



**I'm a
Green
Building!**

Climate Leadership
in Action

Energy Conservation and Demand Management Plan for Municipal Buildings 2024 - 2029

**Facilities Management
and Construction Services**



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Land Acknowledgement

The City of Kingston acknowledges its location on the ancestral lands of the Anishinaabe, Haudenosaunee, and Huron-Wendat peoples, expressing a deep gratitude for their historic stewardship over this shared land. The City is committed to working collaboratively with Indigenous communities and residents to pursue a united path to reconciliation.



1.0 Executive summary

Addressing climate change and the reduction of greenhouse gas (GHG) emissions has been a central focus for the City of Kingston since 2011. The City has since established an annual GHG inventory and, in 2014, implemented an Energy Conservation and Demand Management (ECDM) Plan to steer its efforts in reducing GHG emissions. By 2018, the City of Kingston had achieved a significant milestone, reducing its corporate GHG emissions by 23% from the baseline year of 2011. Between 2018 and 2023 the City of Kingston has further reduced emissions by 19% per SqFt. These emissions stem from the operation of City-owned assets, which are integral to providing essential services to the community and staff, including the operation of buildings, fleet, equipment and outdoor lighting. Looking ahead to 2040, the City of Kingston aims to be net zero energy related to the energy consumption of buildings.

The achievement of these GHG reduction milestones is crucial, but to significantly mitigate the risks and impacts of climate change, there is a consensus among scientists and policymakers that global society must stabilize and lower GHG emissions to prevent global temperatures from increasing more than 1.5°C within the next three decades. The City of Kingston remains committed to its role in this global effort, continuously seeking ways to innovate and improve its practices for a sustainable future.

1.1 Introduction

The City of Kingston (City) developed its first Energy Conservation and Demand Management (ECDM) Plan in 2014 in accordance with former Ontario Regulation (O. Reg.) 397/11 under the Green Energy Act, 2009. The Green Energy Act was subsequently revoked in early 2019; however, an updated ECDM Plan was still required to be in compliance with O. Reg. 507/18 under the Electricity Act, 1998. In February of 2023, O. Reg. 507/18 was replaced with the current regulation, O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans.

Similar to previous legislation, O. Reg. 25/23 requires public agencies, including municipalities, to report annually on energy consumption and greenhouse gas (GHG) emissions from the operation of facilities. The regulation also continues the prescribed requirement for publication of an updated ECDM Plan, in this case on or before July 1, 2024, and then every 5 years thereafter. This plan meets the requirements of this regulation and also includes:

- A description of current and proposed measures for conserving and otherwise reducing energy consumption and managing its demand for energy.
- A revised forecast of the expected results of the current and proposed measures.
- A report of the actual results achieved.
- A description of any proposed changes to be made to assist the public agency in reaching any targets it has established or forecasts it has made.

The preparation of this ECDM Plan provided City staff with the opportunity to re-evaluate the status of current corporate emissions, as well as investigate an updated emissions forecast, with and without planned energy and GHG reduction initiatives.

This updated ECDM Plan covers all climate-controlled facilities used by the City of Kingston for municipal operations except for those related to the treatment or pumping of water or sewage, which are managed by Utilities Kingston (who separately provide similar reporting). Seasonal buildings which are neither heated nor cooled are not included, nor are buildings leased to non-municipal tenants. The facilities covered in this report are listed in Appendix A.

1.2 About the City of Kingston

Established through amalgamation in 1998, The City of Kingston now hosts over 130,000 residents and over 30,000 students annually. Situated in a convenient location between Toronto, Ottawa, and Montreal, Kingston is uniquely positioned as an excellent place for business, life, and leisure. Its scenic setting along the shores of Lake

Ontario, the Cataraqui, and St. Lawrence Rivers enhances its residents' quality of life.

Kingston boasts a diverse economy that embraces culture, innovative industries, and respected institutions such as Queens University, Royal Military College of Canada, and St. Lawrence College. Playing a pivotal role as the first capital of United Canada in 1841, the historic downtown and monuments reflect this legacy.

With strong foundations in the past and a thriving population today, The City of Kingston has looked to the future with ambition, emphasizing sustainability, energy conservation, and greenhouse gas (GHG) emission reduction across all levels of local Government. In response to rising concern and recognition of the human impact of Climate Change, City Council has established priorities to address greenhouse gas emissions.

1.3 Alignment with Strategic Plan and Climate Action

Much of the work encompassed by this ECDM Plan is contributing to steady progress being made on priorities identified under one of the pillars of the City's Strategic Plan for 2023 - 2026: Lead Environmental Stewardship and Climate Action.

The City has long fostered a corporate culture that values and promotes sustainability, energy conservation, and reduction of GHG emissions; from Council and senior management through to front line staff. In 2014, the Kingston Climate Action Plan established a goal to reduce the overall carbon footprint 15 percent by 2020 and 30 per cent by 2030, as compared to a 2011 baseline.

More recently, in 2019 Kingston became the first municipality in Canada to declare that climate change is an emergency that requires an urgent and strategic response. A new comprehensive Climate Leadership Plan (CLP) was adopted by Council in December of 2021 and includes 10 objectives and 54 actions, providing a roadmap for the City and community to reduce GHG emissions and reach carbon neutrality by 2040. This plan has a broad scope which encompasses

the reduction of GHG emissions from all sectors as well as a framework for development of adaptation and mitigation measures that will be necessary to address various impacts of climate change.

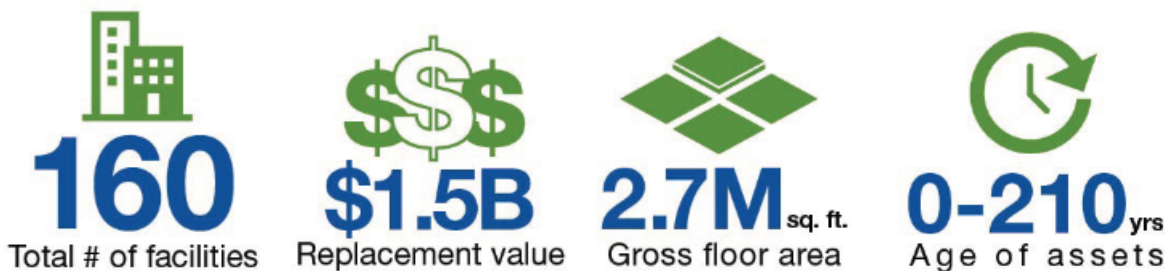
In 2021, the CLP specifically included the following targets for reduction of GHG emissions:

- 15% reduction by 2022 compared to 2018;
- 30% reduction by 2030 compared to 2011; and
- Carbon neutral operations by 2040.

On January 23, 2024, Council subsequently approved Report #24-010 aligning all new GHG reduction targets to a 2018 baseline year to ensure consistency in climate action planning.

1.4 Facilities Management & Construction Services

The City's Facilities Management & Construction Services (FMCS) department is comprised of three divisions: Facilities Management, Energy & Asset management, and Facilities Construction. FMCS maintains the City's diverse portfolio of municipal buildings, thereby supporting other departments who provide an extensive range of frontline services to the community. This centralized, shared services approach has allowed for the integration of energy management and sustainability considerations along with other aspects of facilities maintenance, asset management, space planning, design, and construction. FMCS is responsible for annual reporting of energy consumption and GHG emissions from municipal facilities in accordance with O. Reg. 25/23.



1.5 Goals and Objectives

This ECDM plans reaffirms the following goals and objectives which have been updated to reflect current policy and best practices:

- To continue optimizing the energy efficiency of municipal facilities, where possible reducing consumption and operating costs.
- To reduce the carbon footprint of municipal facilities in accordance with the Strategic Plan and Climate Leadership Plan targets, as amended.
- To align energy and sustainability objectives with ongoing asset management planning, optimizing the scope and timing of projects while balancing financial feasibility.
- To leverage proven methodologies as well as innovative solutions and technologies, allowing for evolution of best practices in facility operations, maintenance, major renovations, and new construction projects.
- To provide education and training based on analysis of facility performance, supporting energy conservation and operational improvements.
- To expand renewable energy generation in support of the net-zero energy transition.

2.0 Work Highlights and Facility Performance Update

The following sections highlight current practices, ongoing work and significant projects which impact overall performance of the municipal facilities portfolio in terms of energy consumption. An update regarding renewable energy systems along with overall summary of annual energy consumption and associated GHG emissions are also provided per requirements of O. Reg. 25/23.

2.1 Centralized Energy Management Practices

The City's FMCS department tracks energy consumption with approximately 500 utility meters throughout 160 municipal buildings. Various factors affect levels of consumption including building operations, occupancy levels, and weather (i.e. number of heating or cooling degree days). Other extreme conditions, such as increased ventilation requirements during the global COVID-19 pandemic, also have an impact on overall facility performance.


