



CITY OF POWELL RIVER

2017 Corporate Greenhouse Gas Emissions Inventory

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Report Highlights

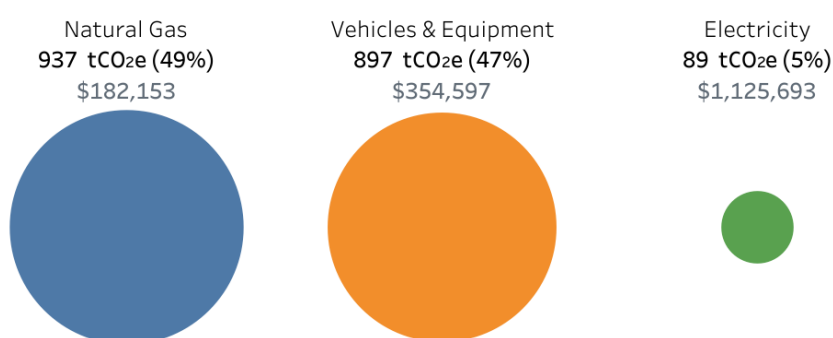
Total emissions from all City operated buildings, fleet, and equipment in 2017:

1,923 tonnes

Total cost of carbon-emitting activities (electricity, natural gas, and fuel):

\$1,662,442

Total corporate emissions by activity (tonnes of CO₂e, costs of electricity, fuels, and natural gas):



Total corporate emissions and costs by building and fleet category:

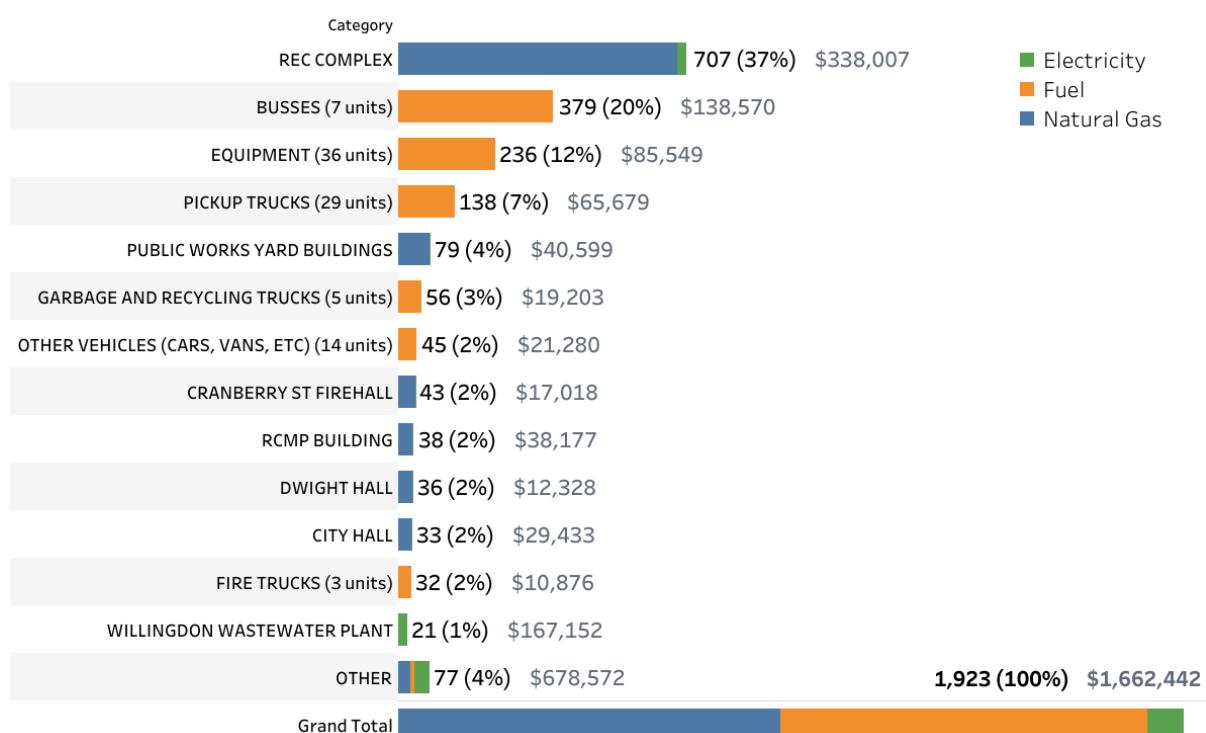


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Background

The City of Powell river has signed the BC Climate Action Charter, a commitment adopted by almost all of BC communities to be carbon neutral in their corporate operations. The first step on the path to carbon neutrality is to measure the corporate emissions annually. The process of measuring involves establishing an inventory boundary (or deciding what to measure), collecting data on energy and fuel use, and then converting it into greenhouse gas (GHG) emissions using established emission factors. Corporate GHG emissions and actions implemented towards carbon neutrality are reported annually to the province through the CARIP (Climate Action Revenue Incentive Program) reporting process. Submission of a CARIP report is required for the City to receive its carbon taxes paid back from the Province (this amounts to approximately fifty thousand dollars annually).

In 2017, all 187 Climate Action Charter signatories submitted CARIP surveys. 147 of them measured their GHG emissions and 45 achieved carbon neutral status. Figure 1 lists reporting BC municipalities by their stage on the pathway to carbon neutrality (the table is taken from the latest annual *Summary Report on Local Government Climate Actions* published by the Province in September 2017).

CARIP summary report groups municipalities into the following four categories based on their progress towards carbon neutrality:

1. Carbon Neutral (45 local governments, highest level of achievement)
2. Accelerating Progress on Charter Commitments (75 governments)
3. Measuring GHG Emissions (27 local governments)
4. Demonstrating Progress Towards Charter Commitments (40 governments, including City of Powell River)

The latest City of Powell River corporate GHG inventory was completed for the 2011 calendar year by the Community Energy Association. This report presents an updated corporate emissions inventory for the 2017 calendar year. Corporate GHG emissions should be measured annually to track progress and document emissions reductions over time.

Reduced GHG emissions mean lower operating costs and more efficient City operations protected from future rise in electricity, natural gas and fuel prices. The next step should be prioritizing reduction strategies based on their emission impact and financial payback and beginning implementation. The data presented in this report will assist in this process.

Figure 1 Carbon neutral status of reporting BC local governments (source: Summary Report on Local Government Climate Actions, September 2017)

CARBON NEUTRAL				
Ashcroft	Dawson Creek	Ladysmith	Osoyoos	Thompson-Nicola RD
Capital RD	Delta	Langley, Township	Parksville	Tofino
Central Saanich	Duncan	Lantzville	Pemberton	Vancouver
Coldstream	East Kootenay RD	Logan Lake	Penticton	Vanderhoof
Columbia Shuswap Regional District	Fort St. James	Mount Waddington Regional District	Pitt Meadows	Victoria
Comox	Granisle	Nanaimo RD	Richmond	View Royal
Comox Valley RD	Highlands	North Cowichan	Sidney	West Vancouver
Cowichan Valley RD	Islands Trust	Oak Bay	Sooke	Whistler
Cumberland	Keremeos	Oliver	Squamish-Lillooet RD	White Rock
ACCELERATING PROGRESS ON CHARTER COMMITMENTS				
Abbotsford	Fernie	Langford	Okanagan-Similkameen RD	Salmon Arm
Alert Bay	Fort St. John	Langley, City	Peace River RD	Slocan
Armstrong	Fraser-Fort George RD	Lumby	Port Alberni	Smithers
Burnaby	Fruitvale	Maple Ridge	Port Alice	Spallumcheen
Bulkley-Nechako RD	Gold River	Masset	Port Coquitlam	Sparwood
Campbell River	Golden	Metochosin	Port Hardy	Squamish
Central Kootenay RD	Grand Forks	Metro Vancouver RD	Port McNeill	Strathcona RD
Clearwater	Houston	Midway	Port Moody	Summerland
Colwood	Invermere	Mission	Prince George	Surrey
Coquitlam	Kamloops	Montrose	Qualicum Beach	Taylor
Courtenay	Kelowna	Nanaimo	Radium Hot Springs	Trail
Cranbrook	Kimberley	New Westminster	Revelstoke	Valemount
Creston	Kitimat-Stikine RD	North Saanich	Roseland	Vernon
Elkford	Kootenay Boundary Regional District	North Vancouver, City	Saanich	Wells
Esquimalt	Lake Country	North Vancouver, District	Salmo	West Kelowna
MEASURING GHG EMISSIONS				
100 Mile House	Enderby	Kitimat	Northern Rockies Regional	Terrace
Cariboo RD	Fraser Valley RD	Mackenzie	Powell River RD	Tumbler Ridge
Central Okanagan RD	Gibsons	Merritt	Port Clements	Ucluelet
Chetwynd	Greenwood	Nelson	Quesnel	Williams Lake
Chilliwack	Harrison Hot Springs	New Denver	Sunshine Coast RD	
Clinton	Hudson's Hope	North Okanagan RD		
DEMONSTRATING PROGRESS ON CHARTER COMMITMENTS				
Alberni-Clayoquot RD	Castlegar	Lake Cowichan	Peachland	Sechelt
Anmore	Central Coast RD	Lillooet	Port Edward	Sicamous
Barriere	Chase	Lions Bay	Pouce Coupe	Silverton
Belcarra	Fraser Lake	Lytton	Powell River	Stewart
Bowen Island	Hazelton	McBride	Prince Rupert	Sun Peaks
Burns Lake	Hope	Nakusp	Princeton	Tahsis
Cache Creek	Kaslo	New Hazelton	Queen Charlotte	Telkwa
Canal Flats	Kent	North Coast RD	Sayward	Warfield

Boundaries: What's Included in the Corporate Inventory?

CARIP Reporting Boundaries

The provincial and UBCM Green Communities Committee's Workbook – Helping local governments understand how to be carbon neutral in their corporate operations – provides guidance on what should be included within the boundaries of municipal corporate emissions for CARIP reporting. According to the workbook, the corporate inventory must capture emissions occurring in the course of delivering Traditional Services. This is done to ensure comparability and consistency between corporate inventories for different BC municipalities.

Traditional services include:

- Administration and Governance
- Drinking, Storm and Waste Water
- Solid Waste Collection, Transportation and Diversion
- Roads and Traffic Operations
- Arts, Recreation and Cultural Services
- Fire Protection

For the City of Powell River, this leaves the RCMP building, the airport, the old barge terminal (now demolished), the bus depot (located at the Public Works Yard), and the transit vehicles out of the CARIP inventory scope.

PCP (Partners for Climate Protection) Protocol Boundaries

The PCP Protocol was developed to support Canadian municipalities working through the steps of the FCM's Partners for Climate Protection program. The PCP Protocol is a Canadian supplement to the IEAP (international Emissions Analysis Protocol). The IEAP outlines high-level principles for municipal GHG accounting, and the PCP Protocol serves as a Canadian supplement describing detailed methodology for Canadian municipalities in the context of the PCP Program. Inventories that follow the PCP Protocol also meet globally recognized standards for emissions accounting.

The PCP Protocol corporate inventory boundary is based on the operational control approach and includes all buildings, facilities, vehicles and equipment that the City operates, even if they are not associated with the delivery of a traditional service. For the City of Powell River, this means that the RCMP building, the airport, the old barge terminal, the transit vehicles and the bus depot all fall within the corporate inventory boundary. A PCP Protocol-compliant inventory must also include emissions from the solid waste generated by municipal operations.

If a municipality operates a landfill, the landfill emissions must be included in the inventory. For Powell River, this means including emissions from the old airport landfill site. The airport site does not have a landfill gas capture system. For landfills without such a system, there are two approaches to tracking landfill emissions outlined in the PCP protocol: 'methane commitment' or 'waste-in-place' model.

