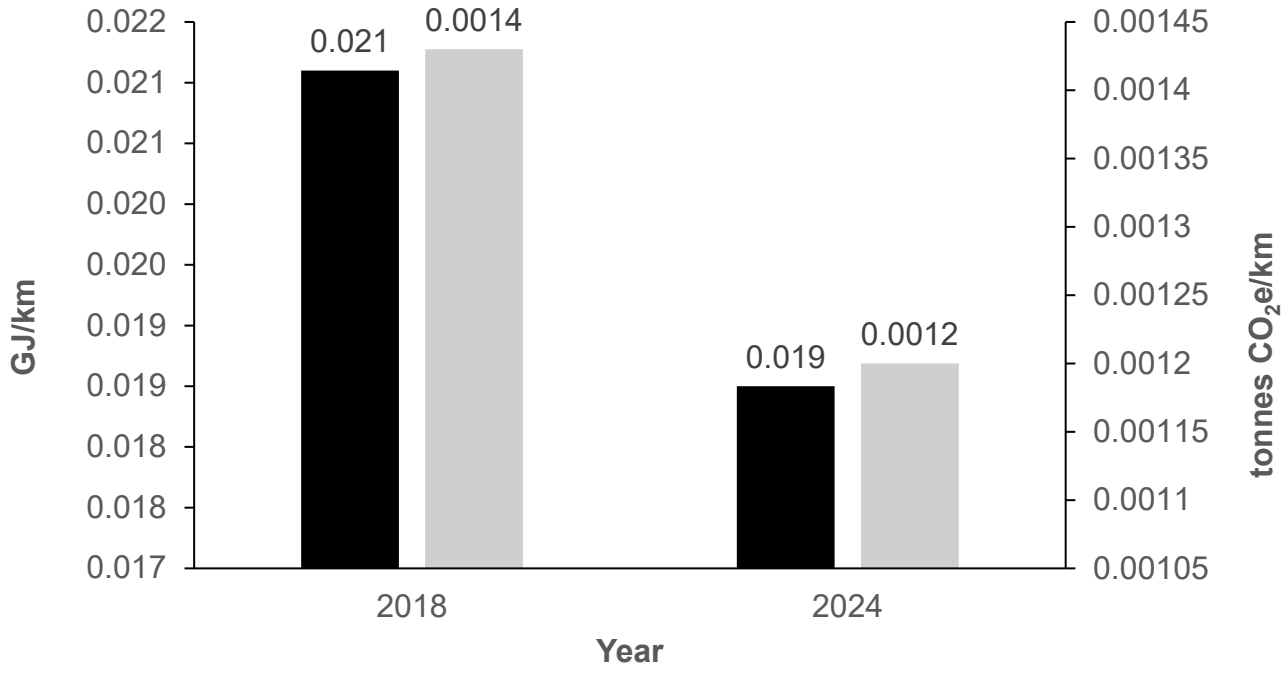


Figure 2. Energy and emissions per km driven for Transit in 2018 vs 2024. Black bars represent changes in GJ/km and grey bars represent changes in tCO_2e/km.

c) Wastewater & Water

In 2024, wastewater-related emissions totaled 2,306 tonnes CO_2e, an increase of 545 tonnes or 31.0% compared to 2018. Over the same period, total energy consumption increased slightly from 76,983 GJ to 77,685 GJ. However, when normalized by facility area, energy use per square metre dropped by 65.9% (from 29.44 to 10.05 GJ/m²), and emissions per square metre declined by 55.7% (from 0.673 to 0.298 tCO_2e/m^2). These reductions reflect a major expansion in the size of the heated wastewater facility—from 2,615 m² in 2018 to 7,733 m² in 2024—combined with targeted performance upgrades and ongoing system adjustments.

According to Utilities Kingston, the rise in emissions is largely attributable to recent upgrades at the Cataraqui Bay Wastewater Treatment Plant, which included the addition of two new buildings requiring space heating. Mechanical issues with the plant's new digester boilers have also reduced biogas utilization, resulting in greater reliance on conventional natural gas boilers. These operational conditions have contributed to increased natural gas consumption. Utilities Kingston has noted that internal work is underway to address the digester performance issues. Emissions from the remaining wastewater facilities have remained stable or shown marginal improvement since 2018.