All building energy consumption and generation are tracked in our Centralized Maintenance Management System called Asset Planner. Asset Planner also tracks all building conditions assessments, asset planning, capital funding, service requests, preventive maintenance, and is the backbone of our centralized service delivery to the corporation.


Analysis of energy consumption is undertaken following best practices (e.g. IPMVP protocol), including statistical normalization of data to allow for 'apples-to-apples' comparison between different seasons or timeframes. This type of approach can be used to verify the performance of specific energy conservation measures; and regular benchmarking also helps to identify trends that may warrant further investigation, operational changes, maintenance, or other repairs.

 **95**
EV Charging Stations

 **28**
Building Automation Systems (BAS)

 **2**
Ground Source Heat Pump (Geothermal / GeoX) Systems

 **500+** Utility Meters
(electricity, natural gas, fuel oil, propane, and water/sewer)

 **15**
Solar PV Systems
(generating ~860 kW, enough to power more than 85 homes!)

Larger, energy intensive facilities now typically incorporate the use of a Building Automation System (BAS) which allows for remote management of heating, ventilation, and air-conditioning (HVAC) equipment. The City currently has 28 locations with a advanced Niagara N4 BAS which is used to optimize occupant comfort and overall facility performance while providing real-time measurements and notifications to building technologists who monitor conditions and support troubleshooting or maintenance of HVAC systems.

FMCS has also been deploying EcoBee smart thermostats in smaller facilities where there is no BAS. These thermostats allow for web-based control of simple HVAC systems and monitoring of facility temperatures, alerting staff to potential issues while also limiting the need for unnecessary physical inspections. A dynamic schedule can be incorporated with temperature setbacks for periods when the facility is not occupied and, by strategically placing sensors, comfort in the facility and overall efficiency can also be enhanced. 19 buildings have smart thermostats installed to date with more to be deployed in the future.

2.2 Work Completed in Existing Facilities

In 2018, the City’s FMCS department established an energy and asset management program to prioritize replacement of aging equipment with a focus on fuel burning equipment, as well as other initiatives that would improve energy efficiency and reduce GHG emissions. Some highlights include:

Project	Buildings completed	Year Completed
Boiler System Replacements	KFR Headquarters	2020
	1211 John Counter Blvd.	2020
	Grand Theater	2020
	British Whig Building	2020
	Fire Sation 5 & 6	2021
	Visitor Information Centre	2021

Project	Buildings completed	Year Completed
Lighting Retrofits	Kingston Area Recycling Centre	2019
	Invista Centre, Cat Kin Arena	2019
	1181 John Counter Blvd.	2020
	1183 John Counter Blvd.	2020
	Various Parking Lots	2019 - 2022
Oil Heating Replacements (With Electric or Propane)	Belle Park	2023
	MacLachlan Woodworking Museum	2020
	Polson Park	2022
	City Park	2022
	KFR Station 1 & 2	2021
Coil Cleaning Pilot (Enzyme Solution)	1211 John Counter Blvd.	2023
	Utilities Kingston Headquarters	2023
	The Grand Theater	2023
	Rideaucrest Homes	2023
VFD on motors / pumps	KFR Headquarters	2020
	1211 John Counter Blvd.	2020
	The Grand Theater	2020
	British Whig Building	2020
	Rideaucrest Homes	2022
	City Hall	2022
	KFR Station 1, 2, 5, 6	2021
Demand Control Ventilation	KFR Headquarters	2019
	1211 John Counter Blvd.	2020
	The Grand Theater	2021
	British Whig Building	2023
	City Hall	2022
Chiller Replacements	KFR Headquarters	2022
	1211 John Counter Blvd.	2021
	City Hall	2023
	Rideaucrest Homes	2019

Project	Buildings completed	Year Completed
BAS Optimization and upgrades	All 28 locations	2020 - 2023
EcoBee Smart Thermostat	19 Facilities	2023 - 2024
Retro-commissioning, RETScreen Expert energy models, and ASHREA Level 2 audits	61 locations	2021 - 2024

One of the most successful programs the City has implemented includes a comprehensive multi-year initiative which started in 2021, has targeted the 61 most energy intensive municipal buildings, which account for approximately 90% of all facility related GHG emissions. Work has been proceeding in the following stages:

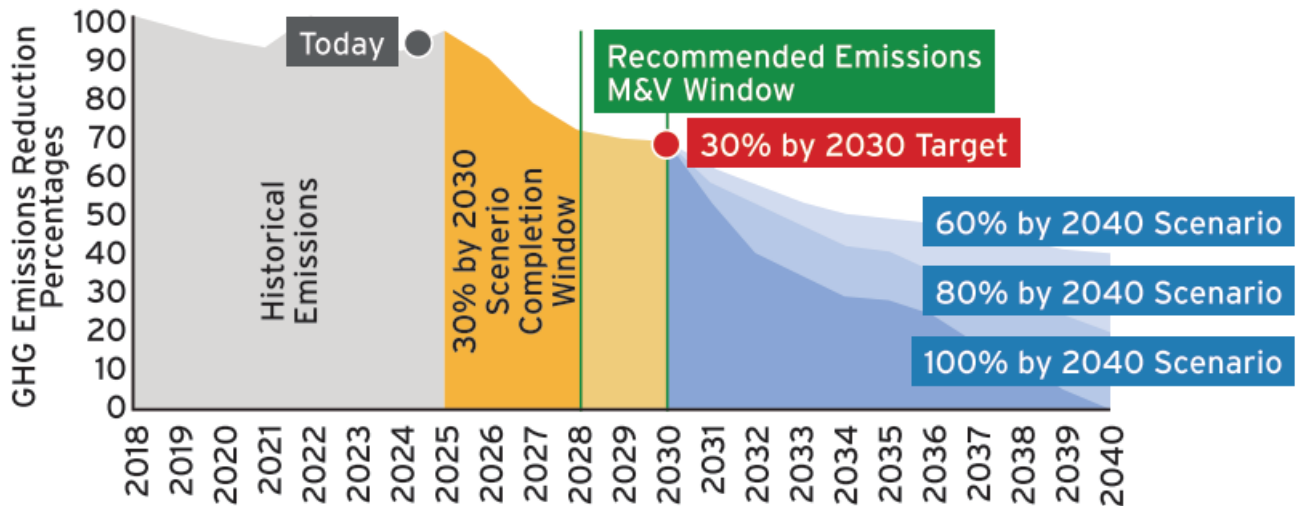
- **Stage 1 - Recommissioning (RCx):** Optimizing existing buildings to ensure equipment and systems are running efficiently (as designed) to meet occupant needs. The fine tuning completed at this stage leads directly to operational efficiencies, energy savings as well as GHG reductions. This stage also provides a detailed report of potential issues to be resolved through maintenance, etc.
- **Stage 2 - Deep Carbon/Energy Audits:** Detailed energy modeling and evaluation of building systems to identify deeper energy conservation measures and potential retrofit scenarios that will result in significant GHG reductions from facilities (i.e. at least 80%).

This initiative, now in its third and final year, has already resulted in improved facility reliability and performance as well as approximately 5% reduction of energy consumption (per location).

This two-stage program has been incorporated into FMCS's workplan to repeat at a regular frequency of 4 - 5 years to sustain the improvements in reliability and energy efficiency which have been gained, and ensure the energy models are up to date. This process is called ongoing commissioning and more details are found in section 2.3.

Stage 3 of this program is now evaluating four GHG reduction scenarios for all municipal buildings in the portfolio to establish a detailed Net Zero Transition Plan (NZTP) with estimated capital costs, and electrical grid restrictions to achieve the mid- and long-term CLP targets. These four reduction scenarios are: 30% by 2030, 60%/80%/100% by 2040. The transition scenarios along with forecasted increases in electricity demand at each location are also being reviewed with Utilities Kingston and Hydro One in order to understand the full impacts of electrification and to assist with long-term planning for local distribution system upgrades that will be required.

This Net Zero Transition Plan will be published in Q2 2025.



2.3 Building Commissioning

The City of Kingston continues to use construction commissioning, which is the process that ensures a building is constructed according to the designated specifications. Optimal timing for commissioning occurs during the design and construction phases, with a focus on the building envelope, which significantly impacts the building's overall performance, including energy efficiency, occupant comfort, and long-term durability. During the design stage, potential issues such as design excesses and mechanical and electrical (M&E) system coordination can be identified and addressed. By implementing construction commissioning, adherence to the design is verified, and functional performance testing confirms that operational sequences are executed correctly.

