City of Cambridge

2025-2029 ECDM Plan Update

Stantec

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Acknowledgement

We embrace our shared responsibility with the First Nations people to take care of this Earth and its creatures; we can only do so by walking the path as partners stewarding this land as we have been given the duty together to live in balance and harmony with all living things. We acknowledge and respect the Anishinaabe, Chonnonton, and Haudenosaunee peoples who came before us and who we live amongst. By honouring this truth of past and present may we come to true reconciliation through listening, reflecting, and learning.

The City is committed to raising awareness and taking action around the principles of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the recommendations of the Truth and Reconciliation Commission of Canada (TRC). This acknowledgement, and reconciliation in general, seeks a new commitment and a future built on relationships, shared values, and stewardship. This corporate plan advances aspects of sustainability of the municipal organization by moving away from dependence on fossil fuels but also to guide City staff in managing the transition for future generations in an equitable way.

The City of Cambridge wishes to thank Stantec Consulting Ltd. and the City staff on the GHG Team who contributed to the development of this ECDM Plan update.

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Executive Summary

The reduction of greenhouse gas (GHG) emissions in support of limiting the effects of climate change has long been a priority for the City of Cambridge (City). Since 2013, the City has reported its GHG emissions under the Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP) Program and provincial regulations. The City's first GHG Reduction (Energy Management) Plan was prepared in 2013, with updates in 2014 and 2020 to address evolving regulatory requirements and best practices for GHG accounting while setting GHG emission reduction targets.

This Energy and Conservation and Demand Management (ECDM) Plan update for 2025-2029 includes initiatives and actions identified by the City to meet its current GHG emission reduction targets. This plan was developed with input from all City divisions with influence on corporate GHG emissions through the "GHG Team" as well as in consultation with the Corporate Leadership Team and Cambridge Environmental Advisory Committee. This ECDM Plan meets the requirements of the *Ontario Regulation 25/23 Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans (O. Reg. 25/23)*. Alongside meeting regulatory obligations, previous versions of the ECDM Plan were used by the City to receive recognition in the Federation of Municipalities (FCM) Partners for Climate Protection Program (PCP) through achievement of Milestone 1 to Milestone 5 in this program in 2022.

The City has committed to reducing GHG emissions by 50% below 2010 levels by 2030 and 80% below 2010 levels by 2050 to help support efforts to limit global temperatures from rising beyond 1.5°C over the next 30 years. If the current global GHG emissions trajectory continues, scientists estimate that global temperatures could rise by 4°C to 6°C this century, resulting in irreversible environmental, social and climatic changes, and result in economic losses ranging from 5% to 20% of global Gross Domestic Product (GDP) annually.[a]

The City's GHG emissions are the direct result of the provision of key services and facilities by the City to the community, which include buildings, fleet, equipment, wastewater pumping, streetlighting, and solid waste. In 2023, the City's total corporate energy consumption (including electricity and all fossil fuels) was approximately

[a] https://unfccc.int/process-and-meetings/the-paris-agreement; Top Findings from the IPCC Climate Change Report 2023 | World Resources Institute (wri.org); Climate impacts set to cut 2050 global GDP by nearly a fifth (phys.org)

137,000 gigajoules (GJ) and the City's operations resulted in the release of 7,780 tonnes of carbon dioxide equivalent (tCO_2e). This is an 11% decrease in GHG emissions in comparison to the initial baseline year of 2010.

This ECDM Plan was based on corporate energy and GHG emissions available for the most current year (2023), trends over the past fifteen years, as well as anticipated growth to 2050.

A forecast of the "business-as-usual" scenario, which assumes that the City does not implement any GHG reduction initiatives, estimates that the City's 2050 GHG footprint would be 7,214 tCO_2e - a decrease of 17% from the base year of 2010. These reductions are anticipated to be gained through changes to the electricity grid such as increased power generation from non-fossil fuel sources (e.g., wind, solar, etc.). The reduction from the anticipated changes to the electricity grid will not achieve the City's reduction targets; and therefore, the City will need to implement additional measures as outlined in this ECDM Plan.

With implementation of the initiatives described in this ECDM Plan, it is estimated that the City would release 2,700 tCO_2e in 2050 – a reduction of 69% compared to 2010 levels. To achieve the 80% reduction in GHG emissions by 2050, the ECDM Plan includes the procurement of carbon offsets, provided by accredited environmental energy projects (e.g., electricity credits provided by solar farms). To minimize the necessity to purchase offsets, the City will need to implement further ambitious actions to reduce energy use within all City owned facilities, services, and the City's fleet of equipment and vehicles in order to meet the 80% by 2050 target.

The Initiatives identified in this EDCM Plan Update (2025-2029) are provided in Table ES-1.

Table ES-1: ECDM Plan Initiatives

Buildings and Facilities
B1: Update Green Building Policy & Technical Standards
B3: Develop & Implement Decarbonization Plans for Buildings & Facilities
B5: Implement a Building Commissioning Program
B8: Opportunistic Energy Conservation Projects for Buildings & Facilities

Fleet and Equipment
F3: Develop and Implement a Fleet Rightsizing Operational Procedure
F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric
F5: Install Appropriate Charging Infrastructure to Support Light Duty Fleet Conversion
Solid Waste
SW1: Develop Corporate Solid Waste Management Plan
Public Lighting and Wastewater
W2: Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators
Corporate Leadership
C1: Update Asset Management Plan and Policy
C2: Recognize Green Infrastructure as an Asset Class
C4: Develop a Sustainable Purchasing Policy
C5: Develop a Corporate Energy Savings Reserve Fund Policy and Terms of Reference
C7: Develop an Internal Cost of Carbon Policy
C9: Develop Policy for Purchasing of Emission-free / Low Emission Electricity and Natural Gas
C10: Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions
C11: Develop an ECDM Plan Financial Strategy

Table ES-2 provides a summary of the estimated interim GHG emissions reductions which would be achieved with implementation of the GHG reduction initiatives as well as utilizing carbon offsets and energy credits such as Renewable Natural Gas (RNG) and Renewable Energy Certificates (RECs) to meet the 2030 and 2050 targets.

Table ES-2: Summary of Estimated GHG Emissions Reductions below 2010 with and without Carbon Offsets and Energy Credits

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
Buildings & Facilities Emissions Reductions	-		2,058	2,959	3,007
Passenger Vehicle Emissions Reductions	-		287	559	823
Heavy Duty Equipment Emissions Reductions	-		3	140	314
Small Equipment Emissions Reductions	-		-44 [1]	-4 [1]	-4 [1]
Wastewater Pumping Emissions Reductions	-		46	94	97
Streetlight Emissions Reductions	-		788	980	991
Solid Waste Emissions Reductions	-		747	847	847
Remaining GHG Emissions	8,763	7,780	4,899	3,208	2,708
Percent Change from 2010 Base Year	-	-11%	-30 to -44%	-63%	-69%
Reductions Associated with Offsets and Credits	-		1,229	-	917
Remaining GHG Emissions after Offsets and Credits	8,763	7,780	3,666	-	1,791
Percent Change from 2010 Base Year	-	-11%	-58% [2]	-	-80%

Notes for Table ES-2:

1 Negative numbers indicate an increase to emissions. The equipment tracked in the inventory has expanded since 2010 as improved data collection and reporting systems have been implemented by the City. As a result, emissions in this sector

appear to have increased since 2010 but this is only because better data has become available. At the same time, the greening of the electrical grid is expected to reduce the total impact to emissions even as electricity usage increases.

2 This value represents the reduction achieved if all the City's electricity use is offset by purchased electricity credits. As the City is trying to achieve a 50% target in 2030, not all of these forecasted credits would need to be purchased. However, the total amount of offset required for 2030 and the available offsets at the time will heavily influence how the City can achieve its 2030 reduction target and this is one possible scenario if all the proposed initiatives are completed as scheduled in this forecast.

The City's successful conversion of all streetlights to energy efficient LED highlights the benefits of pursuing greener technologies. In 2016 the City was paying approximately $1.5 million per year for the electricity associated with streetlights with an additional amount for maintenance and regular servicing. By 2023, the amount the City spent on streetlight energy usage dropped to $890,000 despite growth during that time. The results provide savings of approximately $600,000 per year, additional monetary savings from reduced maintenance and replacement of fixtures, thousands of kilowatts of energy, and significant reductions in corporate GHG emissions. The project also led to new standards for lighting for new developments so that energy efficiency in street lighting would continue when the City assumed new streetlights. Similar success stories (e.g., eliminating natural gas use at all arenas) will be necessary to meet the 2030 and 2050 reduction targets using minimal offsets and energy credits.

The identification of initiatives for incorporation into the ECDM Plan Update (2025-2029) was accomplished through staff engagement and consideration of initiatives implemented or proposed in other Canadian municipalities. Table ES-3 provides a summary of the initiatives and the anticipated GHG reductions. Without making progress on these tasks, it is likely that the City will need to procure more offsets than forecasted to meet the reduction targets or continue to pursue emissions reductions measures (mainly at facilities and fleet) in the 2030-2034 ECDM Plan update and work toward the 2050 emissions reduction target. The Pathway (Table ES-3 below) notes that if all initiatives are implemented that the estimated reduction will be 30% below 2010 emissions baseline which falls short of the 50% 2030 emissions reduction target. The City can choose to make up the difference with the purchase of offsets and credits or accept the reductions achieved by 2030 and continue to work toward the 80% by 2050 reduction target.

In 2023, the City's energy costs exceeded $4.7 million (including electricity, natural gas, gasoline, and diesel). Without a dedicated focus on reducing and conserving energy,

annual corporate energy costs could increase to $7.2 million by 2050 as the cost of electricity and natural gas increase (not including any taxes such as the carbon tax). By implementing the 2025-2029 Plan, the annual energy cost could be limited to $6.6 million by 2050.

It should be remembered that the City's population is forecasted to grow by 46% by 2050 and that Ontario's electrical energy demand is expected to increase by 75% by 2050 due to growth, electrification and evolving technologies (IESO, 2025 Annual Planning Outlook).

Implementing the GHG reduction initiatives will require investment of staff resources as well as capital costs. Operating budget savings would decrease energy costs going forward. Some projects will have operating budget impacts (e.g. purchase of RNG over Natural Gas). High-level estimates of costs are provided below:

- 8.9 Full-Time Equivalent (FTE) – this reflects the existing human resources in various City divisions required to implement the 2025-2029 projects. No new positions are proposed;
- $11.715 m Decarbonization Study 2025-2029 implementation projects in 10 highest-emitting buildings;
- Corporate Solid Waste Management Plan $150,000 (2026 inventory, 2027-2028 plan);
- $300,000 consultant (2028-2029) Climate Action Financial Strategy in 2029;
- $250,000 optional consulting to complete the Green Building Policy, Sustainable Purchasing Policy, Cost of Carbon Policy, and Offsets Policy Review;
- Capital costs (To be determined and proposed for the capital budget) for light duty fleet EV chargers, upgrades, and site preparation for implementing the fleet strategy;
- Capital costs for replacement generators are within existing budgets ($200,000 estimated for two replacement generators);
- Capital costs for Asset Management plan are approved and within existing budget;
- $25,000 for annual regulatory reporting of GHG emissions associated with facilities is within the annual operational budget account; and

- a capital budget project be submitted for 2028 ($100,000) in order to complete the 5-year inventory and a new ECDM Plan as per Ontario Regulation 25/23.

Table ES-3: Pathway to 2030 – Initiatives to Meet 50% Reduction by 2030

Initiative [1]	Year [2]	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reduction as a Percent of 2010 Emissions	Initiative Costing [3]	Funding (F) and Timeline (T) Status
SW1	2026	Data Refinement - Fullness of Garbage Containers	Waste containers are collected at 80% full	356	4%	$	F – Full T – Reasonable
SW1	2026	Data Refinement - Composition of Waste	Waste composition has less food and more inert material than assumed residential composition; waste also then has a lower density	1,425	16%	$	F – Full T – Reasonable
F4	2026 - 2029	Parks Equipment Conversion to Electric	~10 fuel-based equipment replacements to electric per year; this also results in a 50% reduction in fuel usage	134	2%	$$	F – Partial T – Possible with full funding
B3	2026 - 2029	Decarbonization Study – implementation	"FCM Minimum Performance Scenario" projects scheduled in the study to be completed by 2029	594	7%	$$$	F – Pending capital budget approval and GMG grants T – Reasonable
B8	2026 - 2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parks Facilities find 30% electricity efficiencies and (lighting, AC); other	16	0%	$	F – Partial T – Reasonable

Initiative [1]	Year [2]	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reduction as a Percent of 2010 Emissions	Initiative Costing [3]	Funding (F) and Timeline (T) Status
			natural gas improvement				
B8	2026 - 2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parking lot public electric vehicle (EV) charging increases 5% per year;	-97 [5]	-1% [5]	$$	F – Allocated T – Reasonable
F5	2026 - 2029	Implement the Recommended Actions with the Low-Carbon Fleet Master Plan	45 EV replacements ; 10 Gas Pickups retired; 5 Pickup converted to an electric option; Charging Infrastructure expansion	180	2%	$$	F – Partial T – Unlikely (market constraints)
Total Reduction possible by 2029 from Pathway Initiatives				**2,608**	**30%**		
C10	2026 - 2029	Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions	Renewable Electricity Credit for All City Electricity	1,753 [6]	20%	$ - $$$ [7]	F – Unallocated T – Reasonable
Total Reduction including Offset				**4,877**	**50%**		

Notes for Table ES-3:

1 These initiatives are proposed for achieving the 2030 50% emissions reduction target based on the City's current inventory of assets and their current use status.

2 This represents the year(s) by which the forecasted emission reduction will be achieved.

3 Financial considerations:

$ Lowest anticipated cost; can be / is being implemented with currently allocated resources

$$ Mid-range anticipated cost; can be / is being implemented with currently allocated resources but will require continuing investment

$$$ Highest anticipated cost; projects have not been started and will require a significant allocation of resources to complete

4 Bishop Operations Centre (BOC) is the main service / operations centre for the City.

5 Negative numbers indicate an increase to emissions. The equipment tracked in the Inventory has expanded since 2010 as improved data collection and reporting systems have been implemented by the City. As a result, emissions in this sector appear to have increased since 2010 as better data has become available. At the same time, the greening of the electrical grid is expected to reduce the total impact to emissions even as electricity usage increases.

6 This offset represents the maximum potential electricity credit for use as an emission offset available if all proposed initiatives are completed. The City is trying to achieve a 50% reduction target by 2030 and purchased offsets only need to be chosen at that time if the target is to be achieved. It is likely that a mix of electricity and natural gas offsets will be necessary, but the offset quantity and type will depend on the City's achieved emission reductions by 2030 and whether the City decides to purchase offsets or instead direct limited resources to emissions reduction projects in fleet and facilities and the pursuit of the 2050 emissions reduction target instead.

7 Energy credits and emission offsets are available from a wide range of vendors; costs will vary depending on the City's chosen parameters for their offset purchasing policy and the total amount of offset required to meet the 2030 reduction target.

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Acronyms / Abbreviations / Glossary

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BOC	Bishop Operations Centre, the main City of Cambridge Operations Service Centre
BAU	Business-as-usual, a forecast scenario assuming no further steps are taken to reduce emissions or energy use
BCA	Building Condition Assessment
CEEP	Community Energy and Emissions Plan
CNG	Compressed natural gas
CH_4	Methane, a greenhouse gas
City	The City of Cambridge
ClimateActionWR	A collaborative partnership for the Waterloo region to achieve “community” (as opposed to “corporate”) reduction targets, as outlined in the TransformWR Action Plan. The partnership consists of the Region of Waterloo, 3 Cities (including Cambridge), 4 townships, Reep Green Solutions, and Sustainable Waterloo Region but also involves many community organizations, businesses, and residents as well on various committees and Action Tables.
CO_2	Carbon dioxide, a greenhouse gas
ECDM	Energy Conservation and Demand Management
EQ	Equipment; drivable parks equipment which included tractors, riding mowers, etc.

EUI	Energy use intensity, a measure of energy use relative to total infrastructure size
EV	Electric Vehicle
FCM	Federation of Canadian Municipalities
FTE	Full-time Employee
GDP	Gross Domestic Product
GHG	Greenhouse Gas (e.g., CO_2, CH_4, N_2O)
GHGI	Greenhouse Gas intensity, a measure of GHG emissions relative to infrastructure size
GJ	Gigajoules, a unit of energy consumption
HDV	Heavy Duty Vehicle
ICC	Internal Cost of Carbon
ICLEI	ICLEI – Local Governments for Sustainability (previously the International Council for Local Environmental Initiatives)
IPCC	Intergovernmental Panel on Climate Change
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LDT	Light Duty Truck
LDV	Light Duty Vehicle
LEED	Leadership in Energy and Environmental Design, a ranking certification based on the energy efficiency of the building design

N_2O	Nitrous oxide, a greenhouse gas
O. Reg.	Ontario Regulation
PCP	Partners for Climate Protection; a voluntary program designed to support municipalities in their efforts to reduce GHG emissions
The Plan / the 2025 Plan	The 2025-2029 ECDM Plan update; this document
PV	Photovoltaic (solar) power
REC	Renewable Energy Certificate(s)
Region	The Region of Waterloo, comprising of three urban municipalities – Cambridge, Kitchener and Waterloo – and four rural Townships – North Dumfries, Wellesley, Wilmot and Woolwich
ROI	Return on Investment
SME	Subject Matter Expert
TCFD	Task Force for Climate Related Disclosures
TransformWR	A community climate action plan (as opposed to this "corporate" ECDM Plan) that was developed to support the emission reduction goals of the municipalities of the Region of Waterloo, Reep Green Solutions and Sustainable Waterloo Region; see ClimateActionWR
tCO_2e	Tonnes of carbon dioxide (CO_2) equivalents, a unit of mass to measure the amount of GHG emissions, taking into account the three largest GHGs: CO_2, methane (CH_4), and nitrous oxide (N_2O) relative to the global warming potential of CO_2.

1 Climate Change is a Priority

Climate change has emerged as an unprecedented social, economic, and environmental challenge facing our society today. It poses a serious threat to our quality of life, jobs, and our physical and natural assets. Scientists believe that the human-caused greenhouse gas (GHG) emissions since the industrial revolution of the 1800s have already surpassed the Earth's "carrying capacity" and pose significant future risks to human well-being as well as natural ecosystems. As such, if we do not reduce our GHG emissions soon, we can expect to be impacted by more floods, windstorms, heat waves, droughts, and wildfires which can drag down our economy, erode our social systems, impact our natural resources, and limit our ability to respond and recover.

Local governments are in a good position to address the climate crisis and take actions at the local level through mitigation and adaptation practices to reduce impacts and realize other community benefits. To substantially reduce the risks and effects of climate change, scientists and policy makers have come to the agreement that global society must stabilize and reduce GHG emissions to limit global temperatures from rising beyond 1.5°C over the next 30 years (IPPC, 2018). To support this undertaking, the City has committed to reducing its GHG emissions by 50% below 2010 levels by 2030 and 80% below 2010 levels by 2050. If the current global GHG emissions trajectory continues, scientists estimate that global temperatures could rise by 4°C to 6°C this century, resulting in irreversible environmental, social and climatic changes, and economic losses ranging from 5% to 20% of global Gross Domestic Product (GDP) annually (Stern, 2007).

Taking action on climate change and reducing GHG emissions has long been a priority for the City of Cambridge (the City). The City prepared its first *GHG Reduction (Energy Management) Plan* in 2013 as part of the Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP) Program, and to meet regulatory requirements under the Green Energy Act. The preparation, updating, and implementation of these plans allowed the City to participate in the PCP Milestone program. The City received recognition of the PCP Milestone program completion by FCM in 2022 and has decided to restart the program to continue its commitment to GHG reductions. The ECDM Plan provides City staff to identify actions that can be implemented over the next 5 years (2025-2029) and beyond to reduce energy and GHG emissions. The implementation of this updated Plan will maintain the City's trajectory towards its 2050 GHG reduction target.

1.1 Alignment with the City's Strategic Plan, Partners for Climate Protection Framework, and Ontario Regulation 25/23

The City's 2025-2029 ECDM Plan has been prepared in accordance with O. Reg. 25/23 (and its focus on prescribed City facilities). This plan also implements the City's Strategic Plan and its objectives around resiliency and prosperity (i.e. "Use a future-oriented, proactive approach to climate action and emergency preparedness to ensure we can adapt in a changing environment."). Finally, this plan aligns with the Partners for Climate Protection (PCP) framework and its focus on quantifying, monitoring and managing GHG emissions generated at the local level.

Ontario Regulation 25/23 (O. Reg. 25/23) - *Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans* (formerly O. Reg. 507/18) requires local governments to report on energy and GHG emissions from owned and leased buildings and to produce a five-year ECDM Plan. Local governments are also required to inventory their prescribed facilities and report their energy use annually. As noted above, this Regulation is only concerned with a subset of City facilities, but this Plan encompasses all corporate emissions (e.g. fleet, waste, lighting).

This plan, annual regulatory reporting, and implementation studies, such as the recently approved Greenhouse Gas Emissions Reduction Feasibility Study, address the requirements of O. Reg. 25/23 in detail and are summarized below:

- A summary of annual greenhouse gas emissions for various City operations can be found in Table 1-1: 2023 Corporate Energy and GHG Emissions by Category.
- A description of the results of previous activities and measures to conserve energy include the acquisition of electric fleet vehicles and equipment such as ice resurfacers, conversion of streetlights to LED fixtures, and various facility improvements ranging from LED lighting conversion in arenas to geothermal heating and cooling at a City pool.
- The Greenhouse Gas Emissions Reduction Feasibility Study provides the cost and savings estimates for the City's 10 highest-emitting buildings for proposed energy conservation measures for the next ten years (2026-2036).
- The City has a solar array at the Bishop Operations Centre that produced 22,182 kWh of electricity usage in 2023.

1.2 About the City of Cambridge

The City of Cambridge is located within the Region of Waterloo and occupies an area of 113 square kilometers. The current population is 152,130 (2023) and is expected to grow 10% by 2030 and, if trends continue, is forecasted to increase by 46% by 2050.

To provide essential services to the community, the City owns and/or operates over $4.2 billion (2024) in assets in the form of 163 buildings and structures, a fleet of approximately 400 vehicles and equipment, wastewater pumping stations and supporting infrastructure like streetlights. The operation of these corporate assets collectively consumes energy and results in the release of GHG emissions. Some services provided in the City, such as curbside waste collection, landfill, drinking water supply, wastewater treatment, and police services, are provided by the Region of Waterloo (the Region) as part of the Region's two-tiered municipal government system and are therefore not accounted for in this plan or in the City's emissions inventory but are accounted for in the scope of Region's corporate plan.