Water-related emissions increased from 567 to 819 tonnes CO_2e, an increase of 251 tonnes or 44.5%. During the same period, energy use declined from 40,642 GJ to 40,022 GJ, a 1.5% decrease. The rise in emissions despite lower energy use is attributed to the increased carbon intensity of electricity in 2024, which directly affects electrically powered water infrastructure. Together, the water and wastewater sectors contributed 3,125 tonnes CO_2e to the 2024 corporate inventory, accounting for 13.4% of total corporate emissions.

3. Takeaways & Summary

The 2024 inventory reflects modest but meaningful progress in reducing corporate GHG emissions, especially when viewed in the context of population and service growth. Between 2018 and 2024, total emissions declined by 713 tonnes CO_2e, a 3.1% reduction, while per capita emissions fell by 11.0%. Although the reductions are smaller than previously reported, emissions are now 7% lower than 2023, and the City's total annual corporate carbon footprint has dropped from 23,886 to 22,188 tonnes CO_2e. These outcomes occurred alongside substantial increases in building area, expanded transit service, and rising infrastructure demands.

1. Emissions Stability Reflects Both Operational Gains and Systemic Constraints

From 2018 to 2024, the City's total GHG emissions declined by 3.1%, and per capita emissions fell by 11.0%, even as services expanded and the population grew by more than 13,000 residents. These results reflect operational improvements in areas like fleet fuel efficiency, facility performance, and lighting upgrades. However, many of these local gains were offset by changes outside the City's control — most notably, the doubling of Ontario's electricity emission factor over the same period. Since electricity powers nearly all municipal operations, this shift increased emissions in sectors that had otherwise reduced their energy use. If Ontario's grid had maintained its 2018 emissions intensity, Kingston's total corporate emissions in 2024 would have been approximately 7% lower. This highlights a dual challenge: while local efficiency efforts are delivering results, broader structural factors — particularly how energy is generated — remain a significant influence on municipal emissions outcomes.

2. More Buildings, But Less Energy Use and Emissions Per Square Foot

Since 2018, the total floor area of municipal buildings has increased by nearly 29%, adding more than 630,000 square feet. Despite this growth, facility emissions in 2024 were only 2.1% higher than in 2018, and total energy use declined by 7.6%. When adjusted for the size of the building portfolio, energy use per square foot dropped by 28.5%, and emissions per square foot fell by 21%, indicating that both new and existing buildings are operating more efficiently. These gains reflect the cumulative effect of retrofits, energy upgrades, and improved building systems implemented across the portfolio. However, overall emissions would have been lower if Ontario's electricity grid had not become more carbon intensive. If the grid had maintained its 2018 emission factor, facility emissions in 2024 would be approximately 813 tonnes lower — representing a 9.5% reduction from the 2018 baseline, rather than a 2.1% increase.

3. Combined Transportation and Transit Emissions Declined, Even as Service Expanded

From 2018 to 2024, emissions from transportation and transit declined by 9.9% and 14.2%, respectively, despite population growth and expanded service delivery. Per capita emissions fell in both sectors—transportation dropped from 0.0335 to 0.0277 tonnes CO_2e per person, while transit declined from 0.0515 to 0.0406, a 21.2% reduction. These reductions were supported by decreases in energy use: transportation energy fell by 9.2%, and transit energy use declined by 10.3%.

At the same time, Kingston Transit increased its annual route kilometres by 2.5%, adding over 136,000 kilometres of service compared to 2018. On a per-kilometre basis, transit energy and emissions intensity both dropped by more than 14%, indicating improved operational efficiency across the system. These results point to the combined effect of fuel switching, vehicle upgrades, and better route planning. Continued reductions in future years will depend on ongoing fleet replacement, access to low-carbon fuels, and investments in zero-emission vehicle infrastructure.

