



2020 ANNUAL ENERGY REPORT

CITY OF HAMILTON

Public Works
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Letter from the Director

Reporting of annual energy results for 2020 is a little different than in previous years. As the world tackled the far-reaching impacts of a global pandemic, cities were sent into various forms of lockdowns necessitating changes to its social and public services. The City of Hamilton was no different as it navigated the fluid and developing situation throughout 2020.

City buildings were mostly shuttered to the public for at least part of 2020, with services shifting to online or by-appointment to limit contact. Recreational programs were postponed, limited or cancelled at various times throughout the year. Many of the City's employees worked completely or partially remotely. In the first half of 2020, project activities were also impacted as the province limited non-essential construction. Construction and project activity resumed by mid-2020 but many experienced schedule delays as a result.

Despite the varying stay-at-home orders and lock-down restrictions in 2020, it is important to remember that city buildings still required heating, cooling and lighting even with lower capacity. In some cases, buildings were re-purposed or modified to accommodate new health measures and staff re-deployed to administer required City amenities to the public. Fleet and transit vehicles still required fuel in order maintain essential City services. While this did result in lower consumption and costs overall, it is difficult to quantify a specific causal relationship between pandemic-related reactions and energy reduction results from focused activities.

The City still has a commitment to energy and greenhouse gas (GHG) reduction, and efforts toward those goals continued throughout 2020. The Climate Change Emergency continues to be a driving force behind the development of corporate and public action plans and policy changes. A revision to the Corporate Energy and Sustainability Policy document that revised targets and further defined actions around energy-related decisions including those to reduce energy usage and GHGs and increase building standardization and renewable resources was adopted by council in Feb 2021.

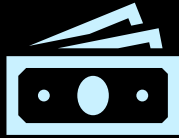
The Community Energy and Emissions Plan continues with its development and has engaged staff, public stakeholders, local industry and the community. The Plan aims to enhance public awareness around sustainability, create community action plans and develop public policies with the goal to promote reductions in energy use and GHGs to build a sustainable net-zero city.



Rom D'Angelo
Director of Energy, Fleet and Facilities Management Division

A handwritten signature in blue ink that reads "Rom D'Angelo". The signature is written in a cursive, flowing style.

2020



*Utility Spend of
\$37.7 Million*



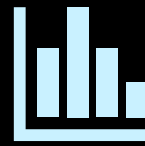
*Energy Intensity
Reduction of 35%
from base year*



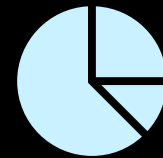
*Corporate GHG
Emissions Inventory
2019 Reduction of
43% from base year*

**NET
ZERO**

*New Target in
emissions reduction
by 2050*



*Energy Strategies
and Programs
Savings & Avoided
Costs \$11.9 Million*



*Combined
(Electricity & Natural
Gas) usage down
3% from 2019*



*Corporate Energy
and Sustainability
Policy Updated*



*HRPI Benefit of \$1.2
Million*



*10% reduction in
Fuels consumption
(diesel, gasoline
and CNG) from
2019*

AT A GLANCE

Strategic Highlights

The main KPI for City facilities for energy use is the measure of its energy intensity (energy use per area). Typically, energy intensity can show how actions taken to reduce energy use – through energy efficiency projects, operational improvements and behaviors – can impact the intensity results. 2020 was atypical in that closing of sites and usage shifts also impacted the KPI and does overstate the results of those actions.

2020 Energy Intensity Reduction of 35% when compared to 2005 base year, and 14% reduction from 2019.

Financial Highlights

The overall annual cost of utilities (electricity, natural gas and fuels) amounted to \$37.7 million, which was a reduction of 7% from last year. A lot of this can be attributed to lower consumption. In addition, Provincial COVID-19 rate relief was introduced throughout 2020 as a temporary method to mitigate the impacts of peak electricity and natural gas while residents and businesses were urged to reduce contact and stay home. Energy strategies and programs (cost recovery, hedging, rates activities and conservation efforts) continued, and the annual results of savings and avoided costs for 2020 was \$11.9 million.

Operating Highlights

Operationally, COVID-19 impacted consumption across corporate sites to varying degrees. Overall, there was a combined electricity and natural gas (in ekWh) reduction of 3%. Some buildings, particularly those in the recreation and office sectors, saw drops in consumption while others remained status quo. Hamilton Water saw an increase in natural gas due to the installation of a Biosolids production operation. Fuel consumption in 2020 also resulted in an 10% reduction year over year.

COVID-19 impacted consumption across corporate sites to varying degrees. Overall, there was a reduction of 3% in consumption and 10% reduction in fuel consumption from 2019.

Looking Ahead

Heading into 2021, corporate activities continue to evolve as the Province and the City's Public Health continuously update health measures required in the face of the ongoing pandemic. It is unlikely that City sites will return to full capacity within 2021, and therefore further impacts to KPIs, energy consumption and energy-related decisions are expected. Conservation activities, including energy efficiency projects, operational improvements and policy and plan development intended to reduce energy usage and GHG emissions will remain key priorities in 2021.



CORPORATE ENERGY & SUSTAINABILITY POLICY

In 2020, the former Corporate Energy Policy, undertook a review and revision to be renamed the Corporate Energy and Sustainability Policy (PW14050(a)). The policy is designed to act as a guideline for making energy and emissions related decisions for corporate assets and operations. The revised policy continues to include policy actions to support making building and operational improvements that lead to energy usage reductions and emissions reductions that impact the City environmentally and financially.

The intent of the review was to better align the current energy policies to recent regulatory changes, City-wide community-based plans and the increased focus on climate change and resiliency. In 2019, the City of Hamilton declared a climate change emergency, initiated a climate change task force and engaged the public in development of a community-based climate change plan. This revised policy incorporated updates to facilitate Corporate actions to meeting overall targets and goals. Primary among those was the commitment to achieving net zero emissions by 2050. Additionally, the policy includes updates to building standards, renewable energy considerations and better-defined reporting.

Accepted by Council in February 2021, the Corporate Energy and Sustainability Policy recommitted to the existing energy intensity targets and new emissions reduction targets, with a long-term goal of net zero emissions. Net zero means achieving overall, zero greenhouse gas emissions by balancing any emissions from energy use with carbon removal via a combination of reducing usage, changing to low or zero energy sources (i.e. renewable energy sources), changing processes and carbon offsetting.

Figure 1: Corporate Energy Intensity and Emissions Reduction Targets

Year	Energy Intensity Reduction Targets	Emissions Reduction Targets
2020	20%	20%
2030	45%	50%
2050	60%	100% *

*Net zero emissions

In order to ensure the policy targets and policy actions remain relevant and align with the City's strategic plans, the policy document is reviewed and revised approximately every five years.

ENERGY STRATEGIES & PROGRAMS KPI RESULTS

The City has been tracking and reporting on data results for several years to evaluate the City's performance using key performance indicators related to decisions specifically around energy and utilities.

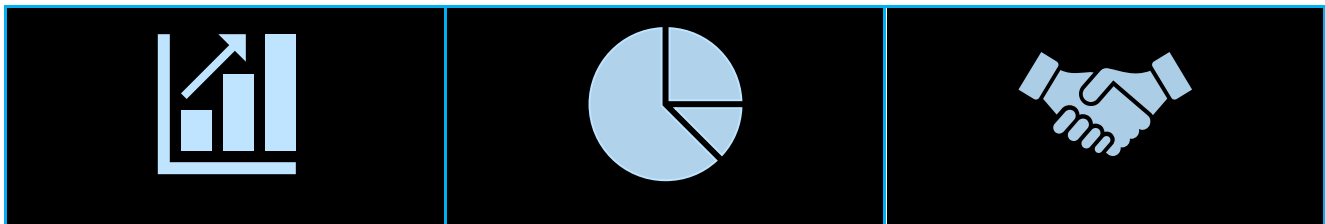
Cost reductions and the avoidance of costs are a result of the impacts of a variety of energy strategies and programs. Energy conservation, incentive programs, bill recovery from reviewing utility invoices or tax rebate programs, and utility rate optimization are a few of the factors that contribute to annual cost savings or mitigation of costs for the City.

Overall, the total results from implementing the various energy strategies and programs in 2020 has resulted in a savings and avoided costs of \$11.9 million.

Utility Rates and Commodity Strategies

This category reports the results of the electricity and natural gas costs that would have been incurred by the City had no action been initiated to reduce costs. Actions include procurement plans, natural gas hedging strategies and optimizing utility rates including switching rate class to increase benefits from Global Adjustment (GA) savings opportunities.

In 2020, the results of natural gas commodity and hedging strategies was \$624,300. The 2020 results for GA rate optimization amounted to \$7.4 million, for a total of \$8.0 million in this category.



Cost Recovery

This category reports on the results of costs recovered due to the City's continuous efforts to review its utility accounts to correct any billing errors as well as recover credits from tax recovery programs. Cost recovery from billing or rate corrections amounted to \$173,600 for 2020.

Energy Conservation and Incentive Programs

This category reports the results of the savings achieved from implementing energy efficiency measures, equipment and processes within the City's building assets that lead to reductions in energy consumption as well as financial incentives received for completing those projects. Incentives in this context refers to those from utility providers, the Independent Electricity System Operator (IESO) or provincial or federal funding options that are provided to eligible energy efficiency projects.

Conservation

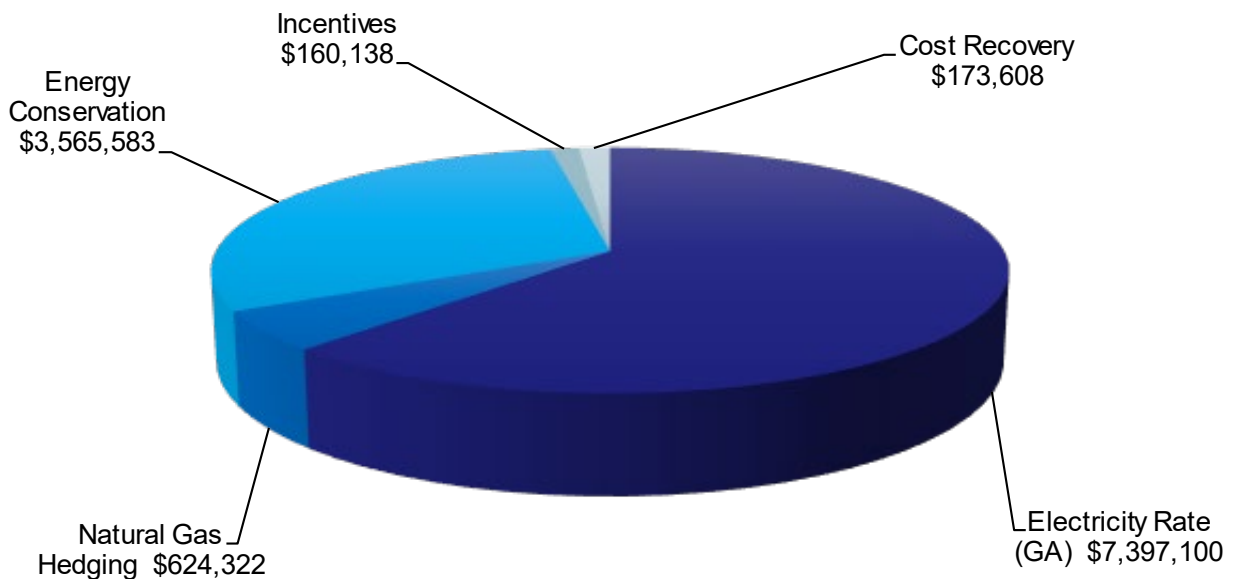
Project activities in this category amounted to a total savings of \$3.6 million for 2020. The City tracks the energy savings achieved from energy projects once they are complete.

Incentives

Incentives received for project activities amounted to \$160,100 for 2020. These values include all incentives received in 2020 and may be from completed projects in the prior year.

"In 2020, Energy Strategies and Programs resulted in \$11.9 million in avoided costs."

Figure 2: 2020 Breakdown of Energy Strategies and Programs



OVERALL ENERGY COSTS

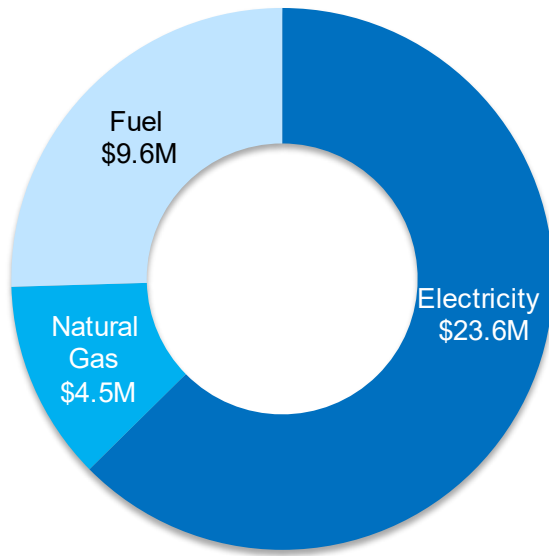
The City tracks costs and consumption to evaluate performance, but also to help budget for upcoming years. Costs for electricity, natural gas and fuels are compiled and measured against the previous year and compared to the baseline year of 2005. For this report, costs for sites connected to the district energy system (and supplied by HCE Energy Inc.) are included in electricity and natural gas costs.

Overall energy costs are a significant operating budget item for corporate buildings and vehicle assets. Although action to mitigate costs through completing energy efficiency projects that reduce consumption can have a positive impact on costs, costs themselves are impacted by more than usage. Regulatory changes, rate changes, inflation, global markets and weather can all impact costs despite reductions in usage. Costs for energy include regulated charges and market-based (commodity) charges.

2020 had the added impact of a wide-spread global pandemic, which led to market-based reactions resulting in shifts to supply and demand, as well as regulatory relief actions to mitigate pandemic cost impacts. Energy demand waned in large sectors causing uncertainty in commodity markets. Utilities unveiled temporary programs intended to assist with slowed and closed businesses through deferred costing and rate reductions. The federal carbon charge changes did however continue as scheduled. Caution must be paid when evaluating 2020 costs. As expected, overall lower usage resulted in lower costs, but with the other contributing factors noted above, it can be difficult to forecast upcoming costs utilizing 2020 as any kind of basis. 2021 is shaping up to be a similar anomaly, though the initial volatility felt in 2020 may be lessened. Additional information on the impacts will be discussed in upcoming sections of this report.

In 2020, the total spend for consumption of electricity, natural gas and fuels (diesel, unleaded gasoline and compressed natural gas (CNG)) was \$37.7 million. This was a decrease of 7% from 2019.

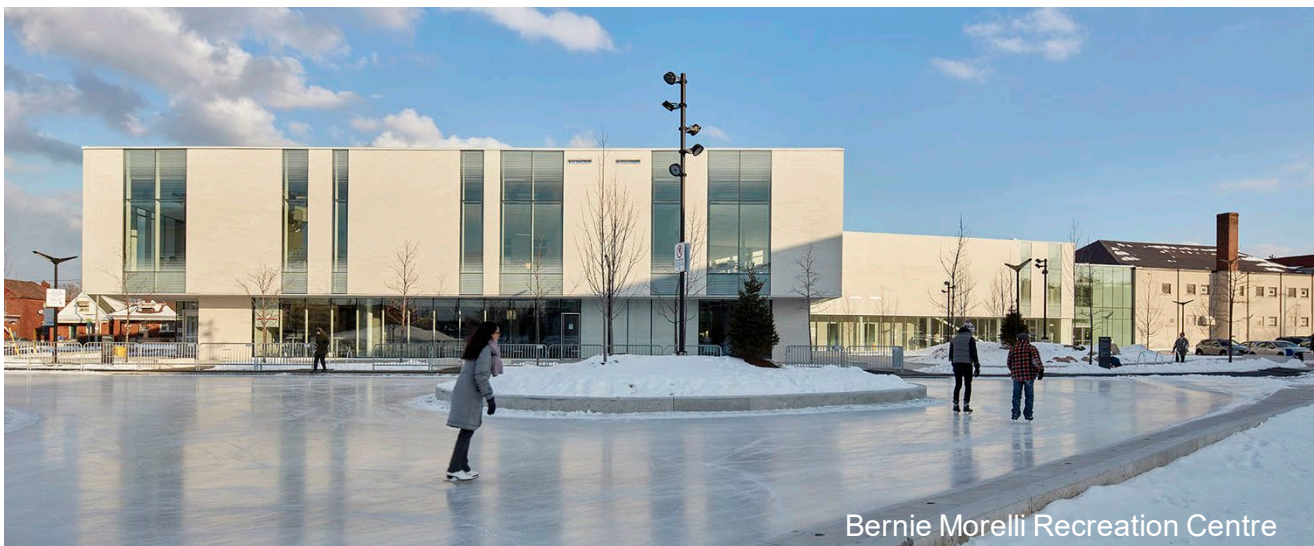
Figure 3: Overall Energy Costs in 2020 in Millions (\$M)



- Overall 7% Reduction**
- **Electricity cost was 4% lower than in 2019.**
 - **Natural Gas cost was 19% higher than in 2019.**
 - **Fuel (diesel, gasoline and CNG) cost was 22% lower than in 2019.**

Costs are incurred by City-owned buildings/sites and exclude City Housing Hamilton. Utilities include Alectra Utilities, Hydro One Utilities and Enbridge Gas Inc. (formerly Union Gas Ltd). Sites linked to the district energy system with utility costs provided from HCE are included in electricity and natural gas respectively. Fuels include diesel, unleaded gasoline and CNG for all Transit and Fleet operations but does not include Hamilton Police Services or Darts. Sites with partial data may be excluded.