1.3 Scope of the 2025-2029 ECDM Plan

Calculating corporate municipal GHG emissions can be complicated because of how services are delivered. To be relevant, GHG inventories must reflect the operations of a City and the way in which it interacts with the local and regional community. At the same time, it is important that the GHG inventory conform to international standards for reporting to facilitate consistency and comparability with other cities. To this end, the City's energy and GHG boundary has been set following an "operational control" approach where the City tracks energy and GHG emissions of an asset when:

- The City owns the asset; and
- The City is responsible for maintenance and capital upgrades.

The assets over which the City has direct control, and which were considered in the development of this Plan, are presented below. The City had previously presented the energy consumption of some buildings where the tenant-maintained control of its own use of energy within the building and was responsible for payment of its own utility accounts. With the exception of the Cambridge Public Library branches, these tenant facilities have been removed, retroactive to the 2010 energy consumption reporting year, and the City's total energy and emissions have been recalculated for accurate assessment of the City's 2030 and 2050 GHG emissions reduction commitments.

Assets Included in the ECDM Plan

Buildings and Facilities – Administrative Offices, Service Buildings, Storage Facilities, Cultural, Arts, Entertainment and Heritage Facilities, Indoor / Outdoor Recreational Centres, Pools, Arenas and Sports Facilities, Fire Stations, Libraries, Parks & Cemeteries. Renewable Energy Generation (solar array at the Bishop Operations Centre).

Fleet and Equipment – Light Duty Vehicles, Heavy Duty Vehicles, Off Road Vehicles, Other Equipment.

Wastewater – Pumping Stations.

Public Lighting – Street and traffic lights for roads and parking lots, Lighting in parks for trails, signage, etc.

Waste – Waste generated from City owned properties and buildings, facilities, and parks.

This is a 5-year plan (2025-2029) that focuses exclusively on energy and GHG emissions resulting from the City's service delivery. It does not include "community energy use" or GHG emissions that are outside the operational control of the City, such as those provided by the Region identified in Section 1.2 or the emissions of businesses, residents, or institutions in the community. Community emissions are addressed through the ClimateActionWR collaborative partnership and the TransformWR community climate action plan. A focus on the pathway to achieving 50% GHG emissions reductions by 2030 (below 2010 base year levels) is the priority for this iteration of the 2025-2029 ECDM Plan, in alignment with the greater community objectives.

1.4 Plan Development

The ECDM Plan's energy and GHG emission forecasting was based on corporate energy and GHG emissions for the latest available year, 2023, trends from the last fifteen years, and anticipated growth to 2050. The identification of initiatives for incorporation into the ECDM Plan was accomplished through staff engagement and consideration of initiatives in other Canadian municipalities.

1.5 Update on 2020 ECDM Plan Initiatives

The previous update of this ECDM Plan was produced in 2020 (2020 ECDM Plan) and contained energy conservation actions (i.e., retrofits and upgrades) to reduce GHG emissions, as well as several "supportive projects," such as policy development initiatives, which did not directly result in GHG reductions but were consistent with the City's strategic plan goals of acting on climate. Table 1-1 presents the status of the initiatives of the previous 2020 ECDM Plan and whether they are being carried forward into the next 2025-2029 ECDM Plan. The 2020 ECDM Plan Initiatives that are not carried forward were either completed, have been integrated fully into City protocols, or are considered to be less impactful than other initiatives and were deprioritized, additional details for each are provided in Appendix A.

Table 1-1: Status of 2020 ECDM Plan Initiatives

Action Item	Status	Carried Forward into the 2025 ECDM Plan?
B1: Update Green Building Policy and Technical Standards	Ongoing	Yes
B2: Complete Building & Facility Utilization Assessments	Completed	No
B3: Develop Decarbonization Plan for Buildings & Facilities	Ongoing	Yes
B4: Implement Energy Audit Recommendations	Completed	No
B5: Implement a Building Commissioning Program	Ongoing	Yes
B6: Pilot Building Energy Management System	Completed	No

Action Item	Status	Carried Forward into the 2025 ECDM Plan?
B7: Continue to Develop Alternative Work Strategies and Supportive Policies	Completed	No
F1: Conduct Fleet Data Analysis with Sustainability Focus	Completed	No
F2: Develop a Low-Carbon Fleet Master Plan	Completed	No
F3: Develop and Implement a Fleet Rightsizing Operational Procedure	Ongoing	Yes
F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric	Ongoing	Yes
SW1: Develop Corporate Solid Waste Management Plan	Not Initiated	Yes
W1: Assess the Feasibility of Micro-Hydro Turbine Systems When Installing or Upgrading Existing Wastewater Infrastructure	Completed	No
W2: Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators	Ongoing	Yes
C1: Update Asset Management Plan and Policy	Ongoing	Yes
C2: Recognize Green Infrastructure as an Asset Class	Ongoing	Yes

Action Item	Status	Carried Forward into the 2025 ECDM Plan?
C3: Incorporate Life Cycle Considerations into Capital Planning and Purchases	Ongoing	No; merged with C4
C4: Develop a Sustainable Purchasing Policy	Ongoing	Yes
C5: Develop a Corporate Energy Savings Reserve Fund Policy and Terms of Reference	Ongoing	Yes
C6: Develop a Sustainable Infrastructure Rating System Policy	Not Initiated	No
C7: Develop an Internal Cost of Carbon Policy	Not Initiated	Yes
C8: Establish Dedicated Sustainability Planning Resource(s)	Completed	No

2 Corporate Energy & GHG Emissions

Cities are centres of communication, commerce, and culture. They are also a significant and growing source of energy consumption and GHG emissions. Cities and regional centres can affect considerable change on GHG emissions levels on a global scale as they are responsible for more than 70% of global energy related GHG emissions (UNEP, 2024).

2.1 Current Energy and GHG Emissions

In 2023, the City's corporate energy consumption was approximately 137,000 gigajoules (GJ) including use of electricity, natural gas, gasoline and diesel. The City's total GHG emissions in 2023 was 7,780 tonnes of carbon dioxide equivalent (tCO_2e). The consumption of energy and associated GHG emissions were the direct result of the provision of key services by the City, which are organized into the following categories.

- **Buildings**: The City's buildings consume electricity and natural gas to heat, cool, ventilate, and illuminate buildings, maintenance facilities, and community and recreation centres.
- **Wastewater**: While the Region owns and operates the water supply and sewage treatment systems for the whole region (including Cambridge), the City operates multiple wastewater pumping stations within its jurisdiction which consume energy and release GHG emissions.
- **Public Lighting**: The City operates over 10,000 streetlights which are powered by electricity. Other public energy uses for public facilities (such as trail lighting in parks and public signage) are included in this category.
- **On-Road Vehicles**: The City's fleet vehicles include light, medium and heavy duty vehicles for corporate use. These include passenger vehicles (cars and pickup trucks) as well as larger vehicles (fire trucks and snowplows).
- **Off-Road Vehicles and Equipment**: All off-road and non-hand-held equipment that consume gasoline and diesel, such as excavators and riding lawnmowers.
- **Solid Waste**: Although the City does not own or operate a landfill, the corporate operations generate waste which is sent to the Region's landfill. This waste decomposes in the landfill and releases methane (CH_4) which is a GHG.

Table 2-1 presents the breakdown of the 2023 energy and GHG emissions by sector. Buildings and Facilities account for 66% of the City's energy usage and 39% of the City's GHG emissions profile.

Table 2-1: 2023 Corporate Energy and GHG Emissions by Category

Sector	Energy (GJ)	Proportion of Energy (%)	GHG Emissions (tCO_2e)	Proportion of GHG Emissions (%)
Buildings & Facilities	89,896	66%	3,000	39%
Wastewater Pumping	4,076	3%	62	1%

Sector	Energy (GJ)	Proportion of Energy (%)	GHG Emissions (tCO_2e)	Proportion of GHG Emissions (%)
Public Lighting	15,443	11%	163	2%
Heavy Vehicles [1]	13,169	10%	925	12%
Passenger Vehicles & Equipment [2]	13,990	10%	957	12%
Solid Waste [3]			2,673	34%
Total	**136,574**	**100%**	**7,780**	**100%**

Notes for Table 2 1:

1 These are heavy duty vehicles for which no electric options are expected in the medium to long term.

2 These are light duty vehicles and equipment for which electric options are expected in the short to medium term.

3 This waste analysis was performed using the latest methodology required by PCP Milestone program. Refer to Section 4.3 for further description on how it is calculated.

More than 33% of the City's GHG emissions result from the consumption of natural gas which has a higher GHG intensity than electricity in Ontario. Diesel and gasoline fuels used in the operation of fleet and equipment account for 22% of the City's energy usage and 24% of the City's GHG emissions profile. A breakdown of energy consumption and GHG emissions respectively are presented in Figure 2-1 and Figure 2-2.

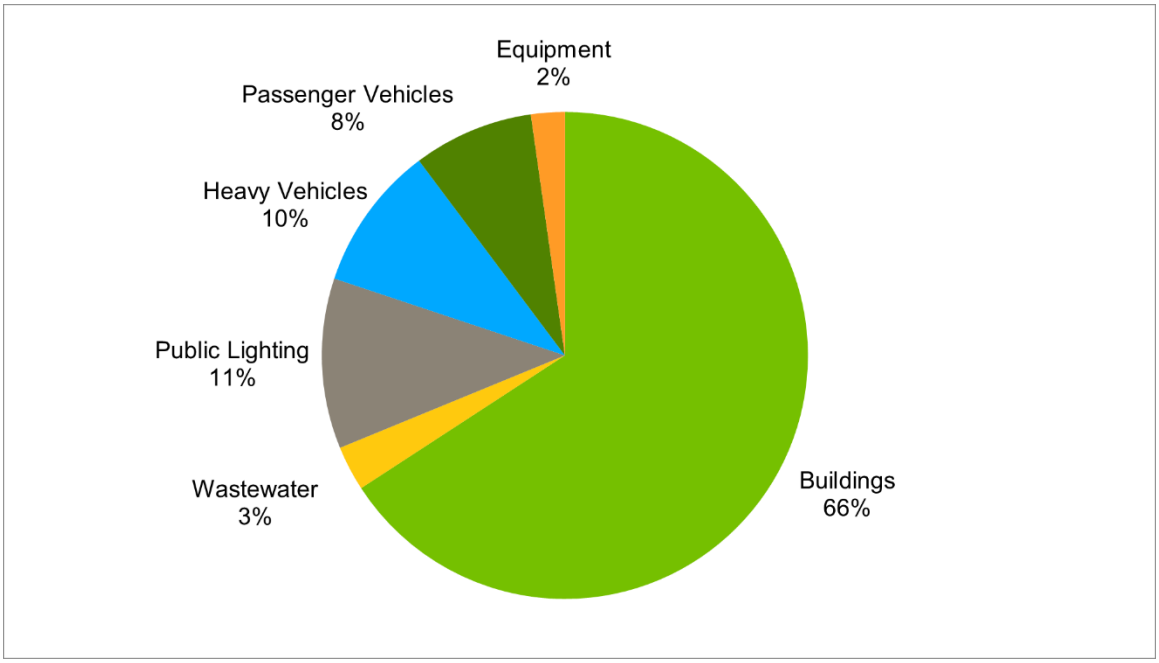


Figure 2-1: Energy Use (GJ) By Sector

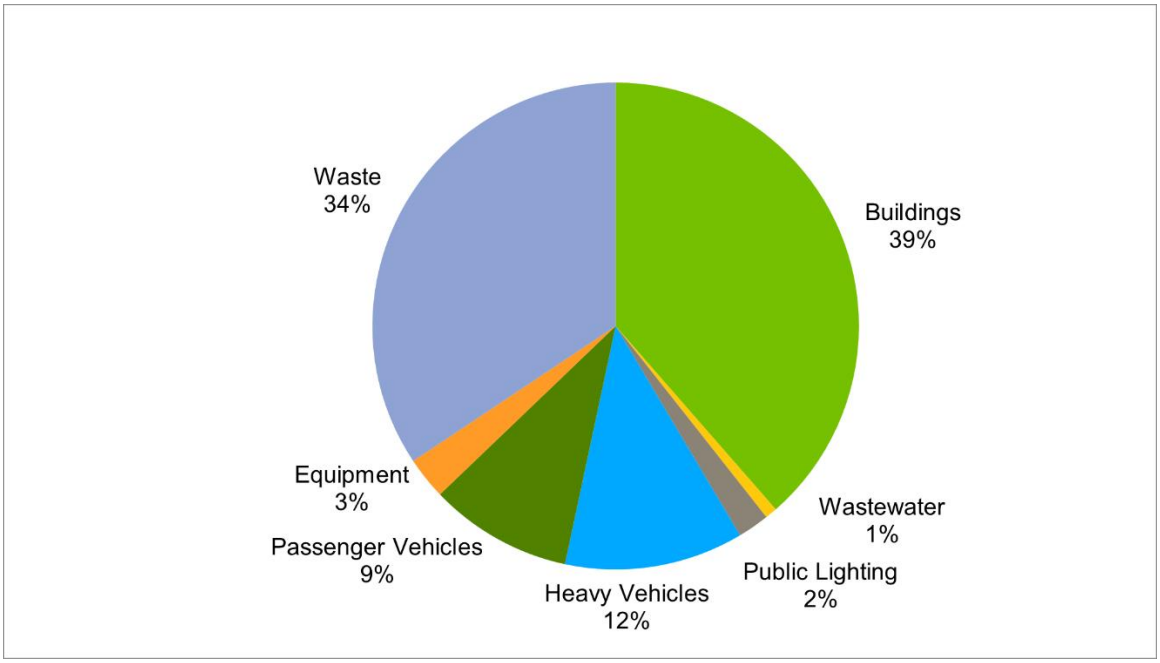


Figure 2-2: GHG Emissions (tCO_2e) By Sector

2.2 Historical Trends

Between 2010 and 2023, the City's population increased by over 15% while energy and GHG emissions from corporate operations have decreased by 11%. The relationship between GHG emissions and energy consumption is illustrated in Figure 2-3.

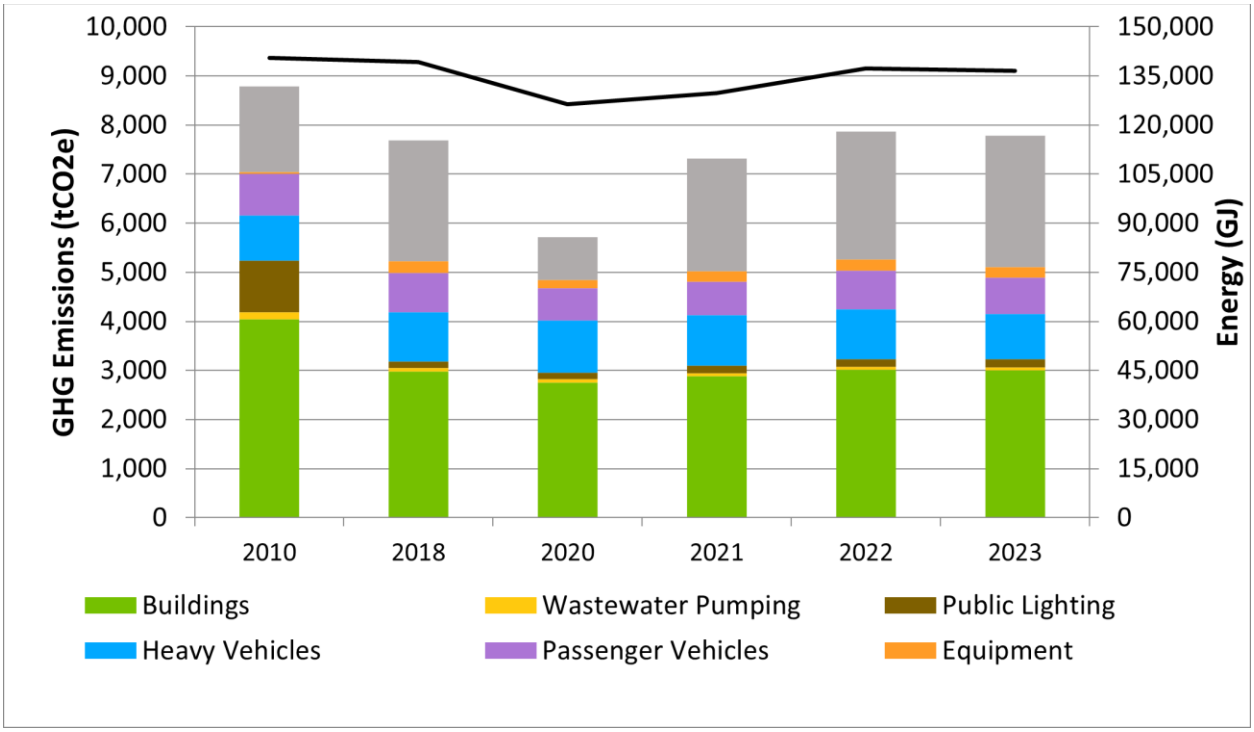


Figure 2-3: Corporate Energy and GHG Emissions Trends

As with any growing city, the increase in population is often the largest driver of GHG emissions. However, a more dramatic rise in GHG emissions has been mitigated because of the implementation of energy efficiency and reduction actions by the City, as well as the greening of the provincial electrical grid.

Building energy use intensity (EUI) and GHG intensity (GHGI) are industry-accepted metrics to benchmark the performance of the City's building asset portfolio over time and to other municipal portfolios in similar geographies. Assessing buildings on an energy intensity basis allows the identification of the high energy consuming buildings relative to their size as these buildings have the most potential to generate significant energy savings. The City is currently undergoing an asset management review to update the quantity and size of its current inventory, and it is expected that these

metrics will begin to provide comparable benchmarks for the City moving forward upon completion of this review.

3 Forecast to 2050

This section provides a Business-As-Usual forecast of energy, GHG emissions, and energy costs (the BAU Forecast) as well as the anticipated GHG emissions reductions. A summary of the quantified emissions included in the BAU and ECDM Forecasts are provided in Appendix B.

3.1 Business-as-Usual GHG Emissions Forecast

An energy-and-GHG-emissions forecast was developed for the Plan to understand how the City's GHG emissions will change from 2024 to 2050 if no additional energy and GHG reduction initiatives are implemented by the City. This is often referred to as the Business-As-Usual (BAU) forecast. The BAU Forecast assumes that additional energy will be required and consumed by the City to accommodate a growing population. In the BAU Forecast this increase has been simulated by increasing the total arena count by one, which would consume energy and release GHG emissions at the average rate as the current City arenas (Note, there is no current plan to build a new arena in the City). While no significant expansion of the fleet is forecasted, hybrid/electric vehicles are anticipated to be more readily available as the regulatory phase-out of the sale of new vehicles powered solely by gasoline or diesel reaches 100% in 2035, this will help to reduce emissions from this sector but will also increase the general population's use of City's electric charging infrastructure to charge personal vehicles.

The BAU Forecast does not consider potential impacts to energy consumption due to climate change (e.g., warmer summers could result in more electricity use for air conditioning within buildings). Other external factors are likely to have impacts to the overall energy used by the City, but this is anticipated to be mostly additional electrical energy. As the Ontario electrical grid increases renewable and nuclear electricity generation (referred to as "greening"), the GHG emission coefficient associated with electricity is anticipated to decrease. The amount of GHGs released by energy generation is expected to be one-third its current level by 2050 (Infrastructure Canada, 2023).

Assuming the City does not implement any of the energy saving and GHG emissions reduction initiatives recommended within this ECDM Plan, the City's energy and emissions are expected to peak by 2026 and decline and stabilize by 2038. The changes are largely related to the natural adoption of electric vehicles and the greening of the electrical grid. Overall, corporate energy consumption is estimated to remain around 140,000 GJ by 2050 – virtually unchanged from 2023 or the 2010 baseline. In terms of GHG emissions, the City's 2050 Business-As-Usual GHG footprint is estimated to be 7,400 tCO_2e - a decrease of 17% from the base year of 2010. As presented in

Figure 3-1, this trajectory does not meet the City's GHG emissions reduction targets of 50% by 2030 or 80% by 2050. As such, an alternative path to Business-As-Usual operations is proposed, called the 2025-2029 ECDM Forecast (Section 3.2), which outlines a pathway for reaching the 2030 target focused on more immediate actions the City can take to directly decrease GHG emissions.

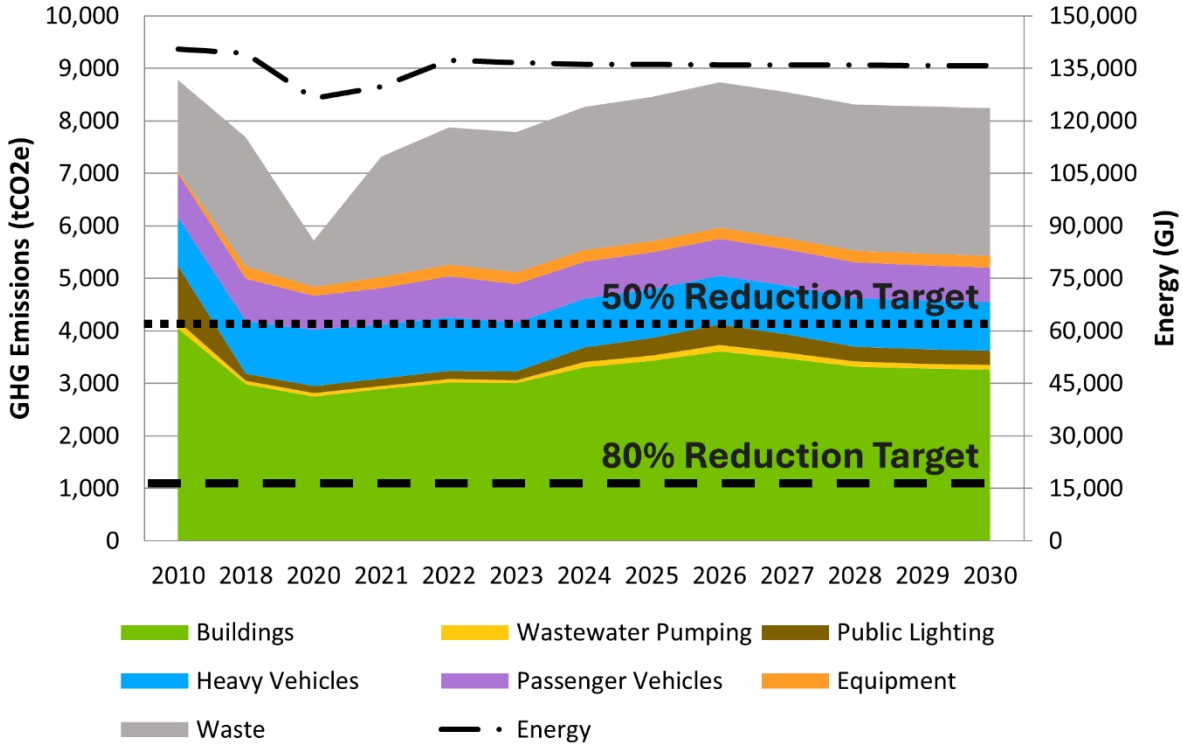


Figure 3-1: Forecasted BAU 2030 Energy and GHG Emissions

Figure 3-1 presents the forecasted Business-As-Usual (BAU) energy and GHG emissions forecast until 2030. The years 2010 and 2018 through 2023 years represent analyzed data; 2024 through 2030 is forecasted emissions. The "dash-dot" line represents the total energy used by the City. The coloured segments represent the GHG emissions for each sector (for example, in 2010, the total City emissions were estimated at just under 9,000 tCO_2e and the Heavy Vehicles Sector for that year was estimated at ~1,000 tCO_2e). The dotted line represents the 2030 50% emission reduction target. The dashed line represents the 2050 80% emission reduction target.