4. Water and Wastewater Emissions Increased Due to Site-Level Operational Changes

Between 2018 and 2024, emissions from both water and wastewater systems increased, even though energy use across the two sectors remained largely unchanged. Wastewater emissions rose by 31.0%, and water emissions by 44.5%. Energy use increased by 0.9% in wastewater and declined by 1.5% in water. These changes were driven not by energy volume, but by higher grid emission factors and operational conditions at specific sites.

At the Cataraqui Bay facility, wastewater energy and emissions intensity declined when measured per area of buildings managed. Energy use per m² fell by 65.9%, from 29.44 to 10.05 GJ/m², while emissions per m² dropped by 55.7%, from 0.673 to 0.298 tCO_2e/m^2. These declines reflect a large increase in heated facility area—from 2,615 m² in 2018 to 7,733 m² in 2024—following upgrades that added new treatment and biosolids buildings.

Utilities Kingston attributed the increase in wastewater emissions to changes at the Cataraqui Bay facility. Two new buildings introduced additional space heating requirements, and mechanical issues with the new digester boilers over the past several years have reduced biogas recovery. As a result, natural gas boilers have been used more frequently than intended. Utilities Kingston has indicated that internal work is underway to resolve these digester issues. Emissions from other wastewater facilities in the system have remained consistent or shown marginal improvement since 2018.

5. Lower Emissions Intensity Has Helped Offset Growth in Population and Infrastructure

Between 2018 and 2024, total corporate energy use decreased from 549,240 GJ to 510,163 GJ—a reduction of 39,077 GJ, or 7.1%. Total GHG emissions declined by 713 tonnes CO_2e, or 3.1%. The gap between energy and emissions reductions reflects the impact of changing fuel

and electricity emission factors—particularly the increase in the carbon intensity of Ontario's electricity grid. While fuel use declined, emissions did not fall at the same rate.

Over this same period, the City added more than 630,000 ft² of municipal facility space (a 28.7% increase), extended transit service coverage, and served a larger population. That total emissions remained stable through this period of growth points to reductions in emissions intensity across multiple services—whether measured per square foot, per person, or per kilometre travelled. These improvements in operational efficiency have helped offset the emissions impact of expansion and will remain essential as infrastructure and service demands continue to increase.

Summary

While overall emissions have remained relatively stable since 2018, the results vary by sector and reflect a mix of operational improvements and structural constraints. Total corporate GHG emissions declined by 3.1% (713 tonnes CO_2e) over the six-year period, with reductions achieved primarily in transportation, transit, and facilities. In contrast, emissions from water and wastewater services increased, driven by site-specific operational changes and the rising carbon intensity of electricity and fuels. In sectors where energy use could be more directly managed, emissions intensity declined—even as population, floor area, and service levels continued to grow.

These results reinforce that efficiency improvements across the City's operations are having a measurable impact and should be continued. However, they also show that existing measures are not yet sufficient to fully outpace the effects of service expansion and external factors like the rising carbon intensity of Ontario's electricity grid. If both grid intensity and population had remained at 2018 levels, corporate emissions in 2024 would have been approximately 18% lower than the 2018 baseline—highlighting the scale of improvement needed to meet targets under current conditions.

To remain on track, the City's climate action plans will require adjustments that account for these broader pressures. This includes prioritizing net-zero building, accelerating the replacement of high-emission systems in facilities, expanding zero-emission vehicle infrastructure, and coordinating more directly with utilities and other levels of government to influence the pace of energy system decarbonization. Planning frameworks will also need to place greater emphasis on scaling solutions, ensuring that as buildings, services, and population grow, the emissions intensity of each unit delivered continues to decline. These adjustments reflect the need for a shift in capital strategy, operational timelines, and intergovernmental coordination to match the scale of the climate and infrastructure challenge ahead.

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Appendix 1. GHG Emission Factors used and their sources.