The inclusion of buildings/sites in the report may vary from year to year. In any given reporting period, buildings and vehicles could be added (built or purchased) or removed (sales or demolitions). Major renovations may decommission a site for a time and may be excluded as a full year data set may not be available. As such, square footage to include only reported sites are also adjusted.



ENERGY PERFORMANCE KPI RESULTS

This section reviews the comparison results of electricity, natural gas and energy intensity to the prior year (2019) and to the base year (2005). The energy consumption and costs reported here are period normalized for 2020 and are calculated as usage and cost during that period and may or may not coincide with a billing period for any given account. Additional charts on the results presented in this section are in Appendix A of this report.

Electricity Consumption and Cost

Overall the electricity consumption in 2020 was 8% less than in 2019, and its overall costs were 4% less than in 2019.

Figure 4: 2020 Electricity Consumption and Cost Comparison

Electricity Overview	2005	2019	2020	Comparisons	
				2020 vs 2005	2020 vs 2019.
Total Electricity (kWh)	236,362,045	216,929,517	199,136,278	-16%	-8%
Total Electricity (\$)	\$20,657,050	\$24,575,215	\$23,619,728	14%	-4%
Total Electricity (\$/kWh)	\$0.087	\$0.113	\$0.119	36%	5%

Costs for electricity comprises commodity, delivery, transmission and other regulatory charges. Commodity includes the Hourly Ontario Energy Price (HOEP) and the Global Adjustment (GA). Both portions of the commodity are determined by market-based factors and are administered by Ontario's Independent Electricity System Operator (IESO). The other charges, delivery, transmission and regulatory are regulated by the Ontario Energy Board (OEB), and any requests by a local utility (also called a local distribution company), to change such rates requires OEB approval. The City of Hamilton operates within two local distribution companies, Alectra Utilities and Hydro One.

The impacts to consumption (and cost) are varying, but typically relate to weather conditions, building capacity, operations and energy efficiency. In 2020, COVID-19 impacted building capacity and operations in a greater way as many of the city buildings were shuttered to staff and the public. However, most buildings did continue to require base cooling and heating throughout 2020. As a response to the COVID-19 pandemic, electricity utilities offered government recommended temporary rate relief plans, including price caps on peak electricity prices and global adjustment, and deferred some pre-approved rate plans and

increases into 2021. Additional programs were implemented to offer financial stability for small business and residents with deferred payment or payment plans. For the large commercial and industrial sector, modifications were made to the IESO’s ICI program (GA – Class A) to allow for those sectors to focus on financial recovery and stimulating the economy by eliminating the requirements that they respond to peak electricity demand events during the peak setting period (May 2020 – April 2021) while maintaining their current peak demand factors used in calculating their GA contributions.

In addition to the broad impact of the pandemic, weather also played a role in usage across the City. The cooling degree days in 2020 were 43% higher than 2019 and 12% higher than the 5-year average. Recall, even though buildings may have been reduced for capacity, cooling may still be a requirement for health and safety of any building occupants and operational equipment.

Natural Gas Consumption and Cost

Overall, the City’s natural gas consumption for buildings (not compressed natural gas for vehicles) was 5% higher than in 2019, with costs increasing by 19% as well.

Figure 5: 2020 Natural Gas Consumption and Cost Comparison (non-vehicle)

Natural Gas Overview	2005	2019	2020	Comparisons	
				2020 vs 2005	2020 vs 2019.
Total Natural Gas (m ³)	15,403,956	13,478,604	14,100,215	-8%	5%
Total Natural Gas (\$)	\$6,520,253	\$3,800,296	\$4,505,011	-31%	19%
Total Natural Gas (\$/m ³)	\$0.423	\$0.282	\$0.319	-25%	13%

Natural gas comprises commodity (market-based), delivery and regulatory components such as the Federal Carbon Charge. Enbridge Gas Inc is the local distribution company, and like electricity, all changes to regulated items must be approved by the OEB. However, the difference is that the City purchases its natural gas commodity directly from wholesale suppliers not Enbridge Gas, which acts as the billing and delivery agent.

The biggest impact to the consumption in 2020 was the added volume from a Hamilton Water biosolids production project at the Woodward water and wastewater treatment site. Steady biosolids production at the plant began in May 2020. While many facilities experienced reduced consumption from building closures and limited capacities, the biosolids production

was a steady user, and its added volume increased the City's purchases of natural gas overall. Heating requirements played a lesser role in 2020. Although a good portion of the heating season was over by the first lockdowns in March 2020, the heating degree days were also on average 13% lower than the 2019 and 7% lower than the 5-year average. Cold weather had little effect to overall usage in 2020.

One of the biggest impacts to costs (besides an increase in purchases) include the Federal Carbon Charge, the government's carbon pricing program, which applies to fossil fuels sold in Ontario. The charge increased as per its pre-determined schedule to 5.87 cents per m³ in April 2020, from 3.91 cents per m³.

Combined Consumption and Cost (Electricity & Natural Gas)

Collectively, the combined consumption of electricity and natural gas, converted to equivalent kilo-watt hours (ekWh), was 3% lower compared to 2019 and 14% lower when compared to base year. The combined costs were 1% lower than in 2019 and 3% higher than the base year.

Figure 6: 2020 Combined Electricity and Natural Gas Consumption (ekWh) and Costs¹

Total Combined Energy Overview				Comparisons	
	2005	2019	2020	2020 vs 2005	2020 vs 2019.
Total Energy (ekWh)	400,722,256	356,567,857	345,214,509	-14%	-3%
Total Energy Cost (\$)	\$27,177,303	\$28,375,511	\$28,124,739	3%	-1%
Total Energy (\$/ekWh)	\$0.068	\$0.080	\$0.081	20%	2%

When reviewing the results of the overall combined energy usage in ekWh, the impacts of lower electricity consumption are offset by the increases in natural gas consumption. Collectively, the total numbers result in a skewed view that the City was less impacted by facility closure and capacity reductions as a result of the pandemic. Most facility groups saw decreases in the combined electricity and natural gas. In the chart below, the combined consumption information is shown by facility grouping, which may be a better reflection of the 2020 results on the various facility and operational groups.

¹ Combined usage is electricity in kWh plus natural Gas in m³ (converted to ekWh).

Figure 7: 2020 Combined Electricity and Natural Gas Consumption by Facility Grouping (000's of ekWh)

	in 000's of ekWhs			Comparisons	
	2005	2019	2020	2020 vs 2005	2020 vs 2019
Total Energy Consumption					
City/Town Halls	13,775	8,899	7,528	-45%	-15%
Corporate Facilities	17,188	12,256	11,702	-32%	-5%
Street Lighting and Traffic Lighting	39,290	19,920	19,328	-51%	-3%
Other City Operations	5,618	6,355	4,866	-13%	-23%
Hamilton Water	121,040	126,788	145,802	20%	15%
Yards	39,589	27,869	25,517	-36%	-8%
Arenas	39,904	35,094	24,505	-39%	-30%
Community/Senior Centers	3,834	3,601	3,122	-19%	-13%
Rec Centres/Pools	26,789	30,073	27,230	2%	-9%
Tim Horton's Field	0	9,267	6,652	0%	-28%
Rec Parks/Stadiums/Golf	8,332	4,997	4,661	-44%	-7%
Lodges (Macassa, Wentworth)	24,938	15,774	14,756	-41%	-6%
Culture	5,383	5,278	3,368	-37%	-36%
Fire/ EMS	10,698	12,803	11,639	9%	-9%
Hamilton Public Libraries	9,343	11,726	10,654	14%	-9%
First Ontario Centre	10,122	9,214	8,654	-15%	-6%
First Ontario Concert Hall	5,466	4,571	3,735	-32%	-18%
Hamilton Convention Centre	4,656	3,780	3,175	-32%	-16%
Hamilton Police Services	14,757	8,303	8,323	-44%	0%
City Wide Total	400,722	356,568	345,215	-14%	-3%



Energy Intensity (City-Owned Sites)

Energy intensity is the measurement of usage in equivalent kilo-watt hours per square foot (ekWh/sqft). The forward targets outlined in the Corporate Energy & Sustainability Policy are a reduction in energy intensity of 45% by 2030 and 60% by 2050 as compared to the base year of 2005. The overall results for 2020 is a reduction in energy intensity of 35% when compared to the base year, and 14% lower than in 2019. The total cost per square foot has reduced by 16% when compared to base year and by 6% compared to 2019. There was little change to the square footage for 2020 when compared to 2019.

Figure 8: 2020 Energy Intensity Comparison (in ekWh per sqft)²

Energy Intensity	2005	2019	2020	Comparisons	
				2020 vs 2005	2020 vs 2019.
City Total (ekWh/sqft)	45.69	34.34	29.50	-35%	-14%
City Total (\$/sqft)	\$2.67	\$2.37	\$2.23	-16%	-6%
Reported Square Footage	5,138,852	5,926,831	5,940,090	16%	0%

Due to the irregularity of consumption patterns in 2020, the energy intensity results need to be viewed with some caution. Although consumption reductions are always a goal, and various policies are in place to support reductions in consumption, such as building temperature set points, reaction during peak days and installation of energy efficient equipment, the 2020 results were heavily impacted by the pandemic response to close buildings and/or limit capacity throughout 2020.

Operational sites, such as street lighting, traffic lighting and park lighting (without buildings) and Hamilton Water sites are not included in the calculation of energy intensity. This is important to note, because for intensity, the additional natural gas volume added for the biosolids production operation at Hamilton Water would not impact the energy intensity results.

In the following chart, the energy intensity results for specific groupings shows where the impacts were more greatly felt as compared to the base year (2005) and to 2019.

² Operational sites (street lighting, traffic lighting, park lighting and Hamilton Water) excluded from EI calculations.

Figure 9: 2020 Energy Intensity Comparison by Site Grouping

Energy Intensity	ekWh/sqft			2020 vs 2005	2020 vs 2019.
	2005	2019	2020		
City/Town Halls	39.6	24.9	21.0	-47%	-15%
Corporate Facilities	44.6	22.3	20.3	-55%	-9%
Street Lighting	n/a	n/a	n/a	n/a	n/a
Traffic Lighting	n/a	n/a	n/a	n/a	n/a
Other City Operations	n/a	n/a	n/a	n/a	n/a
Hamilton Water	n/a	n/a	n/a	n/a	n/a
Yards	38.1	28.7	26.3	-31%	-8%
Arenas	51.3	41.9	29.1	-43%	-30%
Community/Senior Centers	31.1	24.3	24.3	-22%	0%
Rec Centres/Pools	78.6	64.6	59.0	-25%	-9%
Tim Horton's Field	0.0	28.3	20.3	0%	-28%
Rec Parks/Stadiums/Golf	36.5	30.9	25.9	-29%	-16%
Lodges (Macassa, Wentworth)	113.6	45.4	42.5	-63%	-6%
Culture	35.5	33.3	25.6	-28%	-23%
Fire/ EMS	45.2	37.3	33.4	-26%	-10%
Hamilton Public Libraries	25.2	33.0	29.3	16%	-11%
First Ontario Centre	22.5	20.5	19.3	-15%	-6%
First Ontario Concert Hall	57.8	48.7	39.8	-31%	-18%
Hamilton Convention Centre	37.2	30.2	25.4	-32%	-16%
Hamilton Police Services	59.8	35.1	35.2	-41%	0%
City Wide Total	45.7	34.3	29.5	-35%	-14%

VEHICLE FUELS



The City reports on the corporate fleet vehicles which include various vehicle types: buses, waste collection vehicles, snow removal trucks, street sweepers, light weight departmental vehicles and Fire and EMS vehicles. The fuels used for these vehicles is diesel, unleaded gasoline and compressed natural gas (CNG). The performance of the fleet as it relates to its fuel usage is reported below.

Fuel Consumption and Cost

Fuel for the City's fleet of vehicles is purchased on wholesale markets. This allows for economies of scale around bulk purchasing. Most of the vehicles are fueled by diesel and unleaded gasoline. Transit continues to expand its fleet of CNG-fueled buses as direct replacements for diesel-fueled buses.

In 2020, the City used 7.6 million litres of diesel fuel, a 12% reduction from 2019. The City used 2.3 million litres of gasoline, a 3% decrease from 2019. The average per litre cost for both diesel and gasoline decreased by 16% and 13% respectively. Pricing in the early months of the pandemic saw average fuel prices for diesel and gasoline drop, likely as a response to lower demand and excess supply. However, prices did rebound nearing the end of 2020.

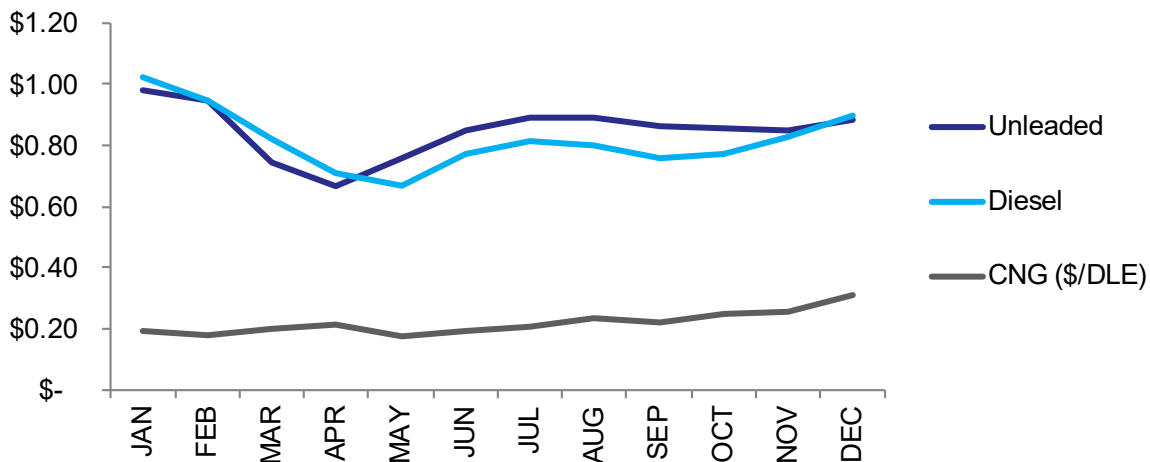
CNG usage decreased by 10% overall in 2020, with a total of 5.8 million diesel litre equivalent (DLE). The cost of CNG increased by 2% over 2019.

Figure 10: 2020 Fuel Consumption and Costs³

Fuel Type			
	Consumption Litres (DLE)	Cost	Average \$/L
Diesel	7,599,384	\$6,313,428	\$0.83
Unleaded Gasoline	2,292,783	\$1,977,370	\$0.86
CNG (DLE)	5,776,818	\$1,260,549	\$0.22
Total	15,668,985	\$9,551,347	\$0.61

Although fleet vehicles continued to be available for services throughout 2020, fuel usage overall was impacted by COVID-19, particularly during the early months of the pandemic. There were operational shifts (limited or delayed work) in several sections within Public Works that reduced fuel requirements. Transit schedules were modified reducing the number of vehicles or amounts of fueling required as the ridership needs were changed. Some departments would remain relatively stable, and by mid to late 2020, most crews and transit schedules were operating at a new “normal” level once health and safety measures were addressed.

Figure 11: Fuel Consumption and Costs 2020



CNG is a lower cost fuel for buses compared to diesel and gasoline, but they do operate at approximately 75% efficiency per DLE when compared to diesel fueled buses. However, despite a lower fuel efficiency, when converted to diesel equivalent dollars and adjusted for efficiency, Transit spent \$2.3 million less running their fleet of CNG buses than they would have only using diesel buses. In addition, the lower GHG emissions from using CNG fuel

³ Compressed natural gas converted from m³ to DLE.

versus diesel is of benefit to the City overall and positively impacts the City's GHG emissions inventory.