3.1.1 BAU Energy Costs

The BAU Forecast assumes that electricity and natural gas costs will increase by 3% and 2% per year respectively, and cost of fuels such as gasoline and diesel will increase by about 2% per year. Naturally, rising energy costs will negatively impact ongoing operating costs making energy conservation and demand management even more important to help mitigate these rising costs. In 2023, energy costs to the City exceeded $4.7 million. Without a dedicated focus on reducing and conserving energy, corporate energy costs could increase to over $7.2 million by 2050 (it should be noted that these total costs include current legislative fuel levies which were repealed in April 2025). A federal carbon fuel levy first came into effect in Canada at $20 per tonne in October 2019 and is applied to the purchase of fossil fuels. These fuel levies have been legislated to help incentivise emitters to reduce their total GHG emissions. When forecasting City costs, it was assumed that the federal carbon fuel levy would increase by $15 per year from $65 per ton in 2023 to $170 per ton in 2030, in alignment with current federal plans, and is stable afterwards. With this method, related costs from the fuel levy will account for about 8 to 14% of the total energy costs within each year.

3.2 Pathway to 2030 – Proposed 2025-2029 ECDM Plan Initiatives

To achieve the 2030 GHG emissions reduction target, the aggressive implementation of energy and GHG reduction projects at City assets will be required in conjunction with the purchase of renewable energy certificates (REC), renewable natural gas (RNG), and carbon offsets. These offsets are not preferred over “real emissions reductions”; however, it is the most feasible option based on current market forecasts and possible capital expenditures within the next 5 years. Alternatively, the City could forgo purchasing offsets by continuing with building, vehicle, and waste projects that decrease actual GHG emissions beyond those documented here.

Achievement of the 2030 reduction target would involve converting most of the City’s energy intensive assets (buildings – natural gas consumption, fleet and equipment – diesel and gasoline consumption), to achieve net-zero energy intensity, resulting in net-zero GHG emissions. This would require extensive staff and contractor resources as well as capital resources above and beyond what is currently available in the capital budget, a material and equipment supply chain without bottlenecks, available electric vehicle (EV) technologies for light and heavy duty trucks, and a willingness by residents to accept a potential level of service reduction (e.g. building retrofits requiring periodic construction-related shutdowns) as assets are adapted. While this approach is not currently considered feasible, over the next two decades, it is anticipated that new or

cheaper electric technologies will emerge, and the supply chain will loosen which will allow for the faster adoption and conversion of buildings and fleet.

The City has identified initiatives to achieve the 2030 emission reduction target using currently available technologies and has begun to implement them to various degrees of completion. Table 3-1 provides a summary of select initiatives and how they were quantified in the 2025-2029 ECDM Forecast. Collectively, these identified initiatives and offsets in Table 3-1 is the City's Pathway to 2030 scenario – the ideal situation for reaching the 2030 emission reduction target of 50%. The outcome of all initiatives in the 2025-2029 ECDM Plan is presented in Figure 3-2.

Table 3-1: Pathway to 2030 – Initiatives to Meet 50% Reduction by 2030

Initiative [1]	Year [2]	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reduction as a Percent of 2010 Emissions	Initiative Costing [3]	Funding (F) and Timeline (T) Status
SW1	2026	Data Refinement - Fullness of Garbage Containers	Waste containers are collected at 80% full	356	4%	$	F – Full T – Reasonable
SW1	2026	Data Refinement - Composition of Waste	Waste composition has less food and more inert material than assumed residential composition; waste also then has a lower density	1,425	16%	$	F – Full T – Reasonable
F4	2026 - 2029	Parks Equipment Conversion to Electric	~10 fuel-based equipment replacements to electric per year; this also results in a 50% reduction in fuel usage	134	2%	$$	F – Partial T – Possible with full funding
B3	2026-2029	Decarbonization Study –	"FCM Minimum Performanc	594	7%	$$$	F – Pending capital budget

3 Forecast to 2050

Initiative [1]	Year [2]	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reduction as a Percent of 2010 Emissions	Initiative Costing [3]	Funding (F) and Timeline (T) Status
		implementation	e Scenario" projects scheduled in the study to be completed by 2029				approval and GMG grants T – Reasonable
B8	2026 - 2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parks Facilities find 30% electricity efficiencies and (lighting, AC); other natural gas improvement	16	0%	$	F – Partial T – Reasonable
B8	2026 - 2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parking lot public electric vehicle (EV) charging increases 5% per year;	-97 [5]	-1% [5]	$$	F – Allocated T – Reasonable
F5	2026 - 2029	Implement the Recommended Actions with the Low-Carbon Fleet Master Plan	45 EV replacements; 10 Gas Pickups retired; 5 Pickup converted to an electric option; Charging Infrastructure expansion	180	2%	$$	F – Partial T – Unlikely (market constraints)
Total Reduction possible by 2029 from Pathway Initiatives				**2,608**	**30%**		
C10	2026 - 2029	Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions	Renewable Electricity Credit for All City Electricity	1,753 [6]	20%	$ - $$$ [7]	F – Unallocated T – Reasonable
Total Reduction including Offset				**4,877**	**50%**		

Notes for Table 3-1:

1 These initiatives are proposed for achieving the 2030 reduction target based on the City's current inventory of assets and their current use status. Other City and Regional strategies (e.g., the City's Decarbonization Study) may alter the asset inventory and their uses and could affect the potential reductions noted here.

2 This represents the year(s) by which the forecasted emission reduction was achieved.

3 Financial considerations:

- $ Lowest anticipated cost; can be / is being implemented with currently allocated resources
- $$ Mid-range anticipated cost; can be / is being implemented with currently allocated resources but will require continuing investment
- $$$ Highest anticipated cost; projects have not been started and will require a significant allocation of resources to complete

4 Bishop Operations Centre (BOC) is the main service / operations centre for the City.

5 Negative numbers indicate an increase to emissions. The equipment tracked in the Inventory has expanded since 2010 as improved data collection and reporting systems have been implemented by the City. As a result, emissions in this Sector appear to have increased since 2010 as better data has become available. At the same time, the greening of the electrical grid is expected to reduce the total impact to emissions even as electricity usage increases.

6 This offset represents the maximum potential electricity credit for use as an emission offset available if all proposed initiatives are completed. The City is trying to achieve a 50% reduction target by 2030 and purchased offsets only need to be chosen at that time. It is likely that a mix of electricity and natural gas offsets will be necessary, but the offset quantity and type will depend on the City's achieved emission reductions by 2030.

7 Energy credits and emission offsets are available from a wide range of vendors; costs will vary depending on the City's chosen parameters for their offset purchasing policy and the total amount of offset required to meet the 2030 reduction target.

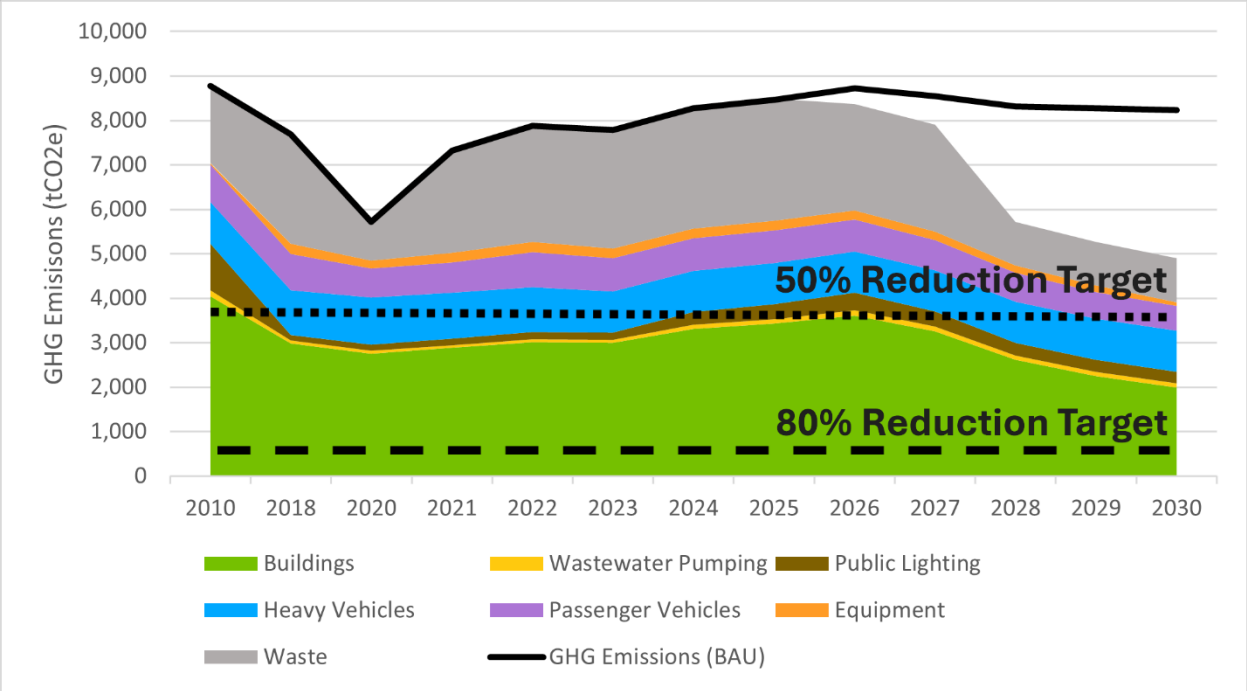


Figure 3-2: Forecasted 2030 GHG Emissions Forecast with ECDM Initiatives (No Offsets or Credits)

Figure 3-2 presents the forecasted 2025-2029 ECDM Plan energy and GHG emissions Forecast until 2030. 2010 through 2023 years represent analyzed data; 2024 through 2030 is forecasted emissions. The black line represents the estimated GHG emissions under the BAU scenario (Figure 3-1). The coloured segments represent the GHG emissions for each Sector, in tonnes of CO_2 equivalents (tCO_2e), with the total height representing the total estimated emissions. For example, in 2010, the total City emissions were estimated at just under 8,763 tCO_2e, and the Heavily Vehicles Sector (the Blue segment) for that year was estimated at ~1,000 tCO_2e (the difference in Emissions between the top and bottom of the blue segment). The dotted line represents the 2030 50% emission reduction target. The dashed line represents the 2050 80% emission reduction target. The solid black line represents the BAU Forecast, the space or gap between the solid black line BAU Forecast and the total cumulative emissions represents the GHG emission reductions that could be achieved by the ECDM Initiatives.

The Pathway initiatives result in approximately 30% reduction in GHG emissions. By purchasing RECs for all of the City's forecasted electrical energy use during 2030, the total emission reduction is forecasted to be 50%. However, without significant progress into the Pathway to 2030 initiatives, it is likely that the City will need to procure more credits and offsets than forecasted to meet the GHG reduction target if it wants to achieve the target instead of continuing with buildings and fleet emissions reduction initiatives.

While not accounted for in the ECDM Forecast, the following initiatives are likely to produce further benefits:

- Prepare and implement additional building decarbonization plans for the remaining City buildings not included in the original study which focused on the 10 highest-emitting facilities. These energy-saving retrofits could be completed by 2035 (e.g., only one of the City's libraries is generally among the top 10 GHG emitters at the City, but all libraries will eventually need to be retrofitted to meet the 2050 targets).
- Implement energy projects to reduce energy and GHG emissions for all other facilities and infrastructure (e.g., conversion / retrofits to park facilities and lighting; increasing solar energy capture and directly use the energy instead of transferring to the grid).
- Accelerate the conversion to electric and low-carbon fuels using a cost of carbon analysis to support the life cycle replacement cost; where no direct conversion options exist, investigate alternate reduction opportunities (e.g., can a pickup truck be replaced by a car or van; can a mini excavator replace a full-size excavator) or temporarily furlough equipment and fleet until City activities require them or electric replacements are available (e.g., can alternate scheduling reduce the need for dump trucks or excavators).
- Seek opportunities to invest in local nature-based solutions or energy generation projects (e.g., local solar panel installations) to be able to recognize the future carbon or energy benefit.

3.3 Pathway to 2050 – Actions Required in The Future

To achieve the 2050 GHG emissions target, the City will need to aggressively convert all fleet, and off-road equipment to either electric or low-carbon fuels, invest in nature-based solutions, and likely, adjust various business models and service levels. The

residual or hard-to-reduce GHG emissions will need to be reduced via the purchase of carbon neutralization offsets (e.g., direct air capture, reforestation, etc.) and/or investment in carbon neutralization projects (e.g., protection and rehabilitation of natural lands). More description about these offsets is presented in Section 4.5 (Initiative C10).

The emission reductions quantified for the ECDM Forecast to 2050 includes all the assumptions used for the 2030 Forecast (Table 3-1) and further includes the conditions below. The outcome of these actions on the forecasted GHG emissions is presented in Figure 3-2.

- No expansion of the total size of the vehicle or equipment inventory occurs. While expansion could be justified for 100% electric options with minimal impact to emissions, meeting the 80% reduction without significant conversion of the existing fleet will likely rely heavily on purchasing offsets or other credits.
- Building decarbonization is successful for Fire Station #3 / Allan Reuter Centre and all Libraries.
- Heavy duty vehicles fuel usage was forecasted to have a 2% annual reduction in fuel use from better training and scheduling; beginning in 2045 two (2) heavy duty vehicles per year are anticipated to be converted to electric options, or improvements to scheduling eliminates their continued need.
- Passenger vehicles continue to be upgraded to electric options at the rate of about 4 per year until 2035; after 2035, all new vehicles purchased must be electric / hybrid options, and it is possible electric pickup trucks will be more readily available at this time, enabling vehicles to be upgraded at 5 per year. Industry production trends for electric vehicles will heavily influence the ability for the City to fully convert its fleet.
- Solid waste diversion programs (e.g., increasing access to recycling) or public / workplace awareness is forecasted to result in a further 10% decrease in waste.

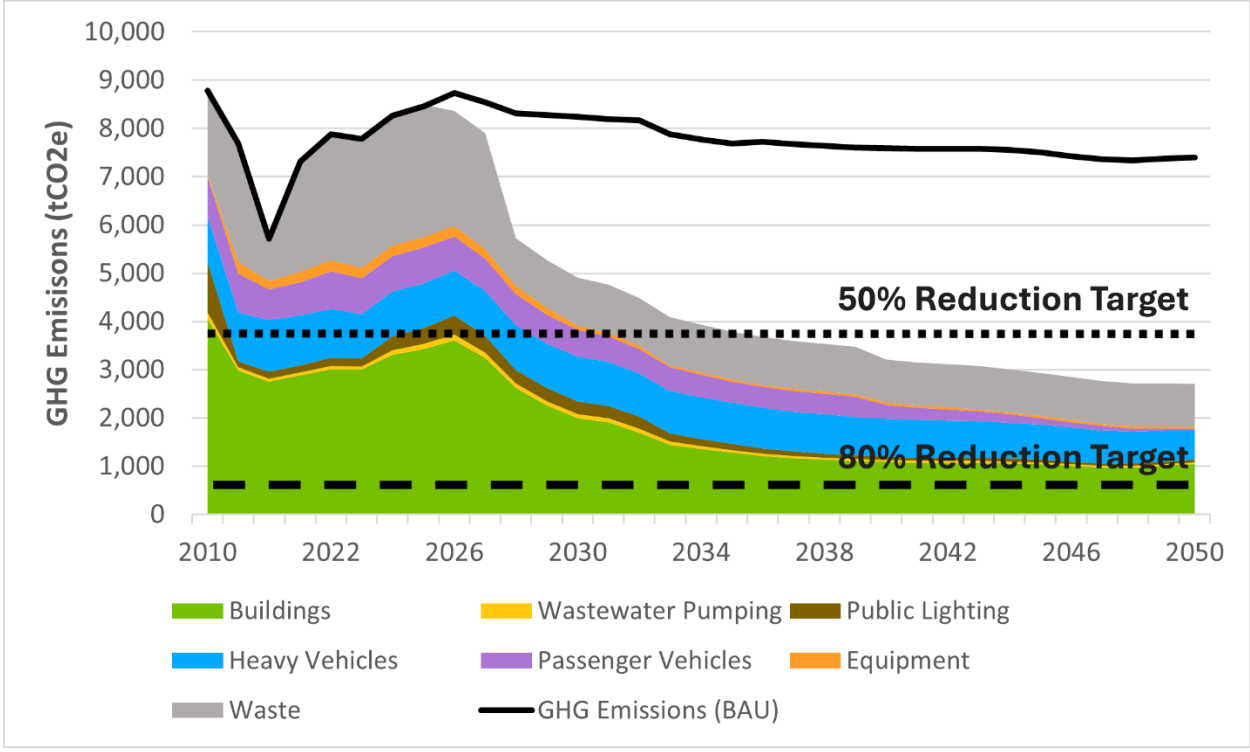


Figure 3-3: Forecasted 2050 GHG Emissions Forecast with ECDM Initiatives (No Offsets or Credits)

A large emission reduction is forecasted as natural gas services at City facilities are converted to electrical options (e.g., electric hot water systems instead of gas boilers). With the electrification of City facilities, electrical energy consumption is anticipated to increase, but costs will decline over time given lower costs to purchase electricity than natural gas. Overall, the forecast shows that the City could reduce total corporate energy consumption by 23% by 2050. In the long-term, shifts in federal and provincial regulations, industry development, and global prices for energy and carbon could yield opportunities for accomplishing the City's 2050 GHG reduction target in a faster or more cost-effective manner.

3.4 Estimated GHG Reductions for Milestone Years

Table 3-2 presents the estimated short, medium, and long term GHG emission reductions based on the estimated potential of the 2025-2029 ECDM Plan initiatives proposed and those needed to achieve the 2050 target. Since the City has committed to reducing its corporate GHG emissions by 50% below 2010 levels by 2030 and 80% below 2010 levels by 2050, the table also shows the impact of purchasing RECs and carbon offsets.

Table 3-2: Estimated GHG Emission Reductions By Sector

Reduction Opportunity (tCO_2e)	2010	2023	2030 [1]	2040	2050
Buildings & Facilities Emissions Reductions	-	-	2,058	2,959	3,007
Passenger Vehicle Emissions Reductions	-	-	287	559	823
Heavy Duty Equipment Emissions Reductions	-	-	3	140	314
Small Equipment Emissions Reductions	-	-	-44 [2]	-4 [2]	-4 [2]
Wastewater Pumping Emissions Reductions	-	-	46	94	97
Streetlight Emissions Reductions	-	-	788	980	991
Solid Waste Emissions Reductions	-	-	747	847	847
Remaining GHG Emissions	8,763	7,780	4,899	3,208	2,708
Percent Change from 2010 Base Year	-	-11%	-30 to -44%	-63%	-69%

Reduction Opportunity (tCO_2e)	2010	2023	2030 [1]	2040	2050
Reductions Associated with Offsets and Credits	-	-	1,229	-	917
Remaining GHG Emissions after Offsets and Credits	8,763	7,780	3,666	-	1,791
Percent Change from 2010 Base Year	-	-11%	-58% [3]	-	-80%

Notes for Table 3 2:

1 This table includes the results of all considered initiatives that could be completed by 2030, above and beyond the Pathway to 2030 initiatives. For example, this table considers increasing heavy duty vehicle fuel efficiency (either through mechanical or protocol updates), but it is not considered a Pathway to 2030 initiative. This will result in some minor differences in the final total emissions in 2030.

2 Negative numbers indicate an increase to emissions. The equipment tracked in the Inventory has expanded since 2010 as improved data collection and reporting systems have been implemented by the City. As a result, emissions in this Sector appear to have increased since 2010 as better data has become available. At the same time, the greening of the electrical grid is expected to reduce the total impact to emissions even as electricity usage increases.

3 This value represents the reduction achieved if all the City's electricity use is offset by purchased electricity credits. As the City is trying to achieve a 50% target in 2030, not all of these forecasted credits would need to be purchased. However, the total amount of offset required for 2030 and the available offsets at the time will heavily influence how the City can achieve its 2030 reduction target and this is one possible scenario if all the proposed initiatives are completed as scheduled in this forecast.

4 Description of 2025-2029 ECDM Plan Initiatives

This 2025-2029 ECDM Plan contains new initiatives as well as several ongoing initiatives identified in the 2020 ECDM Plan that are proposed to be carried forward. Initiatives are described below grouped by source type.

4.1 ECDM Plan Initiatives in the Context of the Community

The City's emission reduction efforts through this plan are a part of the larger community context that involves actions from individuals, homes, businesses, institutions, and community organizations. The City has a carbon footprint of 8,763 tonnes (2010 baseline) while the community carbon footprint is estimated at over 4 million tonnes. Both the City and community have similar reduction targets (i.e. 50% by 2030 and 80% by 2050). The 2022 Waterloo Region Community Greenhouse Gas Inventory Report (June 2024) noted a 12% reduction below the 2010 baseline and predicted that the community would not meet the 2030 50% target; similarly, it was noted above that the City is currently 11% below the 2010 baseline, and based on the Pathway estimates in Table 3-2 above, will only be able to achieve at most a 30% reduction by 2030 (however purchasing offsets would be one way to achieve the 50% target).