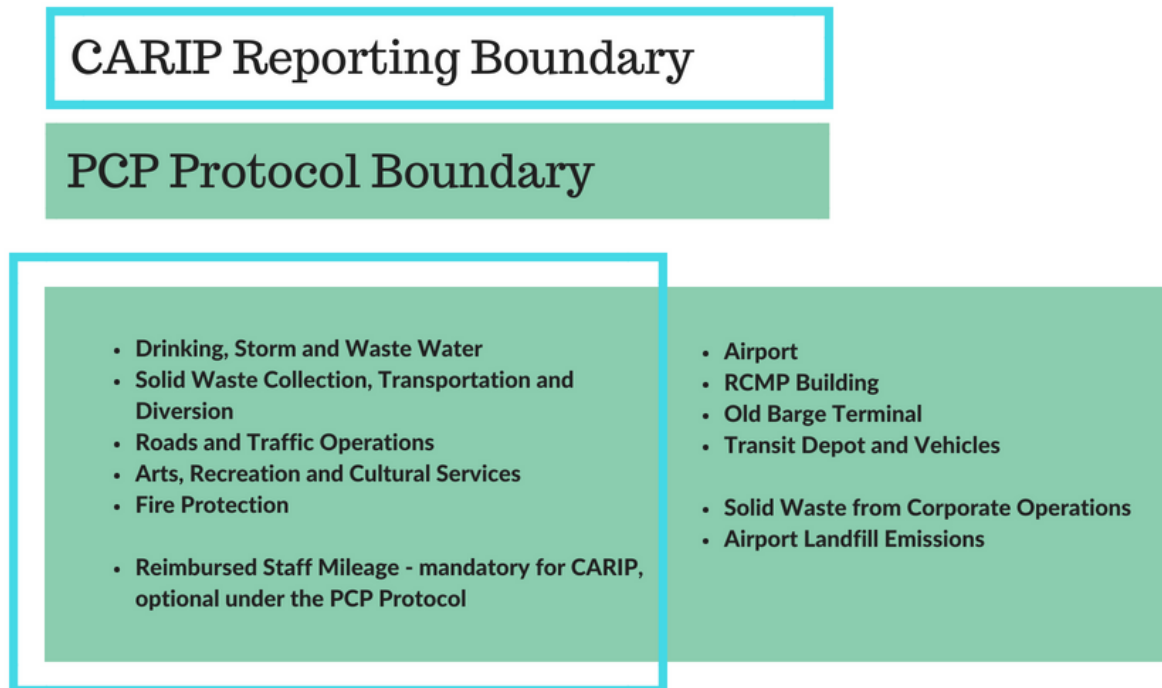
The waste-in-place model looks at emissions from all the waste that has been deposited into the landfill over the previous years that occur during the inventory year. This model requires years of historic data on waste deposited each year. This is the recommended approach for landfills without a gas capture system.

The methane commitment model looks at the waste deposited during the inventory year and the emissions that this waste will generate over the course of its decomposition. This is a simpler approach because it only requires data on waste deposited during the inventory year.

Since the Powell River airport landfill is closed and no longer receives waste, the City would need to get historic data and use the waste-in-place model to calculate the emissions to comply with the PCP Protocol.

The airport landfill emissions and the municipal solid waste calculations are not included in this report since its primary purpose was to create an inventory for the City's CARIP reporting. However, the report does include emissions for buildings and vehicles outside the CARIP boundary: the RCMP building, the old barge terminal, the airport, the bus depot, and transit vehicles. Should the City choose to complete a PCP Protocol compliant inventory in the coming years, the only additional pieces will be the corporate solid waste and airport landfill emissions.

Figure 2 CARIP and PCP Protocol Corporate Inventory Boundaries



Data Sources

The data for this inventory was derived from the following sources:

- BC Hydro online account
- Fortis BC online account
- City vehicles and equipment fuel use data provided by Tor Birtig, the Director of Infrastructure
- Staff reimbursed mileage records provided by the Financial Services department

The fuel data was derived from the ProFuel software linked to the fuel dispensing equipment located at the Public Works Yard. The equipment requires a fob to access the fuel and the software records the type and amount of fuel issued. Mileage and vehicle number are entered by the pump operators. The data is downloaded from the pumps regularly to a database. Reimbursed staff mileage information was kindly provided by Roberta Ciaraulo (Finance Department).

Emission Factors

Emission factors used to calculate the carbon footprint were derived from the 2017 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions (Including Guidance for Public Sector Organizations, Local Governments and Community Emissions) published by the BC Ministry of Environment and Climate Change Strategy. The 2017 version of the document was provided by the following Ministry contact:

Orest Maslany, MBA, MA (Econ)
Director, Carbon Neutral Government Program
BC Climate Action Secretariat
250-698-4069

What is a tonne of CO₂e?

Greenhouse gas emissions are measured in **metric tonnes of carbon dioxide equivalent (tCO₂e)**. What is the meaning of "equivalent"? While carbon dioxide is the most common greenhouse gas, there are other gasses human activities release into the atmosphere that contribute to climate change, for example, methane. Methane's greenhouse gas effect is 25 times stronger than that of CO₂. This factor is called the global warming potential (GWP) of methane. Methane is converted to CO₂e by multiplying its weight by its GWP: 1 tonne of methane = 25 tonnes of CO₂e. Converting all GHGs to tonnes of CO₂e allows the different greenhouse gases to be combined into one total. The image below shows the size of a balloon filled with one tonne of carbon dioxide.

Figure 3 A Display at the 2009 UN Climate Conference in Denmark



Corporate Inventory Totals for 2017

CARIP Reporting Totals

This section presents the emission totals according to the CARIP reporting boundary (excluding the RCMP building, the works yard bus depot and transit vehicles, the airport, and the old barge terminal on Marine). A detailed CARIP reporting table is included in the Appendix (see Figure 29).

Total 2017 CARIP GHG emissions (tCO₂e):

1,471.4

Figure 4 CARIP Emissions by Source

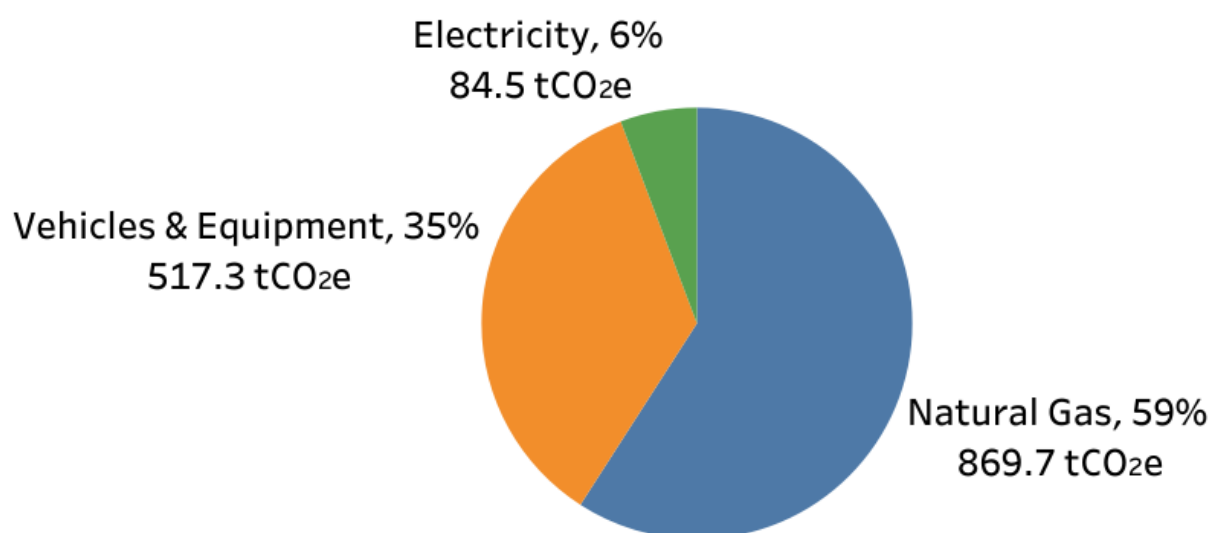


Figure 5 2017 CARIP Inventory Totals (Emissions, Energy Use, and Costs) by Source

Source	Emissions (tCO ₂ e)	Energy (GJ)	Cost (\$)
Natural Gas	869.67	17,439	\$166,947
Vehicles & Equipment	517.27	7,466	\$216,026
Electricity	84.47	28,500	\$1,061,951
Grand Total	1,471.41	53,405	\$1,444,924

Figure 6 Detailed 2017 CARIP Emissions Breakdown

Source	Subcategory	Emissions (tCO2e)	Energy (GJ)	Cost (\$)
Electricity	REC COMPLEX	23.1	7,781	\$213,559
	WILLINGDON WASTEWATER PLANT	21.2	7,150	\$167,152
	NORTH HARBOUR	7.7	2,609	\$66,339
	STREET LIGHTS (OVERHEAD)	7.0	2,363	\$310,157
	OTHER	25.5	8,597	\$304,744
	Total	84.5	28,500	\$1,061,951
Natural Gas	REC COMPLEX	683.5	13,705	\$124,448
	PUBLIC WORKS BUILDING A	43.5	872	\$9,563
	CRANBERRY ST FIREHALL	42.0	842	\$9,222
	DWIGHT HALL	35.8	717	\$7,896
	OTHER	65.0	1,302	\$15,819
	Total	869.7	17,439	\$166,947
Vehicles & Equipment	EQUIPMENT	236.5	3,433	\$85,549
	PICKUP TRUCKS	138.3	2,051	\$65,679
	GARBAGE AND RECYCLING TRUCKS	56.3	755	\$19,204
	OTHER VEHICLES (CARS, VANS, ETC.)	45.5	670	\$21,280
	FIRE PROTECTION VEHICLES/EQUIPMENT	32.4	436	\$10,876
	STAFF MILEAGE	8.3	120	\$13,439
	Total	517.3	7,466	\$216,026
Grand Total		1,471.4	53,405	\$1,444,924

Emissions Outside the CARIP Boundary

The table below outlines the emissions that fall outside the CARIP reporting boundary. These emissions are included in the detailed emissions breakdowns in the following sections of the report since they represent significant emissions and costs and therefore opportunities for emission reductions and costs savings for the City. In addition, they do fall within the City's corporate inventory boundary according to the PCP Protocol.

Figure 7 Emissions from Buildings and Vehicles Outside the CARIP Inventory Boundary

Source	Subcategory	Emissions (tCO2e)	Energy (GJ)	Cost (\$)
Electricity	RCMP BLDG (BARNET ST)	2.8	955	\$30,339
	OLD BARGE TERMINAL (4315 MARINE AVE)	1.0	350	\$18,967
	AIRPORT BLDGS	0.9	300	\$11,695
	PUBLIC WORKS YARD BUS DEPOT	0.2	76	\$2,743
	Total	5.0	1,680	\$63,743
Natural Gas	RCMP BUILDING	35.5	711	\$7,838
	PUBLIC WORKS - BUS DEPOT BLDG	27.3	547	\$6,135
	AIRPORT TERMINAL	4.2	85	\$1,232
	Total	67.0	1,343	\$15,205
Vehicles & Equipment	BUSSES	379.4	5,580	\$138,570
	Total	379.4	5,580	\$138,570
Grand Total		451.3	8,603	\$217,518

Total Emissions Measured (All City Buildings and Vehicles/Equipment)

Total emissions from all City operated buildings, fleet, and equipment in 2017:

1,923 tCO₂e

Total cost of carbon-emitting activities (electricity, natural gas, and fuel):

\$1,662,442

The total emissions from City buildings and its fleet of vehicles and equipment in 2017 were 1,923 tonnes of CO₂e. This includes electricity and natural gas used in City buildings as well as gasoline, diesel, and propane used in City's vehicles and equipment. The combined cost of electricity, natural gas, and fuel in 2017 was over \$1.6M.