Corporate Average Fuel Economy (CAFE)

One of the KPI measurement targets for fleet is to achieve an improvement in fuel consumption efficiency. That is, to reduce the amount of fuel consumed in diesel litre equivalent (DLE) per 100 kilometers of distance travelled. The long-term target is to reduce the CAFE by 20% by 2030 compared to the base year of 2012. The City's goals are to improve and manage fleet efficiency by utilizing vehicles with clean drive technology, improving operator behaviors and abiding fit-for purpose vehicle principles and City idling bylaws. As of 2020, there is a 1% increase compared to the base year and a 3% increase over 2019.

Figure 12: Corporate Average Fuel Economy 2020 Comparison

Diesel Litre Equivalent (DLE) per 100 KM	BASE (2012)	Revised 2019 ⁴	2020
Unleaded Gasoline	20.7	21.8	21.5
Diesel	54.5	48.9	54.6
CNG	66.2	69.6	67.0
Total	46.2	45.2	46.7
% Change in DLE/100 KM Base Year		-2%	1%
% Change in DLE/100 KM Year to Year			3%

Data provided for the purpose of reporting on fuel analytics, such as mileage and usage for CAFE is collected by Fleet. With fueling stations throughout the City, managing the data continues to be an identified area of concern. Staff take extra time with the existing system to ensure the results are accurately interpreted. Ongoing review of available enhanced data collection systems occur. For the 2020 reporting period, a vetting process was performed to verify equipment being used in the CAFE calculation. This resulted in exclusion of some equipment (i.e. Tractors, mowers). While the equipment may consume fuels, there is no odometer readings tracked. The same process was applied to the 2019 data and the revised data was provided.

⁴ Revisions made to the 2019 calculations correct overall results from 41.6 DLE/100 KM stated in the 2019 Annual Report.

ENERGY CONSERVATION

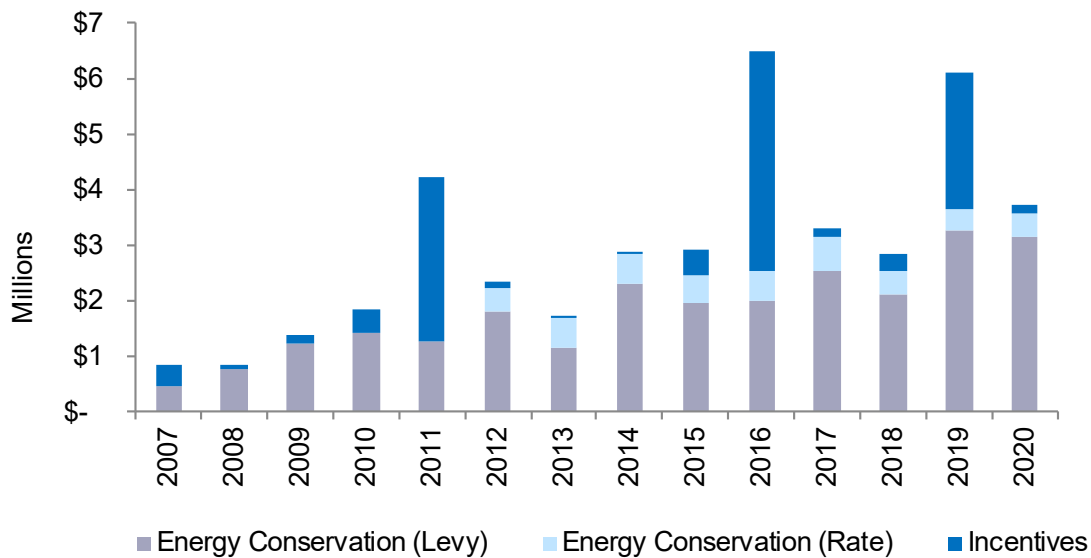
Project activities focused on energy reductions, and GHG reductions can assist in the City's long-term goal to become a sustainable and net-zero city.

One of the strategies the City uses to reduce energy and improve energy intensity is focusing attention on efficiency and conservation-based projects. Upgrades to existing corporate buildings by installing energy efficient lighting and equipment or utilizing new technologies can help to improve operational efficiencies, cost effectiveness and help meet corporate targets for energy intensity and GHG reductions.

The City's project teams work closely with consultants, engineers, utility personnel and industry experts to retrofit existing buildings, construct new buildings, and upgrade equipment and processes. In addition, securing funding and incentives for efficiency and GHG-reducing projects and the post project monitoring and verification of savings is an important process for reporting and tracking the efforts.

The City tracks the energy savings achieved from projects once they are complete. Although project activity in 2020 may have had some unexpected delays, the 2020 contribution from all annual project savings was \$3.6M. There was \$160,100 in incentives received in 2020. Cumulatively, a total result is \$41.1M since 2005 for projects and incentives.

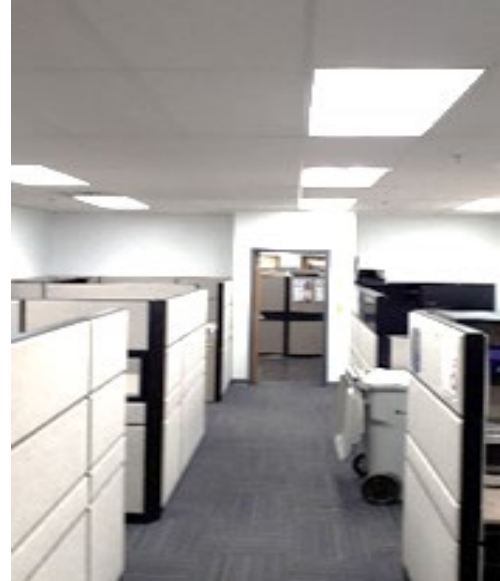
Figure 13: Annual Project Savings (Rate & Levy) and Incentives



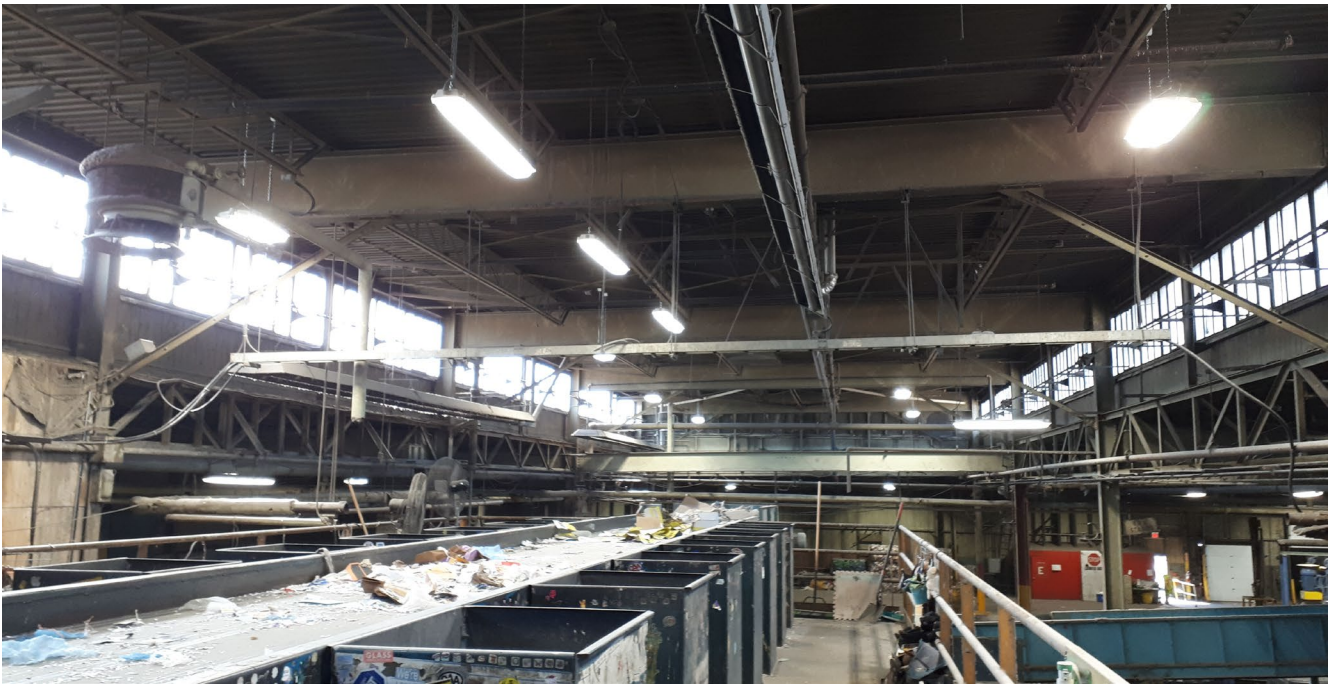
Some highlights on projects completed in 2020 are:

Wentworth Street Ops – LED Lighting Upgrade

- Retrofit of indoor light fixtures (Office space) to energy efficient LED technology;
- Benefits include improved lighting conditions, reductions in energy use and GHG emissions and a reduction in lamp maintenance costs.
- Verified annual energy savings of 36,309 kWh resulting in an estimated annual operational savings of \$5,083;
- \$3,708 in incentives from the IESO SaveOnEnergy program.



Material Recycling Facility - LED lighting Upgrade Project



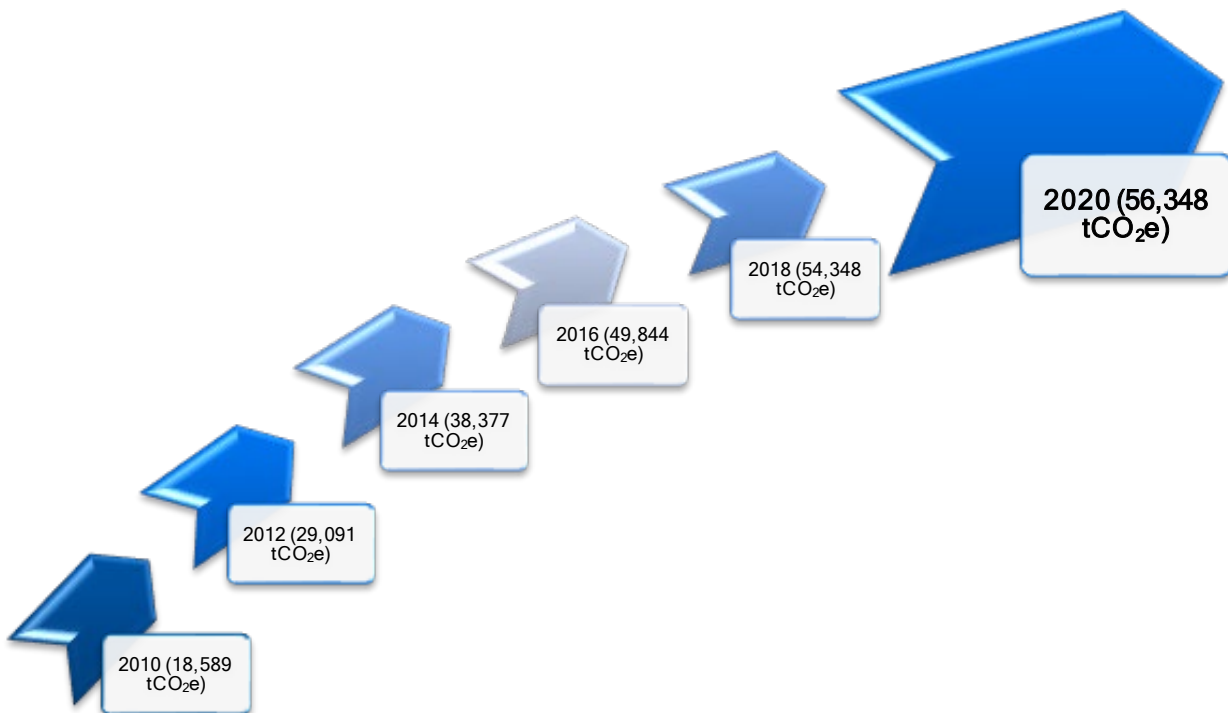
- Installation of new LED lighting & controls in the material shipping/receiving, sorting, and storage areas, offices areas, change rooms, parking lot and building exterior.
- Benefits include: much improved lighting conditions, health & safety improvements, a reduction in electrical consumption and GHG emissions & reduced maintenance costs.
- Annual Energy savings are estimated at 281,362 kWh, with annual operational savings estimated at \$39,400.
- IESO SaveOnEnergy incentives estimated at \$27,775.

Development of future projects and efficiency upgrade opportunities is an ongoing task. Looking forward, some energy-related projects in 2021 include:

- Wentworth Lodge – HVAC and BAS Upgrades
- Central Public Library and Library Branches LED Lighting Retrofit
- Central Public Library's IT Room Data Center Environmental Control Units (ECUs) Replacement
- Hamilton City Hall LED Lighting Retrofit
- BAS Controllers Upgrade at Macassa Lodge
- Air circulation and Perimeter Heating Upgrade at Wentworth Lodge
- Westmount DHW Solar Thermal & Controls.
- Arenas - Ice Plant Controls.
- Various Recreation Facilities – LED Lighting Retrofit.
- Stoney Creek Rec Centre – Heat Reclaim & Controls Project

With the global attention on climate change, greener public buildings are an expectation by staff and communities and will help move Hamilton toward meeting its strategic and corporate goals. Efficiency projects that reduce energy use also have the added benefit of reducing greenhouse gas (GHG) emissions that would have otherwise been emitted into the atmosphere. The GHG savings from projects in 2020 was 1072 tonnes (t) of CO₂e, for a cumulative GHG reduction of 56,348 tCO₂e.

Figure 14: Cumulative GHG Savings from Project Activities



RENEWABLE ENERGY



Existing renewable generation operations for the City are managed through Hamilton Renewable Power Inc. (HRPI). HRPI owns and operates three 1.6 MW biogas fueled systems. Two of the units are located at the Glanbrook landfill site. The third unit, a cogeneration site, producing electricity and heat, is located at the Hamilton Water site at Woodward Avenue.

The three units use raw biogas as a renewable fuel sources to produce electricity for the power grid through a long-term contract with the province. Using renewable fuel contributes to a more efficient and sustainable process, and further offsets GHG emissions. The systems produce 28,000,000 kWh of renewable energy annually, with a reduction of 100,000 tonnes CO_{2e}. In 2020 the net benefit from all HRPI operations was approximately \$1.2 million, with a cumulative total of \$19.9 million from 2006.

Renewable natural gas is also produced at Woodward Avenue using a Biogas Purification Unit (BPU). The BPU captures excess methane gas from the anaerobic digestion process of the waste water process. The raw biogas is purified, treated and conditioned to yield the utility grade renewable natural gas that can be injected into Enbridge Gas distribution system.

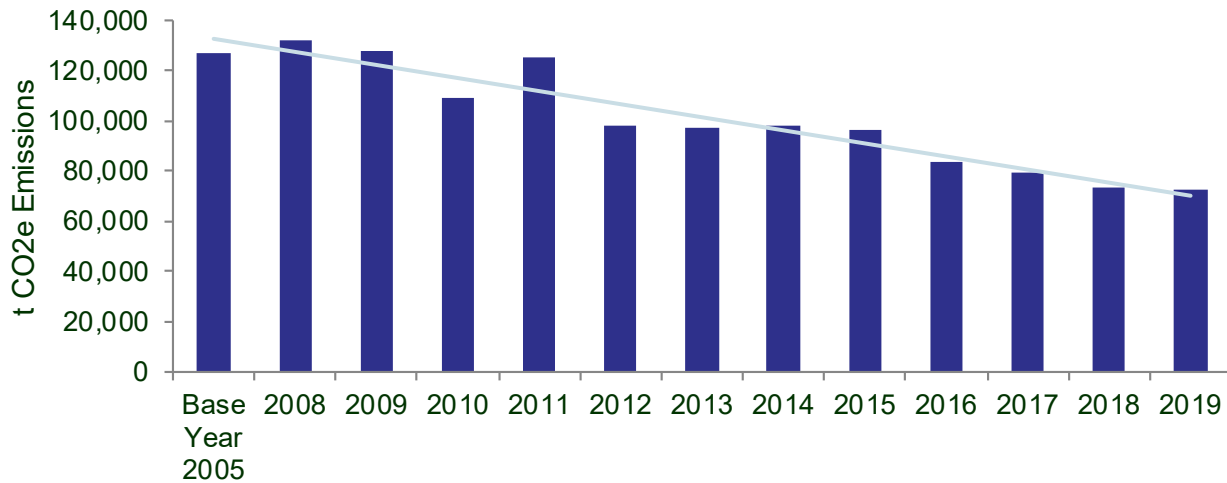


2019 CORPORATE GREENHOUSE GAS (GHG) EMISSIONS INVENTORY

GHG emissions related to corporate operations have been inventoried and reported annually since the adoption of the Corporate Air Quality and Climate Change Strategic Plan (PED06336(a)) in 2008 and the Board of Health Climate Change Actions 2012 report (BOH13024). The original targets set were for a 20% reduction by 2020 and an 80% reduction in GHG emissions by 2050 from the base year 2005. With the update to the Corporate Energy and Sustainability Policy, the long-term target was updated to net zero emissions by 2050 when compared to the base year 2005.