The strategy that guides community action, TransformWR, was developed through extensive consultation with community groups and residents. It was unanimously approved by all area municipal and Region Councils in June 2021. The ClimateActionWR collaborative leadership consists of a partnership between Reep Green Solutions, Sustainable Waterloo Region, the Region of Waterloo, and area municipalities including Cambridge. The TransformWR strategy outlines 78 actions, 23 of which are attributed to the City of Cambridge (and area municipalities). This ECDM Plan Update 2025-2029 plays a key role in implementing the TransformWR strategy. The City reports its progress through the ClimateActionWR Dashboard, regular Council reports and presentations, and community outreach opportunities. The Actions identified within the ECDM Plan align with implementing the TransformWR actions around active transportation, micro mobility systems, urban planning and design standards, transitioning fleets to zero emissions, community-wide strategies (e.g. EV charging), waste reduction, and building public facilities to net zero standards.

4.2 Buildings & Facilities

The City owns or leases 163 buildings and structures including administrative and community centres, park facilities, fire stations, operations centres, and vehicle storage facilities. In 2023, the City's buildings and facility portfolio accounted for 66% of its energy use and 39% of its annual GHG emissions. With an average lifecycle of 50+

years, many, if not most, of the City's current building stock will still be operational in 2050.

Green building certifications are an important first step toward reducing GHG emissions from energy consumption but achieving zero-carbon emitting buildings will require more than the City's current policy which is based on the standard of Leadership in Energy and Environmental Design (LEED®) Silver certification for new buildings. New buildings will need to be "net-zero energy ready" which means they will be designed as highly efficient buildings that can easily accommodate future renewable energy add-ons, such as rooftop solar panels, that will enable them to produce at least as much energy as they consume. Recognized standards, such as the Canada Green Building Council Zero Carbon Standard, should be considered for amendments to the City's Green Building Policy. Existing buildings and facilities will require deep energy retrofits that radically overhaul the building envelope to reduce energy needs or a complete replacement of the building to a higher energy standard.

To aggressively reduce GHG emissions by 2050, the City will need to prioritize reducing energy and GHG emissions from its largest GHG contributors. The top 10 GHG emitting facilities in 2023 are presented in Table 4-1.

Table 4-1: Top 10 Energy Consuming Buildings & Facilities in 2023

Facility	Energy (GJ)	Percent of Buildings Energy (%)	Total GHG Emissions (tCO_2e)	Percent of Buildings GHG Emissions (%)
Hespeler Memorial Arena	11,328	15%	380	13%
Bishop Operations Centre	5,508	7%	288	10%
John Dolson Centre	4,854	7%	239	8%
City Hall	7,446	10%	229	8%
Galt Arena Gardens	5,458	7%	219	7%

W.G. Johnson Centre and Pool	4,384	6%	140	5%
Queens Square Library	2,919	4%	112	4%
Duncan McIntosh Arena	2,748	4%	112	4%
Preston Auditorium	2,201	3%	93	3%
Karl Homuth Arena	2,199	3%	78	3%
Total (Top 10)	**49,045**	**66%**	**1,890**	**63%**
Total (All)	**74,203**	**100%**	**3,000**	**100%**

Maintenance and ongoing commissioning programs - a process of ongoing monitoring, adjustment, and retrofitting with new technologies like building automation systems upgrades, and energy sub-metering - will be key to maintaining energy and GHG reductions. Building Condition Assessments (BCA) and behavioral change programs are also important initiatives that will complement retrofit and building monitoring programs. One of the most cost-effective GHG emissions avoidance measures is to improve existing building utilization rates; thereby minimizing the number of new buildings requiring construction in the future. This will require the development of programs and policies that allow staff to work from home, staff hoteling, and improved space layouts.

The following is a list of the proposed building and facility initiatives that are discussed in detail in the following sections:

- B1: Update Green Building Policy & Technical Standards
- B3: Develop & Implement Decarbonization Plans for Buildings & Facilities
- B5: Implement a Building Commissioning Program
- B8: Opportunistic Energy Conservation Projects for Buildings & Facilities

Initiatives which were forecasted to have currently quantifiable impacts on GHG emissions are summarized in Table 4-2. With the quantified building and facility initiative reductions, it is estimated that the City could reduce GHG emissions by 74% by 2050 as

per Table 4-3. Continued development of the other initiatives not quantified in this forecast could reduce emissions further to net zero with energy generation at some facilities. Figure 4-1 illustrates the progression of GHG emissions reductions over time compared to the forecasted BAU scenario. It shows that the decarbonization plans and energy retrofits will be the main driver of GHG reductions over time.

Table 4-2: Forecasted GHG Emission Reductions from Buildings and Facilities for Pathway to 2030 Initiatives

Action	Year	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reductions as a Percent of 2010 Emissions
B3	2026-2029	Implement Decarbonization Study		594	7%
B8	2026-2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parks Facilities find 30% electricity and gas efficiencies	16	0%
B8	2026-2029	Opportunistic Energy Conservation Projects for Buildings & Facilities	Parking lot public electric vehicle charging increases 5% per year	-97	-1%
Totals				513	6%

Notes for Table 4 2:

1 Negative numbers indicate an increase to emissions due to predicted increases in electricity consumption from the increased usage in electric vehicles. At the same

time, the greening of the electrical grid is expected to reduce the total impact to emissions even as electricity usage increases.

Table 4-3: Forecasted GHG Emission Reductions From Buildings & Facilities

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
Business-as-Usual Forecasted GHG Emissions	4,046	3,000	3,262	2,907	2,872
ECDM Forecasted GHG Emissions			1,987	1,087	1,039
GHG Reductions from BAU Forecast	-	-	1,275	1,821	1,833
ECDM Forecast Emissions (percent of 2010 Baseline)	-	-26%	-51%	-73%	-74%

Notes for Table 4-3:

1 Reduction values and percentages do not include the procurement of RNG, RECs or offsets.

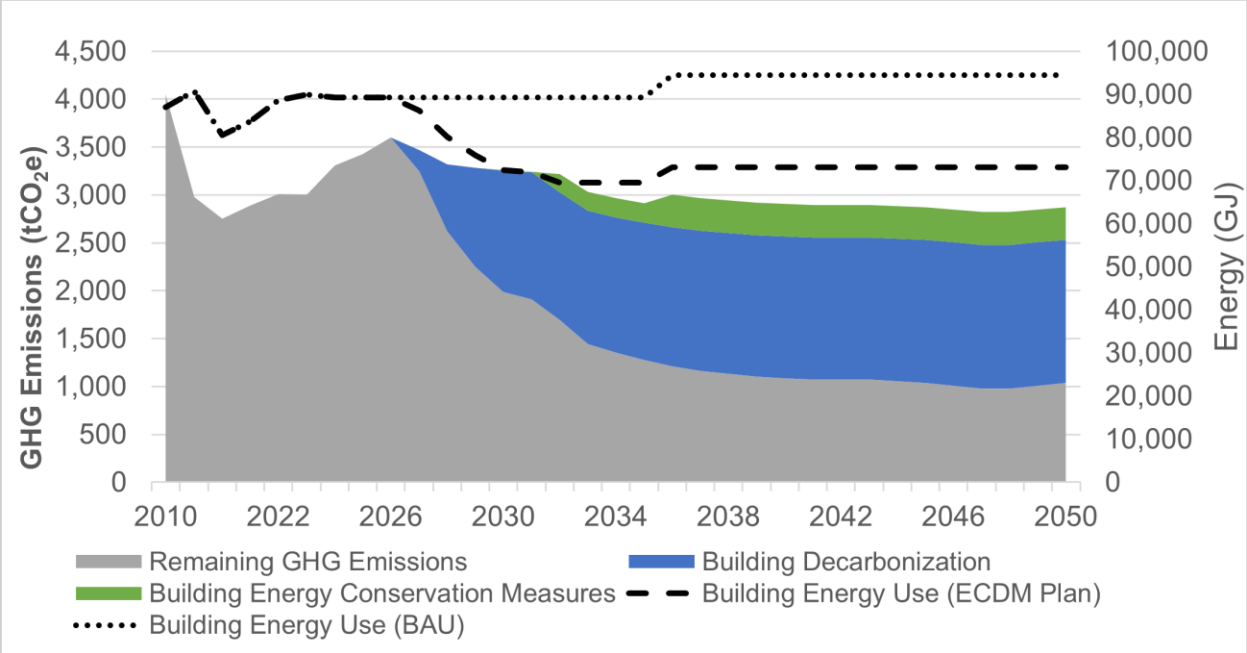


Figure 4-1: Forecast of Buildings Energy & GHG Emissions

Descriptions of each initiative for Buildings & Facilities that can lead to the estimated reductions are discussed here.

B1: Update Green Building Policy & Technical Standards

The City can maximize energy efficiency and conservation during the design and construction of new buildings. It is recommended that the City update its Green Building Policy and associated technical standards. A zero-carbon building is a highly energy efficient building that produces onsite, or procures, carbon-free renewable energy or high-quality carbon offsets to neutralize the annual carbon emissions associated with building materials and operations (CGBC, 2024).

Supporting the updated Green Building Policy would be the development of technical standards that direct contractors and project staff to focus on specific areas of performance that are important to the City (e.g., energy and water efficiency, waste diversion, sub-metering, etc.). Strong enforcement of technical standards and accountability would limit the number of future retrofits and change orders. It is recommended that the City develop these technical standards and processes with clear lines of accountability for all parties involved with the design, construction, operational management, and major renovation of City buildings.

The City's current LEED Silver Policy requires an update to align it with the City's Strategic Plan, and ECDM Plan and TransformWR GHG emissions reduction targets. A revised Green Building Policy for the City of Cambridge will involve an environmental scan of the latest best practices (e.g. Toronto Green Standard Tier 5 and 6 for public buildings, LEED Gold and Platinum, Canada Green Building Council Zero Carbon Standard, and other municipal and industry best practices and frameworks). The City policy should align with other initiatives concurrently underway such as the High Performance Building Standards initiative led by WRCommunity Energy for private sector developments.

This is a supportive initiative and would be used to support Initiative B3 (Develop & Implement Decarbonization Plans for Buildings & Facilities). No energy or GHG benefit has been estimated for this initiative.

B3: Develop & Implement Decarbonization Plans for Buildings & Facilities

Achieving the City's 2050 GHG emission reduction target will require all large emitting facilities to be decarbonized – this means increasing the roof and wall insulation R values (the industry rating for how effective thermal insulation is), replacing inefficient windows, switching to renewable or low-carbon heating and cooling systems, like heat pumps, and, where feasible, harnessing sunlight for heat and illumination. The decarbonization of buildings is also an opportunity for the City to consider and adjust for climatic impacts during retrofits, and how buildings are currently designed and operated. For instance, a significantly reduced building energy demand means smaller mechanical systems and options for cleaner fuel sources. While electrically driven heat-pumps generate significantly fewer GHG emissions than a natural gas boiler or furnace, they result in increased electricity consumption and may cost more to operate. The use of solar photovoltaic (PV) energy is a strategy that can be utilized to reduce electricity costs while increasing energy and climate resilience. The decarbonization of City buildings can be complemented by purchasing carbon offsets and energy credits to balance the remaining emissions.

This 2025-2029 ECDM Plan recognizes that the implementation of the decarbonization plans will require a significant capital investment depending on the deep energy retrofits chosen by the City. The 2026-2029 projects identified in the Decarbonization Study (FCM Minimum Performance Scenario) for 10 facilities result in the following:

- An estimated 594 tonnes emissions reductions

- Capital cost of $11,714,777
- $36,232 in estimated utility savings

However, the energy savings from these retrofits could reduce energy reductions greater than 70%, greatly reducing annual energy costs (CAP, 2024b). To achieve the forecasted GHG emissions reductions, the City has begun the decarbonization retrofits on the top buildings and should have these completed by 2035. Any preliminary decarbonization studies should be completed using a methodology recognized by FCM / Green Municipal Fund as a precursor for applying for capital grants to undertake the retrofit projects.

As the City is currently implementing the decarbonization retrofits at several facilities, the next highest emitting buildings should be analyzed for further decarbonization opportunities. The Asset Management Plan referred to in initiative C1 should also reference that “like for like” replacement does not apply to building retrofits and that instead “best emissions reduction measures” is the new standard.

Comparing the Business As Usual (BAU) scenario to the FCM Minimum Performance scenario will result in a life cycle cost increase or premium of $14.1 million if the FCM scenario is fully implemented. However, the City will reduce annual emissions by 99% in 2050 (savings of $350,000 per year) from present levels and meet the target of 80% within 20 years (Walter Fedy, Executive Summary, Greenhouse Gas Reduction Feasibility Study / Decarbonization Study, June 2025 and Council report 25-006-CRE, July 2025).

B5: Implement a Building Commissioning Program

Commissioning verifies that a building has been constructed to its proper specifications. The best time to commission a building is during construction, with special attention being paid to the building envelope. The building envelope influences most aspects of building performance such as energy consumption, occupant comfort and durability over the life of the entire building (50+ years).

Ongoing commissioning is the continuous examination of a building’s entire systems over a specified period of time to verify continuous peak performance over its useful life. Ongoing commissioning is important because it reduces operating costs, reduces the risk of failures, and informs retrofit opportunities and deep energy retrofit plans. Various pre- and post-implementation commissioning case studies have showed efficiency improvements on the order of 5% to 20% because of improved operations and

maintenance. The studies also showed that the resulting simple payback periods are typically less than 2 years (USDOE, 2010). Typical commissioning activities include:

- Adjusting reset and set-back temperatures and temperature settings
- Staging / sequencing of boilers, chillers, and air handling units
- Adjusting and repairing dampers and economizers
- Modifying control strategies for standard hours of operation
- Eliminating simultaneous heating and cooling
- Air and water distribution balancing and adjustments
- Verifying controls and control sequencing, including enabling and re-enabling automatic controls for set points, weekends, and holidays

It is recommended that the City schedule the commissioning of buildings on at least a five-year cycle, or when the function of a building or facility changes, and that an ongoing commissioning program be developed, managed, and tracked by the Facilities department in conjunction with the City's asset management system. To limit the impact of occupant behavior on building performance, it is also recommended that the City use change management techniques to help occupants understand and adapt to the defined parameters (i.e., temperature range, light, air flows, etc.) for conditioned spaces. No energy or GHG benefit has been estimated for this initiative.

B8: Opportunistic Energy Conservation Projects for Buildings & Facilities

It is recommended that City continue to seek out energy conservation and demand management opportunities in buildings and facilities that are not going to be prioritized for decarbonization studies over the next 10-15 years. These could be energy conservation projects at historical buildings, parking lots, parks lighting and structures and / or expansion of solar generation followed by direct consumption at these locations (e.g., solar supplemented electric vehicle charging).

This initiative also considers the City's expansion of the number of publicly accessible electric vehicle charging stations with a focus on charging stations specifically for fleet vehicles (Initiative F5). These charge points are anticipated to be located and connect to the electricity services at various parking lots owned by the City and therefore may increase electricity usage associated with Buildings. It is currently forecasted that

energy use from public electric vehicle charging at these locations will increase by 5% each year after 2030, however the greening of the electrical grid is expected to offset future electricity emissions resulting from the increase in charging.

4.3 Fleet & Equipment

The City owns and operates over 400 light and heavy duty vehicles and equipment. Both fleet and equipment are almost entirely powered by gasoline and diesel, accounting for 24% of the City's 2023 GHG emissions. Light duty vehicles, trucks and equipment accounted for 50% of the fleet and equipment's GHG emissions, with heavy duty vehicles accounting for the remaining 50% of the GHG emissions (Table 4-4). The light duty classification is expected to have electric replacement options in the short to medium term and the heavy duty classification is not expected to have electric replacement options until the long term (forecasted as a possibility in 2045).

Table 4-4: GHG Emissions by Vehicle Classification

Classification	GHG Emissions (tCO_2e)	Percent of Related Vehicle GHG Emissions
Heavy Duty Vehicle (HDV)[1]	925	50%
Light Duty Truck (LDT)[2]	536	28%
Light Duty Vehicle (LDV)[3]	203	11%
Equipment (EQ)[4]	202	11%
Total	**1,866**	**100%**

Notes for Table 4-4:

1 Heavy duty vehicles and equipment (dump trucks, excavators, fire engines, etc.) with no electric replacement options expected in the medium to long term.

2 Light duty pickup trucks with electric replacement options expected in the medium term.

3 Light duty passenger cars and vans with electric replacement options available or expected in the short term.

4 Drivable parks equipment (tractors, riding mowers, etc.) with electric replacement options available or expected in the medium term.

In 2023, the City had 14 electric vehicles (9 Chevrolet Bolts, 4 Hyundai Konas, and 1 Ford E-Transit cargo van) and also used a variety of electric equipment options (ice re-surfacers and edgers, volleyball court sand groomers, and self-guided robot grass mowers). The City's EV and electric equipment inventory for the period 2019 – 2024 is provided in Table 4-5.

Table 4-5: Cambridge Electric Vehicle and Equipment Inventory

Year	Ice Edger	Ice Resurfacer	Groomer / Mower	Cars	SUVs	Cargo Vans	Annual Total
2019	3	1	0	0	0	0	4
2020	4	1	0	7	0	0	12
2021	4	1	0	9	0	0	14
2022	5	1	1	9	0	0	16
2023	5	3	2	9	4	1	24
2024	5	3	2	9	4	2	25

In an effort to mitigate and reduce GHG emissions the City's Municipal By-law compliance team is moving towards a 100% electric fleet for City By-Law enforcement vehicles, additionally the City's Fleet Strategy (see Appendix C) identifies the need to convert to light duty EV options, install Level 3 or higher charging infrastructure as well as building electrical upgrades, at key City properties where vehicles are stored.

Fleet and equipment GHG emissions are the direct result of a wide and varied range of services delivered to the community. As no single measure can eliminate all fleet GHG emissions, a suite of strategies is required which include:

- F3: Develop and Implement a Fleet Rightsizing Operational Procedure
- F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric
- F5: Install Appropriate Charging Infrastructure to Support Light Duty Fleet Conversion

Initiatives which were forecasted to have currently quantifiable impacts on GHG emissions are summarized in Table 4-6, based on the proposed actions, it is estimated that the City can reduce fleet and equipment GHG emissions by 63% by 2050 (Table 4-7).

Table 4-6: Estimated GHG Emission Reductions From Fleet & Equipment for Pathway to 2030 Initiatives

Initiative	Year	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reductions as a Percent of 2010 Emissions
F3 / F5	2026 - 2030	Fleet Carbon Reduction and Conversion to EVs	45 EV Car Replacements; 10 Gas Pickups retired; 5 Pickup converted to an Electric Van	206	2%
F4	2026 - 2030	Parks Equipment Conversion to electric vehicle (EV)	~10 EV Equipment replacements per year; this also results in a 50% reduction in miscellaneous fuel usage	134	2%
Total		**340**		**4%**	

Table 4-7: Forecasted GHG Emission Reductions From Fleet & Equipment

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
BAU Forecasted GHG Emissions	1,810	1,883	1,803	1,760	1,622
ECDM Forecasted GHG Emissions	-	-	1,569	1,117	678
GHG Reductions from BAU Forecast	-	-	234	643	944
ECDM Forecast Emissions (percent of 2010 Baseline)	-	4%	-13%	-38%	-63%

Notes for Table 4-7:

Reduction values and percentages do not include the procurement of offsets.

Figure 4-2 illustrates the progression of GHG emissions reductions over time compared to the forecasted business-as-usual scenario. It shows that the aggressive implementation of the low carbon fleet master plan actions like vehicle and equipment electrification will be the main driver of GHG reductions over time.

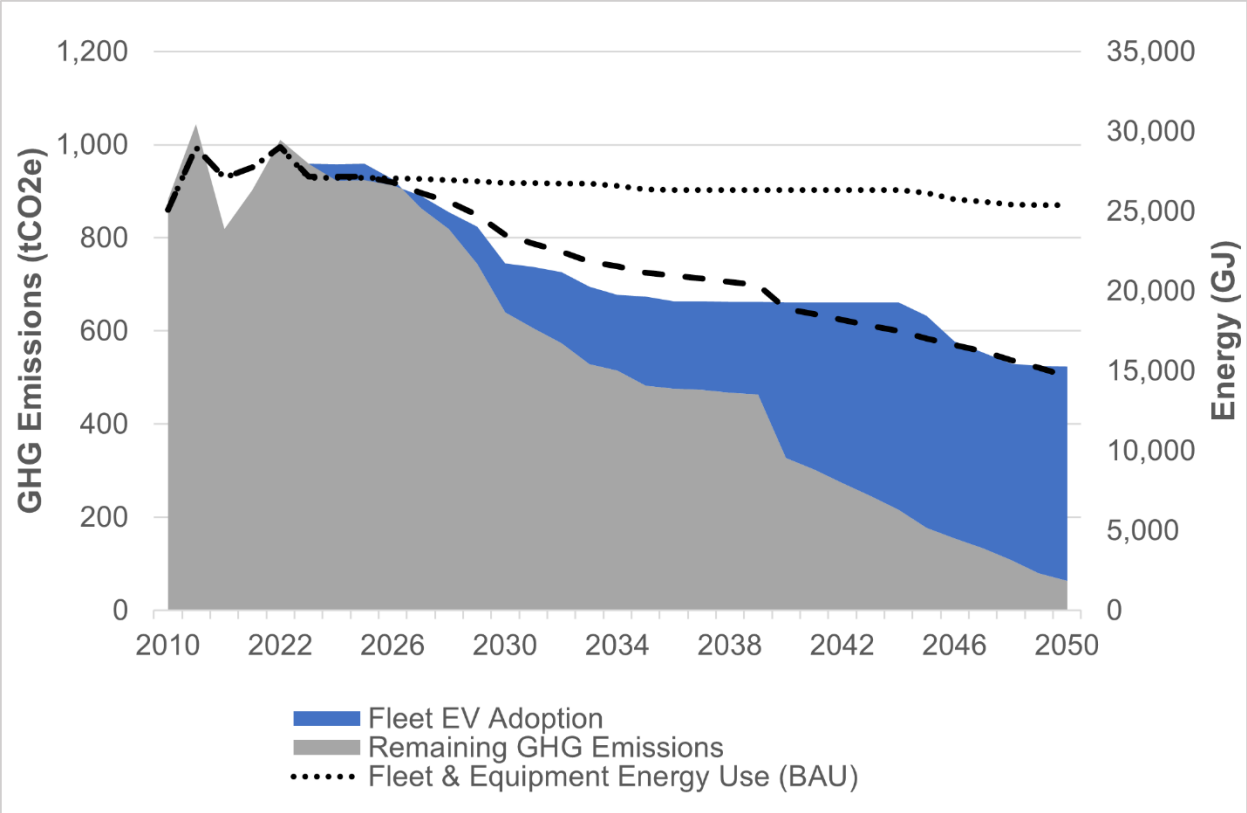


Figure 4-2: Forecast of Fleet & Equipment Energy and GHG Emissions

Descriptions of the actions for each fleet and equipment initiative that can lead to the estimated GHG reductions are discussed here.