For comparison, the 2011 emissions total (according to the report by the Community Energy Association) was 2,144 tCO₂e. Based on this total, **the City's corporate emissions have decreased by 10% from 2011 to 2017.**

Figure 8 shows the City's emissions broken down by electricity and natural gas use for buildings and fuel for vehicles and equipment. Natural gas use accounts for 49% of emissions, fuel for 47%, and the remainder of emissions is electricity. Electricity emissions are relatively small because most of BC's electricity is low-carbon hydro power. However, electricity costs are the highest of these three activities — in 2017, the City's total BC Hydro bill was over \$1.1M.

Figure 9 shows emissions in more details, highlighting buildings and vehicles/equipment with the highest emissions. The Rec Complex is the largest emitter (707 tonnes, or 37% of City's emissions total) and is responsible for \$338k in electricity and natural gas costs annually. The majority of the Rec Complex emissions (684 tonnes) are from natural gas.

In subsequent sections, we will look in more detail at each emitting activity (electricity and natural gas used in buildings and fuel for City's fleet of vehicles and equipment). We will highlight the buildings and vehicles/equipment with the highest emissions and associated costs as well as look at historic data to see how consumption has changed in recent years.

This information is intended to help the City better understand its emission sources. In addition, it will help prioritize strategies for reducing emissions going forward and develop the environmental and business cases for specific emission reduction projects.

Figure 8 Total Emissions by Activity (tCO₂e, associated cost)

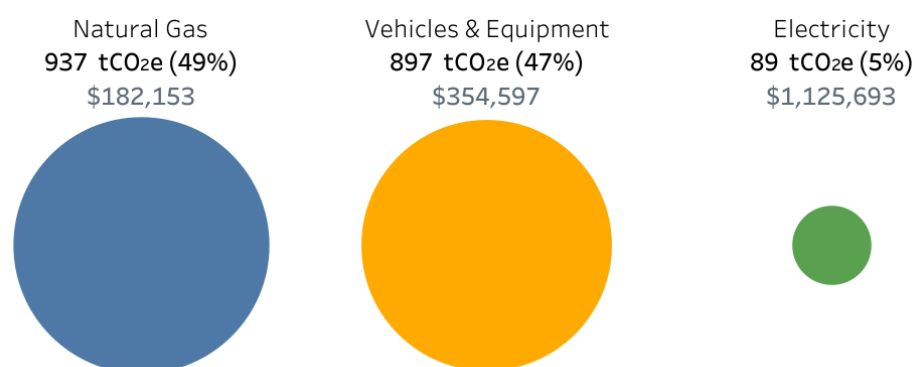


Figure 9 Total Emissions by Source (tCO₂e, % of total emissions, annual costs of fuel, electricity, and natural gas (\$))

Category	Activity			Grand Total
	Electricity	Fuel	Natural Gas	
REC COMPLEX	23.1 (1%) \$213,559		683.5 (36%) \$124,448	706.5 (37%) \$338,007
BUSSES (7 units)		379.4 (20%) \$138,570		379.4 (20%) \$138,570
EQUIPMENT (36 units)		236.5 (12%) \$85,549		236.5 (12%) \$85,549
PICKUP TRUCKS (29 units)		138.3 (7%) \$65,679		138.3 (7%) \$65,679
PUBLIC WORKS YARD BUILDINGS	1.7 (0%) \$23,109		77.6 (4%) \$17,490	79.3 (4%) \$40,599
GARBAGE AND RECYCLING TRUCKS (5 units)		56.3 (3%) \$19,203		56.3 (3%) \$19,203
OTHER VEHICLES (CARS, VANS, ETC) (14 units)		45.5 (2%) \$21,280		45.5 (2%) \$21,280
CRANBERRY ST FIREHALL	0.6 (0%) \$7,797		42.0 (2%) \$9,222	42.6 (2%) \$17,018
RCMP BUILDING	2.8 (0%) \$30,338		35.5 (2%) \$7,838	38.3 (2%) \$38,177
DWIGHT HALL	0.3 (0%) \$4,432		35.8 (2%) \$7,896	36.1 (2%) \$12,328
CITY HALL	1.9 (0%) \$22,396		31.6 (2%) \$7,037	33.5 (2%) \$29,433
FIRE TRUCKS (3 units)		32.4 (2%) \$10,876		32.4 (2%) \$10,876
WILLINGDON WASTEWATER PLANT	21.2 (1%) \$167,152			21.2 (1%) \$167,152
OTHER	37.8 (2%) \$656,909	8.3 (0%) \$13,439	30.8 (2%) \$8,223	76.8 (4%) \$678,572
Grand Total	89.5 (5%) \$1,125,693	896.7 (47%) \$354,596	936.6 (49%) \$182,153	1,922.8 (100%) \$1,662,442

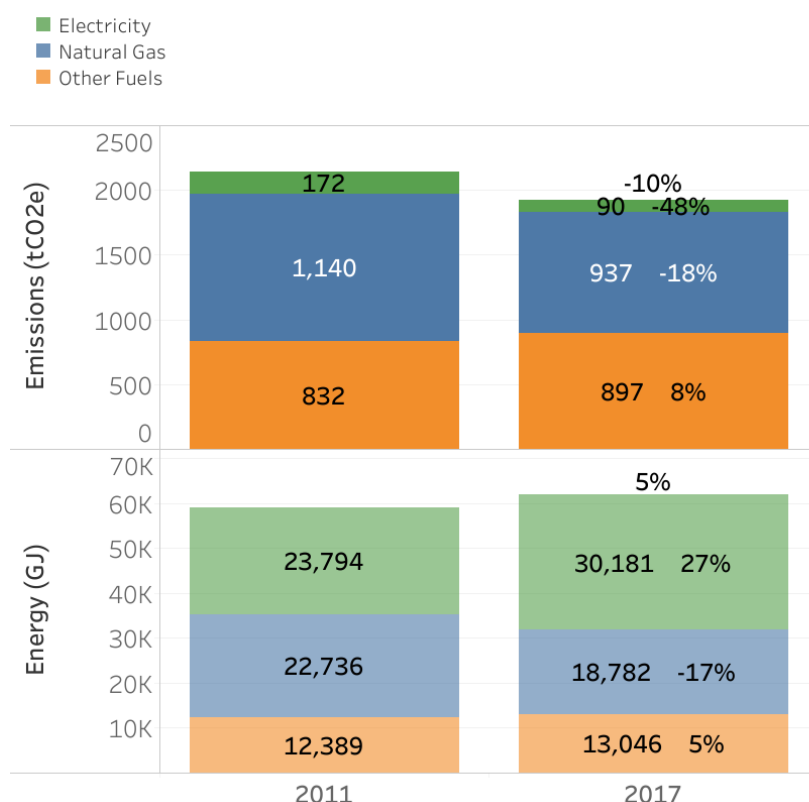
2011 and 2017 Corporate Inventories Comparison

The latest corporate inventory for the City of Powell River was completed by the Community Energy Association for the 2011 calendar year. The chart below shows how the City's GHG emissions and energy use have changed from 2011 to 2017. Overall, the emissions decreased by 10%. The current Provincial GHG reduction targets are as follows (as compared to 2007 emissions level):

- At least a 40% reduction by 2030
- At least a 60% reduction by 2040
- At least an 80% reduction by 2050

City's corporate electricity emissions decreased by 48%, however electricity use increased by 27%. The emissions decrease is attributed to a reduction in BC Hydro emission factor for electricity and not reduction in use. Natural gas emissions decreased by 18% with a similar reduction in usage (emission factor for natural gas stays relatively constant year to year). Emissions from other fuels (this primarily includes gasoline and diesel for City vehicles and equipment) increased by 8%, and the associated energy use increased by 5%.

Figure 10 2011 and 2017 Corporate Emissions and Energy Use Comparison



Electricity

TOTAL ELECTRICITY EMISSIONS:

89.5 tCO₂e

TOTAL ELECTRICITY USAGE:

8,383,597 kWh (or 30,181 GJ)

TOTAL ELECTRICITY COST:

\$1,125,693

While electricity represents a relatively small portion of the total corporate emissions (5%), it corresponds to a large portion of corporate energy use. In addition, the total cost of electricity is very high — in 2017 it was over \$1.1M.

Strategies aimed at reducing electricity use, such as lighting retrofits, often have a short payback (as short as under 2 years for some LED conversions). Many City buildings have old lighting (primarily fluorescent T8 tubes). Updating lighting to LED is a great opportunity for the City to reduce its operating costs and emissions associated with electricity. The City should investigate other electricity reduction strategies such as variable frequency drives for fans and pumps and low-e ceiling for the ice arenas. BC Hydro website has multiple case studies on these and other types of upgrades which often include the retrofit costs and financial payback.

Historic Data

Compared to 2016, the electricity use in 2017 was 2.7% higher. However, the electricity costs rose by 8.2% from \$1,040,754 in 2016 to \$1,125,693 in 2017. The higher increase in costs than in usage highlights the rising BC Hydro rates.

Figure 11 Total Corporate Electricity Use for 2016 and 2017 (kWh)