Reporting data for the GHG emissions inventory is one year behind the annual energy report. Therefore, the data presented here is for the 2019 calendar year, and therefore was not impacted by any usage reductions due to pandemic-related building closures, fleet reductions, or operational changes. In 2019, the GHG emissions inventory was 72,223 tonnes of CO₂e (carbon dioxide equivalent). This represents a 43% reduction from the base year and 2% reduction from 2018. The inventory does not include HRPI operations.

Figure 15: City of Hamilton Corporate GHG Emissions Annual Trends

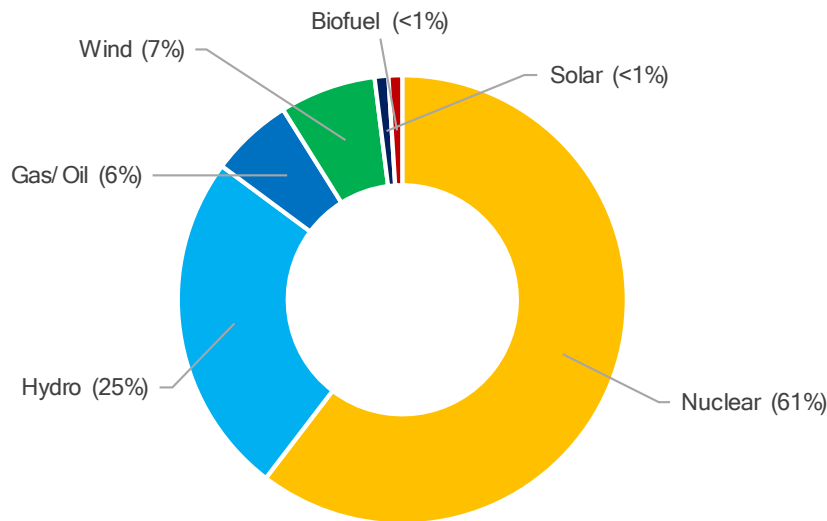


Since 2005, the inventoried emissions have been on a downward trend. Several factors have contributed to the downward trend, most notably the removal of coal-fired generation as a component of the electrical generation supply mix. The Ontario electricity emission factor, which is the measurement of the CO₂e intensity of the electricity generation, has had a significant impact on GHGs. As the Ontario electricity supply mix moves towards increasing

its cleaner power sources, the lower the City's use of electricity impacts the emissions inventory.

The diagram below shows the energy output by fuel type for 2019. This is reported by the Independent Electricity System Operator (IESO) for transmission – connected generation. It does not include embedded generation. The mix can vary annually as it depends on what fuel sources have been dispatched throughout the year. Provincial emissions factors are impacted by the generation mix.

Figure 16: 2019 Ontario Energy Output by Fuel Type⁵

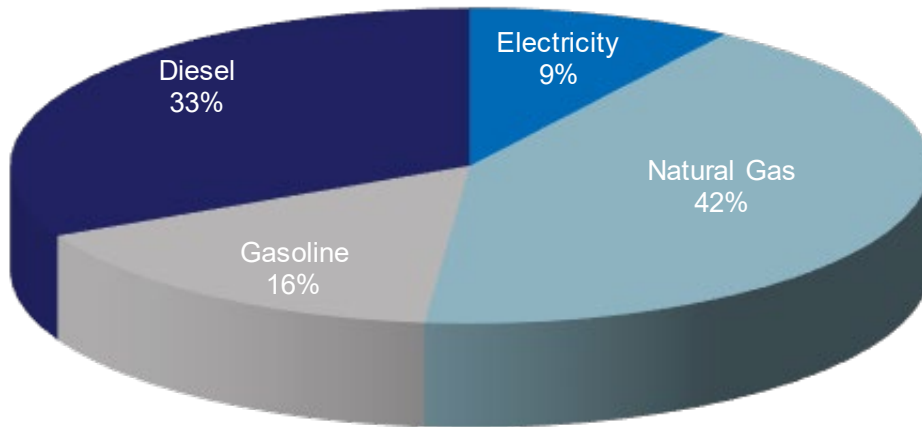


In addition to electricity emission factors, other impacts to the City's inventory include completion of energy efficiency projects, reductions in usage from operational improvements and fuel switching, such as Transit's ongoing conversion from diesel buses to CNG-powered buses. Future developments around this area, particularly electric-power transportation for City's fleet and transit vehicles should significantly impact GHG emissions for the City.

Corporately, the generation mix for the City's inventoried emissions is as follows: electricity, natural gas, diesel and gasoline. Ideally, renewable energy sources can be used to offset the higher emissions fuel sources such as diesel, gasoline and natural gas.

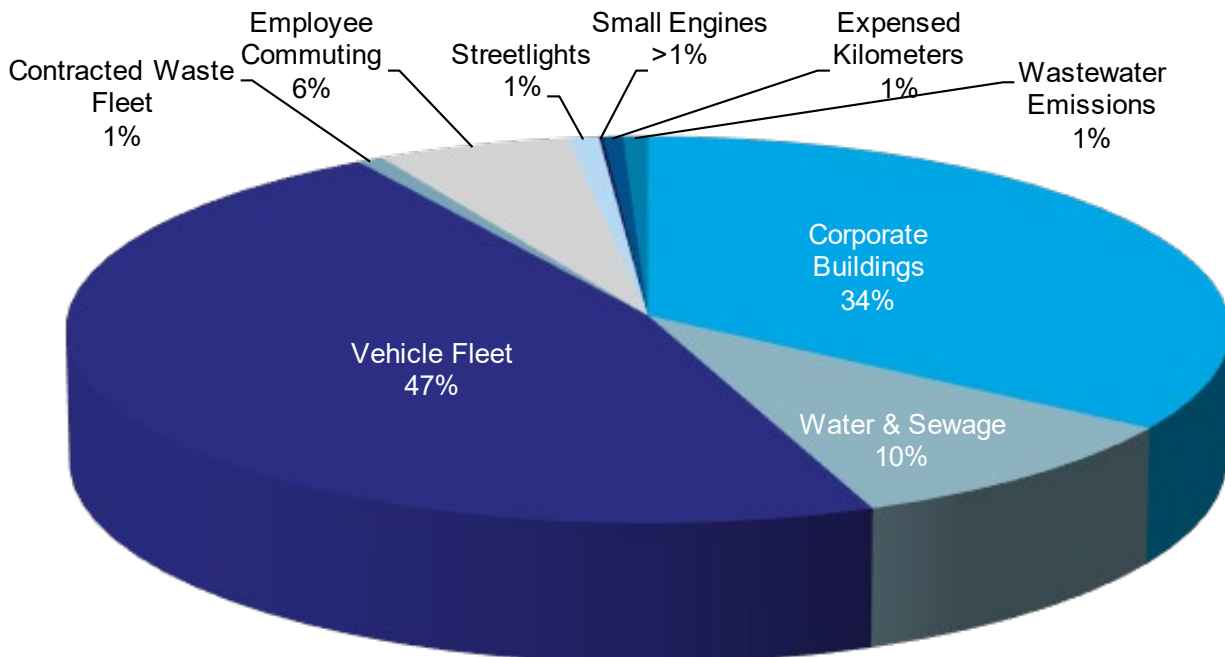
⁵ Source Data: Transmission-Connected Generation 2019 Output – (www.IESO.ca)

Figure 17: 2019 Percentage of tCO₂e Emissions by Fuel Source



The breakdown of the corporate emissions inventory for the City by sector is shown in the chart below. These include emissions from buildings, vehicles, activities and processes.

Figure 18: 2019 Percent Tonnes CO₂e of Total by Sector



Of the reported sectors the largest emitter is Vehicle Fleet. In 2019, it accounted for 47% (33,932 tCO₂e) of the total CO₂e emissions. The emissions for vehicles are calculated from diesel, gasoline and natural gas usage. This is approximately 6% less than the base year of

2005. The composition of fleet vehicles and fuel sources of vehicles have varied over the years. The number of fleet vehicles has increased. Many transit buses have been switched from diesel to compressed natural gas (CNG) which has lower emissions than diesel. In addition, year over year usage can be impacted by weather conditions. An example would be the varying demand for large winter-related vehicles (snow-removal, salters and sanders).

Corporate Buildings are the next largest emitters, with 34% (24,904 tCO₂e) of the total emissions for 2019. This amounts to 47% less than the base year. For facilities, a large part of the reduction can be attributed to efficiency projects including LED lighting installations, other equipment upgrades and operational changes. However, the electricity co-efficient changes and the inventory of corporate buildings year over year is also a contributing factor. The number of buildings can increase or decrease year over year as assets are acquired or removed and can have broader changes in usage and GHG emissions due to large scale renovation projects and program or operational changes. Unlike the measurement for intensity, the inventory includes full and part year data for corporate sites as applicable.

Water and Sewage, which includes the Woodward Water and Wastewater plant, pump stations, wells and reservoirs throughout the City make up the third largest emission sector (6,970 t CO₂e), with 10% of the total inventory for 2019. It is a 72% decrease from the base year. Process efficiencies have had a large impact on this reduction. The Water and Sewage sector is the largest user of electricity in the City.

Although GHG reductions has been a focus area for some time, it has largely been a result of energy usage reduction. However, a greater emphasis has been placed on addressing climate change and resiliency within the City, specifically as a response to the climate change emergency declared by Council in 2019. Investments in renewable energy and/or carbon offset plans, retrofit projects that reduce both usage and emissions, greener vehicles and fleet policies, concentrated operational plans and behavioral changes will be necessary to achieve the long-range targets established in the Corporate Energy & Sustainability Policy of net-zero emissions by 2050.

FINAL COMMENTS

2020 had many challenges. Working during a global pandemic is a daunting and unfamiliar task. With continual changes to health and safety guidelines in our facilities, our community and the province, most of 2020 could be classified as reactionary.

Most impressive though, is the adaptability of this City. Although staff were required to pivot away from pre-planned initiatives in order to meet the needs of staff and the community during a global crisis, the ability to continue to provide high quality public services is admirable. Many staff were re-deployed to handle directly, the impacts of COVID-19 on health safety within the community as well enhanced security and cleaning measures in our facilities.

In terms of energy usage and targets, it is difficult to quantify the impacts of COVID-19, because buildings and vehicles continued to require heating, cooling and fuel. Overall, there were reductions in usage and in costs, but some buildings or divisions were impacted more than others, as conditions evolved throughout the year. So, it is important to recognize the atypical experience in 2020.

Despite its challenges, there were still success in 2020. The Corporate Energy and Sustainability Policy was revised, and new targets were adopted. Activities around rate optimization and billing recovery continued to mitigate overall utility costs. There were efficiency projects completed and development around projects for implementation in 2021.

As we look forward, it is important to note that energy efficiency, sustainability and resiliency remains at the forefront of future development for both Corporate assets and the broader community. Across the departments, across the City, actionable plans are continuing to be put in place. Hamilton has a long-term goal to become a net-zero city by 2050. We are making progress, but we must remain focused on making sound decisions around this goal. Implementing new technology, investing in renewable energy and carbon-reducing/carbon-neutral projects and prioritizing climate action is imperative. Reporting annually on the data is intended to keep us on track and identify focus areas.

APPENDIX A

This appendix provides additional information, charts and graphs for more specific details on KPI results and impacts to various KPIs for 2020 as presented in the report.

Energy Strategies and Programs KPIs

Figure A-1: Cumulative Results of Energy Programs and Strategies KPIs (2006-2020)

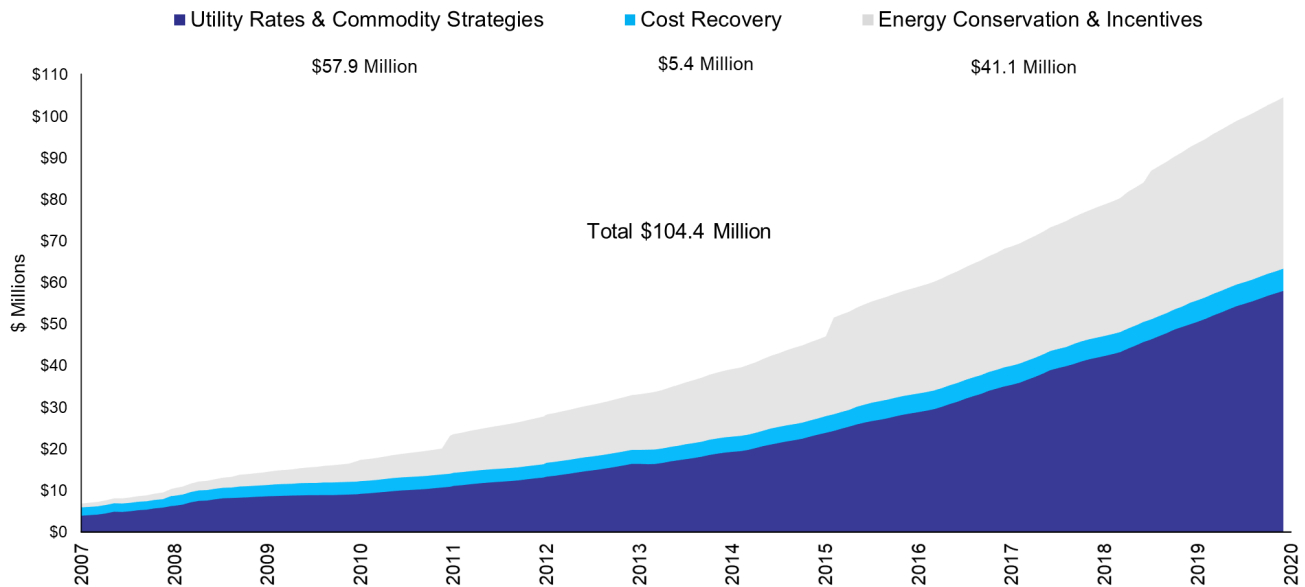


Figure A-2: Three Year Comparison of Energy Programs and Strategies

Category	Past 3 Years			2006-2020 Cumulative
	2018	2019	2020	
Levy RPP/Interval Change	\$ -	\$ -	\$ -	\$ 2,886,651
Rate RPP/Interval Change	\$ -	\$ -	\$ -	\$ 2,873,163
Levy Global Adjustment	\$ 1,953,610	\$ 1,310,581	\$ 1,687,244	\$ 10,089,899
Rate Global Adjustment	\$ 4,450,962	\$ 5,937,456	\$ 5,709,856	\$ 33,049,387
Levy Natural Gas	\$ 465,571	\$ 693,429	\$ 489,742	\$ 7,674,624
Rate Natural Gas	\$ 64,126	\$ 77,155	\$ 134,580	\$ 1,342,831
Energy Conservation Levy	\$ 2,101,419	\$ 3,246,246	\$ 3,154,851	\$ 25,083,055
Energy Conservation Rate	\$ 410,732	\$ 410,732	\$ 410,732	\$ 4,328,156
Incentives	\$ 323,354	\$ 2,447,863	\$ 160,138	\$ 11,747,541
Cash Recovery Levy	\$ 220,046	\$ 358,928	\$ 173,608	\$ 5,116,612
Cash Recovery Rate	\$ -	\$ -	\$ -	\$ 235,375
Totals	\$ 9,989,820	\$ 14,482,390	\$ 11,920,752	\$ 104,427,294

Overall Costs, Consumption and Performance - Electricity and Natural Gas

Figure A-3: Total Annual Consumption Electricity & Natural Gas (Facilities)