F3: Develop and Implement a Fleet Rightsizing Operational Procedure

Using available data (e.g., telematics), it is recommended that the City evaluate vehicle routes to see if they are optimal in terms of fuel and driver time efficiency and consider other technologies or opportunities to reduce travel. It is recommended that the City create policies that afford the Fleet Manager with the ability to allocate vehicles for staff based on the functional needs required with the goal of rationalizing fleet assets, reducing fuel consumption, and increasing fleet efficiencies.

A scan of similar initiatives shows that a vehicle rightsizing operational program can reduce energy and GHG emissions by 5-17% depending on the fleet composition, volume, distances driven and needs. Without more detailed information, a GHG reduction estimate for the City could not be derived and no energy or GHG benefit was estimated for this initiative.

F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric

The City has been actively piloting new technologies as part of reducing fleet and equipment fuel consumption and GHG emissions. The City has incorporated this experience into the Fleet Strategy (Appendix C) and will transition small mobile equipment opportunistically (based on asset lifecycles) to electric or zero emissions technologies. It is also recommended that the City investigate pilot projects utilizing electric vehicle and other heavy truck hybrid technologies as they become available and recommend unique opportunities which result in cost effective and reduced fuel consumption and GHG emissions.

F5: Install Appropriate Charging Infrastructure to Support Light Duty Fleet Conversion

The City is currently developing an Operations Facilities Master Plan, a key aspect of which is light duty fleet conversion which will also involve the installation of appropriate charging infrastructure. The City should develop an electric vehicle (EV) charging station standard to establish base specifications and designs for facilities owned and operated by the City. As part of an EV charging station standard, the City should explore separate metering of power use by the charging station from the parent facility, this will allow for separation in tracking of power consumption from the building energy use and EV charging use. The standard could also explore solar energy technology options to supply energy to electric vehicle charging stations to further reduce GHG emissions. Installation of charging infrastructure, and necessary electrical upgrades at facilities, would need to occur prior to fleet electrification.

4.4 Solid Waste

Waste does not directly consume energy but when deposited into landfills, it decomposes and releases methane (CH_4) which is a more potent GHG than carbon dioxide (CO_2) (i.e. methane has a much higher global warming potential than CO_2, 28-36 over 100 years, and over the 20-year period is significantly higher at 80-86). In addition, the extraction and processing of raw materials, the manufacture, and transportation of these materials prior to disposal also creates GHG emissions. There are other impacts from waste management, beyond the GHG impacts, which range from land-management (using land to bury waste), air quality impacts because of transporting the waste, managing contaminated water that comes from the waste, amongst many others. Keeping waste out of landfills requires a focus on diverting waste

to other uses as well as minimizing the amount of waste generated in the first place. The Region of Waterloo owns and operates the landfill used by the City and is responsible for curb-side waste collection, however the City has included the following initiative to support the Region of Waterloo's efforts:

- **SW1: Develop Corporate Solid Waste Management Plan**

Currently quantifiable impacts on the forecasted GHG emissions from developing and implementing a solid waste management plan are summarized in Table 4-8. With the quantified solid waste initiative reductions, it is estimated that the City could reduce its solid waste GHG emissions by 49% by 2050 as summarized in Table 4-9. Continued development of the other initiatives not quantified in this forecast could reduce emissions further.

Table 4-8: Estimated GHG Emission Reductions From Solid Waste for Pathway to 2030 Initiatives

Initiative	Year	Task	Forecast Scenario	Forecasted Emission Reductions from 2023 (tCO_2e)	Reductions as a Percent of 2010 Emissions
SW1	2026	Data Refinement - Fullness of Garbage Containers	Data containers are collected at 80% full	357	4%
SW1	2028	Data Refinement - Composition of Waste	Waste composition has less food and more inert material than assumed residential composition; waste has a lower density due to less food content	1,426	16%
			Total	**1,783**	**20%**

Table 4-9: Estimated GHG Emission Reductions From Solid Waste

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
BAU Forecasted GHG Emissions	1,739	2,673	2,815	2,810	2,810
ECDM Forecasted GHG Emissions	-	-	992	893	893
GHG Reductions from BAU Forecast	-	-	1,822	1,917	1,917
ECDM Forecast Emissions (percent of 2010 Baseline)	0%	54%	-43%	-49%	-49%

Descriptions of the actions for the waste initiative that can lead to the estimated reductions are discussed here.

SW1: Develop a Corporate Solid Waste Management Plan

In 2023, the City produced waste resulting in an estimated 2,673 tCO_2e of GHG emissions, representing approximately 34% of the City's total emissions. This is an increase of 50% above the City's estimated waste emissions in 2010 (1,739 tCO_2e). The increase from 2010 is related to normal population growth of the City, the City performing more contracted waste removal at select locations, better data, and changes in the estimation procedure methodology to calculate waste amounts.

In 2023, the emission estimation procedure for waste was updated to reflect the latest guidance for the PCP Milestone program. This latest guidance more fully incorporates the varying composition of waste when estimating emissions (e.g., food waste, garden waste, paper and textiles, inert material). This new methodology requires using a default residential waste composition if no other data is available. Currently, the City does not directly track waste tonnage and composition, and it is estimated by assuming the garbage containers are 100% full every recorded pick-up. These two parameters (composition and tonnage) result in significant increases to the GHG emission estimation than previously reported but is expected to be able to provide more accurate reflection of GHG emissions from City operations. The solid waste management plan should first focus on obtaining more accurate information on waste composition and pick-up tonnage to further refine the emission estimation. It is understood that the City has changed its contracted waste collection service provider and the availability of data

for future analysis is currently unknown, however a study on the waste composition will be beneficial regardless of changes in available contractor provided data.

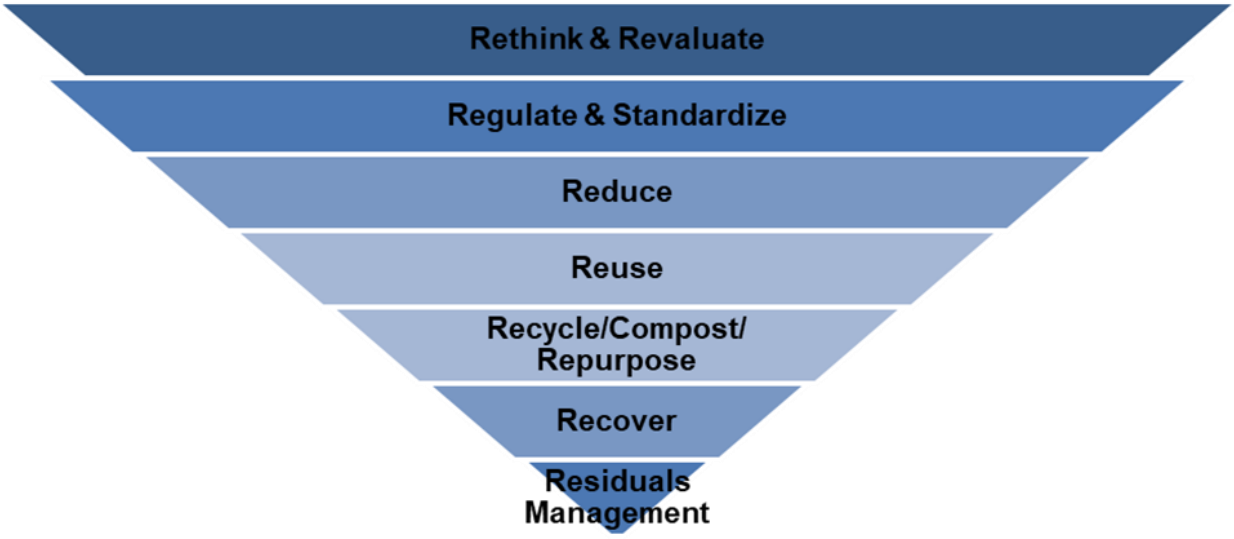
The City's solid waste could be categorized into two streams: Indoor Facilities and Outdoor (i.e., parks, trailheads, core area, and natural area locations). The City contracts waste collection at facilities and picks up / disposes of waste in parks and core areas. In 2026, recycling will be assumed by a new organization, called Circular Materials. As per the Blue Box Regulation section 28 (O. Reg. 391/21), Circular Materials are obligated to provide receptacles, collect blue box materials, and replace damaged receptacles; however, it should be noted that as of writing this ECDM Plan that the Province is considering reducing Circular Materials' responsibilities due mainly to associated costs and this may have implications for the introduction of recycling bins in public spaces in Cambridge. The City currently provides 400 garbage receptacles at 89 locations and will receive approximately 250 recycling bins from Circular Materials. The addition of non-City recycling bins in facilities and parks will reduce the total tonnage managed by the City. Organics (green bins) will not be part of the Circular Materials initiative. This provincial activity should naturally work to decrease the City's waste emissions but would gain the most benefit by performing regular composition analysis on the City's waste to ensure proper recycling use by the public.

Once the City has an understanding of the composition of the waste it manages, the solid waste management plan can be tailored to achieve reductions. Reducing the amount of waste created is critical to reduce the burden on local landfills, while purchasing decisions can reduce GHG emissions throughout a product's lifecycle from extraction to disposal. This initiative recommends the development of a corporate solid waste management plan that aligns with the 7R's of zero waste (Figure 4-3):

- **Rethink & Revaluate** - Current purchasing habits and systems that encourage consumption create much of the waste we need to reduce. The first step is to examine what processes, policies, and actions the City can implement / change immediately to reduce waste.
- **Regulate & Standardize** - Waste suffers from the free rider effect where someone else pays environmentally, economically, or socially, whilst others do not. When City waste is sent to the landfill the waste is buried and left for future generations to contend with. An effective method to addressing this challenge is to implement regional waste reduction initiatives like source waste separation requirements, recycling standards, etc. This will require engagement with the Region and other local governments.

- **Reduce** - Reducing end use waste is important but so is reducing waste throughout the supply chain. This means minimizing the ecological footprint of goods and services by choosing products that last longer, can be repaired, reused, recycled, or sold. It also means prioritizing the purchase and consumption of locally produced goods and services.
- **Reuse** - Wherever possible, use products that retain their value, usefulness, and function. It means using products that have been designed for disassembly and reuse and repairing products when they have broken down.
- **Recycle / Compost / Repurpose** - Many products sold on the market are disposable, but not recyclable / reusable and are meant to be discarded. The corporate solid waste management plan will encourage staff to purchase goods that can be upcycled or recycled and incent the use of diversion systems that allow for the highest and best use of materials, including organics.
- **Recover** - The Region's current waste systems co-mingle, or mix, waste streams, making it nearly impossible to recover some of the materials thrown out. Change will be required at the Regional level of government and will require the re-examination of processes to support the separation of waste streams so that as much material is recovered as possible. This will reduce the amount of virgin materials being used in new products.
- **Residuals Management** - The City will need to monitor and track all its waste streams, diversion rates, and residual waste to identity new opportunities to reduce residual waste to zero.

Figure 4-3: Zero Waste Hierarchy



4.5 Public Lighting and Wastewater

The energy use and associated GHG emissions from public lighting installations (e.g., streetlights, electric vehicle charging, general signage etc.) and the pumping of wastewater represent a small fraction of the City's total portfolio, and while they are not related, they are addressed together. Since the energy used for these sources is nearly completely electricity, as the Ontario electrical grid is expected to green over time, these GHG emissions will continue to decline as well. It is estimated that the emissions from operating public lighting installations will decline by 95% (Table 4-10) and from the wastewater pumping stations will decline by 71% by 2050 (Table 4-11), influenced by the greening of the electrical grid.

Table 4-10: Estimated GHG Emission Reductions from Public Lighting

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
Business-as-Usual Forecasted GHG Emissions	1,049	163	265	69	56
ECDM Forecasted GHG Emissions	-	-	260	69	58
GHG Reductions from BAU Forecast	-	-	5	0	-2
ECDM Forecast Emissions (percent of 2010 Baseline)	0%	-84%	-75%	-93%	-94%

Table 4-11: Estimated GHG Emission Reductions from Wastewater

Reduction Opportunity (tCO_2e)	2010	2023	2030	2040	2050
Business-as-Usual Forecasted GHG Emissions	137	64	91	43	40
ECDM Forecasted GHG Emissions	-	-	91	43	40
GHG Reductions from BAU Forecast	-	-	-	-	-
ECDM Forecast Emissions (percent of 2010 Baseline)	0%	-53%	-34%	-68%	-71%

It is expected that initiatives planned for the City's facilities will simultaneously further reduce emissions from Public Lighting and therefore no specific initiatives for the reduction of emissions from Public Lighting are identified for this ECDM Plan.

Wastewater pumping back-up generators are currently diesel powered and represent an area of improvement for this sector and is included as initiative W2 described below.

W2: Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators

There may be an opportunity to switch diesel generators to natural gas generators in conjunction with the utilization of battery storage which can provide critical power reliability as needed. As switching diesel generators to natural gas and battery storage support has not been planned by the City and would likely involve environmental regulatory hurdles, this initiative should be explored first as a pilot to assess the business case prior to full adoption. During the 2025-2029 cycle of this ECDM Plan it is anticipated that two generators may be replaced as per the capital budget.

4.6 Corporate Leadership

The City has both a responsibility and an opportunity to respond to the causes and impacts of climate change and has recognized this by committing to aggressive GHG reduction targets. The achievement of the 2030 and 2050 emission reduction targets requires both "conservation first" actions like those already identified in this ECDM Plan, but also a change in how the City internalizes and prioritizes climate related actions. The following initiatives, while currently unquantifiable in their emission reduction potential, will set these important corporate cultural and policy framework foundations:

- C1: Update Asset Management Plan and Policy
- C2: Recognize Green Infrastructure as an Asset Class
- C4: Develop a Sustainable Purchasing Policy
- C5: Develop a Corporate Energy Savings Reserve Fund Policy and Terms of Reference
- C7: Develop an Internal Cost of Carbon Policy
- C9: Develop Policy for Purchasing of Emission-free / Low Emission Electricity and Natural Gas

- C10: Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions
- C11: Develop an ECDM Plan Financial Strategy

C1: Update Asset Management Plan and Policy

The City's Asset Management Policy and associated Plan were recently completed (2019 / 2020) and include the objective of investing in and upgrading assets to mitigate and adapt to climate change in accordance with Ontario Regulation 588/17 - *Asset Management Planning for Municipal Infrastructure*. An effective asset management plan references the impacts of climate change on assets and commits the organization to managing these risks, as one of several types of risk to assets. The plan and policy will be reviewed every five years and updated as required in accordance with O. Reg. 588/17. The Asset Management Plan should include a corporate risk management framework outlining a consistent approach to risk identification, classification, prioritization, and management. The risk management framework should identify climate risks as one type of risk to be considered, as well as other types of risk. This initiative supports all initiatives recommended in this ECDM Plan. No energy or GHG benefit has been estimated.

C2: Recognize Green Infrastructure as an Asset Class

The City will need to utilize carbon offsets and energy credits to achieve its GHG emissions reduction targets. To be climate neutral, the neutralization of GHG emissions should be done by investing in local nature-based solutions / projects — such as land conservation projects (e.g., parks and/or street trees), the rehabilitation of riparian ecosystems and wetlands, the construction and maintenance of wetland-based stormwater systems — all of which can act as green infrastructure and replace grey infrastructure and provide GHG sequestration benefits both for the atmosphere and for accounting purposes. To be able to recognize the benefits from these systems, and to properly account and manage them in such a manner to maximize the co-benefits, it is recommended that the City explicitly define and recognize natural assets as an asset class in the City financial accounting systems. This will also require the establishment of obligations to operate, maintain, and replace natural assets alongside traditional capital assets.

There are now several examples of local governments exploring and undertaking such initiatives (e.g., Town of Gibsons, City of Surrey, City of Prince George, City of West Kelowna, etc.) (NAI, 2024).

C4: Develop a Sustainable Purchasing Policy

The City has supported the purchase of environmentally friendly products and services in principle but currently does not have a formalized sustainable procurement program. Such a program can help reduce energy use and GHG emissions that result from operations, contracted services, and in the construction of City infrastructure. The objective of a Sustainable Purchasing Policy is to shift spending away from goods and capital assets that have a greater energy, GHG, water, waste footprint towards those that have a smaller footprint over the goods or services lifespan.

The interest in green procurement reflects growing market preference for environmentally superior goods and capital assets referencing environmental, sustainability and corporate social responsibility standards. However, identifying and verifying the relative environmental benefits of products and establishing which products are actually “green” or “greener” is challenging. There is a general lack of industry standards and accepted criteria for valuation. Many factors throughout the entire life cycle of the product and packaging supply chain, use, and disposal can be included and if so, weighted in analysis. Environmental aspects include items such as recycled content, renewable versus non-renewable resource inputs, GHG emissions and embodied energy, other contaminant emissions, energy efficiency, and waste production and reduction. Economic, social, and cultural aspects of procurement include ethical and fair-trade practices such as economic and employee equity, worker health and safety, child labor, and community economic development.

To reduce energy and GHG emissions from products and services, it is recommended that the City develop a Sustainable Products Ranking Framework and associated program. A Sustainable Products Ranking Framework would enable the City to clearly assess the degree to which environmental and social considerations have been addressed over the life cycle of a good or capital asset. Such a framework is designed to compare, rank and weigh purchases based on set requirements (e.g., cost, efficiency, etc.) as well as the degree to which the environmental and social impacts of concern have been reduced or eliminated. Each purchase would be assessed against a base case product or service for which no identifiable efforts have been made to reduce the environmental or social impacts. Such a framework, its requirements, criteria, and processes would need to be documented and reside in a Sustainable Purchasing Policy Program Guide. In the case of capital goods, like buildings, the Framework would incorporate green performance requirements / objectives and performance metrics such as EUI and/or Thermal Energy Demand Intensity and/or GHGI and would undergo an energy and GHG emissions Life Cycle Assessment (LCA) to quantify the energy and

GHG impact that would be incurred over the life of the asset. These performance targets would then be carried through into contractual requirements, along with associated penalties for non-compliance. To track and monitor contracted services, it is recommended that the City include energy and GHG emissions reporting requirements in all new and renewed contracts post 2024. This is a supportive initiative. No energy or GHG benefit has been estimated for this initiative.

C5: Develop a Corporate Energy Savings Reserve Fund Policy and Terms of Reference

When actual utility savings occur from energy reductions projects, future operational budgets are often reduced to reflect this change. The proposed initiative would assign the remaining budget to a special projects account (e.g., realized utility savings from an LED retrofit program would be assigned to the Energy Conservation Reserve Fund for use in the future). Ideally, this fund would also be enhanced by annual contributions from budget or from other appropriate sources such as the Canada Community-Building Fund (formerly called “Gas Tax Fund”). This is a supportive initiative and would be used to fund GHG reduction initiatives presented in this ECDM Plan, provide leveraging funds for grants, and potentially for climate adaptation and other related initiatives (e.g. installation of EV chargers) which may or may not have an ROI to replenish the fund. No energy or GHG benefit has been estimated for this initiative.

C7: Develop an Internal Cost of Carbon Policy

Climate change impacts are expected to have serious negative effects on global economic growth and development. In 2005, the UK government commissioned an independent economic review called The Stern Review, which concluded, “the benefits of strong and early action far outweigh the economic costs of not acting” (Stern, 2007). Using results from economic models, the Review estimated that if we don’t act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global Gross Domestic Product (GDP) annually - potentially as much as 20% of GDP. In contrast, the costs of implementing actions to reduce GHG emissions and mitigate the impacts of climate change could be limited to 1% of global GDP annually.

Although the social and environmental benefits of reducing energy and GHG emissions are well established, their recognition or importance in decision making processes are often under-represented. Applying an Internal Cost of Carbon (ICC) policy allows organizations to better account for these benefits and is a key component to moving an organization towards its energy and GHG reduction targets. To support many of the proposed initiatives in the ECDM Plan, it is recommended that the City establish an ICC

which would be used to calculate the value (expressed as a cost) of GHG emissions associated with decision-making in respect to all City assets and infrastructure.

It is suggested that the City could align its policy with the City of Vancouver which establishes the ICC at $190/tCO2e and escalates at 6% per year, or the Clean Air Partnership Climate Lens Tool (CAP, 2024a).

No energy or GHG benefit has been estimated for this initiative. Factoring in an ICC into decision making would support the business case for all the initiatives in this ECDM Plan.

C9: Develop Policy for Purchasing Emission-free / Low Emission Electricity and Natural Gas

To achieve its GHG emission reduction targets, particularly the 2050 target of 80%, the City will need to actively work to reduce building, fleet, and waste GHG emissions. Once these are reduced as low as possible, purchasing energy from renewable or low-emission sources will be one method to mitigate the residual, or hard to reduce, GHG emissions. These sources of natural gas and electricity can be obtained through the following project types:

- Renewable Natural Gas: credits available from large scale projects producing natural gas through biological reclamation (e.g., from landfills)
- Green Fuels: large scale projects to produce natural gas through biological processes

This initiative and C10 complement initiatives C2 (Recognize Green Infrastructure as an Asset Class) and C11 (Develop an ECDM Plan Financial Strategy).

C10: Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions

To achieve its GHG emission reduction targets, particularly the 2050 target of 80%, after all possible GHG mitigation measures are implemented including low and emission free energy sources from Initiative C9 and emissions are reduced as low as possible, purchasing and/or utilizing carbon offsets and energy credits will be needed to mitigate the residual, or hard to reduce, GHG emissions.