The City has also implemented continual commissioning which involves the regular review of a building's systems to maintain peak performance throughout its lifespan. This practice is crucial for minimizing operational costs, mitigating failure risks, and identifying opportunities for retrofits and comprehensive energy-saving upgrades. Case studies of commissioning, both before and after implementation, have demonstrated efficiency gains ranging from 5% to 15% due to enhanced operations and maintenance practices. Standard commissioning tasks encompass a variety of adjustments and repairs, such as:

- Setting optimal temperatures
- Sequencing heating and cooling systems
- Fixing dampers and economizers
- Refining control strategies to align with operational hours
- Preventing concurrent heating and cooling
- Fine-tuning air and water distribution systems

A systematic schedule of building commissioning will occur every five years or upon any change in a building's purpose. This strategy is led by the Energy & Asset Management division, working directly with the Facilities division, which together operate in harmony with the City's asset management system.

2.4 Renewable Energy

Renewable energy sources are available in abundance from the sun, wind, and earth - they can be harnessed while emitting little to no GHG emissions or other pollutants. For facilities, these systems are an integral part of the ongoing net-zero energy transition.

The City has been incorporating various renewable energy systems for some time as outlined in the following sections, typically as part of new facility construction or major renovation projects. Ideally, consideration of potential applications is undertaken early in the planning and design stages to evaluate the business case (cost-benefit) of various options and to optimize the energy model for the project within available financial resources.

2.4.1 Solar Photovoltaics (PV)

Ontario's Feed-In Tariff (FIT) and microFIT programs were previously implemented to encourage the development of renewable energy generation in the province. Agreements with municipalities and other private owners were established for renewable energy to be supplied to the grid under a fixed rate fee structure typically remaining in place for up to 20 years. The City previously implemented several solar photovoltaic (PV) installations under these programs, including 2 FIT and 9 microFIT projects with a total capacity of 380 kW.

While the FIT and microFIT programs are no longer available, new solar PV installations are still permitted in a 'net metering' arrangement. This approach requires a connection agreement with the local distribution company (i.e. Utilities Kingston or Hydro One) to allow the building owner to produce energy on site that can be used in the facility. Excess energy is sent to the grid and credited to the billing account for the specific location for up to 12 months. This allows for a system to over produce energy during the summer and use the credits from excess generation in the winter. There is no benefit to generate beyond what can be used on site in the 12-month period, so proper system design is critical to provide the optimum return on investment.

Since 2019, the City has constructed net-metered solar PV systems at the following locations:

- Kingston Police Headquarters (120 kW)
- Fleet Maintenance Garage (312 kW)
- Kingston East Community Center (176 kW)
- Kingston Fire & Rescue Maintenance Center (120KW)

The City's total capacity of renewable solar PV generation is now more than 1.1 MW. Refer to Appendix B for a summary of all solar PV installation including energy output and annual revenue generated. A detailed feasibility study of 30 existing facilities was also recently initiated in early 2024 to evaluate the potential to install additional rooftop or ground mounted solar PV. This work will help to identify where the best business cases exist for further investment going forward.

2.4.2 Solar Thermal

Solar thermal systems typically utilize panels that collect the sun's energy and transfer it to preheat air or water used for various domestic applications. The City has installed these systems to enhance energy efficiency at the following locations:

- Culligan Aqua Park: Rooftop solar thermal panels preheat water for the pool and showers.
- Artillery Park Aquatic Centre: Rooftop solar thermal panels preheat water for the pool and showers.
- Rideau Heights Community Center & Library: Rooftop solar thermal panels preheat domestic hot water.
- 85 Lappan's Lane: Building mounted solar thermal panels preheat domestic hot water.

2.4.3 Heat Pumps and Ground Source Energy

Ground-source heat pump (geo-thermal/exchange) systems extract thermal energy from the earth for heating during colder months and work in reverse during warmer months to optimize facility cooling. The City has installed these systems to enhance heating and cooling efficiency at the following locations:

- Kingston Airport Terminal Building: Ground-source heat pump system supplements heating and cooling systems.
- Kingston East Community Center: Ground-source heat pump system supports heating and cooling for the entire building (there are no GHG emissions from natural gas combustion for heating at this location).

The City has a variety of facilities utilizing air to air and water to air heat pumps for heating and cooling, and as HVAC systems reach their end of life, a heat pump replacement is the first consideration if the technical specifications meet the building requirements.

2.5 New Facility Construction

Since 2019, several new facilities have been constructed as outlined in Table 1 below.

The City of Kingston utilizes a Green Building Policy that outlines the requirements for all new facility construction and major renovations, this policy was updated in 2017. The policy applies to all building projects over 1000 Square Meters, and requires that all buildings achieve at minimum LEED Silver, or demonstrate a pathway to more significant GHG emission reduction that what is required by LEED Silver. This policy is being updated in 2024 to ensure the City of Kingston is following current building techniques and aligning the policy with updated emission reduction targets.

Table 1: Summary of New Facilities Constructed

Project	Description
Fleet Maintenance Garage	High performance facility achieving LEED Gold certification with rooftop solar photovoltaics (PV)
Kingston East Community Centre	Near net-zero energy facility utilizing electric heating with ground source heat pumps (geothermal/geo-exchange), as well as rooftop and carport solar PV
Kingston Fire & Rescue Maintenance Garage	Net-zero energy facility with high performance building envelope, electric heating, and ground mounted solar PV
Rideau Heights Community Centre	High performance facility with advanced BAS, LED lighting, and advanced building envelope
Central Library Branch Renovation	High performance facility achieving LEED Gold certification with rooftop solar MicroFIT photovoltaics (PV)

In the 2024 - 2029 ECDM window the City intends on constructing new facilities based on budget considerations, including:

Project	Description
610 Montreal Street	High performance heritage restoration aiming for 80% GHG emission reductions
Isabel Turner Library	Major Renovation of building mechanical systems, lighting, and interior spaces. Estimated 50% GHG emission reduction
Kingston Fire and Rescue and EMS Station	High performance building, being designed to be near net zero, aiming for no natural gas onsite
Culligan pool enclosure	High performance pool enclosure under design, aiming for significantly better performance than standard building code
Future Fire Station	High performance building, being designed to be near net zero, aiming for no natural gas onsite
Creekford Solid Waste Vehicle Storage Facility	High performance storage enclosure including offices and wash bays; based on growth needs for this service area

In response to the population growth projections for the City of Kingston, there is a growing need for City services including transit, solid waste, public works, recreation & leisure services. This growth may require new facilities to be constructed and the City has undertaken campus planning exercises to understand how to expand services effectively at the John Counter Blvd, Division St, and Creekford Rd Campuses.

3.0 Summary of Energy Consumption and GHG Emissions

Table 1 and Table 2 below outline the overall performance of the municipal facilities portfolio in terms of energy consumption and GHG emissions, starting from the 2018 baseline year. Note that numbers have not been weather normalized or adjusted to account for the impact of occupancy levels or utilization rates, which significantly affect energy consumption and associated GHG emissions.

In 2023 the city's corporate GHG emissions accounted for 7,044 tonnes of CO₂e, these emissions were the direct result of the provision of key services by the City including:

- Buildings and facilities (Electrical, Natural Gas, Propane, Fuel oil)
- Electric vehicle charging for fleet and transit services

More than 90% of the GHG emissions in facilities result from the consumption of natural gas which has a considerably higher GHG intensity than electricity in Ontario.

Table 2: Energy Consumption, Cost and GHG Emissions from Municipal Facilities

Year	Energy Consumption (equivalent from all sources)	Energy Cost (\$)	GHG Emissions (eCO ₂)
2018	222,874 GJ	\$ 5.74 M	6,968 tonnes
2019	227,176 GJ	\$ 6.26 M	7,504 tonnes
2020	206,171 GJ	\$ 5.57 M	6,240 tonnes
2021	200,475 GJ	\$ 5.18 M	6,447 tonnes
2022	220,685 GJ	\$ 5.94 M	7,053 tonnes
2023	215,865 GJ	\$ 6.13 M	6,851 tonnes

Energy and carbon intensity (EUI/CUI) are useful metrics that are determined by taking the ratio of total consumption or emissions to the total area of facilities. As outlined in Table 2 below, reviewing these values over time helps to understand how the consumption or emissions are impacted by the changing area of facilities (e.g. acquired or new construction). The energy or carbon intensity value for a particular location can also be used to benchmark performance against other similar facilities.

Table 3: Energy and Carbon Intensity of Municipal Facilities

Year	Total Area of Municipal Facilities (sq.ft.)	Energy Intensity	Carbon Intensity
2018	2,173,724	4.8 ekWh / sq.ft.	3.20 kg CO ₂ e / sq.ft.
2019	2,504,791	4.92 ekWh / sq.ft.	2.99 kg CO ₂ e / sq.ft.
2020	2,564,791	4.08 ekWh / sq.ft.	2.43 kg CO ₂ e / sq.ft.