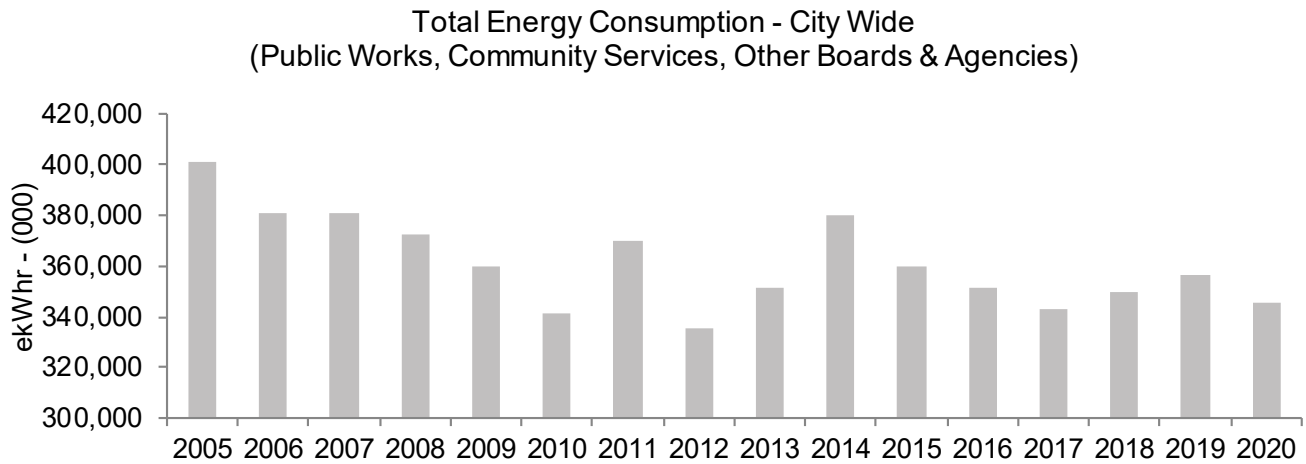


Figure A-4: Electricity Consumption Comparison by Portfolio Category

Electricity Consumption	in 000's of kWhs		
	2005	2019	2020
City/Town Halls	4,736	4,247	3,461
Corporate Facilities	4,669	5,882	5,156
Street Lighting	33,603	17,808	17,757
Traffic Lighting	5,688	2,112	1,571
Other O&M	5,248	6,003	4,396
Hamilton Water	106,561	105,871	102,880
Yards	11,982	8,846	8,459
Arenas	17,834	14,316	10,633
Community/Senior Centers	1,258	1,157	933
Rec Centres/Pools	4,124	8,057	6,800
Tim Hortons Field		5,465	3,587
Rec Parks/Stadiums/Golf	3,885	2,231	2,007
Lodges	4,673	4,970	5,089
Culture	2,254	2,054	1,546
Fire/ EMS	3,766	4,777	4,550
Libraries	7,314	8,682	7,634
First Ontario Centre	6,578	5,548	5,113
First Ontario Concert Hall	3,552	2,421	1,686
Hamilton Convention Centre	3,026	1,954	1,445
Police	5,613	4,530	4,434
Total Electrical Consumption	236,362	216,930	199,136

Figure A-5: Natural Gas Consumption by Portfolio Category

Natural Gas	in 000's of M3s		
Consumption	2005	2019	2020
City/Town Halls	847	449	393
Corporate Facilities	1,173	615	632
Street Lighting	0	0	0
Traffic Lighting	0	0	0
Other O&M	35	34	45
Hamilton Water	1,357	2,019	4,143
Yards	2,587	1,836	1,647
Arenas	2,068	2,006	1,339
Community/Senior Centers	241	236	211
Rec Centres/ Pools	2,124	2,125	1,972
Tim Hortons Field		367	296
Rec Parks/Stadiums/Golf	417	267	256
Lodges	1,899	1,043	933
Culture	293	311	176
Fire/ EMS	650	775	684
Libraries	190	294	291
First Ontario Centre	332	354	342
First Ontario Concert Hall	179	208	198
Hamilton Convention Centre	153	176	167
Police	857	364	375
Total NG Consumption	15,404	13,479	14,100

Figure A-6: Total Consumption Comparison by Portfolio Category

Total Energy Consumption	in 000's of ekWhs			Comparisons	
	2005	2019	2020	2020 vs 2005	2020 vs 2019
City/Town Halls	13,775	8,899	7,528	-45%	-15%
Corporate Facilities	17,188	12,256	11,702	-32%	-5%
Street Lighting	33,602	17,808	17,757	-47%	0%
Traffic Lighting	5,688	2,112	1,571	-72%	-26%
Other City Operations	5,618	6,355	4,866	-13%	-23%
Hamilton Water	121,040	126,788	145,802	20%	15%
Yards	39,589	27,869	25,517	-36%	-8%
Arenas	39,904	35,094	24,505	-39%	-30%
Community/Senior Centers	3,834	3,601	3,122	-19%	-13%
Rec Centres/Pools	26,789	30,073	27,230	2%	-9%
Tim Horton's Field	0	9,267	6,652	0%	-28%
Rec Parks/Stadiums/Golf	8,332	4,997	4,661	-44%	-7%
Lodges (Macassa, Wentworth)	24,938	15,774	14,756	-41%	-6%
Culture	5,383	5,278	3,368	-37%	-36%
Fire/ EMS	10,698	12,803	11,639	9%	-9%
Hamilton Public Libraries	9,343	11,726	10,654	14%	-9%
First Ontario Centre	10,122	9,214	8,654	-15%	-6%
First Ontario Concert Hall	5,466	4,571	3,735	-32%	-18%
Hamilton Convention Centre	4,656	3,780	3,175	-32%	-16%
Hamilton Police Services	14,757	8,303	8,323	-44%	0%
City Wide Total	400,722	356,568	345,215	-14%	-3%

Figure A-7: Total Annual Reported Costs Electricity & Natural Gas (Facilities)

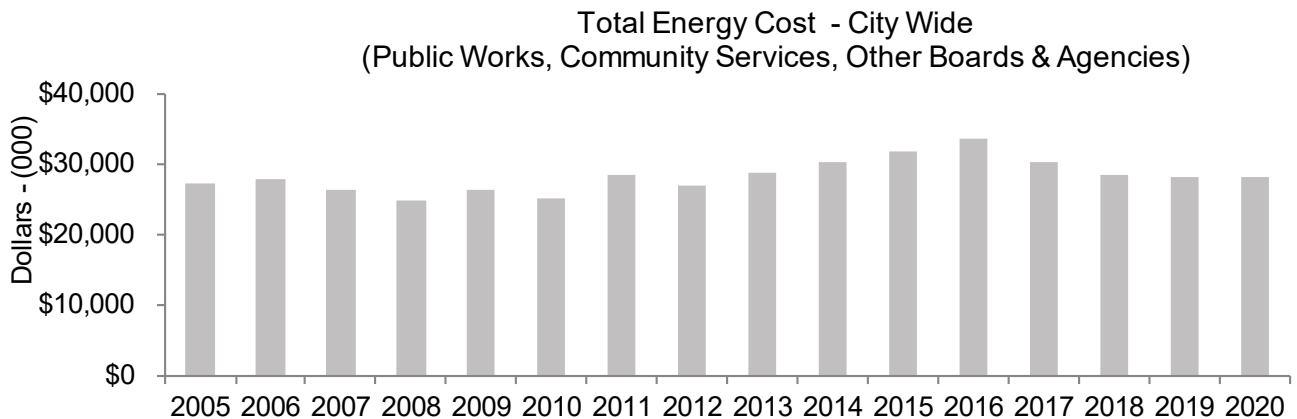
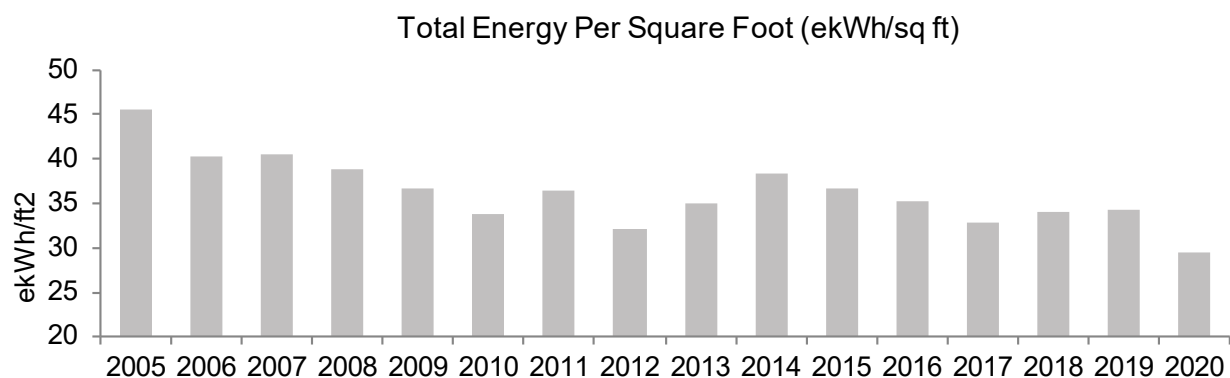


Figure A-8: Total Reported Cost Comparison by Portfolio Category

Total Energy-\$ Cost	in 000's of \$			Comparisons	
	2005	2019	2020	2020 vs 2005	2020 vs 2019
City/Town Halls	\$860	\$700	\$673	-22%	-4%
Corporate Facilities	\$866	\$980	\$940	8%	-4%
Street Lighting	\$2,895	\$3,510	\$3,504	21%	0%
Traffic Lighting	\$462	\$299	\$222	-52%	-25%
Other City Operations	\$534	\$802	\$628	18%	-22%
Hamilton Water	\$9,590	\$9,739	\$10,507	10%	8%
Yards	\$2,205	\$1,658	\$1,635	-26%	-1%
Arenas	\$2,455	\$2,682	\$2,098	-15%	-22%
Community/Senior Centers	\$224	\$241	\$212	-5%	-12%
Rec Centres/Pools	\$1,192	\$1,657	\$1,555	30%	-6%
Tim Horton's Field	\$0	\$712	\$686	0%	-4%
Rec Parks/Stadiums/Golf	\$564	\$407	\$374	-34%	-8%
Lodges (Macassa, Wentworth)	\$1,087	\$700	\$756	-30%	8%
Culture	\$338	\$268	\$218	-35%	-19%
Fire/ EMS	\$614	\$798	\$795	30%	0%
Hamilton Public Libraries	\$827	\$856	\$920	11%	8%
First Ontario Centre	\$840	\$1,087	\$1,116	33%	3%
First Ontario Concert Hall	\$454	\$296	\$285	-37%	-4%
Hamilton Convention Centre	\$387	\$257	\$254	-34%	-1%
Hamilton Police Services	\$783	\$727	\$746	-5%	3%
City Wide Total	\$27,177	\$28,376	\$28,125	3%	-1%

Figure A-9: Total Annual Energy Intensity City-wide (ekWh/sqft)

The following series of graphs represent the energy intensity results per site for 2020 within the specific portfolio categories. Sites that did not have square footage were removed but

were included in the overall consumption and costs data sets. Sites were only included if there were full data sets for the year. There is no energy intensity data for Hamilton Water and Operational (O&M) sites. Also note that the energy intensity axis value may be adjusted depending on grouping. As indicated in the body of the report, energy intensity results for 2020 could be considered anomalous due to the reductions in consumption due to operational reactions to COVID-19.

Figure A-10: 2020 Energy Intensity Corporate Facilities

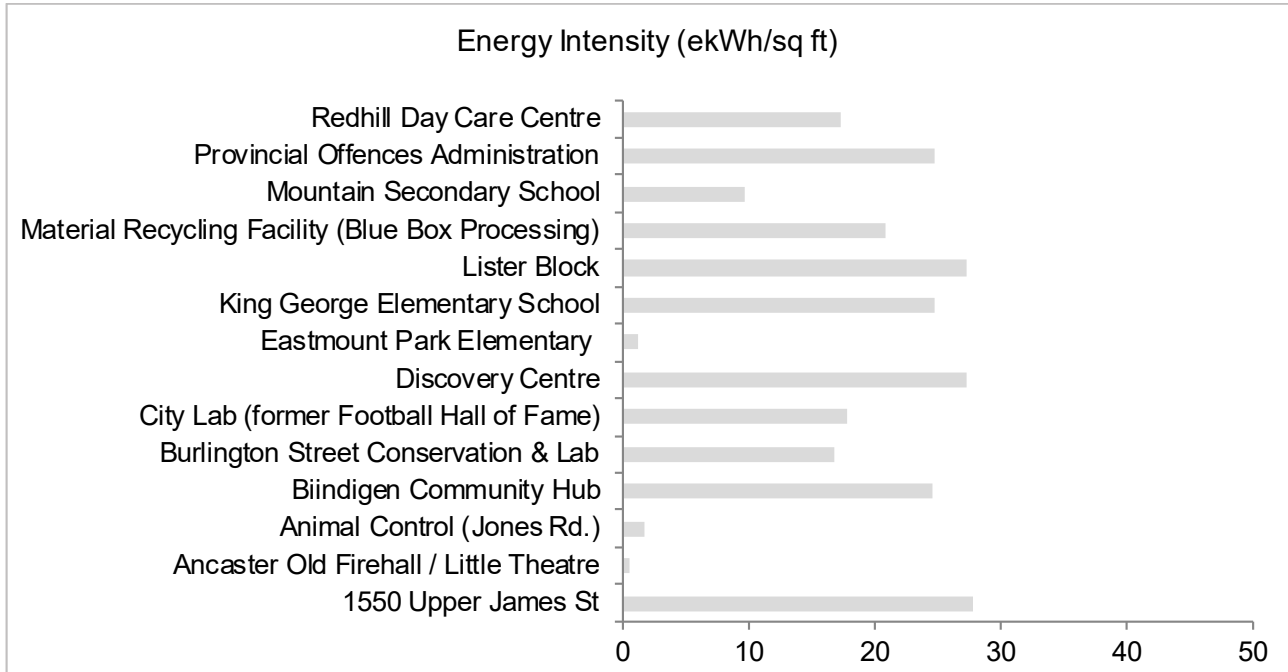


Figure A-11: 2020 Energy Intensity City & Town Hall Facilities

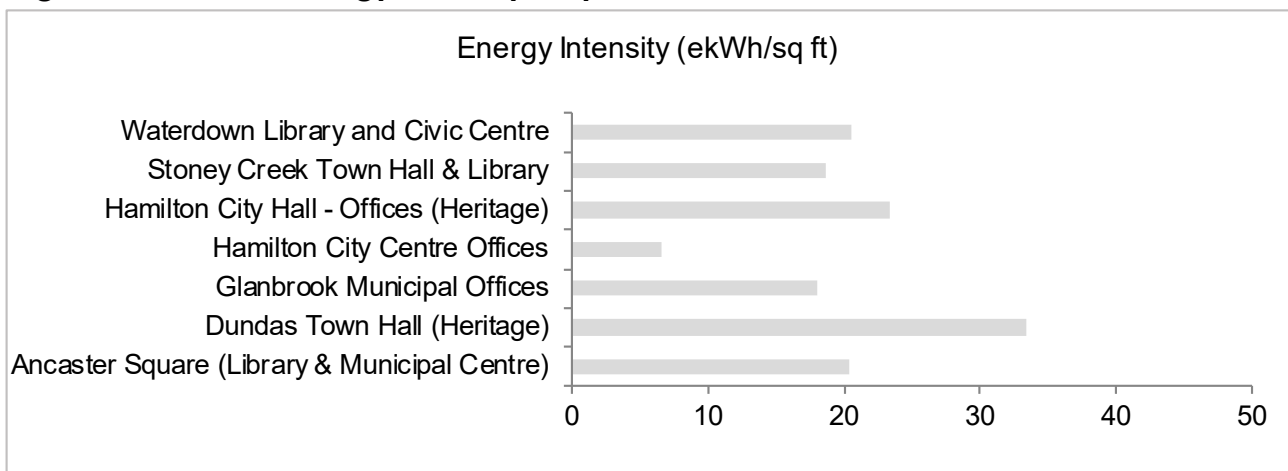
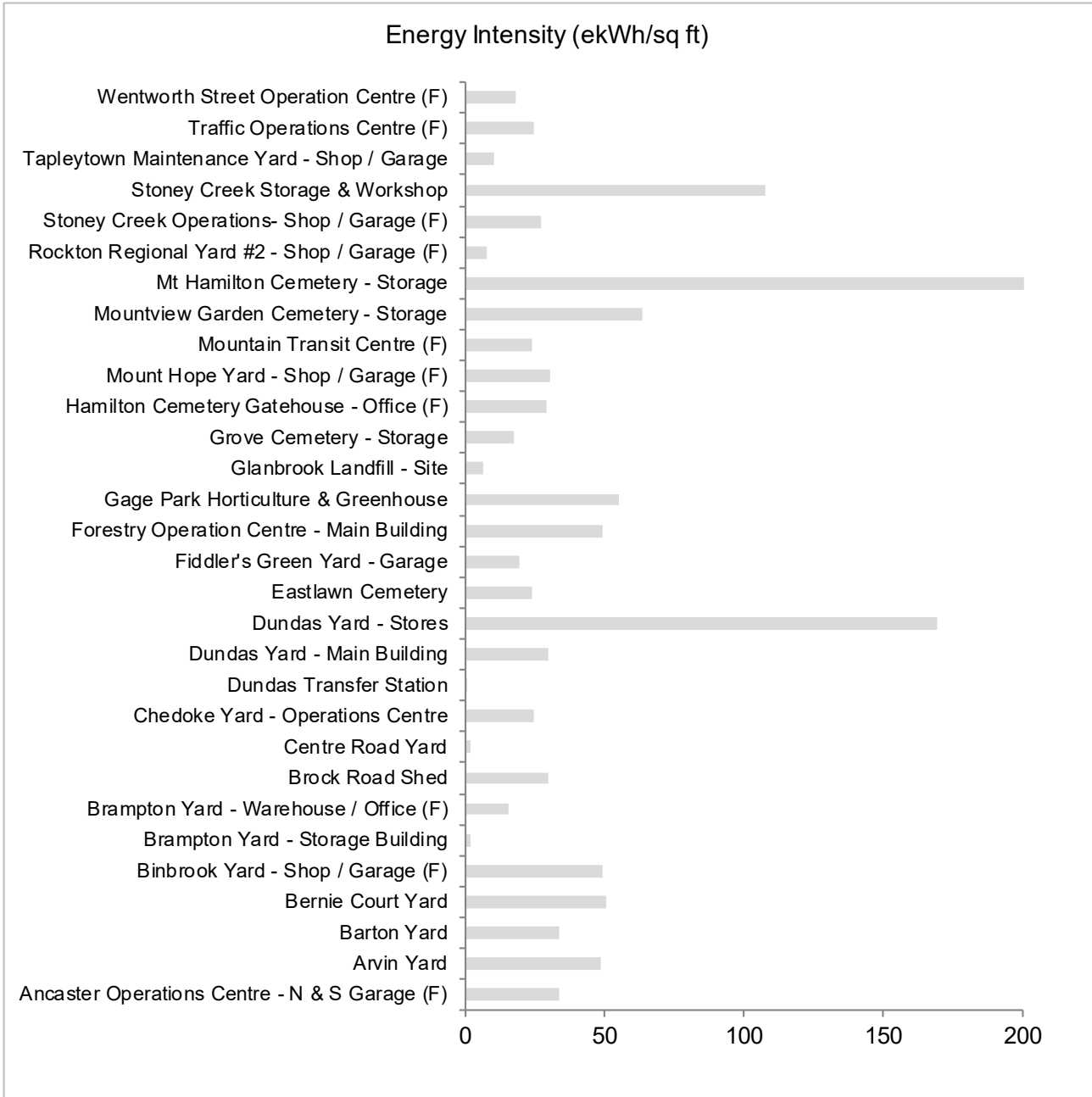


Figure A-12: 2020 Energy Intensity Yards Facilities⁶



⁶ (F) = Fueling site located on the yard premise.