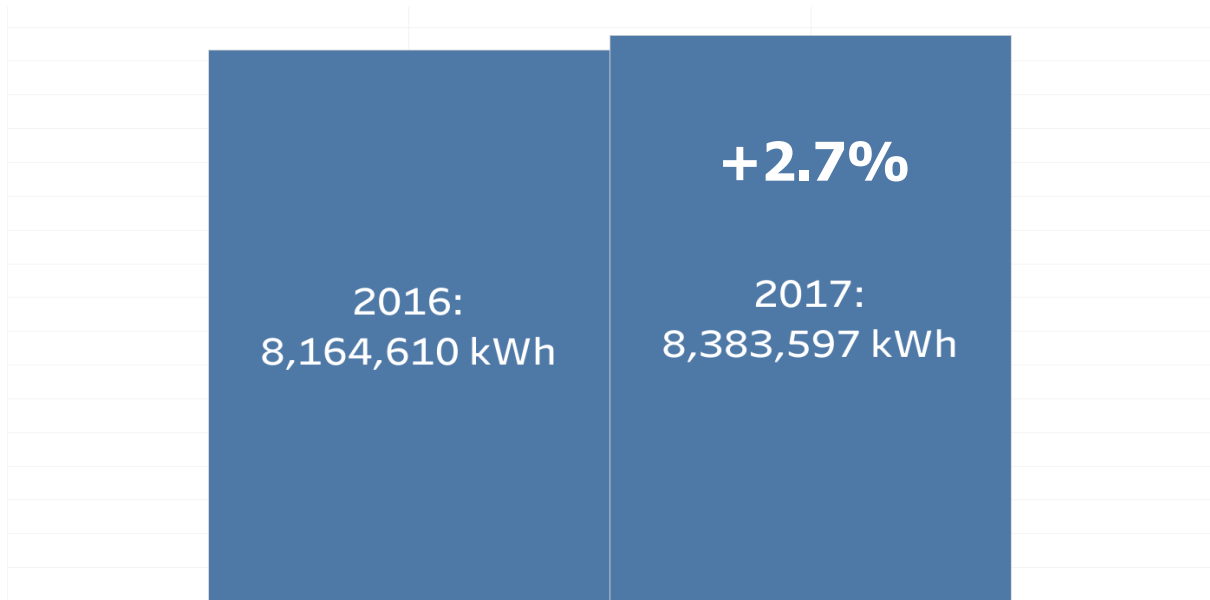
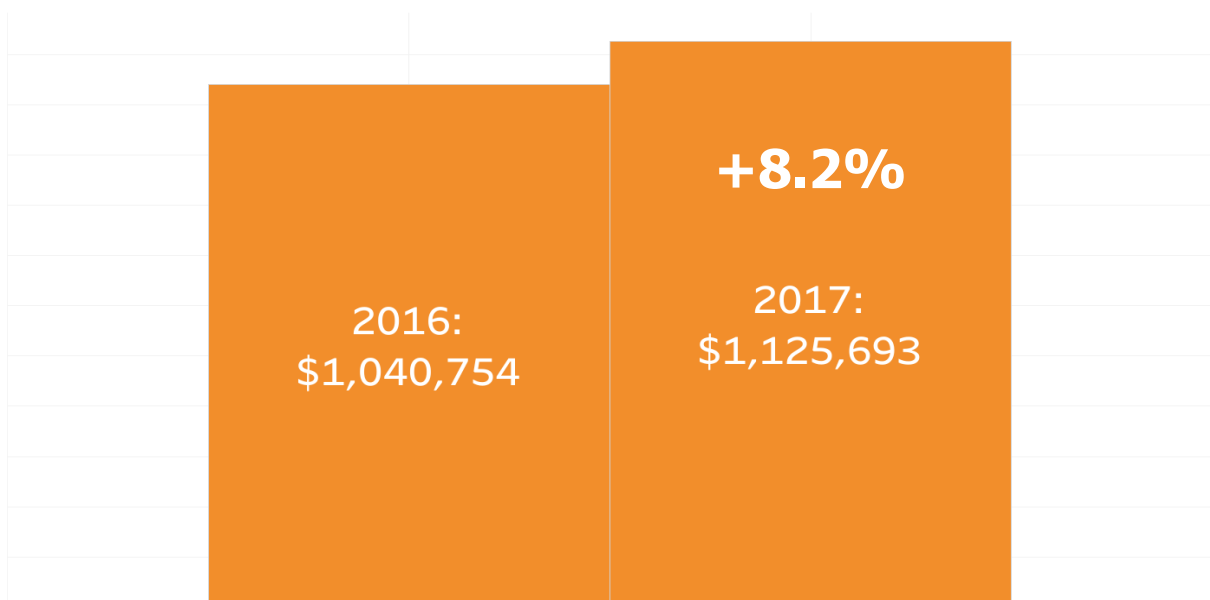


Figure 12 Total Corporate Electricity Costs for 2016 and 2017 (\$, including taxes)



What are the top electricity users?

In 2017, half of the City's electricity consumption was attributed to the Rec Complex and the Willingdon Wastewater Plant, with each accounting for about a quarter of the consumption. Other large users were the North Harbour (9%), overhead street lights (8%), and the Willingdon Campsite (4%).

In terms of the cost, the highest costs were attributed to the overhead street lights (\$310,157), the Rec Complex (\$213,559) and the Willingdon Wastewater Plant (\$167,152). Note that the overhead street lighting is owned by BC Hydro and the cost includes the BC Hydro rental fee.

Figure 13 Electricity Usage by Building/Facility, % of Total

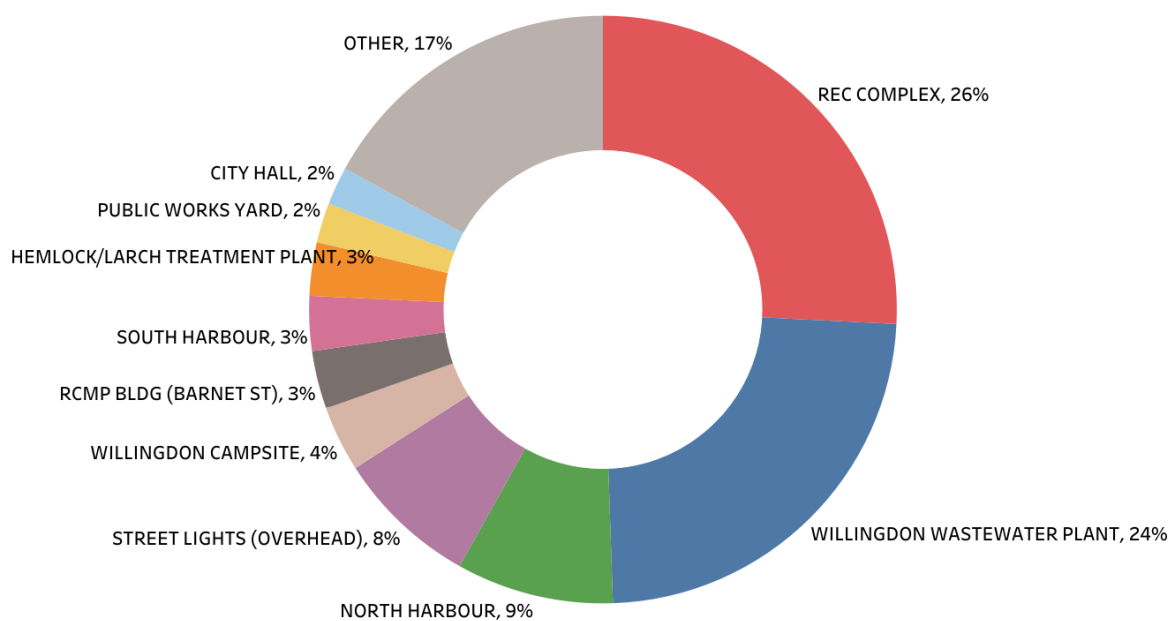


Figure 14 Top 10 Buildings/Facilities by Electricity Cost (\$)¹

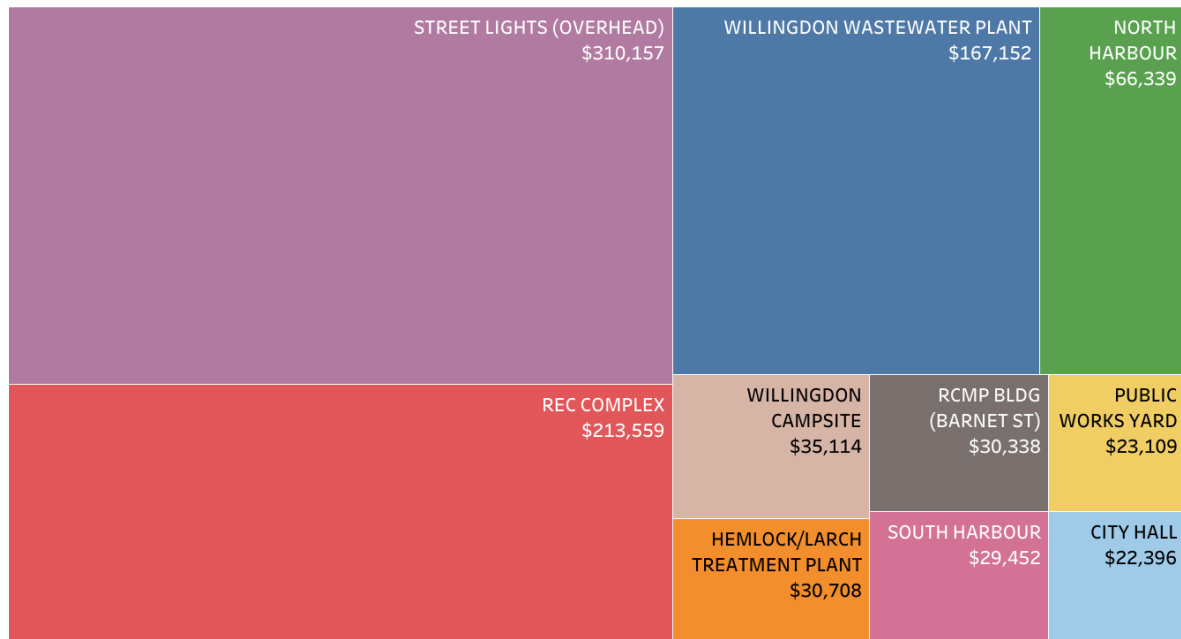
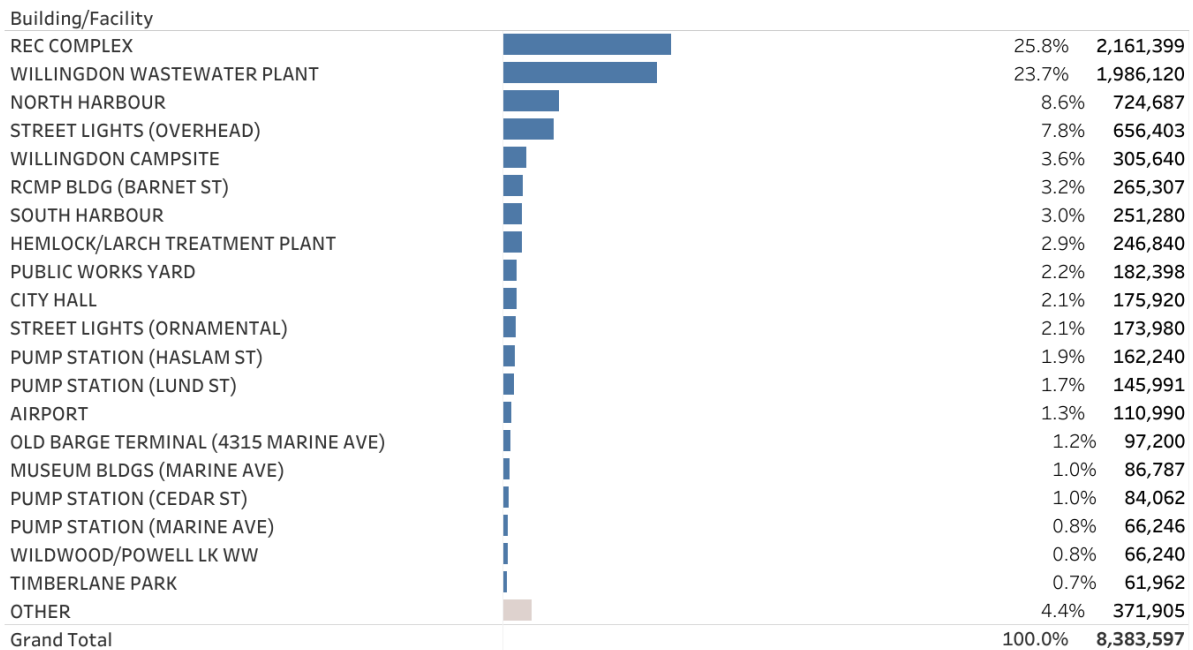



Figure 15 Top 20 Buildings/Facilities by Electricity Use (% of total use, kWh)



¹ Note that overhead street lights cost includes the BC Hydro rental fee – these lights are owned by BC Hydro

Figure 16 Top 20 Buildings/Facilities by Cost (incl taxes)

Bldg/Facility			
STREET LIGHTS (OVERHEAD)		27.6%	\$ 310,157
REC COMPLEX		19.0%	\$ 213,559
WILLINGDON WASTEWATER PLANT		14.8%	\$ 167,152
NORTH HARBOUR		5.9%	\$ 66,339
WILLINGDON CAMPSITE		3.1%	\$ 35,114
HEMLOCK/LARCH TREATMENT PLANT		2.7%	\$ 30,708
RCMP BLDG (BARNET ST)		2.7%	\$ 30,338
SOUTH HARBOUR		2.6%	\$ 29,452
PUBLIC WORKS YARD		2.1%	\$ 23,109
CITY HALL		2.0%	\$ 22,396
PUMP STATION (LUND ST)		1.9%	\$ 21,834
STREET LIGHTS (ORNAMENTAL)		1.8%	\$ 20,808
PUMP STATION (HASLAM ST)		1.8%	\$ 20,434
OLD BARGE TERMINAL (4315 MARINE AVE)		1.7%	\$ 18,966
AIRPORT		1.4%	\$ 15,509
MUSEUM BLDGS (MARINE AVE)		1.1%	\$ 11,833
PUMP STATION (CEDAR ST)		1.0%	\$ 11,283
TIMBERLANE PARK		0.9%	\$ 10,242
WILDWOOD/POWELL LK WW		0.8%	\$ 9,119
PUMP STATION (MARINE AVE)		0.8%	\$ 8,800
OTHER		4.3%	\$ 48,539
Grand Total		100.0%	\$ 1,125,693

Natural Gas

TOTAL NATURAL GAS EMISSIONS:

936.6 tCO₂e

TOTAL NATURAL GAS USAGE:

18,782 GJ

TOTAL NATURAL GAS COST:

\$182,153

Natural gas use is the largest emission source for the City, representing 49% of total emissions. The vast majority of these emissions (73%) are from the Rec Complex. Reducing natural gas emissions in City buildings is an important area for achieving meaningful emission reductions. There are many strategies the City could employ to target natural gas emissions. They should be priced out and prioritized by their projected emission reduction and financial payback.