Year	Total Area of Municipal Facilities (sq.ft.)	Energy Intensity	Carbon Intensity
2021	2,600,780	4.24 ekWh / sq.ft	2.47 kg CO2e / sq.ft.
2022	2,638,061	4.67 ekWh / sq.ft	2.67 kg CO2e / sq.ft.
2023	2,638,061	4.47 ekWh / sq.ft	2.59 kg CO2e / sq.ft.

While there was a significant increase (18%) in total floor area of facilities between 2018 and 2023, energy consumption decreased overall. The energy and carbon intensity values, which account for the area of facilities, have decreased by 7% and 19%, respectively, which illustrate that the City’s energy management and sustainability initiatives continue to be quite successful.

Weather Normalization is a mathematical process used to understand the impact of outdoor air temperatures on building energy use, which can be significant. A colder winter will require more natural gas to heat, while a warmer summer will require more electricity to cool. These relationships are measured in Heating and Cooling Degree Days (HDD/CDD). FMCS weather normalizes energy consumption during energy modelling to ensure that savings are being accurately measured against outdoor conditions and verify that building performance continues to improve.

Refer to Appendix A for a detailed listing of energy consumption and GHG emissions for all municipal facilities.

4.0 Partnerships & Learning Hubs

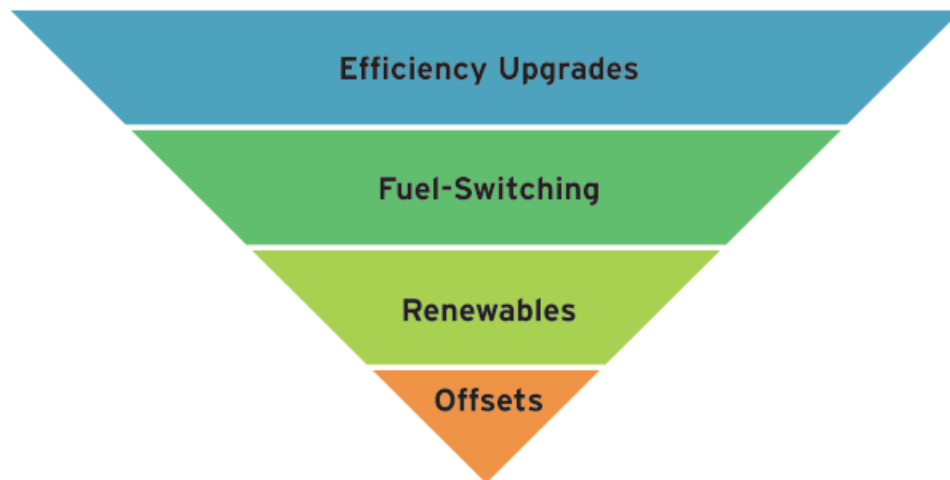
The City’s FMCS team continues to participate in a diverse community of practice to foster ongoing learning and climate action. This approach, which includes engaging with energy managers from other municipalities and piloting new technologies being implemented by leading industry suppliers, helps the City to effectively incorporate current best practices within a rapidly changing world.

FMCS has had a long-standing partnership with the Energy Systems Engineering Technology (ESET) program at St. Lawrence College. This relationship initially began with student placements in 2012 and

subsequently evolved to have students undertake a detailed energy audit of a municipal facility each year beginning in 2019 as part of their third-year capstone project course. Audits have now been completed at City Hall, British Whig Building, Portsmouth Olympic Harbour, Grand Theatre, Pumphouse Steam Museum, and Artillery Park Aquatic Centre. Many recommendations from previous audits have been implemented, including CO2 monitoring for demand control ventilation at City Hall and the Grand Theater, as well as lighting retrofits at multiple locations. This partnership continues to provide students with real-world experience in the energy field while also helping FMCS establish new, innovative ways to meet the City's climate action targets.

5.0 Future Work

Critical priorities (i.e. for facility renewals) are typically identified through ongoing asset management planning with input from frontline operations and maintenance, and then proposed capital expenditures are reviewed annually at minimum. Consideration of these priorities in alignment with energy and sustainability goals is necessary as the expected service life of new equipment in many cases may now exceed the timing of climate action milestones in 2030 and beyond. The general process that is followed to decarbonize buildings is outlined below:



Based on work presently underway to establish carbon reduction pathway scenarios, which is also considering current asset management priorities, it's anticipated that significant measures

at several locations will be required to achieve the targeted 30% reduction of GHG emissions by 2030.

A sampling of these potential upcoming projects is outlined in Table 4; however, the final work plan is subject to available budget based on Council approval as well as electrical grid constraints in the Kingston Area.

Capital budgets are approved on a one year basis, the implementation plan is fluid, and will adjust based on budget availability and asset renewal requirements. It should be acknowledged that the projected project costs have been calculated to a class D estimate, with a variance of plus or minus 25%, and are based on 2024 dollars. As these estimates precede the comprehensive design phase, it is anticipated that the final costs for construction may escalate as the project progresses.

Table 4: Sampling of Potential Upcoming Projects

Location	Potential Project	Estimated Cost	Estimated GHG Reductions
91 Lappans lane	Mechanical System Upgrades	\$1,000,000	33 Tonnes CO2e
British Whig Building	HVAC and envelope upgrades	\$ 500,000	70 Tonnes CO2e
Rideaucrest Home	Mechanical System Upgrades	\$ 7,200,000	500 Tonnes CO2e
Kingston Police	Mechanical System Upgrades	\$ 1,200,000	130 Tonnes CO2e
Frontenac County Courthouse	Mechanical System Upgrades	\$ 450,000	20 Tonnes CO2e
Slush Puppie Place	Mechanical and BAS System Upgrades	\$ 6,700,000	350 Tonnes CO2e
INVISTA Centre	Dehumidifier upgrades	\$ 800,000	150 Tonnes CO2e
362 Montreal St.	Boiler and BAS upgrades	\$ 200,000	7 Tonnes CO2e
The Grand Theatre	Mechanical System Upgrades	\$ 500,000	22 Tonnes CO2e

The projects at these locations account for a significant portion of total facility related GHG emission reductions that are planned. A variety of smaller projects occurring concurrently to the capital projects will include ongoing lighting retrofits, BAS and other operational enhancements, building envelope upgrades, HVAC to Heat Pump upgrades, and solar PV integration where possible.

6.0 Impacts of Electrification of Facilities and Transportation Infrastructure

While beyond the scope of this ECDM Plan, the City is also advancing the transition of the municipal and transit fleets to low or zero emissions vehicles. A number of pilot initiatives are underway, and staff are engaging with a dynamic community of practice to understand how the market and technologies will continue evolving.

Along with population growth and development, the ongoing electrification of facilities and transportation infrastructure across the City of Kingston will have a significant impact on the electric grid in the region (and beyond). The City is presently working closely with Utilities Kingston and Hydro One to support a wider regional planning process for an accelerated load growth that reflects both the anticipated growth scenario and relevant climate targets.

The electrical grid capacity in the Kingston region is limited and both local distribution stations are nearing capacity limits, which poses a significant risk to the implementation for the electrification of Fleet, Transit, and Facilities Net Zero by 2040 strategies.

In 2023 the municipal fleet and transit system consumed 432,611 kWh, and as the electrification of the municipal fleet and transit continues the electrical consumption will increase, putting more strain on both building and grid electrical distribution systems.

7.0 Confirmation of Approval by Senior Management

This updated ECDM plan was endorsed by the City of Kingston's Corporate Management Team on June 19, 2024.