Figure A-13: 2020 Energy Intensity Community Centre Facilities

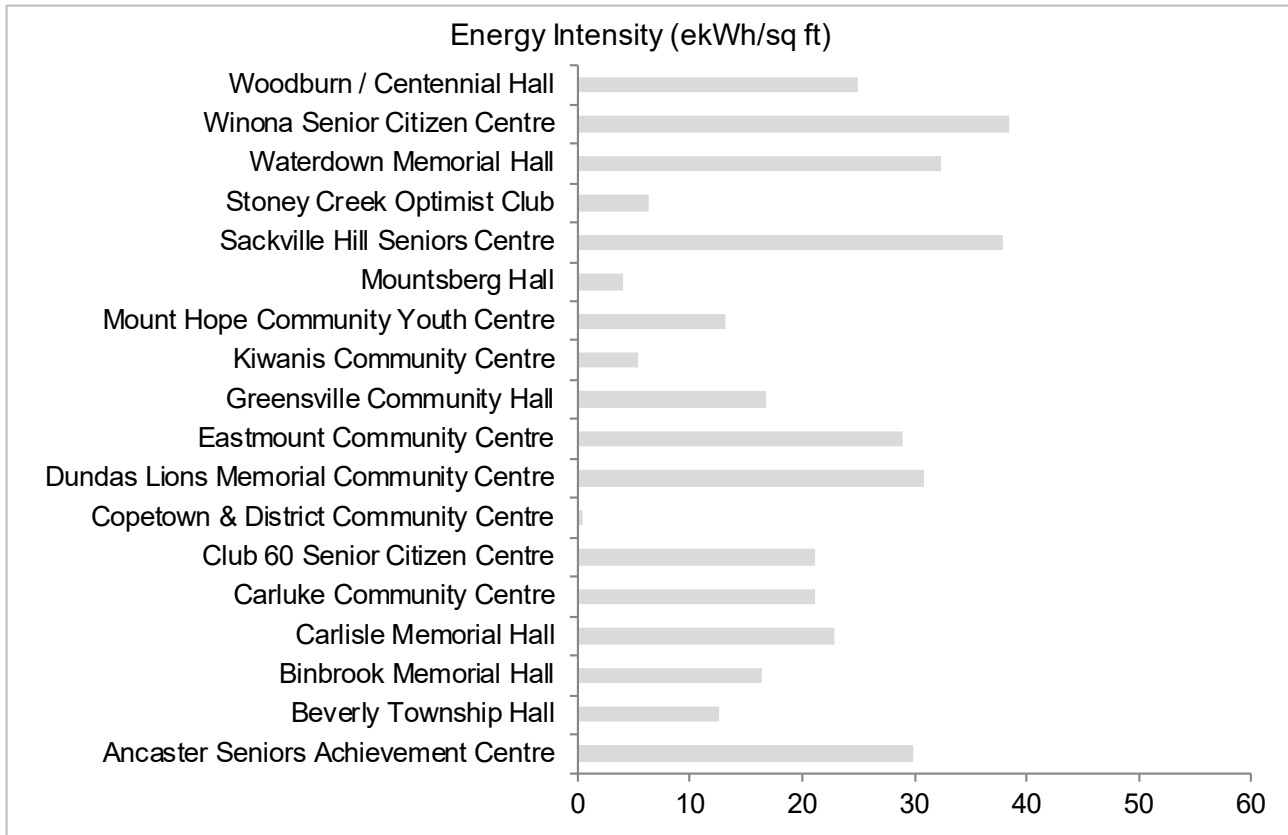


Figure A-14: 2020 Energy Intensity Culture and Museum Facilities

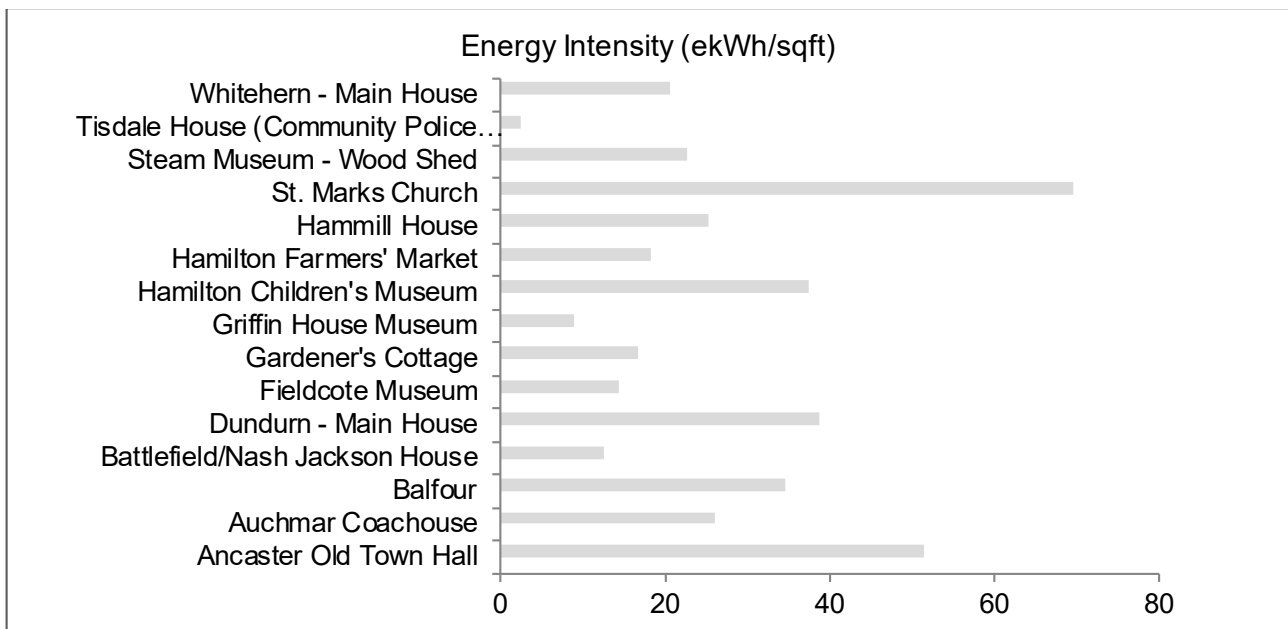
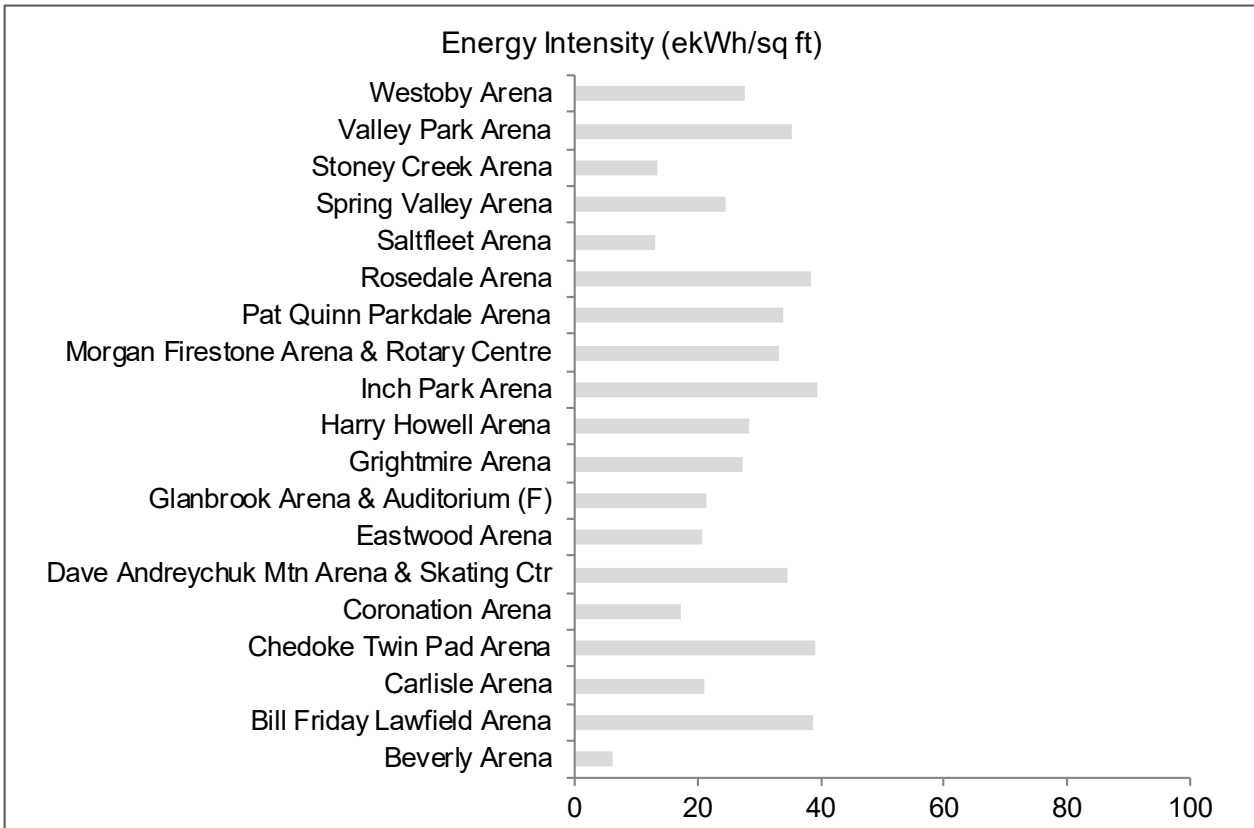


Figure A-15: 2020 Energy Intensity Arena Facilities⁷



⁷ Valley Park Arena normally includes usage and area from arena, aquatic centre and community centre sections of the building. Only included Arena square footage here for 2020 as other portions were under construction.

Figure A-16: 2020 Energy Intensity Recreation Centres and Pool Facilities⁸

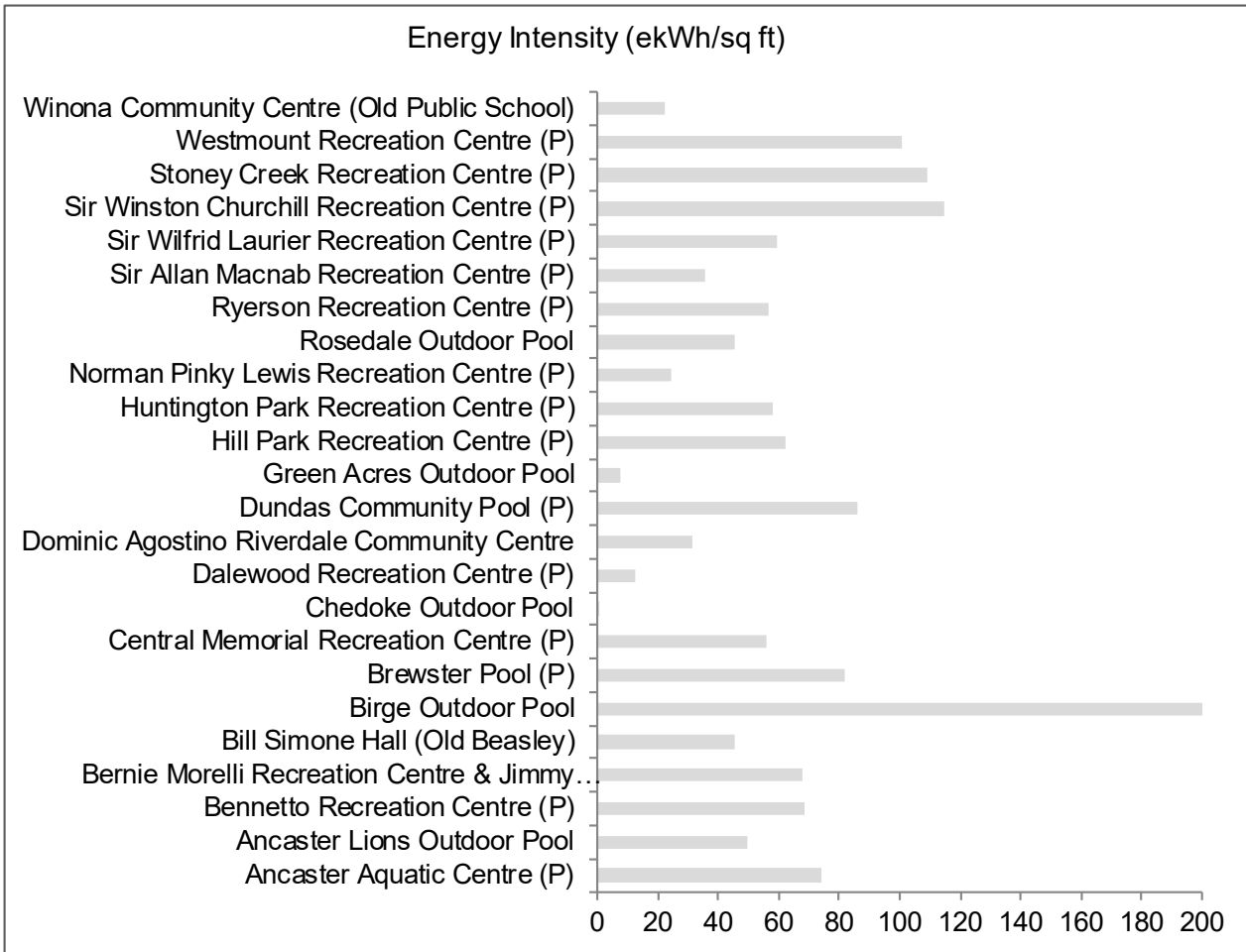
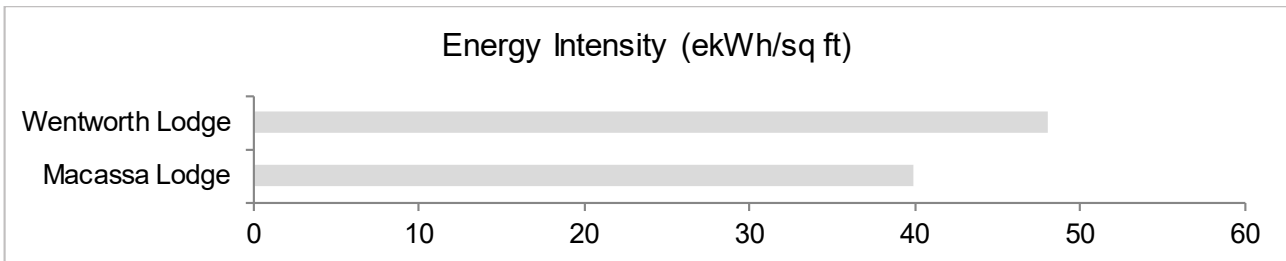


Figure A-17: 2020 Energy Intensity Lodges



⁸ (P) = Pool on site premise.