Sample strategies include:

- Installing programmable thermostats in buildings to reduce natural gas used for heating (very low cost)
- Installing a heat recovery loop to capture waste heat from the arenas ice equipment (Campbell River arena implemented this strategy with great success, a detailed case study on this project is available online on the BC Climate Action Toolkit website)
- Transitioning to electric heat pumps as the old natural gas heating systems reach their end of life
- Installing solar hot water

Historic Data

Figure 17 shows natural gas usage and costs by building for 2014, 2015, 2016 and 2017 calendar years. Note that the costs don't always correlate with the usage as natural gas rates have changed significantly form year to year.

Figure 18 shows how the natural gas usage has changed for buildings that received new boilers in 2016. Overall, the consumption for these four buildings (City Hall, Cranberry St Firehall, Dwight Hall, and the Public Works Building) has decreased from 3,593 GJ in 2014 to 3,065 in 2017 (a reduction of 15%).

Figure 17 Fortis BC Natural Gas Use by Year (natural gas usage in GJ, associated costs (\$))

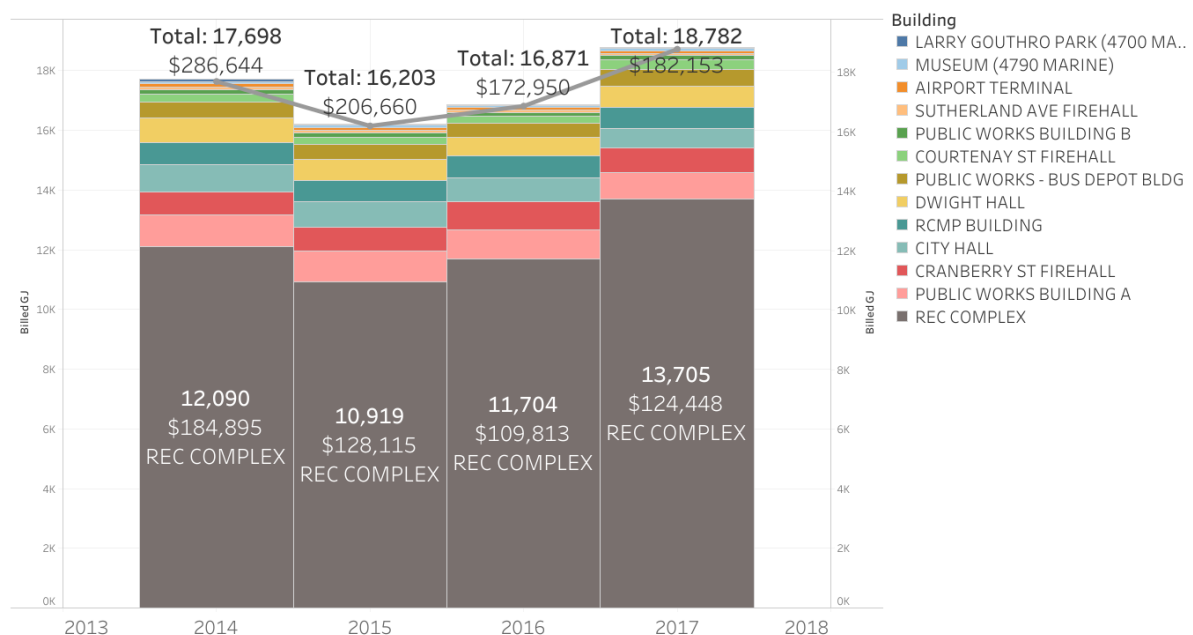
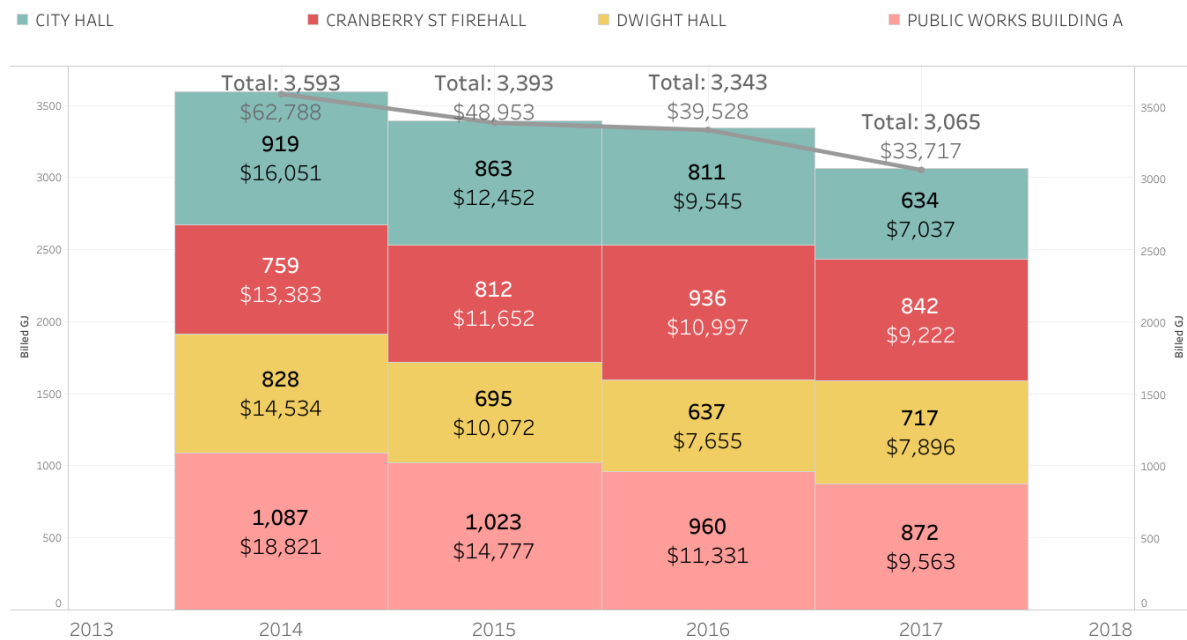


Figure 18 Natural Gas Use (in GJ) and Costs by Year in Buildings that Received New Boilers in 2016



What are the top natural gas users?

The charts below show the 2017 natural gas emissions by building and by calendar month. The Rec Complex represents the majority (683.5 tonnes, or 73%) of natural gas emissions for the City. The natural gas use by the complex is very seasonal, indicating that a significant portion of the gas is used for space heating (as opposed to pool heating and other non-seasonal use such as hot water for bathrooms and showers).

Figure 19 2017 Natural Gas Emissions by Building (tCO₂e)

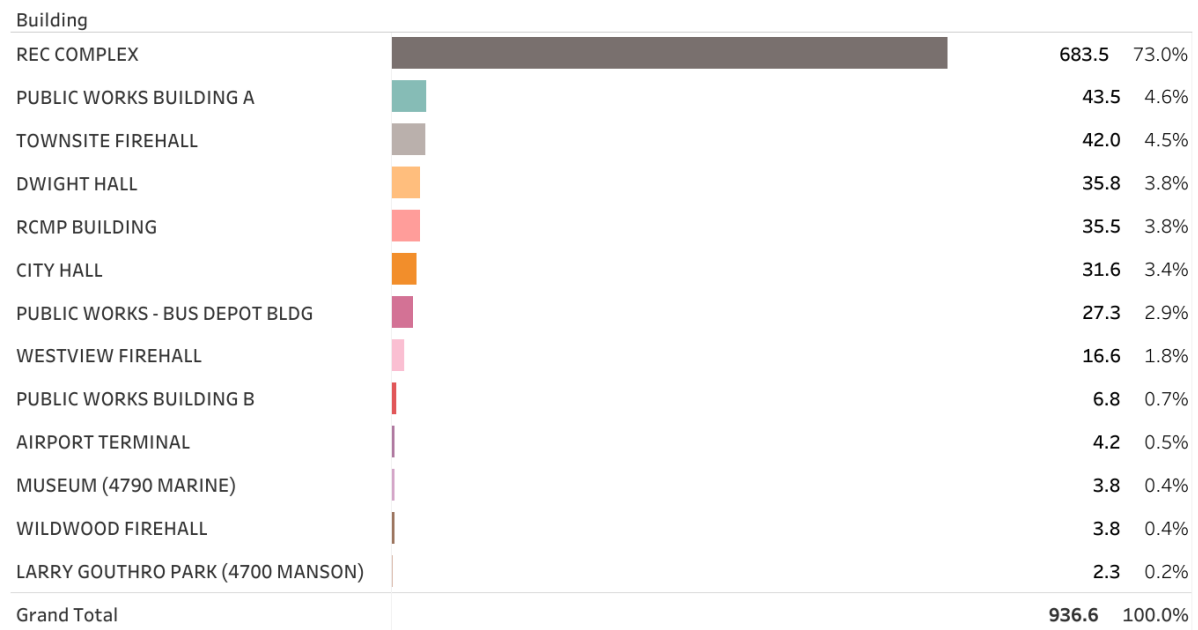
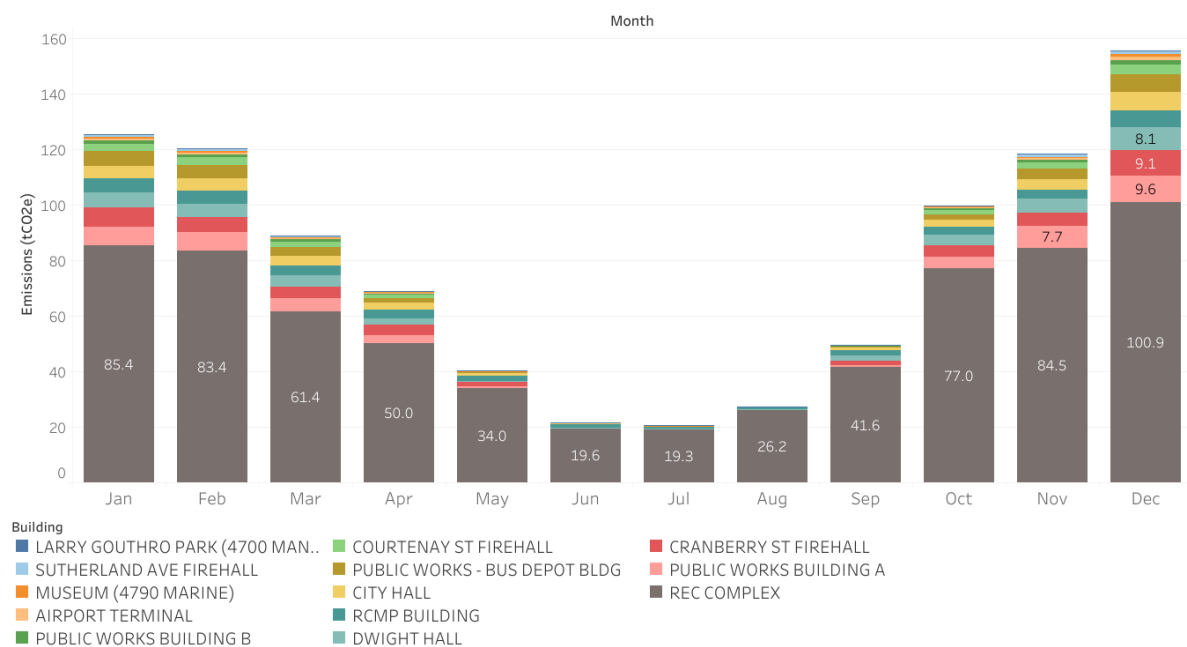