8.0 Appendix A - Detailed Energy Consumption and GHG Emissions Reporting

Facility	2019				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
113 Lower Union Street Building (3186)	72,374	18,091			43
1211 JCB Building(3021)		49,382			92
17, 19, 21, 23 Queen Street (3141)	169,540				23
362 Montreal Street Building (3005)	618,367	61,207			139
805 Ridley Drive Building (3185)					-
85 Lappan's Lane (Utilities Kingston) (3170)		72,620			135
91 Lappan's Lane (Utilities Kingston) (3152)		43,437			81
95 Lappan's Lane (Utilities Kingston) (3169)	1,857,331	7,496			91
Artillery Park Aquatic and Fitness Centre Building (3135)	981,869	101,594			229
British Whig Building (3019)	402,678	31,876			76
Cataraqui Community Centre Building (3138)	1,268,632	65,141			174
Centre 70 Building (3136)	545,728	28,070			82
Chown Memorial Parking Garage (3118)	193,314				26
City Greenhouses Building (3066)	23,443	42,699			80
City Hall Building (3020)	836,069	57,069			141
City Hall Market Square Zamboni Storage Building (3033)		11,552			22
City Park - Field House and Washrooms (3067)	18,206			8,560	26
Cook Brothers Building (3015)	145,172	19,697			43
Creekford Garage & Workshop Building (3103)	27,886	22,298			43

Facility	2019				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Creekford Solid Waste Garage Building (3126)	37,130	45,038			89
Culligan Water Park (3132)	216,757	28,601			62
Forestry Garage Building (3156)	45,525	15,397			32
Frontenac County Court House Building (100443)	248,257	72,611			145
Gaoler's Residence (1858) Building (3149)	2,287	12,748			24
Grand Theatre Building (3028)	493,597	69,261			149
Hanson Memorial Parking Garage (3120)	123,241				16
Harold Harvey Centre Building (3022)	64,447	35,892			69
INVISTA Centre Building (3137)	4,149,934	426,017			963
KFPL - Calvin Park Branch Building (3055)	125,439	20,240			43
KFPL - Central Branch Building (3057)	444,926	16,220			49
KFPL - Isabel Turner Public Library Building (3059)	464,382	47,920			108
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building (3058)	58,362	8,161			18
KFR Headquarters Building (3050)	378,729	21,351			55
KFR Station #1 Joyceville Building (3047)	54,345			17,304	51
KFR Station #10 Building (3051)	55,760	8,829			19
KFR Station #2 Building (3048)	24,130			3,305	10
KFR Station #3 Building (3049)	33,409	19,301			37
KFR Station #4 Building (3035)	140,381	25,543			53
KFR Station #5 Building (3036)	31,050	10,024			20
KFR Station #6 Building (3038)	32,197	14,375			28
KFR Station #7 Building (3052)	171,550	29,823			63
KFR Station #8 Building (3039)	39,001	15,110			30
KFR Station #9 Building (3053)	63,346		17,921		30

Facility	2019				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
KFR Training Centre - Maintenance Garage (3184)					
KFR Training Centre - Storage Quonset (3044)	82,901				11
KFR Unity Road Storage Building (3040)	2,271	7,792			15
Kingston (Norman Rogers) Airport - Hangar 4 (3003)	52,398				7
Kingston (Norman Rogers) Airport Operations Building (3002)	27,222	20,731			40
Kingston (Norman Rogers) Airport Terminal (3001)	448,737	35,067			84
Kingston Area Recycling Centre (KARC) Building (3125)	377,312	106,386			213
Kingston East Community Centre					
Kingston Police Headquarters Building (3122)	2,016,802	144,901			353
Kingston Transit Maintenance Centre Building (3145)	735,651	209,474			420
Kingston Transit Storage Facility (3164)		46,645			87
Maclachlan Woodworking Museum Building (3029)	73,174			840	5
Memorial Centre Building (3131)	851,266	123,916			265
Neighbourhood Sharing Centre Building (3014)	5,543	5,135			10
New Fleet Maintenance Garage (3182)					
Polson Park - Field House and Summer Washrooms (3079)	3,930			2,825	8
Portsmouth Olympic Harbour Building (3062)	918,737	92,590			210
Portsmouth Town Hall (1865) Building (3025)	5,329	4,031			8
Public Works Staff and Operations Building (3166)	452,489	48,116			109

Facility	2019				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Public Works Storage Garage (3155)		117,176			218
PumpHouse Steam Museum Building (3026)	100,939	18,799			39
Richardson Beach House (3072)	4,265				3
Rideau Heights Community Centre (3134)	383,836	35,396			82
Rideaucrest Home Building (3061)	2,850,290	312,112			698
Robert Bruce Memorial Parking Garage Building (3121)	43,550				6
Rodden Park Barn - Building (3154)	31,394	5,307			11
Slush Puppie Place Building (3054)	2,691,349	314,225			695
Tett Centre for Creativity and Learning Building (3024)	211,822	82,898			163
Visitor Information Centre Building (3034)	97,430	9,378			31
Woodbine Park - Concession, Washrooms and Office (3116)	65,043				9
Totals	27,192,469	3,314,768	17,921	32,833	7,504

Facility	2020				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
113 Lower Union Street Building (3186)	49,628	16,260			37
1211 JCB Building(3021)		35,324			66
17, 19, 21, 23 Queen Street (3141)	143,472				19
362 Montreal Street Building (3005)	567,567	56,871			129
805 Ridley Drive Building (3185)					-
85 Lappan's Lane (Utilities Kingston) (3170)		66,500			124
91 Lappan's Lane (Utilities Kingston) (3152)		40,085			74

Facility	2020				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
95 Lappan's Lane (Utilities Kingston) (3169)	1,678,802	22,336			111
Artillery Park Aquatic and Fitness Centre Building (3135)	507,798	70,478			152
British Whig Building (3019)	380,680	30,961			73
Cataraqui Community Centre Building (3138)	1,132,742	68,071			173
Centre 70 Building (3136)	293,405	26,271			67
Chown Memorial Parking Garage (3118)	196,450				26
City Greenhouses Building (3066)	20,065	37,770			71
City Hall Building (3020)	775,276	55,403			135
City Hall Market Square Zamboni Storage Building (3033)		7,662			14
City Park - Field House and Washrooms (3067)	14,891			7,838	24
Cook Brothers Building (3015)	149,382	16,778			37
Creekford Garage & Workshop Building (3103)	31,917	18,383			35
Creekford Solid Waste Garage Building (3126)	36,628	32,102			65
Culligan Water Park (3132)	209,045	17,285			41
Forestry Garage Building (3156)	44,969	13,915			29
Frontenac County Court House Building (100443)	189,357	71,846			141
Gaoler's Residence (1858) Building (3149)	3,006	8,630			16
Grand Theatre Building (3028)	260,243	44,359			93
Hanson Memorial Parking Garage (3120)	124,442				17
Harold Harvey Centre Building (3022)	57,888	31,848			62
INVISTA Centre Building (3137)	2,705,600	274,490			622
KFPL - Calvin Park Branch Building (3055)	137,263	16,519			36

Facility	2020				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
KFPL - Central Branch Building (3057)	301,640	36,437			80
KFPL - Isabel Turner Public Library Building (3059)	443,520	37,000			87
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building (3058)	51,870	8,668			18
KFR Headquarters Building (3050)	380,253	19,277			52
KFR Station #1 Joyceville Building (3047)	52,452			13,548	41
KFR Station #10 Building (3051)	62,813	6,535			15
KFR Station #2 Building (3048)	22,783			3,829	12
KFR Station #3 Building (3049)	34,049	17,167			33
KFR Station #4 Building (3035)	133,557	23,293			49
KFR Station #5 Building (3036)	32,031	8,510			17
KFR Station #6 Building (3038)	34,423	11,400			23
KFR Station #7 Building (3052)	179,530	23,553			51
KFR Station #8 Building (3039)	38,589	12,280			24
KFR Station #9 Building (3053)	60,287		16,213		27
KFR Training Centre - Maintenance Garage (3184)					
KFR Training Centre - Storage Quonset (3044)	57,404				8
KFR Unity Road Storage Building (3040)	1,426	6,413			12
Kingston (Norman Rogers) Airport - Hangar 4 (3003)	10,866				1
Kingston (Norman Rogers) Airport Operations Building (3002)		18,163			35
Kingston (Norman Rogers) Airport Terminal (3001)	20,228	37,735			83
Kingston Area Recycling Centre (KARC) Building (3125)	348,520	98,385			197
Kingston East Community Centre					

Facility	2020				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Kingston Police Headquarters Building (3122)	1,859,819	144,053			345
Kingston Transit Maintenance Centre Building (3145)	772,094	187,052			379
Kingston Transit Storage Facility (3164)		71,437			133
Maclachlan Woodworking Museum Building (3029)	71,829		770	2,130	10
Memorial Centre Building (3131)	480,746	118,167			239
Neighbourhood Sharing Centre Building (3014)	5,448	3,312			7
New Fleet Maintenance Garage (3182)		-			-
Polson Park - Field House and Summer Washrooms (3079)	3,610			1,826	6
Portsmouth Olympic Harbour Building (3062)	695,893	64,347			148
Portsmouth Town Hall (1865) Building (3025)	2,731	3,378			6
Public Works Staff and Operations Building (3166)	463,427	43,955			101
Public Works Storage Garage (3155)		95,510			177
PumpHouse Steam Museum Building (3026)	90,528	13,094			28
Richardson Beach House (3072)	2,865				2
Rideau Heights Community Centre (3134)	324,535	33,437			76
Rideaucrest Home Building (3061)	2,831,472	239,750			563
Robert Bruce Memorial Parking Garage Building (3121)	42,314				7
Rodden Park Barn - Building (3154)	31,909	4,334			9
Slush Puppie Place Building (3054)	2,085,773	183,857			428
Tett Centre for Creativity and Learning Building (3024)	192,180	96,969			188