Emission Source	Unit	2018	2024	Sources
Electricity	g CO_2e/kWh	31.00	60.00	TAF (2024), ECCC (2024b), ECCC (2024c)
Natural Gas	g CO_2/m^3	1888	1921	ECCC (2024a), ECCC (2024b)
	g CH_4/m^3	0.037	0.037	
	g N_2O/m^3	0.035	0.035	
	g CO_2e/m^3	1899	1932	
Light Fuel Oil	g CO_2/L	2753	2753	ECCC (2024a), ECCC (2024b)
	g CH_4/L	0.026	0.026	
	g N_2O/L	0.031	0.006	
	g CO_2e/L	2763	2755	
Propane	g CO_2/L	1515	1515	ECCC (2024a), ECCC (2024b)
	g CH_4/L	0.027	0.027	
	g N_2O/L	0.108	0.108	
	g CO_2e/L	1548	1548	
Gasoline	g CO_2/L	2307	2307	ECCC (2024a), ECCC (2024b)
	g CH_4/L	0.210	0.210	
	g N_2O/L	0.660	0.660	
	g CO_2e/L	2509	2509	
Diesel	g CO_2/L	2681	2681	ECCC (2024a), ECCC (2024b)
	g CH_4/L	0.140	0.140	
	g N_2O/L	0.082	0.082	
	g CO_2e/L	2708	2708	
B5 Biodiesel	g CO_2e/L	2574	2574	FCM (2014)
B20 Biodiesel	g CO_2e/L	2172	2172	FCM (2014)

City of Kingston Corporate GHG Inventory Report – 2024 – Supplemental Information

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1. Wastewater & Water Sector Methods

Electricity and natural gas consumption data for 2024 were provided by Utilities Kingston for all buildings associated with wastewater and water management services. Energy use was calculated in gigajoules (GJ) using conversion factors from the Canada Energy Regulator (Canada Energy Regulator, 2022). Greenhouse gas (GHG) emissions were calculated in tonnes of carbon dioxide equivalent (tCO_2e) using emission factors from the 2025 National Inventory Reports (Environment and Climate Change Canada [ECCC], 2025a, 2025b). These reflect the increased carbon intensity of Ontario's electricity grid, which has nearly doubled since 2018 due to changes in generation sources (The Atmospheric Fund, 2024; Independent Electricity System Operator, 2021). Emission factors used in this analysis are listed in Appendix 1.

Expenditure data for electricity and natural gas in 2024 were submitted directly by Utilities Kingston for each facility, based on actual billing records. These site-level values were used as reported, without applying cross-sector averages or estimated rates. Additional contextual information was integrated to account for changes in building footprint at key wastewater facilities—particularly the Cataraqui Bay Wastewater Treatment Plant, where expanded infrastructure in 2024 affected energy and emissions intensity. All reported values reflect operational emissions only, excluding emissions from construction activities or embodied carbon in capital projects.

2. Facilities Sector Methods

Electricity, natural gas, and propane consumption data for 2024 were provided by the City of Kingston for all buildings under municipal management. These values represent full-year energy use for each facility. Energy consumption was calculated in gigajoules (GJ) using standard conversion factors from the Canada Energy Regulator (Canada Energy Regulator, 2022).

Greenhouse gas (GHG) emissions were calculated in tonnes of carbon dioxide equivalent (tCO_2e) using the most recent emission factors published in the 2025 National Inventory Reports (Environment and Climate Change Canada [ECCC], 2025a, 2025b). These include updated values for natural gas and electricity, reflecting changes in Ontario's electricity generation mix. In 2024, Ontario's electricity emission factor was nearly double that of 2018, contributing to higher GHG totals for the same volume of electricity consumed (The Atmospheric Fund, 2024; Independent Electricity System Operator, 2021). All emission factors used are listed in Appendix 1.

Actual utility expenditures for electricity, natural gas, and propane were provided by Facilities Management and Construction Services, based on 2024 billing data. No estimates or cross-sector averages were used. The total gross floor area of all municipally operated buildings was used to calculate energy and emissions per square foot, supporting normalized comparisons across a facility portfolio that expanded significantly between 2018 and 2024. All data presented for this sector represent operational emissions only, excluding any emissions associated with construction, demolition, or embedded materials.