Figure 20 2017 Natural Gas Emissions by Month by Building (tCO₂e)



Vehicles and Equipment

TOTAL VEHICLES AND EQUIPMENT EMISSIONS:

896.7 tCO₂e

TOTAL ENERGY USAGE²:

13,046 GJ

TOTAL FUEL COST:

\$354,596

In this section, we look at the detailed fuel consumption by the City's fleet of vehicles and equipment. This section also includes emissions from staff vehicles used for City business (reimbursed mileage).

The charts below highlight vehicles and equipment with the highest emissions, as well as vehicles with the lowest fuel efficiency. This information can help develop strategies to reduce fleet emissions by, for example, replacing high-use inefficient vehicles with smaller models, hybrid, or electric vehicles. Highest usage vehicles are likely to have the shortest payback for replacement.

Other sample strategies to reduce vehicle emissions include:

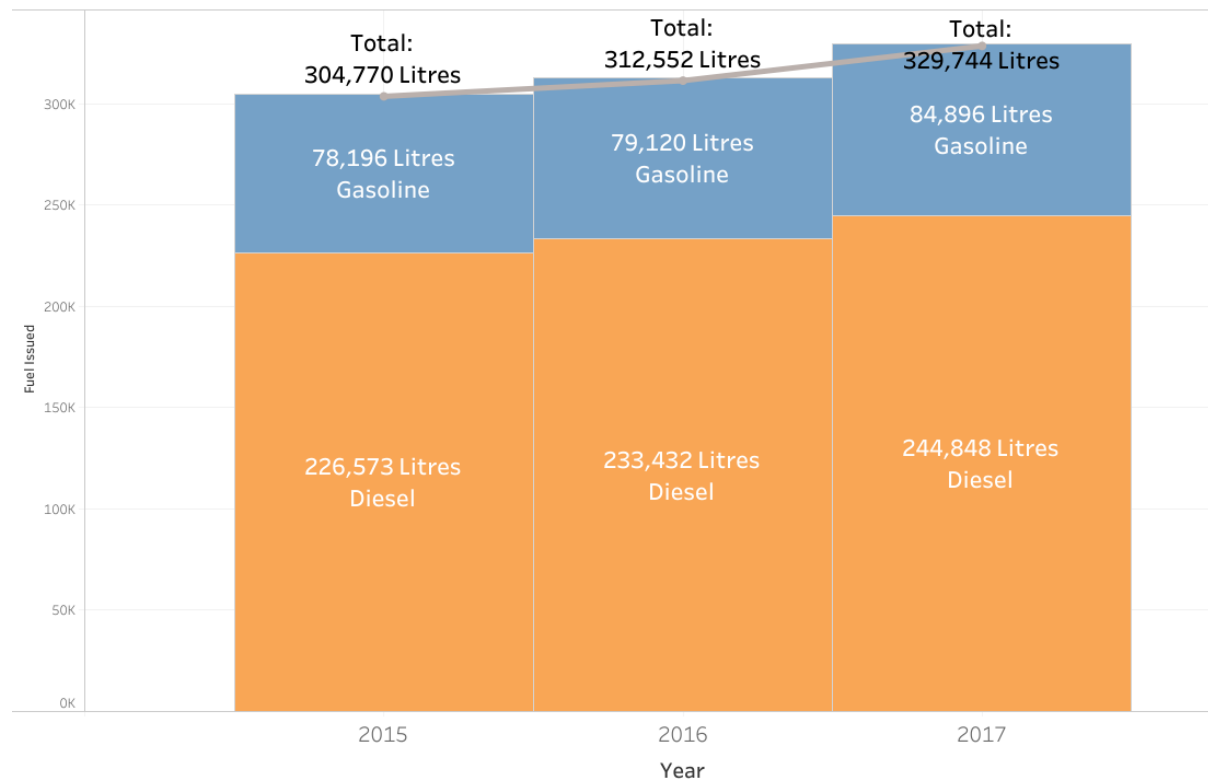
- Anti-idling campaign
- Smart driving campaign (adopting fuel saving driving habits such as gentle acceleration, maintaining a steady speed, anticipating traffic, avoiding high speeds, coasting to decelerate etc.); smart driving training programs are available and can be delivered to City staff
- Downsizing vehicles where possible (e.g. in some cases a large pickup may be replaced with a smaller car)
- Only driving large vehicles when required (e.g. only using trucks when carrying a load)
- Transitioning to electric or hybrid vehicles

² This figure shows the energy contained in the fuel used for the fleet. Looking at the energy content of fuel used can be helpful when thinking about alternative sources for this energy (e.g. using electric vehicles)

Historic Data

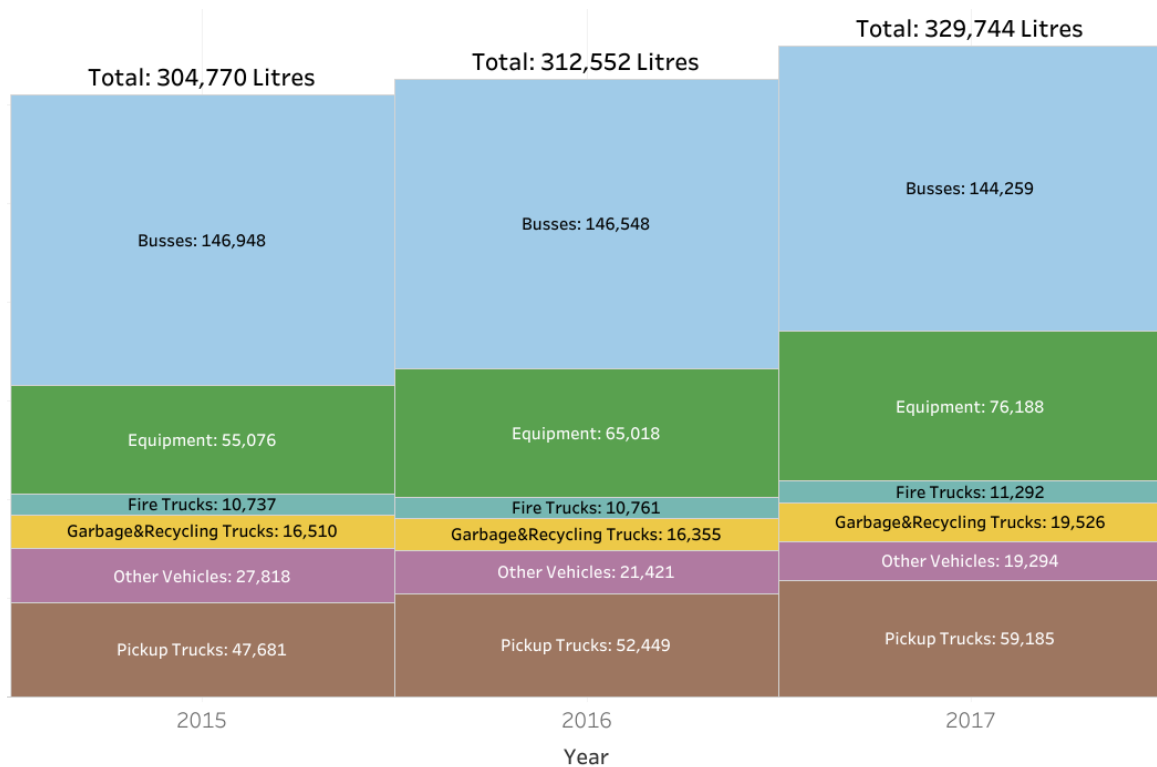
The following figures show the historic fuel use by City vehicles and equipment for 2015-2017 years. The fuel use has increased from 304,770 Litres in 2015 to 329,744 Litres in 2017 (an 8% increase).

Figure 21 Vehicles & Equipment Fuel Use by Year (2015-2017)³



³ Note that the historic data section excludes propane as it represents an extremely small portion of the total fuel used by City's vehicles and equipment; in addition, historic data of its use wasn't readily available (however, propane is included in 2017 totals)

Figure 22 Fuel Use by Year and Fleet Category (Litres) (2015-2017)



What are the top fuel users?

Figure 22 shows 2017 emissions by fleet category. The largest source of emissions is busses (42%) followed by equipment at 26% and pickup trucks at 15%. Garbage and recycling trucks account for 6% of total fleet emissions.

Figure 23 shows the costs of fuel by fuel type and vehicle/equipment category. We can see that the busses represent the highest fuel cost (\$138k) followed by equipment (\$85k) and pickup trucks (\$65k).

Figure 24 shows fuel emissions and costs by individual vehicle or piece of equipment.

Figure 25 shows all City pickup trucks and other vehicles (cars, vans, etc.) by their fuel efficiency. This table can help identify the least efficient, high use vehicles that represent the best opportunities for emission reductions.