Facility	2020				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Visitor Information Centre Building (3034)	82,722	6,659			24
Woodbine Park - Concession, Washrooms and Office (3116)	62,354				9
Totals	22,079,004	2,754,274	16,984	29,172	6,240

Facility	2021				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
113 Lower Union Street Building (3186)	40,023	15,177			34
1211 JCB Building(3021)		37,583			70
17, 19, 21, 23 Queen Street (3141)	113,511				15
362 Montreal Street Building (3005)	496,938	42,172			99
805 Ridley Drive Building (3185)	132,112				18
85 Lappan's Lane (Utilities Kingston) (3170)		69,271			129
91 Lappan's Lane (Utilities Kingston) (3152)		31,471			58
95 Lappan's Lane (Utilities Kingston) (3169)	1,571,780	23,218			108
Artillery Park Aquatic and Fitness Centre Building (3135)	890,265	86,330			197
British Whig Building (3019)	378,441	31,430			74
Cataraqui Community Centre Building (3138)	1,084,834	51,825			141
Centre 70 Building (3136)	257,197	25,223			63
Chown Memorial Parking Garage (3118)	191,642				26
City Greenhouses Building (3066)	18,848	36,525			69
City Hall Building (3020)	827,572	52,301			131
City Hall Market Square Zamboni Storage Building (3033)		8,676			16
City Park - Field House and Washrooms (3067)	17,678			7,117	22
Cook Brothers Building (3015)	115,458	17,139			37

Facility	2021				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Creekford Garage & Workshop Building (3103)	38,380	19,536			38
Creekford Solid Waste Garage Building (3126)	36,649	34,719			69
Culligan Water Park (3132)	221,136	24,423			55
Forestry Garage Building (3156)	45,054	14,441			30
Frontenac County Court House Building (100443)	220,710	61,961			124
Gaoler's Residence (1858) Building (3149)	2,921	5,855			11
Grand Theatre Building (3028)	296,848	46,588			99
Hanson Memorial Parking Garage (3120)	124,662				17
Harold Harvey Centre Building (3022)	57,853	30,655			59
INVISTA Centre Building (3137)	4,275,884	329,654			789
KFPL - Calvin Park Branch Building (3055)	121,672	16,232			35
KFPL - Central Branch Building (3057)	293,043	35,757			79
KFPL - Isabel Turner Public Library Building (3059)	397,029	40,755			92
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building (3058)	66,282	9,012			19
KFR Headquarters Building (3050)	389,634	17,630			49
KFR Station #1 Joyceville Building (3047)	51,194		5,468	8,537	35
KFR Station #10 Building (3051)	63,648	7,078			16
KFR Station #2 Building (3048)	20,424		3,488	3,196	15
KFR Station #3 Building (3049)	32,576	18,381			35
KFR Station #4 Building (3035)	131,680	21,299			45
KFR Station #5 Building (3036)	32,199	8,366			17
KFR Station #6 Building (3038)	32,866	10,758			21
KFR Station #7 Building (3052)	194,875	26,280			57

Facility	2021				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
KFR Station #8 Building (3039)	36,925	12,122			24
KFR Station #9 Building (3053)	58,711		15,607		26
KFR Training Centre - Maintenance Garage (3184)	47,746				6
KFR Training Centre - Storage Quonset (3044)	80,058				11
KFR Unity Road Storage Building (3040)	3,432	6,033			11
Kingston (Norman Rogers) Airport - Hangar 4 (3003)	7,646				1
Kingston (Norman Rogers) Airport Operations Building (3002)	24,106	16,927			32
Kingston (Norman Rogers) Airport Terminal (3001)	282,365	21,493			52
Kingston Area Recycling Centre (KARC) Building (3125)	309,957	115,352			227
Kingston East Community Centre					
Kingston Police Headquarters Building (3122)	1,822,462	137,574			331
Kingston Transit Maintenance Centre Building (3145)	790,084	167,225			343
Kingston Transit Storage Facility (3164)		72,272			134
MacLachlan Woodworking Museum Building (3029)	68,869		2,324		6
Memorial Centre Building (3131)	445,502	112,318			227
Neighbourhood Sharing Centre Building (3014)	5,660	5,338			11
New Fleet Maintenance Garage (3182)		64,474			89
Polson Park - Field House and Summer Washrooms (3079)	3,279			1,903	6
Portsmouth Olympic Harbour Building (3062)	699,884	56,942			135
Portsmouth Town Hall (1865) Building (3025)	6,656	2,516			5

Facility	2021				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Public Works Staff and Operations Building (3166)	667,770	47,342			116
Public Works Storage Garage (3155)		85,591			159
PumpHouse Steam Museum Building (3026)	89,254	12,046			26
Richardson Beach House (3072)	2,560				2
Rideau Heights Community Centre (3134)	316,703	25,135			60
Rideaucrest Home Building (3061)	2,954,345	246,718			581
Robert Bruce Memorial Parking Garage Building (3121)	42,877				6
Rodden Park Barn - Building (3154)	27,529	3,821			8
Slush Puppie Place Building (3054)	1,865,923	228,093			501
Tett Centre for Creativity and Learning Building (3024)	228,217	81,633			161
Visitor Information Centre Building (3034)	108,402	7,355			28
Woodbine Park - Concession, Washrooms and Office (3116)	60,693				8
Totals	24,341,133	2,836,043	26,887	20,753	6,447

Facility	2022				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
113 Lower Union Street Building (3186)	9,874	3,125			7
1211 JCB Building(3021)		45,023			84
17, 19, 21, 23 Queen Street (3141)	94,803				13
362 Montreal Street Building (3005)	488,081	48,881			111
805 Ridley Drive Building (3185)	165,727				22
85 Lappan's Lane (Utilities Kingston) (3170)		58,123			108

Facility	2022				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
91 Lappan's Lane (Utilities Kingston) (3152)		36,744			68
95 Lappan's Lane (Utilities Kingston) (3169)	1,814,522	23,880			120
Artillery Park Aquatic and Fitness Centre Building (3135)	985,906	94,532			216
British Whig Building (3019)	454,121	32,794			80
Cataraqui Community Centre Building (3138)	1,227,951	63,544			169
Centre 70 Building (3136)	412,035	24,916			69
Chown Memorial Parking Garage (3118)	190,685				25
City Greenhouses Building (3066)	20,671	38,732			73
City Hall Building (3020)	785,721	55,749			136
City Hall Market Square Zamboni Storage Building (3033)		6,903			13
City Park - Field House and Washrooms (3067)	32,633			5,353	19
Cook Brothers Building (3015)	98,241	21,563			44
Creekford Garage & Workshop Building (3103)	36,847	21,885			42
Creekford Solid Waste Garage Building (3126)	30,946	19,482			40
Culligan Water Park (3132)	244,820	28,411			63
Forestry Garage Building (3156)	41,733	17,773			36
Frontenac County Court House Building (100443)	216,434	58,498			118
Gaoler's Residence (1858) Building (3149)	3,186	8,709			16
Grand Theatre Building (3028)	394,384	54,619			118
Hanson Memorial Parking Garage (3120)	122,250				16
Harold Harvey Centre Building (3022)	65,588	36,101			70
INVISTA Centre Building (3137)	5,158,210	414,511			984

Facility	2022				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
KFPL - Calvin Park Branch Building (3055)	113,686	17,336			37
KFPL - Central Branch Building (3057)	308,390	37,250			82
KFPL - Isabel Turner Public Library Building (3059)	386,670	34,090			79
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building (3058)	71,380	9,558			21
KFR Headquarters Building (3050)	369,056	17,097			47
KFR Station #1 Joyceville Building (3047)	56,021		7,491		14
KFR Station #10 Building (3051)	63,567	7,532			17
KFR Station #2 Building (3048)	22,129		5,292		9
KFR Station #3 Building (3049)	41,725	19,370			38
KFR Station #4 Building (3035)	139,555	23,989			50
KFR Station #5 Building (3036)	39,511	8,883			18
KFR Station #6 Building (3038)	32,543	10,758			21
KFR Station #7 Building (3052)	185,734	29,027			62
KFR Station #8 Building (3039)	30,598	13,513			26
KFR Station #9 Building (3053)	57,152		16,985		28
KFR Training Centre - Maintenance Garage (3184)	140,189				19
KFR Training Centre - Storage Quonset (3044)	72,019				10
KFR Unity Road Storage Building (3040)	1,655	6,809			13
Kingston (Norman Rogers) Airport - Hangar 4 (3003)	16,859				2
Kingston (Norman Rogers) Airport Operations Building (3002)	25,579	17,767			34
Kingston (Norman Rogers) Airport Terminal (3001)	283,247	24,777			58