Figure A-18: 2020 Energy Intensity Stadium, Golf Courses and Recreation Parks Facilities

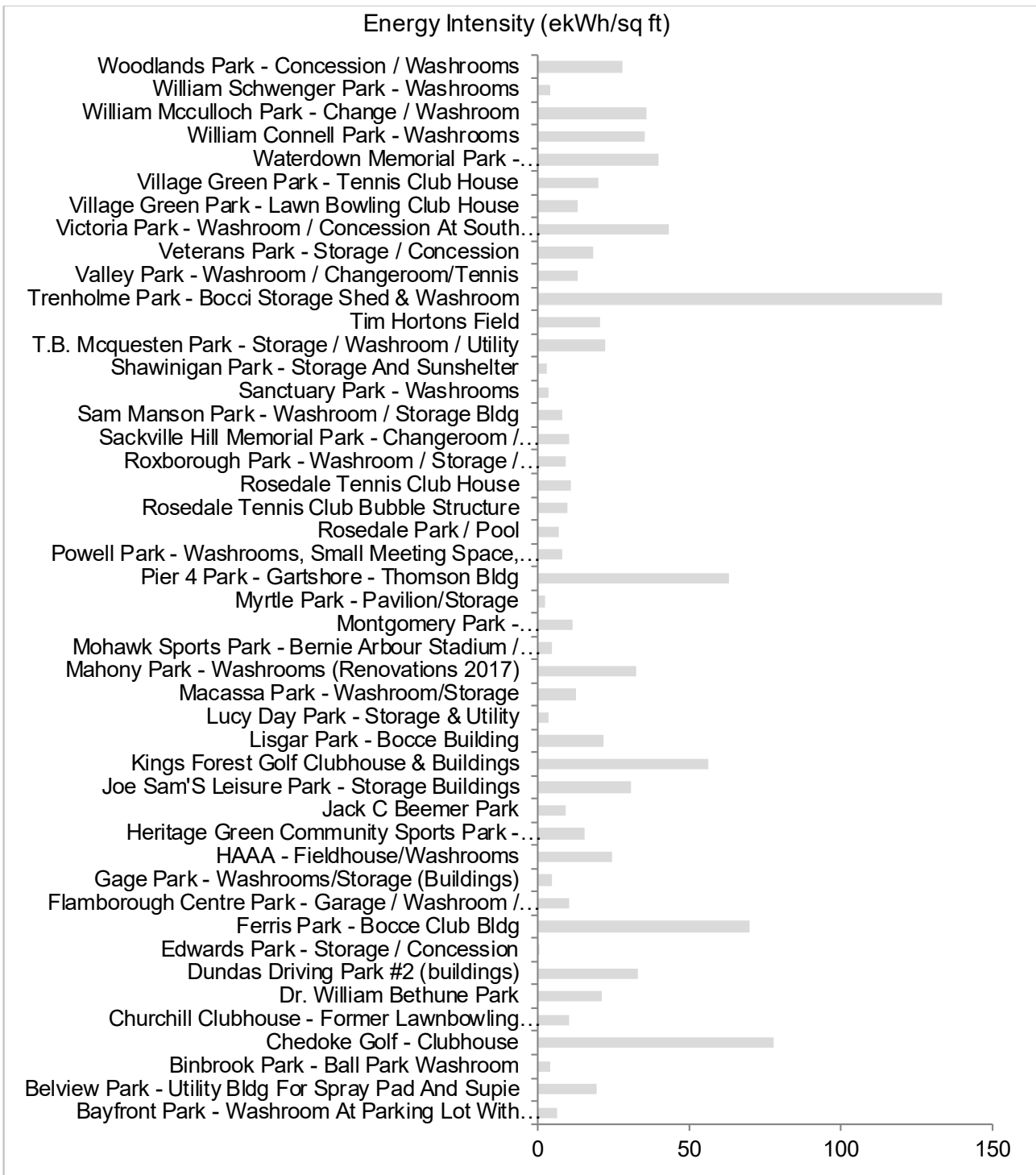


Figure A-19: 2020 Energy Intensity Fire and EMS Facilities

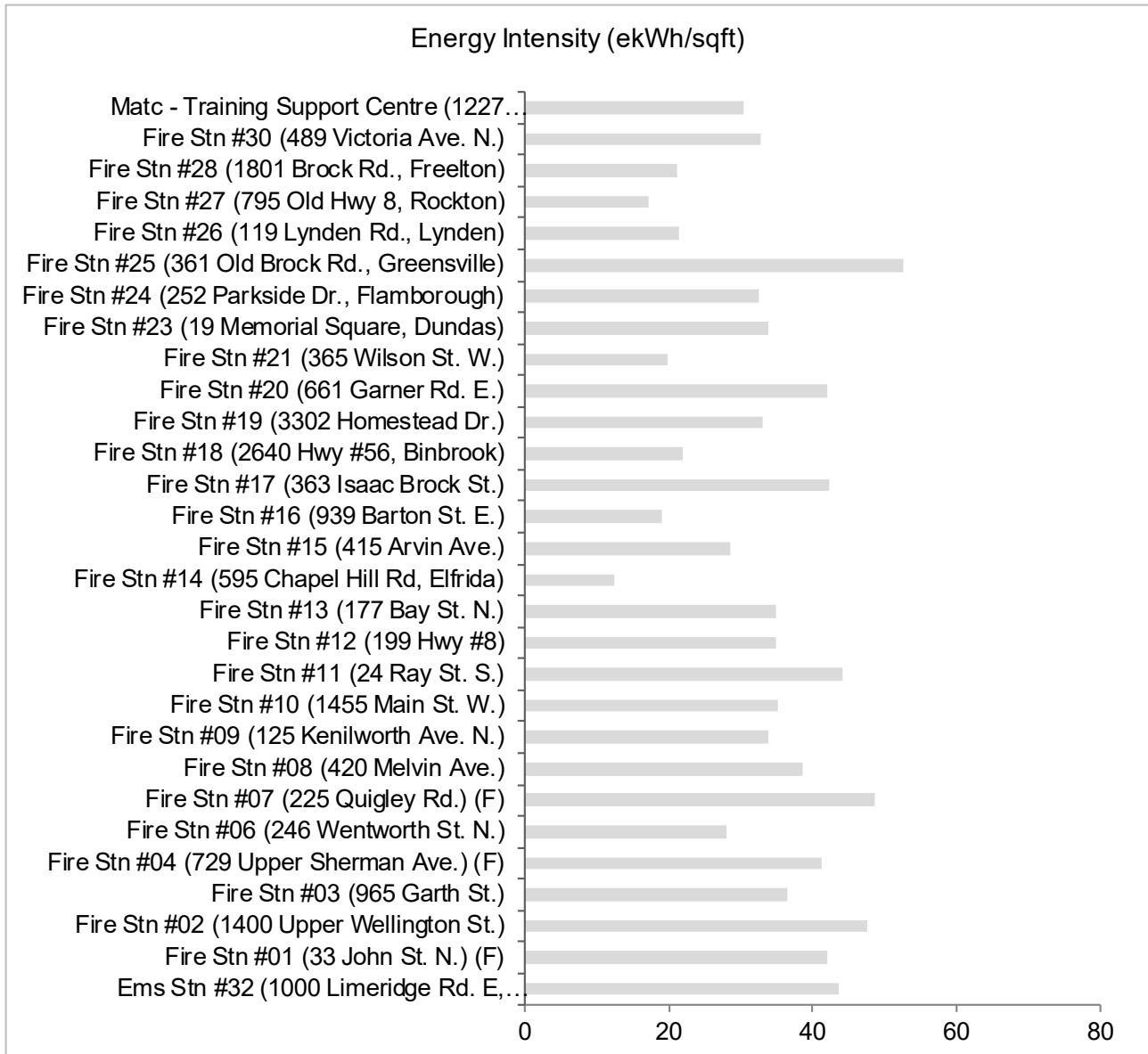


Figure A-20: Energy Intensity Police Facilities

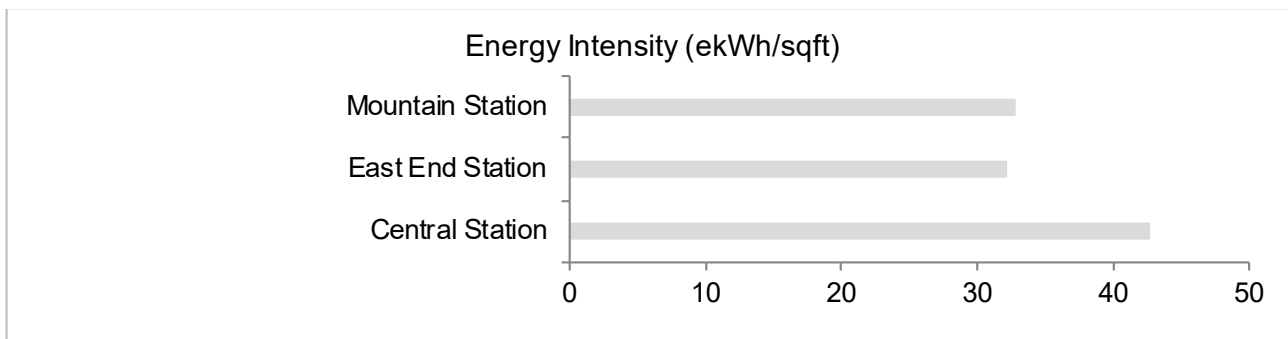


Figure A-21: 2020 Energy Intensity Libraries Facilities⁹

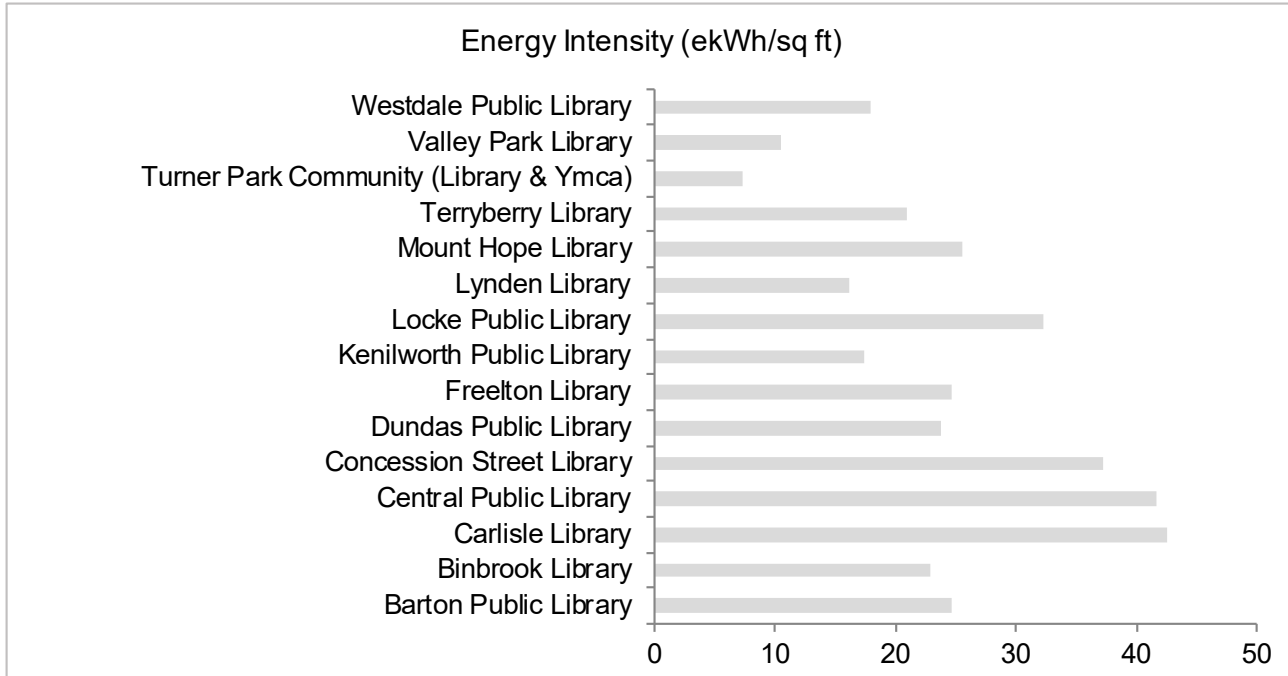
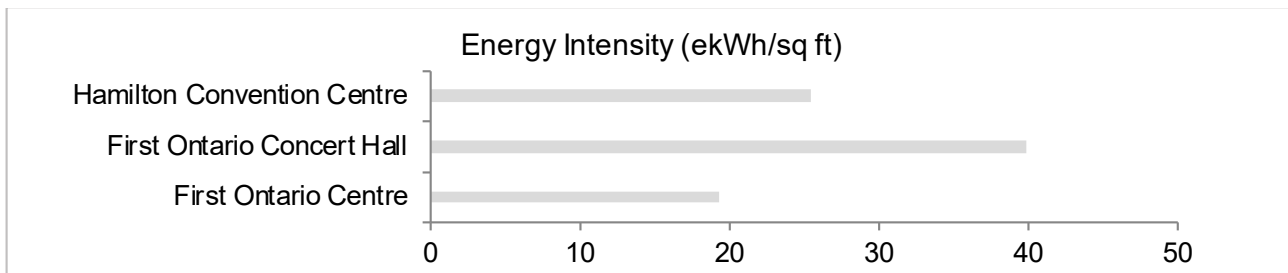


Figure A-22: 2020 Energy Intensity Entertainment Facilities



Weather Data

Weather and temperatures can impact energy consumption for electricity, natural gas and fuel. Referencing cooling degree days (CDD) and heating degree days (HDD) can help identify one reason why consumption could be higher or lower year over year. CDD is a measure of how much (in degrees) and for how long, the outside air temperature was higher than a specific base temperature. HDD is a measure of how much and for how long the outside temperature was lower than a specific base temperature. The base temperature for this reporting is 18 degrees Celsius and is sourced from Environment Canada.

⁹ Bookmobiles included in library facility usage and cost reporting, but not included in Energy Intensity calculation.

Ancaster Square, Stoney Creek Town Hall & Library, Waterdown Library and Civic Centre included in City and Town Hall reporting category (shared utility meters).

Figure A-23: Weather Data for Hamilton (Environment Canada - Station YHM)¹⁰

Month	Mean Temp (°C)	HDD	CDD	2020 vs 2019 HDD	2020 vs 2019 CDD
Jan-20	-1.6	606.1	0	-19%	0%
Feb-20	-4.2	444.7	0	-29%	0%
Mar-20	2.4	469.2	0	-19%	0%
Apr-20	5.3	382.5	0	6%	0%
May-20	11.5	223.4	22.9	15%	76%
Jun-20	19.2	30.7	67	-17%	140%
Jul-20	23.5	0	171.4	-100%	38%
Aug-20	20.5	3.5	79.5	-54%	20%
Sep-20	16	76.4	19.4	67%	15%
Oct-20	8.9	283.5	0	17%	0%
Nov-20	6.2	353.2	0	-33%	0%
Dec-20	-0.5	572.8	0	-4%	0%
2020 Annual Total		3446	360.2	-13%	43%

Figure A-24: 2020 Comparison to 5 Year Average HDD & CDD

Month	HDD		CDD	
	HDD 5 Year Average	2020 vs 5 Year Average	CDD 5 Year Average	2020 vs 5 Year Average
JAN	684	-11%	0	0%
FEB	549	-19%	0	0%
MAR	538	-13%	0	0%
APR	379	1%	0	0%
MAY	173	29%	19	20%
JUN	34	-10%	48	40%
JUL	1	-100%	124	38%
AUG	8	-54%	90	-12%
SEP	59	29%	37	-48%
OCT	241	17%	4	-100%
NOV	435	-19%	0	0%
DEC	614	-7%	0	0%
Average	3715	-7%	323	12%

¹⁰ Source for weather data for HDD and CDD:
https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Figure A-25: Heating Degree Days (HDD)