Figure 23 Emissions by Fleet Category (tCO₂e)

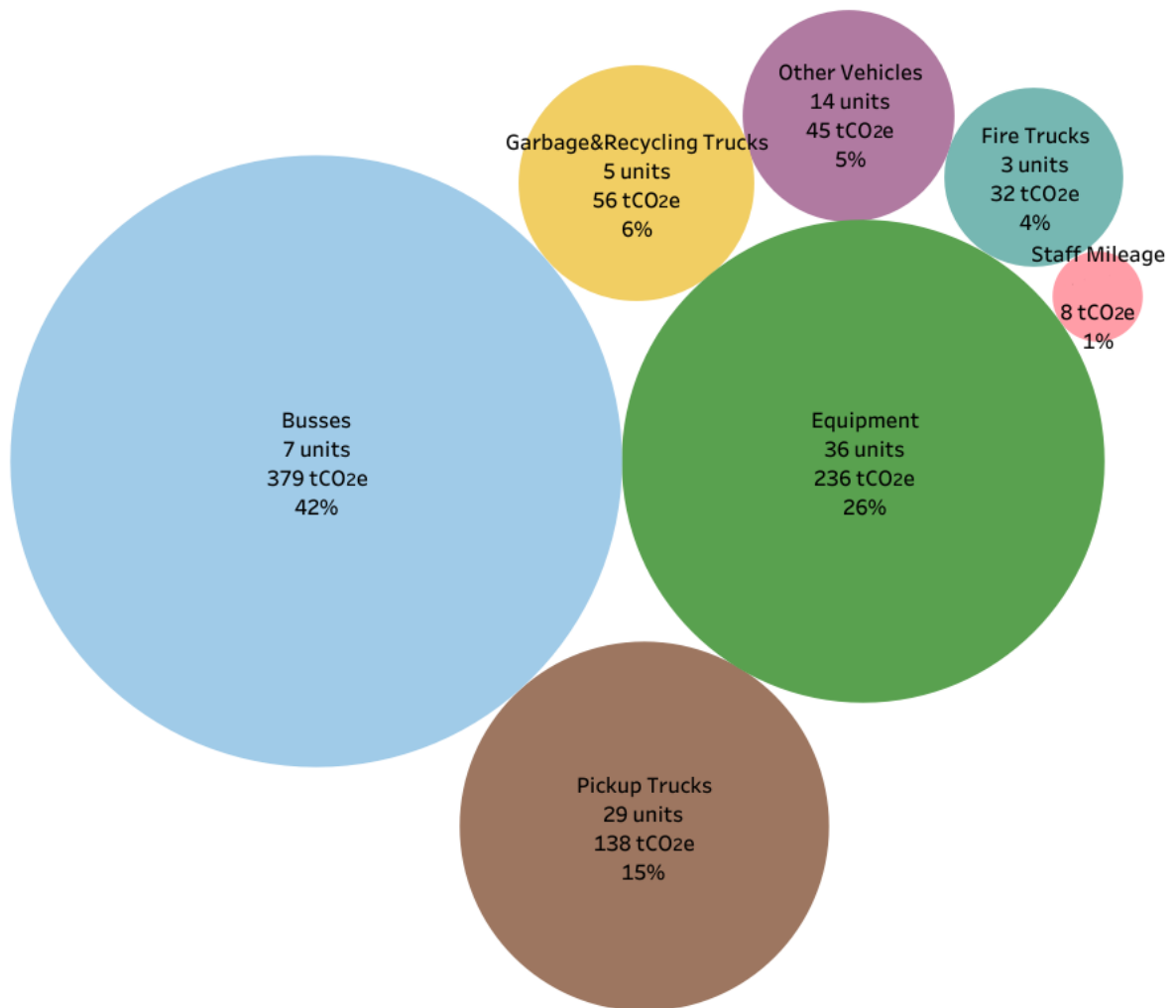


Figure 24 2017 City Vehicles and Equipment Fuel Costs by Category and Fuel Type






















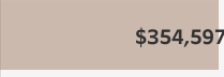
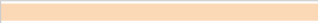



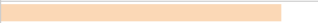













































Category	Fuel Type			Grand Total
	Diesel	Gasoline	Propane	
Busses	 \$138,570			 \$138,570
Equipment	 \$66,615	 \$7,069	 \$11,865	 \$85,549
Pickup Trucks		 \$65,679		 \$65,679
Garbage&Recycling Trucks	 \$19,204			 \$19,204
Other Vehicles	 \$232	 \$21,047		 \$21,280
Fire Trucks	 \$10,663	 \$213		 \$10,876
Staff Mileage		 \$13,439		 \$13,439
Grand Total	 \$235,284	 \$107,447	 \$11,865	 \$354,597

Figure 25 Emissions (tCO₂e) and Fuel Costs (\$) by Vehicle/Piece of Equipment

Category	Description	Fuel Type		
Busses	Unit#9223 - Nova Bus	Diesel		82.67, \$30,250
	Unit#9220 - Nova Bus	Diesel		82.45, \$30,195
	Unit #9211- Nova Bus	Diesel		76.16, \$28,138
	Unit#9219- Nova Bus	Diesel		63.16, \$22,372
	Unit#9212 - Nova Bus	Diesel		50.85, \$18,519
	Unit #8098- Flyer Bus - Loaner Bus	Diesel		14.57, \$5,791
Equipment	Unit#9755 - Spare Bus	Diesel		9.54, \$3,306
	Unit 417 - 2016 Vactor Plus 2100 Flusher Truck	Diesel		37.68, \$12,764
	Unit 416-2011 Schwarze Sweeper	Diesel		33.97, \$11,293
	Unit 325 - 2016 Freightliner 108SD Dump Truck	Diesel		16.15, \$5,308
	Unit 326 - 2016 Freightliner 108SD Dump Truck	Diesel		15.66, \$5,218
	Willingdon Campsite Propane	Propane		14.55, \$8,091
	Unit 312-Western Star Tand/Dump	Diesel		14.52, \$4,797
	Unit 524-2011 5083E Tractor	Diesel		11.09, \$3,711
	Unit 741 - 2011 Sweepster	Diesel		10.11, \$3,270
	Unit 523-2009 Case 580SL Backhoe	Diesel		9.75, \$3,241
	Unit 219 - 06 Ford Dump	Gasoline		9.21, \$4,422
	Unit 522-Case Loader	Diesel		9.19, \$2,963
	Unit 403-1974 Cat Grader	Diesel		9.08, \$2,892
	F.D. #4-2007 Pumper	Diesel		5.10, \$1,683
	2009 Ray-Tech Asphalt Recycler	Propane		4.72, \$2,941
	Unit #84-Truck & Snow Plow	Diesel		4.47, \$1,505
	Unit 525-2008 5083E Ltd Tractor	Diesel		4.41, \$1,404
	Unit 521-2007 Case Loader	Diesel		4.16, \$1,385
	Unit 309-2009 Sterling (Lift Truck)	Diesel		4.15, \$1,377
	Parks Fuel-5400	Gasoline		3.97, \$1,903
	Unit 510- 2000 Case Backhoe	Diesel		3.52, \$1,116
	Unit 526- 580SN Case Backhoe	Diesel		1.67, \$557
	Unit 742 - 2011 Hustler 3700	Diesel		1.34, \$433
	Complex Zamboni	Propane		1.34, \$833
	Unit 734-Snow Blower	Diesel		1.23, \$382
	Cracksealer	Diesel		1.14, \$385
	Unit 518-03 Sellick Forklift	Diesel		1.14, \$384
	Unit 507-2007 Sulliar Compressor	Diesel		1.08, \$372
	Unit 828 - Vermeer Brush Chipper	Gasoline		0.64, \$298
	Roads Fuel-4700	Gasoline		0.49, \$236
	Misc	Diesel		0.33, \$122
	B&G Maintenance Fuel-5100	Gasoline		0.21, \$103
	Unit 411-Bomag Roller	Diesel		0.09, \$28
	Sewers Misc. Fuel-6500	Gasoline		0.09, \$38
	Parks Fuel-5400 (aka 4600)	Gasoline		0.09, \$42
	Transit System Misc. Fuel-5200	Diesel		0.06, \$18
	Shop Fuel -7000	Gasoline		0.03, \$13
	Royer Shredder	Gasoline		0.02, \$11
	Unit 517-2001 Asphalt Saw	Diesel		0.02, \$9
	Unit 414-2009 Ingersoll Rand Roller	Gasoline		0.00, \$1
Fire Trucks	F.D.#41-2014 Spartan Fire/Rescue Pumper	Diesel		25.50, \$8,465
	F.D. #10-01 Ladder Truck	Diesel		5.42, \$1,828
	F.D. #6-1998 Spartan	Diesel		1.08, \$370
	Fire Dept. Misc. Fuel-4500	Gasoline		0.44, \$213


















































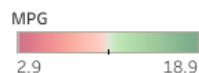
Garbage& Recycling Trucks	Unit 229-05 Ford Garbage Truck	Diesel		15.43,	\$5,082
	Unit #329 - 1999 FL70 Recycle truck	Diesel		13.52,	\$4,364
	Unit 331-2017 Shupak Garbage Truck	Diesel		10.01,	\$3,751
	Unit 330-2017 Shupak Garbage Truck	Diesel		8.92,	\$3,338
Other Vehicles	Unit 230-05 Ford Garbage Truck	Diesel		8.43,	\$2,669
	Unit 235 - 2016 Ford T250 Cargo Van	Gasoline		9.28,	\$4,514
	Unit 131-2004 Ford Ranger 4X4	Gasoline		8.64,	\$3,921
	Unit 133-04 Ford Econoline Van	Gasoline		5.46,	\$2,556
	Unit 211-2004 GMC Savana Van	Gasoline		3.88,	\$1,798
	Unit 139-2016 Dodge Grand Caravan	Gasoline		3.84,	\$1,792
	Unit 136-2008	Gasoline		3.79,	\$1,796
	Unit 117-2004 Ford Van	Gasoline		2.93,	\$1,373
	Unit 118 - 2004 Ford Ranger 4 X 4	Gasoline		2.06,	\$954
	Unit 107-2004 Chevrolet Express Van	Gasoline		1.35,	\$654
	Unit 110 - 2002 Chevrolet Venture Van	Gasoline		1.15,	\$542
	Unit 137-2011 GM Aveo	Gasoline		1.02,	\$480
	Unit 135-04 Ford Freestar	Gasoline		0.99,	\$462
	F.D. #3-1999 Freightliner	Diesel		0.63,	\$232
	Unit 111-2004 Ventura Van	Gasoline		0.46,	\$206
Pickup Trucks	Unit 233-2011 F550	Gasoline		12.73,	\$6,179
	Unit 216-2004 GMC Sierra P/U	Gasoline		10.72,	\$4,985
	Unit 232-2009 GMC	Gasoline		9.86,	\$4,847
	Unit 217-04 GMC Cab/Chassis	Gasoline		8.47,	\$3,858
	Unit 215-2001 GMC 1 TON	Gasoline		7.92,	\$3,668
	Unit 138-2015 Chevrolet Silverado Pickup	Gasoline		7.51,	\$3,524
	Unit 234 - 2012 Chevrolet 3500HD Pickup	Gasoline		7.06,	\$3,457
	Unit 218-'04F350 Cab/Chassis	Gasoline		6.74,	\$3,331
	Unit 231-2006 Ford F-350	Gasoline		5.86,	\$2,735
	Unit 140-2017 Chevrolet Silverado	Gasoline		5.01,	\$2,333
	Unit 116-2004 GMC 4X4	Gasoline		4.95,	\$2,312
	Unit 119 - 2009 Ford F150	Gasoline		4.75,	\$2,221
	Unit 255 2017 F350 Ford 2WD	Gasoline		4.36,	\$2,228
	Unit 130-2004 Ford Pickup	Gasoline		4.12,	\$1,912
	Unit 120 - 2010 Ford F250 4X4	Gasoline		3.99,	\$1,938
	F.D. #5-2006 Sierra	Gasoline		3.87,	\$1,809
	Unit 134-2004 Ford Pickup	Gasoline		3.84,	\$1,786
	Unit 236-2001 GMC 1 Ton Utility	Gasoline		3.63,	\$1,812
	Unit 112-1997 3/4 GMC 4X4	Gasoline		3.27,	\$1,534
	Unit 227-2002-3/4 T.Pickup	Gasoline		3.20,	\$1,482
	Unit 228-2002 GMC Shop Truck	Gasoline		2.89,	\$1,343
	Unit 303-2002 GMC Loaf Truck	Gasoline		2.47,	\$1,183
	Unit 212 3500 GMC	Gasoline		2.21,	\$1,004
	Unit 209-2002 GMC CrewCab	Gasoline		2.19,	\$1,021
	Unit FD17 - 2012 Ford F150 4x4 Pickup	Gasoline		2.11,	\$976
	Unit 115-04 Ford Ranger Ext.Cab	Gasoline		1.92,	\$904
	Unit 129-2001N GMC 4X4	Gasoline		1.74,	\$825
	F.D.#46-2017 GMC Sierra 2500	Gasoline		0.52,	\$277
	F.D. #14-2001 GMC 1 Ton Utility	Gasoline		0.43,	\$198
Staff Mileage	Reimbursed staff travel	Gasoline		8.26,	\$13,439