These offsets can be thought of as an investment in a renewable energy project with the return on that investment being a decrease in the recorded GHG emissions. By contrast, these offsets do not usually mean that the investor will directly use the

products of the project (e.g., buying an offset credit from a wind farm does not mean the user now uses energy from that farm). The purchaser essentially contributes to the economic development of the project to ensure the benefits are realized somewhere. As such, these offsets are widespread and can be achieved through multiple different project types:

- Renewable Electricity Credits: large scale wind / solar farms connected to the grid or from small scale community projects.
- Natural Management and Conservation: large scale reforestation (or avoided deforestation), improved forest management, or other natural areas improvement to increase the potential for carbon sequestering.
- Power Purchase Agreements: Direct, long-term contracts between purchasers and large-scale energy producers to increase the viability of the energy projects.

To this end, it is recommended that the City establish carbon offset and energy credit procurement standards that align with The Oxford Principles for Net Zero Aligned Carbon Offsetting (University of Oxford, 2020) and consider the following criteria:

- **Additional**: The carbon offsets would not have occurred without the carbon finance.
- **Audited**: The carbon offsets have been validated and verified by third-party assessors using independent, recognized, standard quantification methodologies to ensure GHG emission removals were actually achieved.
- **Not Double Counted**: The carbon offsets are serialized on a carbon registry and ownership can be traced back to the developer.
- **Local**: The carbon offsets are Canada-based and local (preference to those based in Ontario).
- **Socially & Environmentally Positive**: There are no negative environmental or social impacts as a result of the generation of the carbon offsets, and the project provides social and community co-benefits, such as those that directly support/engage communities, local/small business, and/or projects with First Nation’s ownership.

- **Certified**: The carbon offsets have been generated under a recognized offset standard (e.g., Gold Standard, BC's Greenhouse Gas Industrial Reporting and Control Act, Verified Carbon Standard).

This initiative together with C9 complements initiatives C2 (Recognize Green Infrastructure as an Asset Class) and C11 (Develop an ECDM Plan Financial Strategy).

C11: Develop an ECDM Plan Financial Strategy

The Financial Strategy will outline the costs, savings, and timing of implementing the actions of the ECDM Plan to meet the 2050 emissions reduction target. The Financial Strategy will also:

- Review the scope and objectives of the Energy Conservation Reserve Fund to finance climate action projects (Initiative C5).
- Examine revenue sources for climate action projects such as a portion of the Community Building Fund (formerly called "Gas Tax Fund") and / or annual contributions to the Energy Conservation Fund through the budget process.
- Examine the possibility, scenarios, costs and premiums, of purchasing City energy from emissions free sources and/or offsets to meet targets.
- Provide an annual report to Council on energy expenditures, conservation project costs, and savings achieved.
- Support a carbon budget that aligns with the City's Asset Management Plan.
- Support a long term decarbonization financial plan. The plan will address the 80% GHG emissions reduction by 2050 target and contemplate the end of natural gas, diesel, vehicle gas, and methane from waste (i.e. "net zero"). The plan will produce an analysis of the costs as well as savings and avoided costs.
- Provide recommendations for the other related ECDM Plan initiatives that involve financial considerations such as the Sustainable Purchasing Policy and Cost of Carbon Policy.

5 Implementation & Monitoring

The following sections discuss implementation of the ECDM Plan, governance and collaboration, funding opportunities and risks, evaluating future initiatives, resource and budget planning, monitoring and reporting progress, and communication strategy.

5.1 Implementation Timing

The analysis in this ECDM Plan indicates that there is a pathway for the City to make significant progress towards its GHG emissions reduction target. The 2025-2029 ECDM Plan identified initiatives were selected based on their energy and GHG reduction potential, either directly (e.g., building retrofits or equipment upgrades), or support measures (e.g., policy development or employee protocols). Table 5-1 presents these initiatives and the timing of their implementation over the next five years (2025-2029).

The following initiatives are recommended to be implemented within the next year, with activities providing the highest anticipated reduction potential listed first:

- SW1: Develop Corporate Solid Waste Management Plan
  - Data refinement: fullness of collecting bins
- B3: Develop & Implement Decarbonization Plans for Buildings & Facilities
- B5: Implement a Building Commissioning Program
- C7: Develop an Internal Cost of Carbon Policy
- B1: Update Green Building Policy & Technical Standards

The recommendation is based on these listed initiatives' foundational nature that when implemented, creates the systems, processes, and programs to support the implementation of the other initiatives to further reduce energy and GHG emissions. It is also recommended to continue to switch to EVs and electric equipment (Initiatives F3 and F4) whenever the opportunity arises.

Table 5-1: 2025-2029 ECDM Plan Initiatives Timing

Initiative	2025	2026	2027	2028	2029
B1: Update Green Building Policy & Technical Standards		X			
B3: Develop & Implement Decarbonization Plans for Buildings & Facilities	X	X	X	X	X
B5: Implement a Building Commissioning Program		X	X	X	X
B8: Opportunistic Energy Conservation Projects for Buildings & Facilities	X	X	X	X	X
F3 Develop and Implement a Fleet Rightsizing Operational Procedure		X	X	X	X
F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric	X	X	X	X	X
F5: Install Appropriate Charging Infrastructure to Support Light Duty Fleet Conversion		X	X	X	X
SW1: Develop Corporate Solid Waste Management Plan		X	X	X	
W2: Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators	X	X	X	X	X
C1: Update Asset Management Plan and Policy	X	X	X		
C2: Recognize Green Infrastructure as an Asset Class	X				

Initiative	2025	2026	2027	2028	2029
C4: Develop a Sustainable Purchasing Policy				X	X
C5: Develop a Corporate Energy Reserve Fund Policy and Terms of Reference		X	X		
C7: Develop an Internal Cost of Carbon Policy		X			
C9: Develop Policy for Purchasing of Emission-free / Low Emission Electricity and Natural Gas		X			
C10: Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions		X			
C11: Develop an ECDM Plan Financial Strategy					X

5.2 Governance & Collaboration

The City's efforts to reduce energy and GHG emissions as a corporation will be measured through an annual GHG inventory as part of the FCM PCP Milestone Program and through annual energy reporting on City-owned facilities as required by Ministry of Energy, Northern Development and Mines, though some initiatives lend themselves to more specific monitoring and measurement. For example, when it comes to monitoring and measuring the outcomes of its proposed building-related initiatives, the City will track energy consumption per building over time to monitor the effect of proposed action items such as the installation of programmable systems (e.g., programmable thermostats). The City will also monitor corporate waste diversion rates over time by implementing a regular waste auditing process that will measure the success of corporate-wide waste management strategies and present additional strategies for the City to implement in time. Success for other initiatives, such as the City's proposed urban forest initiative, will be measured based on an assessment of tree cover and carbon stored and sequestered.

The City's GHG Reduction Taskforce will be responsible for presenting monitoring reports to Council and will be responsible for identifying new action items for the 2029-

2034 ECDM Plan update to reduce energy and GHG emissions over time to facilitate continuous environmental improvement across City operations.

5.3 Funding Opportunities & Risks

Wherever possible, the City should take advantage of funds to speed up the implementation of project initiatives. For example, the City could apply to Infrastructure Canada for federal funding under the Community, Culture and Recreation Fund to support the energy projects at the identified community centres under the basis that the retrofits would reduce GHG emissions but also support using the community centres as "cooling centres" during heatwaves. The City should also take advantage of the current rebate programs for electric vehicles. The FCM Green Municipal Fund often has grants available to support sustainability and climate action planning efforts and offset low-interest loans to support capital projects that reduce energy and GHG emissions.

As these programs are subject to political changes, the City should proactively plan and incorporate capital and operating costs of the proposed initiatives into future budgets. This will enable the City to take advantage of external funding opportunities when they are available but not have to rely on these external sources to move forward on initiatives.

Regardless of external funding availability, the proposed initiatives will require further business case development, are contingent on future Council approval, and future staff and budget (capital and operating) availability. As part of implementation, the following risks would need to be considered and addressed:

- Increasing capital and operating costs, as well as lower than expected savings and revenues.
- Regulatory barriers and compliance issues that impede the implementation of the initiatives.
- Competing Council and departmental priorities including current operational mandates of impacted services and how mandates will need to change to achieve the energy and GHG reductions.

5.4 Evaluating Future Initiatives

The ECDM Plan contains a list of recommended initiatives to be completed over the next 5 years. Implementing the initiatives requires dedicated resources and systems in place to ensure that the policies, programs, and projects recommended are

implemented and tracked so the City's corporate operation targets are met. The objective of the ECDM Plan is to dovetail energy conservation, energy demand management, and GHG emissions as part of the City's normal course of business for asset retrofits, renewals, and life cycle replacement projects. Success in this endeavor requires incorporating conservation and demand management options at the initial design stages. This ensures that options for improving energy efficiency are considered, evaluated, and quantified in terms of life cycle costing analysis, including cost, maintenance, GHG reductions and other co-benefits that may accrue to the City.

When evaluating future initiatives, a City checklist should include the following:

- Project base case
- Energy efficient options
- Project costs (base case vs. energy efficient case)
- Project savings (in terms of energy, maintenance, avoided GHG emissions)
- Maintenance savings
- Financial benefits
- Environmental benefits
- Co-benefits
- Incentives/funding available
- Overall benefits
- Life cycle analysis (LCA) recommendations

The implementation of the ECDM Plan will require the formulation of an annual work plan to define what actions are undertaken annually. To aid in successful implementation, the annual work plan should tie into departmental business plans and budgets to ensure responsibilities and resources are allocated accordingly.

5.5 Resource & Budget Planning

The City's 2023 energy expenditures including electricity, natural gas, diesel, gasoline, and propane was over $4.7 million. It is anticipated over the next 10 years that the average cost of energy will increase by 2 to 3% per year, a large portion of which can

be mitigated through the savings achieved by initiatives recommended in the ECDM Plan.

The 2025-2029 initiatives identified in this plan, and the estimated financial and staff resources are summarized below:

- 8.9 FTE – this reflects the existing human resources in various City divisions required to implement the 2025-2029 projects. No new positions are proposed;
- $11.715 m Decarbonization Study 2025-2029 implementation projects in 10 highest-emitting buildings;
- Corporate Solid Waste Management Plan $150,000 (2026 inventory, 2027-2028 plan);
- $300,000 consultant (2028-2029) Climate Action Financial Strategy in 2029;
- $250,000 optional consulting to complete the Green Building Policy, Sustainable Purchasing Policy, Cost of Carbon Policy, and Offsets Policy Review;
- Capital costs (To be determined and proposed for the capital budget) for light duty fleet EV chargers, upgrades, and site preparation for implementing the fleet strategy;
- Capital costs for replacement generators are within existing budgets ($200,000 estimated for two replacement generators);
- Capital costs for Asset Management plan are approved and within existing budget;
- $25,000 for annual regulatory reporting of GHG emissions associated with facilities is within the annual operational budget account; and
- a capital budget project be submitted for 2028 ($100,000) in order to complete the 5-year inventory and a new ECDM Plan as per Ontario Regulation 25/23.

5.5.1 Financial Resources

It is estimated that the recommended initiatives could result in accumulated energy savings of $5.8 million in energy costs (or about $210,000 per year, on average) if the energy reductions are achieved. It has already been reported that the LED streetlight conversion project alone generates an estimated savings of $600,000 per year (July

2024 report to Cambridge Council, “Sustainability Update” 24-008-IFS). The timing of efficiency upgrades and new projects as part of asset upgrades and renewal will continue to be brought forth to Council for approval within the designated budget year. City staff will need to develop a 10-year spending plan that can be considered in annual municipal budget processes and feed into the City’s long-term financial plans. Specific capital costs to consider the retrofits or operational needs have not been estimated and are not included in this forecast.

5.5.2 Staff Resources

Several strategies are intended to embed sustainable energy management and GHG reduction programs into the departments, systems and polices which require time, staff, and the training of staff. While there will be a coordinated level of effort from City operations and various departments, the ECDM Plan requires that at least three full time employee (FTE) subject matter expert (SME) staff members be dedicated to the sustainability function; one to manage the overall implementation of the ECDM Plan, another for building-related retrofit projects, and a third within the Fleet Department. Training facility staff on energy and GHG management practices and concepts builds competencies that enable staff to carry out operations more effectively and efficiently. Finally, the implementation of the 2025-2029 projects in this ECDM Plan require resources from various departments and subject matter experts (e.g. Finance). The City should seek to include energy training concepts for relevant staff, where appropriate.

5.6 Monitoring & Reporting

An ongoing feedback loop, known as the Deming Cycle, facilitates continuous improvement, and can be used to facilitate the continuous improvement of the ECDM Plan, and ensure that it remains as a living document. The four components of the Deming Cycle, are “plan, do, check and act.” A run through the plan-do-check-act cycle must occur on an annual basis and should coincide with the City’s annual budget cycle for planning each year’s capital and operating budgets.

A monitoring framework provides the City with a task list of items to track that will help re-assess the effectiveness of the proposed initiatives over time (the “check” components of the cycle). Monitoring includes two components. The first is the monitoring of the proposed initiatives - what is being done, who is doing it, is the activity funded, etc. The second component is the compilation of the energy and GHG emissions inventory to monitor the success of the initiatives. Tracking, measuring, and sharing progress towards the City’s GHG reduction target is essential to maintaining

momentum for change. The success of the ECDM Plan will be measured by the results achieved relative to prior reporting years.

On an annual basis, the City should prepare an ECDM Plan status report, which at a minimum, will include:

- Current energy and GHG emissions profile in aggregate and broken down by department
- Change in energy and GHG emissions from the prior year and the baseline
- Follow up actions from the prior year's report
- A description of the work that has been completed
- Progress towards the GHG reduction targets
- Identification of any issues or challenges faced in advancing each initiative
- An indication of progress toward achieving each initiative, using the following scale:
    - Not Started - The initiative has not been implemented
    - On Track - The initiative is being implemented, or in progress
      For various initiatives, progress will be measured through quantitative and qualitative indicators (as identified in the initiatives tables)
    - Outstanding - An issue, barrier and/or challenge is prohibiting the initiative from being implemented
    - Delayed - The initiative has been delayed or placed on hold, and the reason or rationale
    - Completed - The initiative has been completed
- List of new initiatives to address issues, barriers, and challenges
- Timing and assigned responsibilities of the initiatives

The initiatives in this ECDM Plan should be evaluated in consultation with the various City departments on an annual basis, as part of the departmental strategic operations planning process. This will be an opportunity to review and prioritize potential strategies based on resources and emerging technological opportunities.

5.6.1 Reporting to Ministry of Energy, Northern Development and Mines

The City will continue to report its annual energy use and GHG emissions associated with 53 facilities to the Ministry of Energy, Northern Development and Mines on an annual basis in accordance with O. Reg. 25/23. In addition to ongoing monitoring and reporting, the initiatives, and underlying assumptions of this ECDM Plan will be frequently examined to ensure that any major developments are integrated. The ECDM Plan will adapt and respond to the changes in federal and provincial level climate action commitments as they occur.

Effective as of the 2022 reporting period the City will no longer present the energy consumption of buildings that are occupied/leased by outside organizations where the tenant maintains control of their own use of energy within the building and is responsible for payment of their own utility accounts, except for the Idea Exchange libraries. This parameter change will be retroactive, reaching back to the 2010 energy consumption reporting year since this is the baseline comparison year for the City's 2030 and 2050 GHG emissions reduction commitments. This retroactive change allows fair comparisons to be made between the 2010 baseline year and all reporting periods moving forward. This will bring the City's energy reporting into closer alignment with regulatory reporting requirements and standard energy reporting practices in the municipal sector.

5.7 Communication Strategy

The overall goal of the communication strategy is to outline tools and techniques to assist the City with ongoing internal communication about the ECDM Plan, including implementation and progress towards targets. The communication strategy is focused on internal communication for City staff and Council and is not designed to be public. The key objectives of the strategy are:

- To communicate the presence and importance of the ECDM Plan
- To share progress towards the corporate targets
- To motivate multiple audiences about what they can do to reduce the City's energy use and GHG emissions
- To communicate coming changes in business practices to support the ongoing implementation of the ECDM Plan

5.7.1 Responsibility

Responsibility of the ECDM Plan implementation rests with the GHG Reduction Team through to delegation of actions to managers and staff.

5.7.2 Tactics and Recommendations

The Communications Strategy includes a series of tactics and actions the City can take to better communicate to staff the corporate climate action initiatives including appropriate audience and timing, presented in Table 5-2.

Table 5-2: Suggested Communication Tactics

Tactic	Description/Rationale	Audiences	Timing
Host quarterly GHG Reduction Taskforce meetings	The intent of these meetings is to: • Share best practices between departments • Provide status / progress updates on energy conservation and GHG emission reduction strategies across all departments • Prioritize work • Share funding opportunities • Collaborate on shared initiatives that flow into annual work plans and budgets	Senior leaders, representing key departments	Quarterly, Ongoing

Tactic	Description/Rationale	Audiences	Timing
Develop an annual corporate Energy and GHG Emissions Progress Report	The GHG Reduction Team will gather information from all departments, and report annually on energy and GHG emissions. Ensure the development of a one-page, graphic summary document which can be used to communicate results with a wide range of audiences.	Council All staff	Annually
Implement general energy skills training for all staff	Develop (or adopt) a stand-alone webinar that would be suitable for all City staff. The webinar could cover: • An overview of the ECDM Plan • The role of all staff members in contributing to energy conservation and GHG emission reductions • Easy tips and reminders for every day corporate energy conservation and GHG emission reductions	All staff	End of Year Two

Tactic	Description/Rationale	Audiences	Timing
Work to integrate key messaging into existing communications	Work alongside the communications department to share tips and reminders about energy conservation and GHG emission reductions with all staff.	All staff	End of Year One

6 Conclusions

This City will have to aggressively increase the pace of energy retrofits and upgrades to meet their 2030 and 2050 GHG emissions reduction targets. Even considering the most aggressive reduction scenarios, emission offsets or energy credits will still likely be required to offset emissions in 2030 (anticipating that not all recommended ECDM projects will be completed by then) as well as the residual emissions necessary for 80% reduction by 2050.

The ECDM Pathway estimates that only a 30% emissions reduction below the 2010 baseline is possible and that additional emissions reduction projects (e.g. implementation of the Decarbonization Plan) will take place in the 2030-2034 ECDM Plan update.

The forecast and Pathway also rely on the continued conversion to EVs and electrical equipment. Light Duty Vehicles and Equipment were forecasted with 100% and 70% conversion, respectively, by 2029. Light Duty Trucks currently have limited opportunities for conversions to hybrid or electric models; instead, the forecast assumes scheduling and operational improvements allow for the conversion to electric vans or cars or for the early retirement of some vehicles (at least three such actions per year until 2029). As current federal regulations will eliminate the sale of vehicles powered solely by gasoline or diesel in 2035, it is anticipated that an increased quantity and variety of electric or hybrid pickup options will allow the City to further electrify their fleet. Heavy vehicles are not forecasted to be converted to electric options until 2045 and forecasted improvements between 2030 and 2050 were estimated based on improved operational procedures to decrease fuel usage. A key consideration for the pace of fleet conversion will be the availability of charging stations in the City.

Energy use for Public Lighting and Wastewater pumping are forecasted to reduce as the Ontario electric grid greens, but energy efficiencies improvements will be required to meet the more aggressive 80% target.

Given the current estimated solid waste quantity, it will be important for the City to refine the data assumptions behind this current estimation (namely the fullness of the containers at pickup and the composition of the waste). Implementing both of these refinements will be critical to meeting the 2030 target of 50% reduction. The success of any employee or public waste reduction and diversion campaigns can only be assessed when more accurate waste data is available.

Other initiatives presented are critical to providing supplemental actions and policies to ensure that energy efficiencies and improvements will be considered during all stages of City planning (conceptual, design, and operation). Frequent reporting, both as required by regulations and internally to appropriate committees and working groups or externally with the public, will monitor the progress towards achieving the reduction targets as well as providing transparency and accountability. In addition, the City should consider expanding the amount of green energy generation, and work on integrating this energy source directly for the City's needs as opposed to providing it to the grid. Emerging technologies and policies being employed by other municipalities can also provide a guideline for instituting further changes.