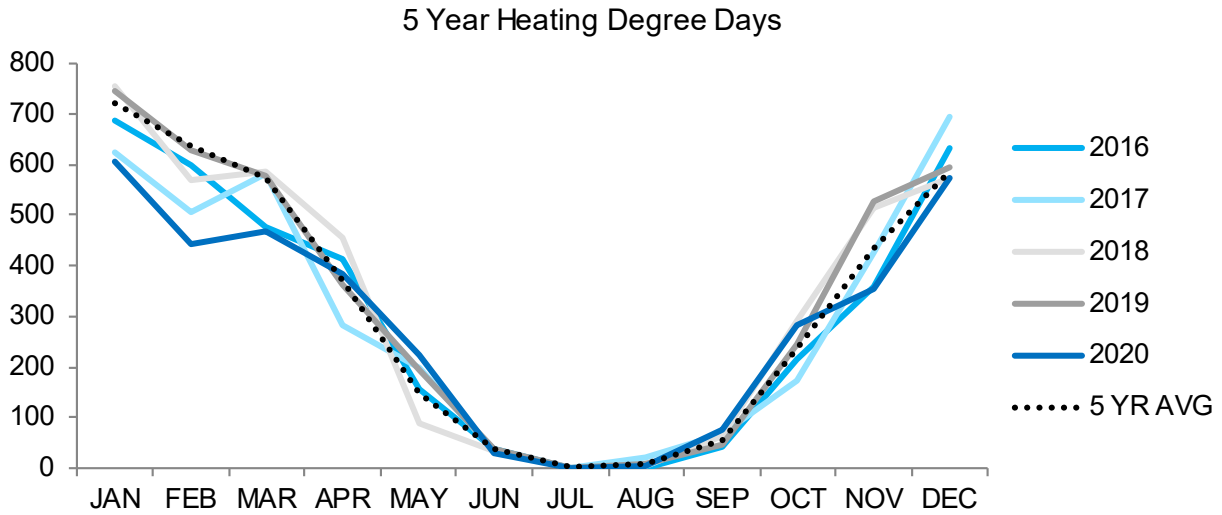
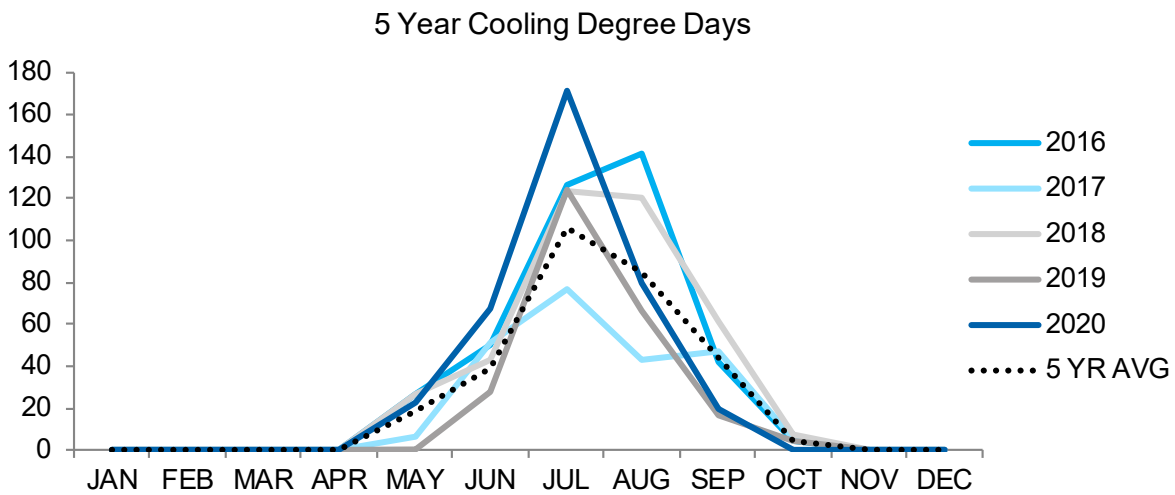


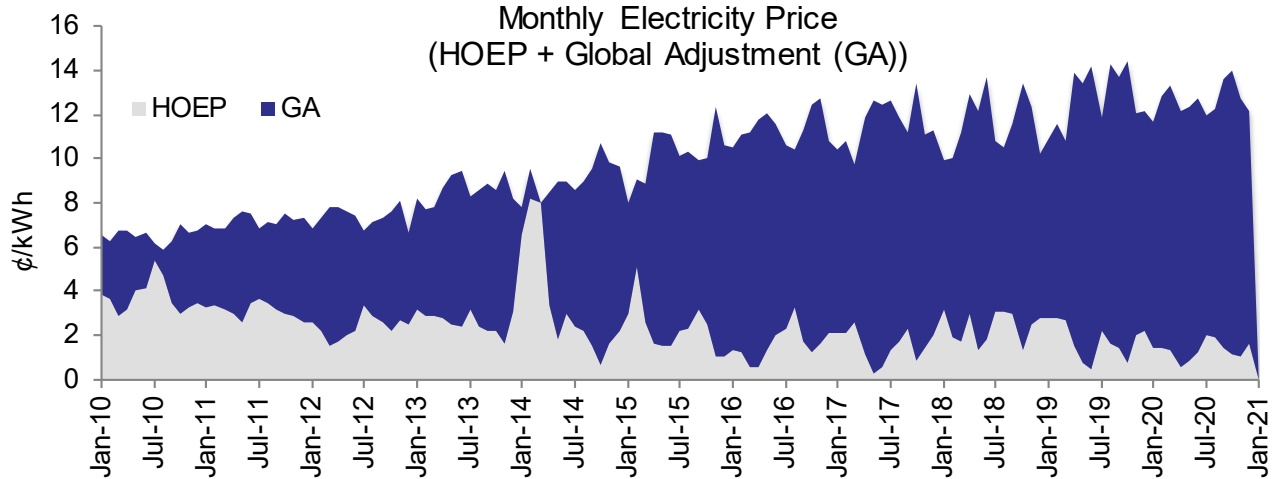
Figure A-26: Cooling Degree Days (CDD)



Electricity and Global Adjustment

Electricity commodity in Ontario comprises two components; the Hourly Ontario Energy Price (HOEP) and the Global Adjustment (GA).

Figure A-27: Monthly Electricity Commodity Prices (2015-2020)



For the Global Adjustment, consumers are divided into two rate classes. Most commercial consumers are Class B. Class B consumers pay the regulated GA rate set monthly. Eligible, high demand consumers can opt for a Class A rate. The Class A rate consumers pay their GA rate based on a percentage contribution to the total provincial monthly GA costs, calculated during a peak setting period. The benefit to a Class A consumer is that they can impact their costs by reducing demand during peak periods. The City tracks these benefits and they are included in this report in the Energy Strategies and Programs under “Utility Rate and Commodity Strategies”. The City has the following Class A sites: 900 Woodward Ave., 850 Greenhill Ave., 78 Kenilworth Ave., FirstOntario Centre¹¹, 1579 Burlington Street (Materials Recycling Facility)¹² the CUP Operations, and Tim Horton’s Field.

In 2020, as provincial demand fell, and global adjustments rose, there was government intervention to cap the price of the GA final rate at \$115 per MWh for April – June period. Some Class A customers continued to benefit under the Class A rate, whereas others were impacted by reduced demand. Overall, however – the City has continued to benefit from rate optimization.

¹¹ First Ontario Centre removed from Class A rate as of July 1, 2020.

¹² 1579 Burlington Street re-added to Class A rate as of July 1, 2020.

Figure A-28: Cumulative Class A Global Adjustment Results

Year	Global Adjustment Cost Benefit
2011	\$1,061,230
2012	\$1,511,939
2013	\$2,598,221
2014	\$2,348,577
2015	\$3,911,299
2016	\$4,682,209
2017	\$5,976,102
2018	\$6,404,572
2019	\$7,248,037
2020	\$7,397,100
CUMULATIVE	\$43,139,287

Figure A-29: 2020 Class A Global Adjustment Results by Month

2020	Standard Global Adjustment Charge	Actual Global Adjustment Charge	Cost Benefit
Jan	\$935,227	\$335,357	\$599,871
Feb	\$984,853	\$344,089	\$640,765
Mar	\$1,079,379	\$353,721	\$725,659
Apr	\$964,041	\$296,584	\$667,457
May	\$1,015,041	\$306,282	\$708,759
Jun	\$1,028,824	\$347,649	\$681,176
Jul	\$949,817	\$473,675	\$476,142
Aug	\$978,477	\$433,919	\$544,558
Sep	\$1,020,744	\$408,259	\$612,485
Oct	\$1,077,135	\$439,342	\$637,794
Nov	\$982,778	\$414,607	\$568,171
Dec	\$966,073	\$431,808	\$534,265
Total	\$11,982,391	\$4,585,291	\$7,397,100

Peak Days

The GA charges for Class A are calculated based on a percentage of demand during the peak setting period. The peak setting period runs from May to April annually, and the top 5 demand hours are used to calculate each Class A site's demand factor, which is used to calculate the GA charges each month. The GA term begins July 1 annually. Public Works personnel work collaboratively to manage peak events and reduce demand during these periods. The Office of Energy Initiatives (OEI) use tools to predict peaks and notify key

frontline staff. Staff, such as operators in Hamilton Water and Corporate Facilities may shift processes to off peak times and/or minimize usage during a potential peak event.

Figure A-30: Top 10 Ontario Verified Peak Demand Days (May 1, 2020-April 30,2021)¹³

Rank	Date	Hour Ending	Ontario Demand (MW)*	AQEW (MW)	AQEW Status
1	09-Jul-20	17	24,446	23,936	Final
2	07-Jul-20	17	24,281	23,558	Final
3	08-Jul-20	18	24,050	23,240	Final
4	27-Jul-20	17	23,910	23,319	Final
5	10-Aug-20	18	23,823	23,077	Final
6	10-Jul-20	13	23,791	23,198	Final
7	24-Aug-20	17	23,415	22,767	Final
8	06-Jul-20	17	23,191	22,614	Final
9	26-Jul-20	18	22,887	22,098	Final
10	03-Jul-20	18	22,522	21,901	Final

Fuels

The following chart breaks down the fuel usage by user group. For further clarification:

1. Transit includes Transit Operations, Route Planning and Transit Yard Support;
2. Operations includes Waste Management (non-contracted), Landfill, Roads and Support Services; and
3. "Other" includes Public Health, Recreation, Tourism, Library, Bi-Law Services, Clerks, Information Services and Fire and EMS.

Figure A-31: 2020 Fuel Usage by User Group

Group	Diesel Litres	Unleaded Litres	CNG DLE	Total (DLE)
Energy, Fleet & Facilities	8,464	72,723		81,187
Engineering Services	0	39,138		39,138
Environmental Services	1,043,425	346,788		1,390,213
Hamilton Water	155,231	202,648		357,879
Operations	1,065,372	437,200		1,502,573
Transportation	91,167	42,483		133,651
Other	299,031	1,089,272		1,388,302
Transit	4,936,693	62,532	5,776,818	10,776,043
Totals	7,599,384	2,292,783	5,776,818	15,668,985

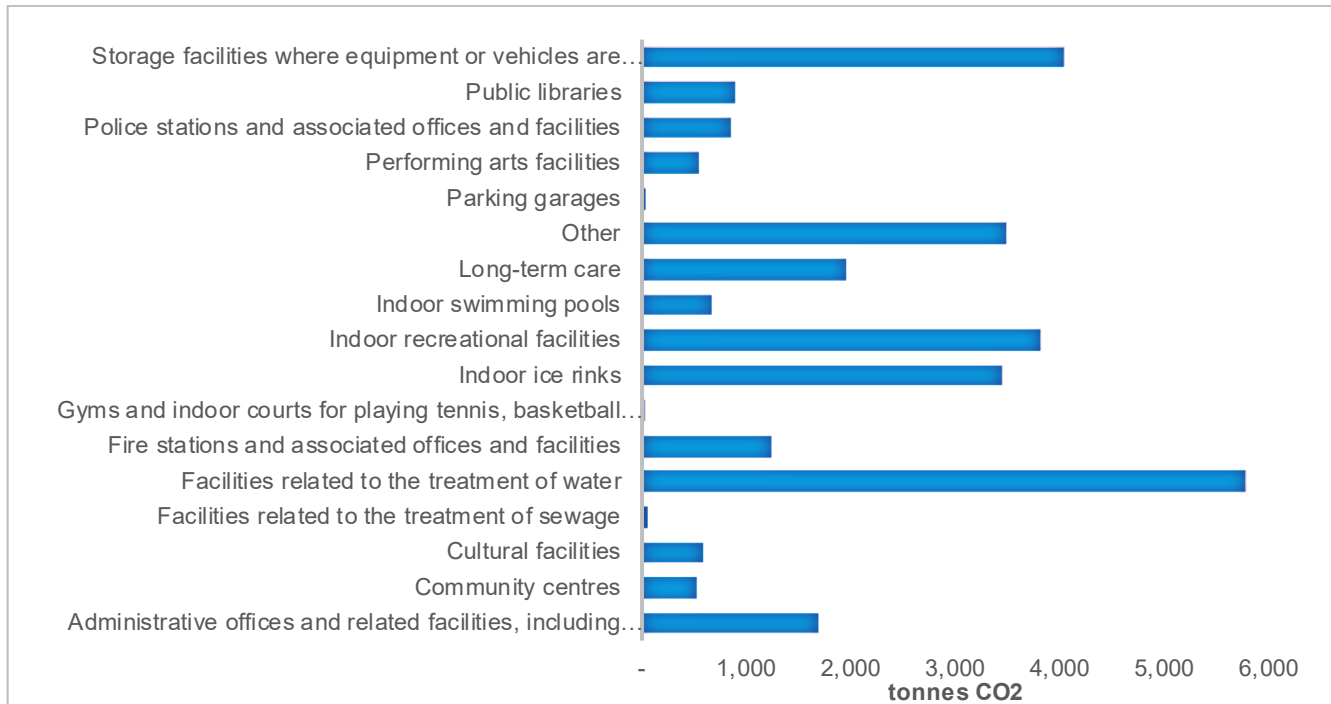
¹³ Source Data: <https://ieso.ca/en/Sector-Participants/Settlements/Peak-Tracker>

*Broader Public Sector Reporting (BPS)*¹⁴

The City submits the annual reporting data for GHG emissions as part of the adherence to Ontario Regulation 507/18. Annual reporting will continue as required.

The latest submission, October 2020 was for the calendar year 2018. According to the reporting formula City-owned corporate facilities (building only) were responsible for emitting 29,542 tonnes of CO₂e. The categories for this reporting requirement are pre-set and do vary from the City's internal reporting and are limited to buildings only. However, they do continue to represent corporately-owned assets only. In addition to reporting on an annual basis, the City is also required to submit a five-year Conservation and Demand Management (CDM) Plan, submitted in July 2019. Both the annual data submission and the CDM Plan are found on the City website: <https://www.hamilton.ca/office-energy-initiatives>.

Figure A-32: 2018 GHG Emissions Results (O.REG 507/18)



¹⁴ Broader Public Sector Report is a pre-templated platform where specific data is required to be reported as per provincial O.Reg 507/18. Next submission for year 2019 is July 2021.

GLOSSARY

Common Acronyms Used Throughout the Report

BPS = Broader Public Sector

CAFE = Corporate Average Fuel Economy

CDD = Cooling Degree Days

CDM – Conservation and Demand Management

CEP = Corporate Energy Policy

CNG = Compressed Natural Gas

CO₂ = Carbon Dioxide

CO_{2e} = Carbon Dioxide equivalent

DLE = Diesel Litre Equivalent

ekWh = equivalent kilowatt hours

GA = Global Adjustment

GHG = Greenhouse Gas

GJ = Gigajoule

HDD = Heating Degree Days

HOEP = Hourly Ontario Electricity Price

HRPI = Hamilton Renewable Power Inc.

IESO = Independent Electricity System Operator

KPI = Key Performance Indicator

kW = Kilowatt

kWh = Kilowatt-hour

LED = Light Emitting Diode

m³ = Cubic Metres

OEB = Ontario Energy Board

tCO_{2e} = Tonnes Carbon Dioxide equivalent

Definitions: Common Concepts Used Throughout the Report

Avoided Cost/Cost Avoidance refers to the costs not incurred as a result of some action taken which is outside of status quo.

Commodity Hedging is the process of fixing prices for specific terms for natural gas, fuels or electricity (commodities).

Corporate Energy & Sustainability Policy is the revised and renamed corporate policy (previously the Corporate Energy Policy) governing energy-related decisions for corporately run assets.

Cost Recovery is the value collected by identifying billing errors, billing anomalies or rates corrections that result in a financial adjustment to costs.

Energy Conservation is the collection of energy efficient measures, equipment or processes that lead to lower consumption.

Energy Intensity is the measurement of energy used per square foot of facility space.

Energy Performance is the collection of performance measurements including consumption, cost and energy intensity as compared against baseline and year over year.

Incentives are monies received from a recognized program including from utility providers, the IESO, Federal or Provincial grant programs where incentives are tied to energy conservation measures.

Net Zero means achieving overall, zero greenhouse gas emissions by balancing any emissions from energy use with carbon removal via a combination of reducing usage, changing to low or zero energy sources (i.e. renewable energy sources) changing processes and carbon offsetting.

Rate Optimization refers to ensuring that utility accounts are assigned to the appropriate rate class to result in best cost benefit.

Unit Cost is the total price of variable and fixed costs per unit. In this report it refers to unit costs of electricity, natural gas and fuels.

Utility Rates refers to the rate classes identified by utility providers.



Prepared by:

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Month, 2021