3. Street light Sector Methods

Electricity consumption data for 2024 was provided by the City of Kingston for all municipally managed streetlighting infrastructure. Total energy use was converted to gigajoules (GJ) using standard conversion factors published by the Canada Energy Regulator (Canada Energy Regulator, 2022). Greenhouse gas (GHG) emissions were calculated in tonnes of carbon dioxide equivalent (tCO_2e) using the most recent electricity emission factors from the 2025 National Inventory Reports (Environment and Climate Change Canada [ECCC], 2025a, 2025b). These values account for the increased carbon intensity of Ontario's electricity grid in 2024, which has risen significantly since 2018 due to a growing reliance on natural gas generation (The Atmospheric Fund, 2024; Independent Electricity System Operator, 2021). All emission factors used are listed in Appendix 1. Electricity expenditures for streetlighting were estimated based on the average price per kilowatt-hour (kWh) derived from utility billing records for the wastewater and water sectors. This average unit cost was applied to streetlight energy totals to estimate total expenditures in the absence of direct billing records for all streetlighting accounts.

4. Transportation Methods

The City of Kingston provided fuel consumption data for the municipal fleet for the 2024 reporting year, including total volumes of gasoline, diesel, and biodiesel used across all departments. Electricity consumption from dedicated electric vehicle (EV) charging stations was also included, covering both standalone EV meters and EV chargers connected to City-owned facility meters.

All energy data was converted to gigajoules (GJ) using standard conversion factors from the Canada Energy Regulator (Canada Energy Regulator, 2022). Greenhouse gas (GHG) emissions were calculated in tonnes of carbon dioxide equivalent (tCO_2e) using emission factors from the most recent National Inventory Reports (Environment and Climate Change Canada [ECCC], 2025a, 2025b), along with updated 2024 Ontario electricity emission factors (The Atmospheric Fund, 2024).

For 2024, updated emission factors for biodiesel blends were applied in line with guidance from Canada's Greenhouse Gas Offset Credit System: Emission Factors and Reference Values (ECCC, 2024b). These updated factors more accurately reflect the life cycle emissions associated with B5 and B20 fuel blends and are provided in Appendix 1. Additionally, a correction was made to the 2018 baseline year to eliminate double counting of diesel across fleet and transit sectors. In previous inventories, overlapping allocation of diesel volumes led to an overstatement of baseline fuel use. This has been corrected in the current analysis to ensure a consistent comparison between 2018 and 2024 emissions.

Expenditure data for gasoline, diesel, and biodiesel was provided directly by the City based on actual 2024 procurement records. EV charging expenditures were estimated using the average electricity price per kilowatt-hour (kWh) derived from facility utility bills, applied to the total EV

metered consumption. All values presented reflect operational fuel and energy use only, and do not include upstream or embedded emissions from vehicle manufacturing or capital procurement.

5. Waste Methods

For corporate waste emissions, an emission factor of 0.5 tCO_2e per tonne of waste was applied, consistent with standard practice in community-scale inventories. Waste generation was estimated at 0.5 tonnes per full-time employee equivalent, based on previous assumptions maintained for consistency across reporting years.

6. Reporting Methods

The data presented in the report is organized by sector and energy source. Sector data illustrates the distribution of emissions across various operational areas (facilities, transportation, transit, wastewater, water, and streetlights). A separate breakdown by energy source (electricity, natural gas, gasoline, diesel, and propane) provides further context on the sources of emissions. The inclusion of waste emissions explains the discrepancy between total emissions presented by sector versus those categorized by energy source. Tables in the report include both total emissions and per capita measures, with updated calculations accounting for the population and facility changes over the years, ensuring accurate representation of the GHG footprint relative to municipal growth and energy trends.

7. Future Methodological Recommendations

The existing approach to estimating waste emissions applies a uniform emission factor across all waste types generated by the City. To improve the accuracy of the City's waste emissions profile, it is advised that the waste emissions methodology be refined by initiating comprehensive tracking of both the volume and the variety of waste produced. This will allow for the application of distinct emission factors tailored to each waste category, yielding a more precise representation of the City's waste-associated greenhouse gas contributions.

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