Facility	2022				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Kingston Area Recycling Centre (KARC) Building (3125)	309,857	101,775			202
Kingston East Community Centre	318,853				43
Kingston Police Headquarters Building (3122)	1,651,433	139,977			328
Kingston Transit Maintenance Centre Building (3145)	853,993	185,852			381
Kingston Transit Storage Facility (3164)		77,065			143
Maclachlan Woodworking Museum Building (3029)	71,262		2,048		6
Memorial Centre Building (3131)	737,613	119,826			253
Neighbourhood Sharing Centre Building (3014)	6,381	7,675			15
New Fleet Maintenance Garage (3182)	5,498	83,814			116
Polson Park - Field House and Summer Washrooms (3079)				1,444	5
Portsmouth Olympic Harbour Building (3062)	800,871	70,295			164
Portsmouth Town Hall (1865) Building (3025)	8,408	3,711			7
Public Works Staff and Operations Building (3166)	1,005,520	46,527			129
Public Works Storage Garage (3155)		91,005			169
PumpHouse Steam Museum Building (3026)	74,256	13,610			28
Richardson Beach House (3072)	22,948				16
Rideau Heights Community Centre (3134)	393,733	28,754			70
Rideaucrest Home Building (3061)	2,901,756	278,351			637
Robert Bruce Memorial Parking Garage Building (3121)	39,275				5
Rodden Park Barn - Building (3154)	26,310	4,659			10

Facility	2022				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Slush Puppie Place Building (3054)	2,997,977	239,005			568
Tett Centre for Creativity and Learning Building (3024)	237,467	79,435			157
Visitor Information Centre Building (3034)	103,732	7,372			28
Woodbine Park - Concession, Washrooms and Office (3116)	65,759				9
Totals	28,185,538	3,070,959	31,817	6,798	7,053

Facility	2023				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
113 Lower Union Street Building (3186)	27,780	34,470			-
1211 JCB Building(3021)					64
17, 19, 21, 23 Queen Street (3141)					4
362 Montreal Street Building (3005)	451,911	41,867			96
805 Ridley Drive Building (3185)	138,137				18
85 Lappan's Lane (Utilities Kingston) (3170)		44,401			82
91 Lappan's Lane (Utilities Kingston) (3152)		33,329			62
95 Lappan's Lane (Utilities Kingston) (3169)	1,758,788	20,790			112
Artillery Park Aquatic and Fitness Centre Building (3135)	1,048,005	87,636			206
British Whig Building (3019)	373,458	24,375			61
Catarauqui Community Centre Building (3138)	1,184,256	58,001			157
Centre 70 Building (3136)	416,001	27,252			74
Chown Memorial Parking Garage (3118)	164,649				22
City Greenhouses Building (3066)	20,825	38,281			72
City Hall Building (3020)	802,709	47,628			122

Facility	2023				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
City Hall Market Square Zamboni Storage Building (3033)		6,840			13
City Park - Field House and Washrooms (3067)	73,032				10
Cook Brothers Building (3015)	79,542	20,133			41
Creekford Garage & Workshop Building (3103)	33,970	19,736			38
Creekford Solid Waste Garage Building (3126)	26,009	19,532			40
Culligan Water Park (3132)	241,629	26,267			59
Forestry Garage Building (3156)	39,541	14,788			30
Frontenac County Court House Building (100443)	235,877	57,058			116
Gaoler's Residence (1858) Building (3149)	3,685	8,252			15
Grand Theatre Building (3028)	390,943	48,991			107
Hanson Memorial Parking Garage (3120)	110,006				15
Harold Harvey Centre Building (3022)	65,474	31,469			61
INVISTA Centre Building (3137)	4,877,928	419,411			981
KFPL - Calvin Park Branch Building (3055)	109,478	15,505			33
KFPL - Central Branch Building (3057)	81,221	46,786			90
KFPL - Isabel Turner Public Library Building (3059)	337,296	37,859			84
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building (3058)	61,455	8,315			18
KFR Headquarters Building (3050)	390,677	15,583			45
KFR Station #1 Joyceville Building (3047)	61,094		17,184		29
KFR Station #10 Building (3051)	74,561	7,581			17
KFR Station #2 Building (3048)	25,931		6,871		11

Facility	2023				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
KFR Station #3 Building (3049)	42,756	16,274			32
KFR Station #4 Building (3035)	139,719	21,866			46
KFR Station #5 Building (3036)	37,231	7,452			15
KFR Station #6 Building (3038)	37,036	9,980			20
KFR Station #7 Building (3052)	215,021	26,291			58
KFR Station #8 Building (3039)	31,925	13,114			26
KFR Station #9 Building (3053)	62,955		13,470		23
KFR Training Centre - Maintenance Garage (3184)	230,257				31
KFR Training Centre - Storage Quonset (3044)	67,021				9
KFR Unity Road Storage Building (3040)	1,824	6,114			11
Kingston (Norman Rogers) Airport - Hangar 4 (3003)	40,326				5
Kingston (Norman Rogers) Airport Operations Building (3002)	26,213	14,673			28
Kingston (Norman Rogers) Airport Terminal (3001)	251,208	24,797			56
Kingston Area Recycling Centre (KARC) Building (3125)	297,529	92,560			184
Kingston East Community Centre	166,990				22
Kingston Police Headquarters Building (3122)	1,522,639	104,767			258
Kingston Transit Maintenance Centre Building (3145)	864,872	202,979			413
Kingston Transit Storage Facility (3164)		71,137			132
Maclachlan Woodworking Museum Building (3029)	73,422		645		4
Memorial Centre Building (3131)	737,371	115,362			245
Neighbourhood Sharing Centre Building (3014)	6,281	3,347			7
New Fleet Maintenance Garage (3182)		71,357			99

Facility	2023				
	Electricity (kWh)	Gas (m3)	Propane (L)	Oil (L)	Emissions (CO2e)
Polson Park - Field House and Summer Washrooms (3079)	19,075				3
Portsmouth Olympic Harbour Building (3062)	720,529	72,600			165
Portsmouth Town Hall (1865) Building (3025)	13,407	3,618			7
Public Works Staff and Operations Building (3166)	739,654	39,258			104
Public Works Storage Garage (3155)		86,834			161
PumpHouse Steam Museum Building (3026)	81,298	11,844			25
Richardson Beach House (3072)	61,612				44
Rideau Heights Community Centre (3134)	359,812	26,468			64
Rideaucrest Home Building (3061)	2,871,969	236,943			559
Robert Bruce Memorial Parking Garage Building (3121)	45,417				6
Rodden Park Barn - Building (3154)	31,593	4,044			9
Slush Puppie Place Building (3054)	3,604,428	373,554			843
Tett Centre for Creativity and Learning Building (3024)	199,435	47,132			96
Visitor Information Centre Building (3034)	95,330	6,486			25
Woodbine Park - Concession, Washrooms and Office (3116)	60,944				8
Totals	27,462,968	2,972,992	38,170	-	6,851

9.0 Appendix B - List of heated and/or cooled Municipal Facilities

Name	Usage	Street Address
KFR Station #1 Joyceville Quonset Hut	Fire Services Building	1648 Joyceville Rd
Frontenac County Court House Building	Courthouse	5 Court St
Kingston (Norman Rogers) Airport Terminal	Airport Terminal	1114 Len Birchall Way
Kingston (Norman Rogers) Airport Operations Building	Maintenance/Shop	1095 Len Birchall
Kingston Housing and Social Services	Corporate & Emergency Services	362 Montreal St
Neighbourhood Sharing Centre Building	Field House	670 Front Rd
Cook Brothers Building	Community Centre	692 Bagot
British Whig Building / Ontario Bank	Office	310 King St E
City Hall Building	Town Hall	216 Ontario St
1211 JCB Building	Office (Corporate & Emerg. Services)	1211 John Counter Blvd
Harold Harvey Centre Building	Community Centre & Maintenance Shop	42 Church
Tett Centre for Creativity and Learning Building	Community Services	370 King St
Portsmouth Town Hall (1865) Building	Museum	632 King St. West
Pump House Steam Museum Building	Museum	23 Ontario
Grand Theatre Building	Performing Arts Venue	218 Princess St
Maclachlan Woodworking Museum Building	Museum	2993 Hwy 2
City Hall Market Square Zamboni Storage Building	Storage building	216 Ontario St.
Visitor Information Centre Building	Tourist Office/Public Bldg.	209 Ontario
KFR Station #4 Building	Fire Services Building	271 Brock
KFR Station #5 Building	Fire Services Building	171 Railway
KFR Station #6 Building	Fire Services Building	262 Palace
KFR Station #8 Building	Fire Services Building	1485 Unity