7 References

Canada Green Building Council (CGBC). 2024. Zero Carbon Building Standards. Accessed August 30, 2024: www.cagbc.org/our-work/certification/zero-carbon-building-standard/

Clean Air Partnership (CAP). 2024a. Municipal Climate Lens Tool. Accessed November 7, 2024: www.cleanairpartnership.org/tools/climatelens/

Clean Air Partnership (CAP). 2024b. March 2024 Briefing note. Accessed November 13, 2024: www.cleanairpartnership.org/wp-content/uploads/2024/03/Briefing-Note-High-Performance-Building-Costing-Studies.pdf

Infrastructure Canada. 2023. The Climate Lens – Disaster Mitigation Adaption Fund, Guidance v2.1. Accessed August 30, 2024: publications.gc.ca/collections/collection_2024/infc/T94-52-2023-eng.pdf

Intergovernmental Panel on Climate Change (IPCC), 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24. https://doi.org/10.1017/9781009157940.001. Accessed August 30, 2024: www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf

Natural Assets Initiative (NAI). 2024. On the Ground. Accessed August 30, 2024: naturalassetsinitiative.ca/on-the-ground/

Stern, Nicholas. 2007. The Economics of Climate Change: The Stern Review. Cambridge University Press, January 2007. www.cambridge.org/core/books/economics-of-climate-change/A1E0BBF2F0ED8E2E4142A9C878052204

United Nations Environment Programme (UNEP). 2024. Cities and Climate Change. Accessed December 12, 2024: www.unep.org/explore-topics/resource-efficiency/what-we-do/cities-and-climate-change

United States Department of Energy (USDOE), Office of Energy Efficiency and Renewable Energy. 2010. Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency. Accessed August 30, 2024: www.energy.gov/sites/prod/files/2020/04/f74/omguide_complete_w-eo-disclaimer.pdf

University of Oxford, Environmental Change Institute. 2020. The Oxford Principles for Net Zero Aligned Carbon Offsetting. Accessed August 30, 2024: www.smithschool.ox.ac.uk/sites/default/files/2022-01/Oxford-Offsetting-Principles-2020.pdf

Walter Fedy. 2025. City of Cambridge Decarbonization Study / Greenhouse Gas Reduction Feasibility Study (and individual reports for the City's 10 highest-emitting facilities)

Waterloo Region. 2022. ClimateActionWR: TransformWR – Waterloo Region's Transition to an Equitable, Prosperous, Resilient Low-Carbon Community. Accessed August 30, 2024: climateactionwr.ca/transformwr/

Appendices

Appendix A ECDM Plans Initiatives Summary

A.1 Initiatives NOT CARRIED FORWARD from the 2020 ECDM Plan

Table A-1: Initiatives from the 2020 ECDM Plan not carried forward to the 2025-2029 ECDM Plan

Initiative	Description	Indicators / Notes
B2: Complete Building & Facility Utilization Assessments	Review service delivery requirements and needs with consideration to facility operational demands with the objectives of identifying operational and service delivery efficiencies.	• This Action is accomplished through the Asset Management process and ongoing planning for future facilities. It involved reviewing the buildings and space required by the City and minimizing the construction of new buildings in the future. Programs and policies that allow staff to work from home, staff hoteling, and improved space layouts, and master plans (e.g. Operations Facilities Master Plan) that optimize current facility resources and efficiently plan for growth were developed and are being utilized.
B4: Implement Energy Audit Recommendations	Implement the outstanding recommendations presented in the previously completed facility energy audits. Leverage external funding opportunities to implement energy reduction initiatives with longer payback periods.	• Audits were completed for 27 buildings between 2014-2019. Some projects identified in the audits were completed others are ongoing (completion is dependent on a Facility basis and not a task basis) • Some identified energy conservation projects with known ROI could be carried out rapidly using the City's energy conservation reserve fund (e.g. switching to LED lighting). However, many previously identified items will be paused pending the results of the item B3 outlined above as much of the remaining opportunities are connected to the 10 highest-emitting facilities.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Indicators / Notes
B6: Pilot Building Energy Management System	Building energy management systems can track energy consumption and costs allowing users to better understand energy use for each facility over time and can also be used to identify trends. It is recommended that the City explore what cost-effective energy management systems are available.	• Discussion and presentations with vendors have occurred to determine currently available technology, but no procurement commitment has been made.
B7: Continue to Develop Alternative Work Strategies and Supportive Policies	The Work From Home (WFH) / Telecommuting initiative was implemented during the COVID-19 pandemic and has continued through to the present. The City now considers it a standard part of their work practices that will continue to be implemented well into the future.	• For 2023, it is estimated that the 95 participating employees in the WFH program have avoided over 530,000 km of travel and saved 109 tCO_2e. While opportunities for further strategies may present themselves in the future, Initiative B7 is considered complete and will be expanded to other staff as they are hired by the City.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Indicators / Notes
F1: Conduct Fleet Data Analysis with Sustainability Focus	Annually conduct a review of the fleet to analyze telematics data and to support the implementation of fleet energy reduction initiatives identified in the ECDM Plan.	• Telemetrics data has been regularly analyzed and reported on by a third party for multiple years. Results have consistently shown Fleet is operating efficiently with no realizable gains.
F2: Develop a Low-Carbon Fleet Master Plan	Develop a Low Carbon Fleet Master Plan to reduce energy consumption, improve cost-efficiency, while maintaining / improving service levels. It is recommended that the Plan establish fleet specific renewable energy targets that align with the City's corporate target of reducing GHG emissions by 80% by 2050.	• Completion and endorsement of the Low Carbon Fleet Master Plan by senior management and Council.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Indicators / Notes
W1: Assess the Feasibility of Micro-Hydro Turbine Systems When Installing or Upgrading Existing Wastewater Infrastructure	Complete an assessment as to the level of opportunity to install micro-hydro turbines in wastewater infrastructure to reduce energy consumption (e.g., Dover Street Pumping Station). Financial viability can be improved by accessing external funding sources (i.e., FCM).	• After a review of the possibility of Micro-Hydro Turbine power generation in wastewater, this action was not considered feasible at the current moment. Environmental Services continues to monitor advances in Technology and the feasibility of using wastewater as alternate power generation
C3: Incorporate Life Cycle Considerations into Capital Planning and Purchases	Pilot the use of publicly available or low-cost Life Cycle Analysis (LCA) tools (e.g., RETScreen) to account for energy and GHG emissions in budget and capital planning and asset management. The LCA should include all of the energy inputs, including those used to create building materials at the outset, and to dispose of them at the end of the building's life	• Pilot projects were implemented and lessons learned applied. • This action is to be completed along with C4, and C11; life cycle considerations are integrated to clearly prioritize products and service that reduces / conserves operational energy use and GHG emissions throughout the entire lifecycle of the asset

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Indicators / Notes
C6: Develop a Sustainable Infrastructure Rating System Policy	Incorporate the Envision ISI Framework into the City's Project Prioritization Model.	• Not initiated
C8: Establish Dedicated Sustainability Planning Resource(s)	Establish dedicated sustainability planning resource(s) to champion the implementation of the energy and GHG reduction initiatives identified within the ECDM Plan, track and report progress, and lead the subsequent updates to the ECDM Plan.	• A Sustainability Planner has been re-assigned from Parks and Forestry Development Planning to City climate change plans / ECDM Plan / TransformWR / climate adaptation, and energy act reporting.

A.2 Initiatives for the 2025-2029 ECDM Plan Update

Table A-2: Initiatives for the 2025-2029 ECDM Plan Update (Includes 2020 ECDM Plan Initiatives carried forward and new Initiatives)

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
B1: Update Green Building Policy and Technical Standards	Update Green Building Policy and associated technical standards.	Supportive Initiative Reduction potential will be realized on new facility construction projects.	Staff Time (0.5 FTE) Consultant Time (optional if drafting in-house) ($50,000)	2026	Sustainable Design & Development Corporate Enterprise	Completion of Green Building Policy
B3: Develop and Implement Decarbonization Plan for Buildings & Facilities	The City received a $200,000 FCM grant (leveraged on $100,000 capital funds) to produce a Decarbonization Study to identify facility retrofit projects and their costs, savings, and GHG emission reductions. The Decarbonization Study examined the City's 10 highest-emitting facilities and develops pathways to achieve 50% and 80% reduction targets. Implementation will consist of the "FCM Minimum Performance Scenario" and only projects within the timeline of 2025-2029 are accounted for in this ECDM Update.	The recommended FCM Minimum Performance Scenario measures attributed to the 2025-2029 period of this ECDM Plan achieve 594 tonnes of reductions (the FCM Scenario achieves a total 1,600 tonnes in ten years)	Staff Time (0.5 FTE) 2025-2029 projects are estiated at $11.765 million. It is anticipated that GMF grants would be pursued to fund these projects	Integral to reducing corporate emissions and targets 594 tonnes 2029	Sustainable Design & Development Corporate Enterprise	Action B3 also implements TransformWR community climate plan Action 3.2.7 ("Show leadership by building net-zero carbon in the public sector").

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
B5: Implement a Building Commissioning Program	Prepare and implement a building commissioning and ongoing commissioning plan to reduce operating costs, reduce the risk of failures, and informs retrofit plans. The recommissioning measures in the Decarbonization Study (Action B3 above) achieve an estimated 20 tonnes across the 10 facilities in the Study and are included in the Reduction Potential for B3. Additional City facilities would achieve less however it is an important action to maintain reductions.	Supportive Initiative Maintains energy efficiency and reduces operating costs.	Staff Time (0.5 FTE) $30,000 per facility (but note that for the 10 facilities in the Decarbonization Study (B3) this is already included above	ongoing process	Sustainable Design & Development Corporate Enterprise	These activities which generally include adjusting temperatures, staging / sequencing of boilers, chillers, and air handling units, eliminating simultaneous heating and cooling and verifying controls, including automatic controls for set points, weekends, and holidays will be carried forward and continued in the 2025-2029 ECDM Plan.
B8: Opportunistic Energy Conservation Projects for Buildings & Facilities	Opportunistic energy conservation projects at historical buildings, parking lots, parks lighting and structures.	<50 tCO_2e	Staff Time (0.25 FTE) Existing operating budgets, City Energy Conservation Reserve Fund or other grants	2026-2029	Sustainable Design & Development Corporate Enterprise	Facilities staff opportunistically make purchasing decisions and replacement of some equipment (e.g. more efficient lights). Sustainable Design & Development staff may also pursue utility incentive programs or the City's Energy Conservation Reserve Fund for small energy efficiency projects.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
F3: Develop and Implement a Fleet Rightsizing Operational Procedure	Identify opportunities to right size equipment, vehicles, and the fleet size for the intended job/purpose. The objective is to develop a formal process that rationalizes fleet assets and reduces fuel consumption and GHG emissions by identifying which vehicles can be replaced smaller, electric, or renewably powered vehicles. Route optimization may also reduce fuel consumption and associated GHG emissions.	Supportive Initiative	Staff Time (0.25 FTE)	Integral to meeting 2030 target; Ongoing	Fleet	Procedures for procurement have been developed and are implemented Current focus is continuing the procurement of electric options and accelerating their intake where possible Possible metrics GHG emissions (tCO_2e) Number of vehicles with greater fuel efficiency, hybrid, EV etc.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
F4: Continue to Opportunistically Switch Off-Road and Hand-Held Equipment to Electric	Continue to opportunistically switch off-road and hand-held equipment to electric powered where health and safety and performance is not compromised.	40-60% Reduction in Equipment GHG Emissions 100% increase in Equipment Electricity Energy	ongoing / part of regular procurement practices	Integral to meeting 2030 target;	Fleet Hand-Held Equipment is replaced by Operations Managers	Procedures for procurement have been developed and are implemented Mower and backpack trimmers have been piloted and evaluated. Equipment, at the end of their life cycle are being replaced with electric equivalents where they commercially exist. Possible metrics GHG emissions (tCO_2e) Number of pieces of electric equipment.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
F5: Install Appropriate Charging Infrastructure to Support Light Duty Fleet Conversion	The City is currently conducting an Operations Facilities Master Plan, a key aspect to light duty fleet conversion to EV will involve the installation of appropriate charging infrastructure. The City should develop an EV charging station standard to establish base specifications and designs for facilities owned and operated by the City, and to allow for easy outsourcing if that is preferred in the future. As part of this, explore supplying power on two separate feeds from the grid to reduce the risk of local failure taking power away from the whole site and metering charging stations to assist with tracking facility energy use versus vehicle electric charging use. Explore solar energy parking lot canopy technology options to supply energy to electric vehicle charging stations to further reduce GHG emissions. Installation of charging infrastructure would need to occur 2026-2029 in order for fleet electrification to proceed.	Supports the electrification of fleet and is a precursor to additional procurement of vehicles	Planning FTEs are part of the Operations Facilities Master Plan Procurement and project management FTE (0.25) Estimated costs (EV charge units, panel and conduit, solar canopy, meters, site preparation and remediation, etc.) will depend on the Operations Facilities Master Plan and locations and specifications of proposed chargers	2029	Fleet	Charging infrastructure installed to support light duty City vehicles

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
SW1: Develop Corporate Solid Waste Management Plan	Develop a corporate solid waste management plan that aligns with the 7R's of zero waste.	Up to 100% reduction of solid waste emissions	Staff Time (1 FTE) Consultant $150,000	Integral to meeting 2030 target; 2026 inventory 2027-2028 plan	Parks Operations and Facilities	Confirm inventory (i.e. bin quantities / % filled) and composition Produce corporate waste plan taking into account Circular Materials will be diverting recyclables starting in 2026
W2: Opportunistically Replace Diesel Powered Backup Generators with Energy Efficient Natural Gas Generators	Replace diesel powered backup generators with natural gas-powered generators to reduce energy consumption and reduce the risks associated with diesel spills, air contaminants, etc.	Upwards of 20 tCO_2e reduction per generator	Staff Time (0.15 FTE) 2025-2029 it is anticipated that 2 generators will be replaced using approved capital budget projects and estimated at $100,000 each	2025-2029 as part of approved capital budget project	Wastewater	Environmental services continue to replace diesel backup power generators with natural gas options as applicable. The design phase of new constructions will assess if a natural gas generator is an option for all new development projects.

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
C1: Update Asset Management Plan and Policy	The City's Asset Management Policy and associated Plan were recently completed (2019/2020) and include the objective of investing in and upgrading assets to mitigate and adapt to climate change in accordance with Ontario Regulation 588/17 - Asset Management Planning for Municipal Infrastructure (O. Reg. 588/17). The plan and policy will be reviewed every five years and updated as required in accordance with O. Reg. 588/17.	Supportive Initiative	Staff Time (0.5 FTE) AND Consultant Time ($350,000). Budget approved	Project started Jan 2024.	Infrastructure Services	Asset Management Policy update is complete
C2: Recognize Green Infrastructure as an Asset Class	The City's Asset Management Policy and Plan includes consideration of green infrastructure such as street trees. The Policy and Plan will be reviewed every five years and updated as required by O. Reg. 588/17.	Supportive Initiative	Staff time (0.25 FTE)	Complete as part of initiative C1	Infrastructure Services	Urban Forest: Green infrastructure is included in the Asset Management Plan update of 2025 (C1)
C4: Develop a Sustainable Purchasing Policy	Develop a Sustainable Purchasing Policy that clearly prioritizes products and services that reduces / conserves operational energy use and GHG emissions	Supportive initiative	Staff time (2 FTE) in project managing the development of a policy and staff training Optional $100,000 consulting	2029	Procurement Finance Divisions that conduct procurement	Completed policy and training of staff on how to incorporate emissions into the decision-making framework and assessment of vendors and products

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
C5: Review the existing Corporate Energy Efficiency Reserve Fund Policy and Terms of Reference	Review the scope and terms of the Corporate Energy Efficiency Reserve Fund to ensure can support the anticipated projects and associated grant applications.	Supportive Initiative	Staff Time (0.5 FTE)	2029	Finance Sustainable Design/Development Facilities	Updating the policy involves revisiting the definitions and scope of the existing ~$2 million Energy Efficiency Reserve Fund to better support the implementation of the ECDM Plan and emissions reduction projects.
C7: Develop an Internal Cost of Carbon Policy	Develop an internal cost of carbon (ICC) policy to realize the cost of GHG emissions in capital decision frameworks.	Supportive Initiative	Staff Time (0.5 FTE) Optional $50,000 consultant	2029	Finance	This project is related to several other Actions (C4, C11) and so should logically proceed concurrently. Develop an internal cost of carbon (ICC) policy to realize the cost of GHG emissions in capital decision frameworks.
C9: Investigate Purchasing of Emission-free / Low Emission Electricity and Natural Gas	Given the likelihood of needing to purchase renewable electricity or natural gas credits to meet the 2030 and 2050 reduction targets, the City should investigate procurement of energy from low emission vendors.	Variable	Staff Time (0.5 FTE)	2028	Procurement Finance	C9 and C10 should be completed concurrently

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
C10: Develop Policy on Purchasing Offsets or Credits to Reduce City Emissions	Given the likelihood of needing offsets to meet the 2030 and 2050 reduction targets, the City should investigate currently available energy offsets and develop the conditions under which offsets would or would not be pursued within a policy.	Variable	Staff Time (0.5 FTE) Optional $50,000 consultant	2028	Procurement Finance	C9 and C10 should be completed concurrently

Appendix A ECDM Plans Initiatives Summary

Initiative	Description	Reduction Potential	Estimated Cost / Effort	Priority	Responsibility	Indicators / Notes
C11: Develop a Climate Action Financial Strategy	The Financial Strategy outlines the costs and savings associated with meeting long term targets and introduces and annual report. • Provide an annual report to Council on energy expenditures, conservation project costs, and savings achieved • Develop a long term decarbonization financial plan. The plan will address the 80% GHG emissions reduction by 2050 target and contemplates the end of natural gas, diesel, vehicle gas, and methane from waste (i.e. “net zero”). The plan will produce an analysis of the costs as well as savings and avoided costs of the City’s climate action initiatives.	Supportive policy Enhances reporting Provides the financial roadmap to achieve the long-term 80% by 2050 target	$300,000 (consultant) AND FTE required (Finance staff for leading Financial Strategy and ongoing annual reporting)	2028 - 2029	Finance Procurement	

Appendix B ECDM Forecast Summary

B.1 BAU Forecast Scenario

Sector	Forecast Description	Start Year	End Year	GHG Emissions Increase by 2050 (tCO_2e)
Buildings	Energy usage at current Facilities remains consistent	2024	2050	Decreases from changes by greening of electrical grid
Buildings	One (1) new arena added to account for expanding services	2035	2036	~129
Public Lighting	Energy usage for current Lighting remains consistent; no expansion	2024	2050	Decreases from changes by greening of electrical grid
Wastewater Pumping	Energy usage for current pumping remains consistent; no expansion or leak improvements	2024	2050	Decreases from changes by greening of electrical grid
Heavy Vehicles / Passenger vehicles / Equipment	Fuel usage for current Fleet remains consistent; no expansion to Fleet; 3 EV passenger replacements per year	2024	2050	Decreases from increasing EV usage
Waste	Waste from City owned garbage trucks increases relative to the forecasted population growth until 2030 then will remain constant	2024	2050	~120

B.2 ECDM Forecast Scenario

Sector	Forecast Description	Start Year	End Year	GHG Emissions Decrease by 2050 (tCO_2e)
Buildings	B8: Opportunistic Energy Conservation Projects for Buildings & Facilities	2026	2029	<50 tCO_2e
Buildings	B3: Decarbonization Study Implementation	2027	2029	594
Public Lighting	Efficiency improvements to all Parks Lighting	2028	2029	Decreases from changes by greening of electrical grid
Public Lighting	5% increase per year for increasing EV charging at parking lots	2026	2050	Decreases from changes by greening of electrical grid
Wastewater Pumping	Energy usage for current pumping remains consistent; no expansion or efficiencies from leak patches	2024	2050	Decreases from changes by greening of electrical grid

Appendix B ECDM Forecast Summary

Sector	Forecast Description	Start Year	End Year	GHG Emissions Decrease by 2050 (tCO_2e)
Heavy Vehicles	No expansion of Fleet; improved operation protocols result in 2% less fuel use per year	2031	2050	357
Heavy Vehicles	Two (2) heavy vehicles per year are retired because of scheduling improvements, or converted to other electric options	2045	2050	45
Passenger vehicles	No expansion of Fleet; expansion of fleet with only electric vehicles functionally equivalent	2026	2050	Decreases from changes by greening of electrical grid
Passenger vehicles	Nine (9) EV replacements per year; three (3) pickups converted to appropriate EV cars or vans or temporarily furloughed	2026	2030	206

Appendix B ECDM Forecast Summary

Sector	Forecast Description	Start Year	End Year	GHG Emissions Decrease by 2050 (tCO_2e)
Passenger vehicles	Four (4) pickups converted to appropriate EV cars or vans or temporarily furloughed	2031	2034	60
Passenger vehicles	Five (5) pickups converted to appropriate EV cars or vans or temporarily furloughed	2035	2050	419
Passenger vehicles	Improved operation protocols result in 15% less fuel use	2040	2040	48
Equipment	Average ten (10) EV replacements per year	2026	2030	120
Equipment	Expanded electric fleet reduces misc. fuel use by 50%	2030	2030	6
Equipment	Five (5) EV replacements per year	2030	2033	40

Appendix B ECDM Forecast Summary

Sector	Forecast Description	Start Year	End Year	GHG Emissions Decrease by 2050 (tCO_2e)
Waste	Waste from City owned garbage trucks increases relative to the forecasted population growth until 2030 then will remain constant	2024	2050	-
Waste	Data refinement determines garbage containers are on average 80% full	2026	2026	155
Waste	Data refinement determines City-Specific waste composition	2028	2028	515
Waste	New public and employee waste awareness and diversion programs result in a 10% reduction in waste	2040	2040	99

Appendix C City of Cambridge Fleet Strategy

Appendix C City of Cambridge Fleet Strategy

Executive Summary

The City of Cambridge initiated this Fleet Strategy as an Energy Conservation Demand Management Plan implementation project. The City owns and operates over 400 light and heavy-duty vehicles and equipment. Both fleet and equipment are almost entirely powered by gasoline and diesel, accounting for 24% of the City's 2023 GHG emissions. The City currently (2024) has 25 zero emission vehicles and equipment including 9 automobiles, 4 SUVs, 2 cargo vans as well as 3 ice resurfacers, 5 ice edgers and 2 mowers.

The overall objective of the Fleet Strategy is to install infrastructure to support the decarbonization of the fleet, procure new vehicles on an asset management basis, and await technology improvements for mid- to heavy-duty vehicle replacement that meet specifications during a period (2025-2050) where the population will increase by 50% and growth in the fleet will be required to maintain levels of service.

The Fleet Strategy includes the following actions:

1. Continue to source, acquire and convert to electrified vehicles and equipment, and for mid- to heavy-duty vehicles, as technologies become available.
2. Charging infrastructure and supportive technology:
    a. Develop an electric vehicle charging station standard to establish base specifications and designs for facilities owned and operated by the City.
    b. Install charging infrastructure to support fleet operations and this may require significant electrical upgrades to buildings. Wherever possible, keep fleet charging infrastructure on sub-meters to differentiate building from fleet electrical use.
    c. Explore solar energy technology options (e.g. solar canopies over parking lots / charging areas) to supply energy to electric vehicle charging stations to further reduce GHG emissions and to act as a resiliency back-up in times of extended power outages.
    d. Keep monitoring hydrogen and emergence of other technologies and their applicability to City operations.

3. Support piloting low emission technologies and equipment in order to determine applicability to City operations.

Introduction

The City owns and operates over 400 light and heavy-duty vehicles and equipment. Both fleet and equipment are almost entirely powered by gasoline and diesel, accounting for 24% of the City's 2023 GHG emissions. Light duty vehicles, trucks and equipment accounted for 50% of the fleet and equipment's GHG emissions, with heavy duty vehicles accounting for the remaining 50% of the GHG emissions. The light duty classification is expected to have electric replacement options in the short to medium term and the heavy-duty classification is not expected to have electric replacement options in the long term (forecasted as a possibility in 2045).

GHG Emissions by Vehicle Classification

The table presents the 2023 GHG emissions from Fleet, categorized by the anticipated availability of electrical replacement options. The first column presents the classification of the vehicle as described in the table notes; the second column presents the 2023 GHG emissions for each classification, in tonnes on CO_2 equivalents; and the third column presents the 2023 GHG emissions for each classification as a percentage of the total 2023 Fleet GHG emissions.

Classification	**GHG Emissions (tCO_2e)**	**Percent of Related Vehicle GHG Emissions**
Heavy Duty Vehicle (HDV)[1]	925	50%
Light Duty Truck (LDT)[2]	536	28%
Light Duty Vehicle (LDV)[3]	203	11%
Equipment (EQ)[4]	202	11%
Total	**1,866**	**100%**

Notes:

1 Heavy duty vehicles and equipment (dump trucks, excavators, fire engines, etc.) with no electric replacement options expected in the medium to long term.

2 Light duty pickup trucks with electric replacement options expected in the medium term.

3 Light duty passenger cars and vans with electric replacement options available or expected in the short term.

4 Drivable parks equipment (tractors, riding mowers, etc.) with electric replacement options available or expected in the medium term.

The City's Municipal By-law compliance team is moving towards a 100% electric fleet by end of 2025 and the City's Fleet Strategy identifies the need to convert to light duty electric options and install Level 3 charging infrastructure at key City properties where vehicles are stored. The City currently (2024) has 14 electric vehicles (i.e. 9 Chevrolet Bolts, 4 Hyundai Konas, and 2 Ford E-Transit cargo vans), and electric equipment options (ice re-surfacers, volleyball court sand groomers, and self-guided robot grass mowers).

Fleet and equipment GHG emissions are the direct result of a wide and varied range of services delivered to the community.

It is estimated that the City can reduce fleet and equipment GHG emissions by 56% by 2050.

The City has committed to reducing overall corporate GHG emissions by 80% below 2010 levels by 2050. Converting this target into action requires the implementation of a Fleet Strategy that establishes the systems and processes to address the barriers and challenges noted and convert the fleet to operate on no- to low-carbon fuels. It is recommended that the Strategy focus on initiatives that aim to reduce the size of the City's fleet, reduce kilometers travelled, use vehicles more efficiently, standardize the vehicle fleet where possible, track life-cycle vehicle costs, and accelerate fuel switching.

The City of Cambridge
Electric Vehicle/Equipment Summary

	Ice Edger	Ice Resurfacer	Groomer / Mower	Automobile	SUV	Cargo Van	Annual Total
2019	3	1	0	0	0	0	**4**
2020	4	1	0	7	0	0	**12**
2021	4	1	0	9	0	0	**14**
2022	5	1	1	9	0	0	**16**
2023	5	3	2	9	4	1	**24**
2024	5	3	2	9	4	2	**25**

GHG Emissions Impacts to Recent and Proposed Fleet Changes

The City is currently in the process of growing the number of electric vehicles and equipment in its fleet. These replacement and growth acquisitions and their estimated GHG emissions are summarized in the Table below (**Estimated GHG Reductions with Electric Fleet Upgrades**).

The equipment in this Table could contribute as much as 49 tonnes of carbon dioxide equivalent (tCO2e) emissions if all growth was achieved using conventionally fueled vehicles and equipment. Alternatively, by making these expansions to the fleet with electric vehicles and equipment, the total emissions are estimated to be 1.3 tCO2e. This represents a potential avoidance in GHG emissions of approximately 48 tCO2e.

Considering the City's 2021 GHG inventory, the total vehicle and small engine fuel combustion emissions (including the emissions from personal vehicles claiming mileage) is estimated to be 1,608 tCO2e. Given that heavy-duty vehicles and trucks do not have many technically or economically feasible electric options currently available, there are limited present-day opportunities to reduce this category of vehicle emissions within the 2025-2029 timeframe. The light-duty vehicles and equipment in the 2021 GHG inventory were estimated to emit 388 tCO2e (approximately 24% of the total fleet emissions). The nineteen (19) upgraded units represent approximately a 4% growth in fleet size. If growth of the light-duty fleet inventory was solely accomplished using fossil fuel options without electric replacements, the growth would represent an increase of approximately 1% to the 2021 light-duty fleet GHG emissions. However, by switching to electric units, an 11% GHG emissions avoidance is expected to the 2021 light-duty fleet. Overall, these electric upgrades would represent a 3% GHG emissions avoidance across all fleet emissions considering the 2021 GHG Inventory estimate.

In addition to GHG emissions avoidance as a result of purchasing electric vehicles and equipment, peripheral benefits are anticipated. For example, by eliminating the internal combustion engines of the current propane-fueled ice resurfacers, the indoor air quality of the arenas will improve (i.e., no exhaust gases) and the energy demand for air exchanges and comfort heating of spectator areas will be reduced. Electric lawn and landscaping equipment eliminates the need to store/transport liquid fuels, removing potential spill hazards during delivery or transfer, and produce lower noise emissions, reducing worker hazards and public nuisance.

Estimated GHG Reductions with Electric Fleet Upgrades

Group	Acquisition Type	Equipment Replaced	Usage			GHG Emissions [1] (t CO_2e)	Electric Replacement	Usage		GHG Emissions [2] (t CO_2e)	Potential GHG Reduction
			Fuel Type	Mileage (Km)	Fuel (L)			Mileage (Km)	Energy (kWh)		
Existing Vehicles											
Building Services	Growth	Personal vehicles claiming mileage [3]	Gasoline [3]		850 [4]	13.7 [5]	2020 Chevrolet Bolt (x7)	9,300	1518 [6]	0.3 [7]	13.4
Parking/Bylaw	Replacement	2012 VW Golf	Diesel	36,000	2600	6.0	2021 Chevrolet Bolt	36,000	5742 [6]	0.2	5.8
Parking/Bylaw	Replacement	2015 Chevrolet Cruz	Diesel	38,000	3750	8.6	2022 Chevrolet Bolt	38,000	5980 [6]	0.2	8.4
Parks	Growth	Average Fleet Mower/Tractor	Diesel		719 [8]	1.7	2022 Smithco Sandstar E		3280 [9]	0.1	1.6
Hespeler Arena	Replacement	Olympia Millenium	Propane			0.1 [10]	2014 Olympia Millennium		62	0.0 [10]	0.1 [10]
Parks	Growth	Average Fleet Mower/Tractor	Diesel		290 [11]	0.7	2023 Huskvarna 550EPS		1794 [12]	0.1	0.6
Currently in Procurement Stages											
Bylaw	Replacement	2015 Chevrolet Cruz	Diesel	16,000	1625	3.7	2020 Chevrolet Bolt	16,000	2535 [6]	0.1	3.7
Bylaw	Replacement	2013 VW Golf	Diesel	12,000	1300	3.0	2020 Chevrolet Bolt	12,000	1885 [6]	0.1	2.9
Building Services	Growth	Average Fleet Gasoline Vehicle	Gasoline	9,300	850 [4]	2.0	2020 Chevrolet Bolt	9,300	1518 [6]	0.0	1.9
Roads	Replacement	2012 VW Golf	Diesel	15,000	950	2.2	2020 Chevrolet Bolt	15,000	2340 [6]	0.1	2.1
Water	Replacement	2013 Mercedes Sprinter 2500	Diesel	21,000	3400	7.8	2023 Ford E Transit 2500	21,000	7072 [6]	0.2	7.6
Arena	Replacement	2009 Olympia Millenium	Propane			0.1 [10]	2023 Olympia Millennium E		62	0.0 [10]	0.1 [10]
Arena	Growth	Propane Resurfacer	Propane			0.1 [10]	2023 Olympia Millennium E		62	0.0 [10]	0.1 [10]
		Total GHG Emissions from Fuel Equipment				49	Total GHG Emissions from Electric Equipment			1	48

Notes:

1 Emissions estimated using emission factors from the National Inventory Report (NIR) 1990-2019 - Part 2 - Greenhouse Gas Sources and Sinks in Canada. Annex 6. Released April 2021. The emission factor used in the 2021 GHG Inventory (i.e., for 2019) is used to estimate emissions for ease of comparison. It is recommended that emission factors be updated to the most recently available ones in Canada's most recent NIR during next update of this inventory. Emission factors are reported as tonnes of CO2 equivalent emissions (t CO2e) per litre of fuel combusted.

2 Emission factors from 2005 to 2019 are from the NIR 1990-2019 - Part 3 - Greenhouse Gas Sources and Sinks in Canada. Annex 13, Table A13-7. Released April 2021. The emission factor used in the 2021 GHG inventory (i.e., for 2019) is used to estimate emissions for ease of comparison. It is recommended that emission factors be updated to the most recently available ones in Canada's most recent NIR during next update of this inventory. Emission factor is reported as tonnes of CO2 equivalent GHG emissions (t CO2e) per total electrical energy consumed in kWh.

3 An assortment of personal gasoline fueled vehicles used by employees on City business.

4 Average gasoline fuel usage of one (1) light-duty vehicle for City fleet 2016 – 2021 (excluding 2020). Used to estimate the amount of fuel needed to conduct City business.

5 Based on augmenting the fleet with seven (7) new gasoline fueled vehicles since seven (7) electric units were purchased.

6 Energy usage for one electric vehicle is based on the expected number of full battery charges given the battery capacity and maximum mileage performance.

7 Total GHG emissions for seven (7) new electric vehicles.

8 Average 2021 diesel fuel usage for one (1) City fleet mower or tractor (excluding snow removal capable equipment).

9 Energy is estimated by assuming the tractor is fully charged twice a day for 200 days a year.

10 GHG emissions are estimated from the total consumption of one full propane tank or one complete charge of the battery. The battery would need to be fully charged approximately 39 times to have equivalent GHG emissions as propane.

11 Average 2021 mower or tractor diesel fuel usage as Note 8 scaled to the anticipated cutting time replaced by electric unit (6 hours per week) compared to the annual mower fuel usage (six hours per day for six days a week).

12 The electric mower is fully charged three (3) times per week for 26 weeks.

Municipal Green Fleet Strategy Review

To inform the recommendations, a literature review of comparable municipal fleet strategies and corporate GHG emissions plans was completed which included the following municipalities:

- City of Abbotsford, British Columbia
- City of Brampton, Ontario
- City of Burlington, Ontario
- City of Calgary, Alberta
- City of Edmonton, Alberta
- City of Fredericton, New Brunswick
- City of Hamilton, Ontario
- City of Mississauga, Ontario
- City of Nanaimo, British Columbia
- City of Thunder Bay, Ontario
- City of Toronto, Ontario
- City of Vancouver, British Columbia
- City of Victoria, British Columbia
- Region of Durham, Ontario
- Region of Peel, Ontario

The objective of a green fleet strategy is to economically minimize municipal fleet fuel consumption and GHG emissions while providing a consistent level of service to the community. While the crux of a typical fleet strategy involves investing in green technologies and low-carbon fuels, based upon the literature review, the more robust municipal fleet strategies tend to include the following strategies:

- Establishing fleet and equipment conversion targets based on an analysis of existing fleet and equipment inventories.

- Incorporating vehicle right-sizing requirements and using telemetric / automatic vehicle location (AVL) data to improve vehicle utilization and reduce fleet size.
- Establishing a life cycle replacement costing program that incorporates an internal cost of carbon to minimize the total cost of ownership.
- Converting light-duty passenger internal combustion vehicles to light-duty passenger electric vehicles that meet range and performance requirements.
- Avoiding and deferring the replacement of light- and heavy-duty trucks (where safety and performance is not compromised) until there is suitable availability of electric versions that meet specifications.
- Converting heavy-duty fleet to alterative lower carbon fuels, such as Compressed Natural Gas (CNG) and Ecodiesel Technology, to reduce GHG emissions in the short term.
- Using internal chargeback systems to incentivize fuel efficiency and vehicle reduction use.
- Developing a fleet electrification financing and infrastructure strategy (e.g., pursue funding from Natural Resources Canada's Zero Emission Vehicle Infrastructure Program (ZEVIP)).
- Utilizing shared mobility systems (e.g., car share) and corporate vehicle pools for staff.
- Encouraging flexible work from home arrangements and active transportation.
- Developing anti-idling policies and providing driver and high-voltage training to staff.
- Piloting new technologies and fuels to assess feasibility, application, range and return on investment.
- Establishing partnerships with Original Equipment Manufacturers (OEMs) to pilot new vehicle technologies.
- Exploring solar energy technology options to supply energy to electric vehicle charging stations to further reduce GHG emissions.

- Developing policies that afford municipal fleet divisions with the ability to allocate vehicles for staff based on the functional needs.
- Embedding decision making frameworks in the strategies to guide decision making through both asset acquisition and optimizing the suitability and sustainingly of fleet assets already in service.
- Developing partnerships with other local and regional governments to participate in pilot projects to test energy efficiency and alternative fuel technologies and/or share data from completed studies.
- Developing an electric vehicle charging station standard to establish base specifications and designs for facilities owned and operated by a municipality.
- Hiring a dedicated fleet analyst / fleet planner.
- Establishing requirements to report Key Performance Indicator (KPI) data to all fleet users annually.

While each of the municipal strategies that were reviewed varied in terms of scope, content, and analysis, all strategies had similar overall GHG reduction targets (i.e., 80-100% emission reduction by 2050). Some of the municipalities that were reviewed went further and developed fleet specific targets (e.g., the City of Brampton targets 86% reduction in fleet emissions). These overall goals and any fleet specific targets are presented in the table below.

Summary of Overall GHG Reduction Goals and Fleet-Specific Targets

Municipality	Overall GHG Reduction Goals and Fleet Related Targets
City of Abbotsford[ii]	• 20% reduction in GHG emissions by 2025 • 50% reduction in GHG emissions by 2040
City of Brampton[iii]	• Establish policies/procedures for new City facilities to provide 10% of parking spaces with electric vehicle charging station, and 25% of remaining parking spaces designed to permit future installation. • 50% reduction in GHG emissions by 2040 and 80% by 2050 • Strategy estimates an 86% emission reductions from its fleet by 2035
City of Burlington[iv]	• Net-zero GHG emissions by 2050
City of Calgary[v]	• 80% reduction by 2050
City of Edmonton[vi]	• Net-zero GHG emissions by 2040

City of Fredericton[vii]	• 50% reduction in GHG emissions by 2030 • Net-zero operations by 2050
City of Hamilton[viii]	• Decommission all diesel vehicles by 2030 • Achieve net-zero carbon emissions before 2050 • Achieve 100% electrification for vehicles by 2050
City of Nanaimo[ix]	• Net-zero GHG emissions by 2050
City of Mississauga[x]	• 40% reduction in GHG emissions by 2030 • 80% reduction in GHG emissions by 2050
City of Thunder Bay[xi]	• Net-zero GHG emissions by 2050
City of Toronto[xii]	• Transition 45% of City-owned fleet to low carbon vehicles by 2030 • 65% GHG reduction by 2030 • Net-zero GHG emissions before 2050
City of Vancouver[xiii]	• Reduce fleet emissions to 60% by 2030 • 100% renewable energy usage by 2050
City of Victoria[xiv]	• 60% reduction of GHG emissions by 2030 and 80% by 2050 • 10% reduction in fleet size (no target year – just a general goal)
Region of Durham[xv]	• 20% reduction in GHG emissions by 2025 • 40% reduction in GHG emissions by 2030 • 7-14% reduction in fleet GHG emissions by 2025
Region of Peel[xvi]	• 80% reduction in fleet GHG emissions by 2050

Many of the municipal strategies reviewed cited several opportunities and challenges as it relates to greening municipal fleets. The opportunities were situated around:

- increasing utilization through right sizing, using Automatic Vehicle Location (AVL) data and shared mobility services;
- decreasing, and adjusting stock through vehicle right sizing programs; and
- accelerating the conversion of light-duty internal combustion engines to electric vehicles.

The bulk of the challenges were related to the adoption of new and untested electric propulsion technologies for trucks and heavy-duty vehicles as well as supply chain issues. To overcome these challenges, many municipalities are exploring delaying the conversion of internal combustion engine trucks until suitable electric replacements are available (and proven), introducing higher blends of ethanol fuels (e.g., E85) for flex-fuel capable vehicles in both light- and medium-duty gasoline vehicles where possible, and converting heavy-duty vehicles to lower carbon fuels (e.g., biofuels, and CNG). The use of alternate fuels approach provides municipalities with the time to pilot different

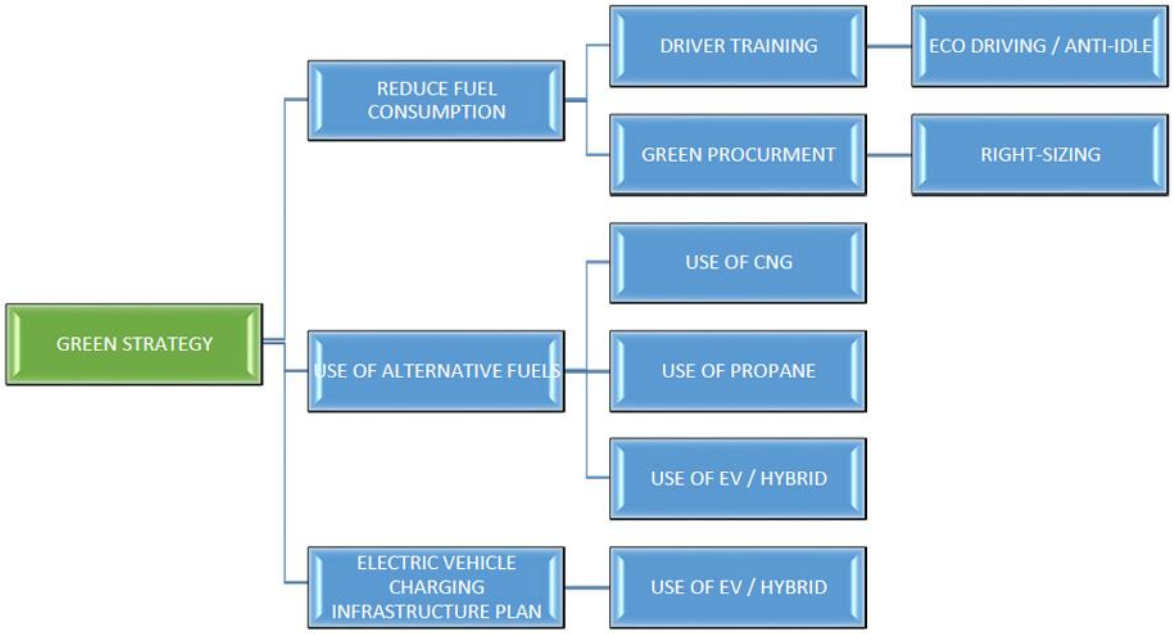
applications and technologies in the fleet while still reducing GHG emissions to some extent.

Employee training and anti-idling policies were noted as being fundamental to overcoming several barriers and achieving GHG reductions in fleet. This generally included enhancing driver training education activities and the development of increased driver awareness around idling statistics and its impacts on fleet's GHG emission profile. Some municipal governments, like the City of Abbotsford, also noted that maintenance staff, mechanics and facility/garage managers, and emergency first responders/utility staff need training on the basics of working with electric propulsion and batteries and charging infrastructure, safety procedures for working around high voltage electrical components, and the appropriate use of protective wear and tools. Emergency first responders are also noted to need training on handling incidents or accidents involving electric vehicles. Some idling practices are based on the equipment requiring the (diesel) engine to be operating during use and a transition from such equipment during renewal would eliminate tailpipe emissions (for example, forestry or other bucket trucks that could be electrified instead of dependent upon the engine running).

Lastly, resourcing and the development of tools was noted as being key to implementing a green fleet strategy. Many fleet departments are understaffed and do not have the resources to support the implementation of the green fleet strategy which includes data collection (e.g., AVL), analysis, and reporting as well as providing ongoing support to procurement and other departments that utilize fleet.

Nearly all strategies were organized directly or indirectly around three principles – reducing fuel consumption, using alternative fuels, and installing infrastructure to accelerate the electrification of fleet. The City of Nanaimo developed a framework that depicts these GHG reduction principles and resulting strategies.

City of Nanaimo Green Fleet Strategy Framework [xvii]



Recommendations

Based on the municipal jurisdictional scan, the following recommendations are proposed to be added to the City of Cambridge's Fleet Strategy:

- Continue progress in purchasing new electric equipment options where industry options are available and meet corporate specifications (i.e. light-duty vehicles and turf maintenance equipment). Recent acquisitions have demonstrated the ability to reduce fleet emissions while simultaneously expanding the capacity and potential services of the fleet.
- Develop a vehicle selection hierarchy for all vehicle classes that ensures future fleet vehicles meet the basic operational requirements for the work while achieving GHG emission reductions. This can include the selection of the right-sized vehicle for the work as well as the type of vehicle or fuel technology to be selected.
- Set aside funding to capitalize on opportunities to adopt new technologies in a temporary pilot capacity, partnering with manufacturers for real world testing. For

example, purchasing an electric truck as an extra unit to prove the suitability in advance of full-scale replacement.

- Evaluate and introduce pilot studies of alternate lower-carbon fuels for select vehicles in the fleet. This may include the trial of higher blend ethanol fuel and biodiesel blends based on seasonality considerations for select fleet vehicles across light, medium, and heavy-duty vehicle classes.
- Explore solar energy technology options to supply energy to electric vehicle charging stations to further reduce GHG emissions.
- Develop internally focused education and outreach tactics to reduce excessive idling and improve driving behaviors.
- Provide electric vehicle and high-voltage training for automotive technicians and staff. Review all electric acquisitions with Fire Department staff.
- Identify aftermarket technologies, in addition to those available through vehicle manufacturers, which can be applied to various vehicle types and classes in the fleet to reduce GHG emissions.
- Continue to identify and pursue grant funding and incentive opportunities to reduce the capital budget pressure for fleet vehicle acquisitions and related equipment.
- Review the process for renting vehicles and develop a policy to prioritize the use of electric vehicles, to ensure vehicle rightsizing, and to prevent departments from using rental vehicles to circumvent fleet vehicle choice.
- Identify charging infrastructure and software management and electrical upgrades needed at City facilities prior to installation and separate building electrical consumption from vehicle charging consumption through sub-metering.

References

i City of Mississauga Corporate Green Fleet and Equipment Policy (September 2020)

ii City of Abbotsford Green Fleet Strategy (June 2019)

iii Brampton Sustainable Fleet Strategy (October 2021)

iv City of Burlington Green Fleet Strategy Update (September 2023)

Appendix C City of Cambridge Fleet Strategy

v City of Calgary Green Fleet Strategy

vi Fleet and Facility Services City of Edmonton

vii City of Fredericton Corporate Energy & Emissions Plan

viii City of Hamilton Green Fleet Strategy (February 2021)

ix City of Nanaimo Green Fleet Strategy (2020)

x City of Mississauga Corporate Green Fleet and Equipment Policy (September 2020)

xi Green Fleet Implementation Plan (February 2009)

xii Sustainable City of Toronto Fleets Plan – City of Toronto

xiii Green fleets | City of Vancouver

xiv City of Victoria Green Fleet Plan (December 2021)

xv Region of Durham Corporate Low Carbon Fleet Strategy

xvi Peel Region Sustainable Transportation Strategy

xvii City of Nanaimo Green Fleet Strategy Attachment “B” (2020)