Name	Usage	Street Address
KFR Unity Road Storage Building	Fire Services Building	2117 Unity Rd.
KFR Station #1 Joyceville Building	Fire Services Building	1648 Joyceville
KFR Station #2 Building	Fire Services Building	3505 Brewers Mills
KFR Station #3 Building	Fire Services Building	211 Gore
KFR Headquarters Building	Fire Services Building	500 O'Connor
KFR Station #10 Building	Fire Services Building	127 Days
KFR Station #7 Building	Fire Services Building	905 Woodbine
KFR Station #9 Building	Fire Services Building	2835 Hy 38
Slush Puppie Place / Leon's Centre Building	Arena/Stadium	1 Tragically Hip Way
KFPL - Calvin Park Branch Building	Library	88 Wright
KFPL - Main Branch Building	Library	130 Johnson St
KFPL - Pittsburgh Branch (former MacLean/Hawthorn and Ruttan Houses) Building	Library	80 Gore Rd
KFPL - Isabel Turner Public Library Building	Library	935 Gardiners Rd
Rideaucrest Home Building	Seniors Residence/Care Facility	175 Rideau St
Portsmouth Olympic Harbour Building	Community Centre	53 Yonge St
Confederation Basin Marina Office	Community Centre	6 Clarence Str.
City Greenhouses Building	Greenhouse	99 Norman Rogers
City Park - Field House and Washrooms	Field House	33 Bagot Street
Richardson Beach House	Change House/Washroom	2 Emily St
Creekford Garage & Workshop Building	Maintenance Shop/Garage	2711 Creekford
Woodbine Park - Concession, Washrooms and Office	Field House	1180 Woodbine Rd
Woodbine Park - Garage and Workshop	Maintenance Shop/Garage	1180 Woodbine Rd
Kingston Police Headquarters Building	Police Station	705 Division St
Kingston Area Recycling Centre (KARC) Building	Recycling Centre/Maintenance Shop	196 Lappan's Lane
Creekford Solid Waste Garage Building	Maintenance Shop/Storage Garage	2701 Creekford

Name	Usage	Street Address
Memorial Centre Building	Community Center & Arena	303 York St (Memorial)
Culligan Water Park	Pool & Aqua Park	303 York St
Rideau Heights Community Centre	Community Centre	85 Maccauley St
Artillery Park Aquatic and Fitness Centre Building	Recreation Center (Gym and Pool)	382 Bagot St
Centre 70 Building	Community Center & Arena	100 Days Road
INVISTA Centre Building	Ice Rink/Community Centre	1350 Gardiners Road
Cataraqui Community Centre Building	Community Centre & Arena	1030 Sunnyside Rd
Kingston Transit Maintenance Centre Building	Transit Maintenance Facility	1181 John Counter Blvd
Frontenac County Land Registry Office (1876) Building	Registry Office	1 Court Street
Gaoler's Residence (1858) Building	Registry Office	150 West St.
91 Lappan's Lane (Utilities Kingston)	Office, Maintenance Shop and Garage	91 Lappan's Ln
Rodden Park Barn - Building	Park Ancillary Building	111 Norman Rogers Dr
Public Works Garage and Fleet Maintenance Building	Maintenance Shop/Garage	157 Railway St
Forestry Garage Building	Maintenance Shop/Garage	1643 Hwy 15
Kingston Transit Storage Facility	Transit Maintenance Facility	1183 John Counter Blvd
Public Works Staff and Operations Building	Office	701 Division St
95 Lappan's Lane (Utilities Kingston)	Maintenance Shop & Garage	95 Lappan's Ln
85 Lappan's Lane (Utilities Kingston)	Office (Corporate & Emerg. Services)	85 Lappan's Ln
Kingston East Community Centre	Community Centre	779 Hwy 15
Public Works New Fleet Maintenance Garage	Public Works Ancillary Building	703 Division St
KFR Training Centre - Maintenance Garage	Fire Services Building	3A Terry Fox Dr.

10.0 Appendix C - Summary of Solar PV Generation

Facility	2019	
	Generation (kWh)	Revenue
362 Montreal Street Building	12,178	\$10,150
85 Lappan's Lane Campus	262,936	\$194,841
Artillery Park Aquatic and Fitness Centre Building	13,236	\$11,032
KFPL - Central Branch Building	12,391	\$10,328
KFR Station #1 Joyceville Building	13,747	\$12,458
KFR Station #2 Building	12,476	\$11,307
KFR Station #3 Building	13,958	\$12,649
KFR Station #7 Building	15,229	\$13,801
KFR Station #8 Building	14,505	\$13,145
Kingston (Norman Rogers) Airport Terminal	8,070	\$7,313
Ravensview WWTP	120,919	\$74,879
Total	499,644	\$371,903

Facility	2020	
	Generation (kWh)	Revenue
362 Montreal Street Building	9,770	\$8,144
85 Lappan's Lane Campus	275,724	\$204,317
Artillery Park Aquatic and Fitness Centre Building	13,340	\$11,119
KFPL - Central Branch Building	12,778	\$10,651
KFR Station #1 Joyceville Building	14,238	\$12,863
KFR Station #2 Building	12,726	\$11,499
KFR Station #3 Building	11,209	\$10,113
KFR Station #7 Building	14,922	\$13,487
KFR Station #8 Building	15,929	\$14,404
Kingston (Norman Rogers) Airport Terminal	12,070	\$10,915
Ravensview WWTP	119,511	\$73,858
Total	512,217	\$381,369

Facility	2021	
	Generation (kWh)	Revenue
362 Montreal Street Building	11,514	\$9,597
85 Lappan's Lane Campus	134,048	\$99,332
Artillery Park Aquatic and Fitness Centre Building	12,565	\$10,473
KFPL - Central Branch Building	12,408	\$10,342
KFR Station #1 Joyceville Building	13,807	\$11,066
KFR Station #2 Building	12,620	\$10,114
KFR Station #3 Building	12,453	\$9,996
KFR Station #7 Building	14,889	\$11,934
KFR Station #8 Building	15,526	\$12,444
Kingston (Norman Rogers) Airport Terminal	12,278	\$9,910
Ravensview WWTP	56,076	\$30,740
Total	308,182	\$225,949

Facility	2022	
	Generation (kWh)	Revenue
362 Montreal Street Building	12,982	\$10,821
85 Lappan's Lane Campus	243,758	\$180,589
Artillery Park Aquatic and Fitness Centre Building	11,594	\$9,662
KFPL - Central Branch Building	2,351	\$1,007
KFR Station #1 Joyceville Building	13,996	\$11,181
KFR Station #2 Building	12,568	\$10,039
KFR Station #3 Building	9,546	\$7,618
KFR Station #7 Building	14,814	\$11,844
KFR Station #8 Building	15,497	\$12,392
Kingston (Norman Rogers) Airport Terminal	11,756	\$9,459
Ravensview WWTP	108,124	\$59,252
Total	456,988	\$323,864

Facility	2023	
	Generation (kWh)	Revenue
362 Montreal Street Building	12,736	\$10,216
85 Lappan's Lane Campus	274,360	\$195,618
Artillery Park Aquatic and Fitness Centre Building	12,761	\$10,234
KFPL - Central Branch Building	14,370	\$10,645
KFR Station #1 Joyceville Building	12,576	\$10,074
KFR Station #2 Building	12,698	\$10,164
KFR Station #3 Building	13,818	\$11,066
KFR Station #7 Building	14,396	\$11,537
KFR Station #8 Building	13,519	\$10,859
Kingston (Norman Rogers) Airport Terminal	6,633	\$5,349
Ravensview WWTP	107,089	\$58,685
Total	494,956	\$344,447

Facility	2019-2023	
	Generation (kWh)	Revenue
362 Montreal Street Building	59,181	\$48,928
85 Lappan's Lane Campus	1,190,826	\$874,698
Artillery Park Aquatic and Fitness Centre Building	63,496	\$52,521
KFPL - Central Branch Building	54,298	\$42,973
KFR Station #1 Joyceville Building	68,364	\$57,642
KFR Station #2 Building	63,088	\$53,122
KFR Station #3 Building	60,983	\$51,442
KFR Station #7 Building	74,250	\$62,602
KFR Station #8 Building	74,975	\$63,244
Kingston (Norman Rogers) Airport Terminal	50,807	\$42,947
Ravensview WWTP	511,719	\$297,414
Total	2,271,986	\$1,647,533