Figure 26 City Pickup Trucks and Other Vehicles (Cars, Vans, etc.) by Fuel Efficiency (MPG, or miles per gallon)

City Vehicles by Fuel Efficiency (Pickup Trucks and Other Vehicles)

VehicleNo	Description	Fuel Type	L/100km	MPG	Kms	Cost	Min Odom	Max Odom
14	F.D. #14-2001 GMC 1 Ton Utility	Gasoline	80	2.9	236	\$198.35	36,378	36,614
216	Unit 216-2004 GMC Sierra P/U	Gasoline	53	4.5	8,579	\$4,984.59	113,003	121,582
212	Unit 212 3500 GMC	Gasoline	44	5.4	2,230	\$1,003.95	105,611	107,841
217	Unit 217-04 GMC Cab/Chassis	Gasoline	42	5.6	8,412	\$3,858.29	131,605	140,017
215	Unit 215-2001 GMC 1 TON	Gasoline	42	5.6	7,896	\$3,668.03	112,243	120,139
3	F.D. #3-1999 Freightliner	Diesel	41	5.8	587	\$232.40	31,953	32,540
255	Unit 255 2017 F350 Ford 2WD	Gasoline	41	5.8	4,748	\$2,227.84	659	5,407
232	Unit 232-2009 GMC	Gasoline	38	6.2	11,456	\$4,846.66	77,417	88,873
233	Unit 233-2011 F550	Gasoline	38	6.2	14,866	\$6,178.50	64,079	78,945
228	Unit 228-2002 GMC Shop Truck	Gasoline	37	6.3	3,273	\$1,343.20	55,390	58,663
120	Unit 120 - 2010 Ford F250 4X4	Gasoline	36	6.4	4,838	\$1,937.47	36,258	41,096
209	Unit 209-2002 GMC CrewCab	Gasoline	35	6.6	2,594	\$1,020.80	48,861	51,455
231	Unit 231-2006 Ford F-350	Gasoline	35	6.7	7,052	\$2,735.10	84,550	91,602
218	Unit 218-'04F350 Cab/Chassis	Gasoline	35	6.7	8,535	\$3,331.21	127,078	135,613
303	Unit 303-2002 GMC Loaf Truck	Gasoline	34	7.0	3,075	\$1,182.71	56,414	59,489
118	Unit 118 - 2004 Ford Ranger 4 X 4	Gasoline	33	7.2	2,652	\$954.37	38,812	41,464
234	Unit 234 - 2012 Chevrolet 3500HD Pickup	Gasoline	31	7.5	9,968	\$3,457.24	41,396	51,364
236	Unit 236-2001 GMC 1 Ton Utility	Gasoline	31	7.7	4,993	\$1,811.57	37,061	42,054
112	Unit 112-1997 3/4 GMC 4X4	Gasoline	29	8.1	4,717	\$1,533.53	135,608	140,325
227	Unit 227-2002-3/4 T.Pickup	Gasoline	28	8.5	4,841	\$1,482.06	80,842	85,683
107	Unit 107-2004 Chevrolet Express Van	Gasoline	28	8.5	2,063	\$653.92	71,792	73,855
131	Unit 131-2004 Ford Ranger 4X4	Gasoline	27	8.8	13,646	\$3,920.60	206,906	220,552
134	Unit 134-2004 Ford Pickup	Gasoline	25	9.4	6,461	\$1,785.54	119,097	125,558
135	Unit 135-04 Ford Freestar	Gasoline	24	9.7	1,725	\$461.89	74,673	76,398
5	F.D. #5-2006 Sierra	Gasoline	24	9.9	6,868	\$1,808.53	92,818	99,686
111	Unit 111-2004 Ventura Van	Gasoline	24	10.0	821	\$206.30	54,649	55,470
116	Unit 116-2004 GMC 4X4	Gasoline	24	10.0	8,829	\$2,311.79	75,102	83,931
46	F.D. #46-2017 GMC Sierra 2500	Gasoline	23	10.2	1,002	\$277.05	295	1,297
211	Unit 211-2004 GMC Savana Van	Gasoline	23	10.2	7,072	\$1,798.33	80,487	87,559
17	Unit FD17 - 2012 Ford F150 4x4 Pickup	Gasoline	23	10.4	3,901	\$975.83	42,938	46,839
129	Unit 129-2001N GMC 4X4	Gasoline	22	10.8	3,361	\$824.46	132,629	135,990
133	Unit 133-04 Ford Econoline Van	Gasoline	21	11.1	10,813	\$2,555.77	129,175	139,988
235	Unit 235 - 2016 Ford T250 Cargo Van	Gasoline	21	11.1	19,384	\$4,513.66	18,307	37,691
119	Unit 119 - 2009 Ford F150	Gasoline	21	11.1	9,433	\$2,220.48	80,901	90,334
117	Unit 117-2004 Ford Van	Gasoline	21	11.4	5,986	\$1,372.84	56,118	62,104
139	Unit 139-2016 Dodge Grand Caravan	Gasoline	18	12.8	8,757	\$1,791.93	19,326	28,083
115	Unit 115-04 Ford Ranger Ext.Cab	Gasoline	18	13.3	4,575	\$904.37	126,281	130,856
140	Unit 140-2017 Chevrolet Silverado	Gasoline	17	13.8	12,309	\$2,333.13	2,521	14,830
138	Unit 138-2015 Chevrolet Silverado Pickup	Gasoline	17	13.9	18,624	\$3,524.42	25,253	43,877
136	Unit 136-2008	Gasoline	16	14.6	9,879	\$1,795.63	108,148	118,027
110	Unit 110 - 2002 Chevrolet Venture Van	Gasoline	16	14.8	3,028	\$541.54	59,298	62,326
130	Unit 130-2004 Ford Pickup	Gasoline	15	15.6	11,520	\$1,912.17	90,802	102,322
137	Unit 137-2011 GM Aveo	Gasoline	12	18.9	3,488	\$480.44	20,094	23,582



Appendix

Figure 27 2017 Electricity consumption by service address and account number (kWh) (includes all City accounts)

SERVICE ADDRESS	ACCOUNT NUMBER	Consumption (kWh)
5000 JOYCE AVE COMPLEX	18813061001	2,161,399
4539 WILLINGDON AVE WWTP	18813412802	1,986,120
NORTH BOAT HARBOUR FT	18813700201	724,680
OVERHEAD STREET LTG	33170018301	656,403
WILLINGDON CAMPSITE	18813432811	305,640
7070 BARNET ST RCMP	18813641901	265,307
SOUTH HARBOUR BOATS/BLDG	18813700221	251,280
HEMLOCK/LARCH TREATMENT	18818022901	246,840
6910 DUNCAN CITY HALL	18813717871	175,920
ORNAMENTAL STREET LTG	33170018251	173,980
8083 HASLAM PUMP STN	8256979	162,240
LUND ST PUMP STN	18820008001	145,991
	18820273301	-
7160 DUNCAN SERVICE CTR	18818543581	125,600
4315 MARINE TANKER WHARF	8174144	97,200
CEDAR ST PUMP STN	8134438	84,062
MARINE AVE PUMPING ST	18814811991	66,246
WILDWOOD/POWELL LK WW	18820200101	66,240
6580 CRANBERRY FIRE	18816247501	56,460
4800 MARINE AVE MUS	18813432371	55,571
HSE1 - 4801 JOYCE AVE (Library)	10120087	45,511
6965 COURTENAY ST FIRE	18813630971	45,014
7516 DUNCAN AIRPORT	5930028	5,664
	18818544041	7,926
	18818544061	30,769
TIMBERLANE PARK	18818001001	26,104
	18818001021	14,558
P R AIRPORT RUNWAY	18818544181	33,952
6274 WALNUT DWIGHT HALL	18818461941	31,140
GRIEF PT PUMP STN	18815451101	28,543
7176 DUNCAN SERVICE CTR	18818543741	26,809
5401 TIMBERLANE PARK	6748687	21,300
7170 DUNCAN TRANSIT	18818543621	21,073
4800 MARINE AVE MUSEUM	18813432321	15,865
5943 WADDINGTON PUMP STN	18817004801	15,819
AIRPORT FIRE TRUCK	18818543981	15,819
HASLAM LAKE RD WATER	18817022801	15,723
4815 MARINE AVE	8769261	15,351
WILLINGDON BEACH WASH	18813400531	14,471
7494 DUNCAN FIRE TRNG CTR	7477757	11,946
SUNSET PARK	18820285401	10,348
7166 DUNCAN POUND	18818543701	8,916

JOYCE AVE/BARNET ST LIGHT	18813242531	7,453
J P DALLOS PARK	18813831001	7,051
WHSRM - 6211 LOIS ST	8455657	6,954
ALBERNI-MARINE LIGHT	18813439902	6,900
JOYCE-ALBERNI LIGHT	18813000111	6,805
JOYCE AV-DUNCAN ST LIGHT	18813000121	6,636
PADGETT RD PUMP STN	18819015001	6,548
6459 SUTHERLAND FIRE	18820060501	6,520
C - 4801 JOYCE AVE	10472492	6,483
MARINE/WHARF SIGNALS	3570704	5,953
JOYCE/GLACIER LIGHT	18813820671	5,786
CRANBERRY LAKE SANCT	18815312501	5,544
MANSON PARK	18815200211	3,967
	18815236901	94
WILLINGDON BEACH	18813432401	3,741
CHILCOTIN AVE PUMP STN	5803026	3,269
DUNCAN STREET AIRPORT	18818500301	3,233
7299 NOOTKA HASLAM LK	7617288	3,033
CRANBERRY ST-LOG RD	18816247001	2,926
JOYCE AVE TRAFFIC	8873112	2,770
ABBOTSFORD PUMP STN	18815204501	1,803
MOWAT BAY PUMP STN	18817004351	1,687
7510 DUNCAN AIRPORT	18818544021	1,681
ZERO WILLINGDON AVE 0	9604632	1,678
POWELL PLACE PUMPING	18820201301	1,408
PUMP - 7118 BAKER ST	8455679	1,333
5570 PARK AVE HOUSE	7264024	700
5815 MARINE AVE	18818453621	700
6235 POWELL PL	8455669	629
6327 DOGWOOD ST PARKS	18818000451	356
CRANBERRY ST PARKS	18816249751	57
HENDERSON PLAYGROUND	18818422402	50
6970 EGMONT ST POOL	18813700061	41
N HARBOUR UPPER PARKING	18813412901	7
WSHRM - CRANBERRY ST	8426509	1
LINDSAY PARK PUMP STN	18817010201	-
7160 DUNCAN ST YARD	18818500011	-
Grand Total		8,383,597

Figure 28 2017 Emissions Totals by Activity Within and Outside the CARIP reporting Boundary

Source	CARIP REPORTING BOUNDARY	Emissions (tCO ₂ e)	Energy (GJ)	Cost (\$)
Electricity	WITHIN CARIP BOUNDARY	84.5	28,500	\$1,061,951
	OUTSIDE CARIP BOUNDARY	5.0	1,680	\$63,743
	Total	89.5	30,181	\$1,125,693
Natural Gas	WITHIN CARIP BOUNDARY	869.7	17,439	\$166,947
	OUTSIDE CARIP BOUNDARY	67.0	1,343	\$15,205
	Total	936.6	18,782	\$182,153
Vehicles & Equipment	WITHIN CARIP BOUNDARY	517.3	7,466	\$216,026
	OUTSIDE CARIP BOUNDARY	379.4	5,580	\$138,570
	Total	896.7	13,046	\$354,597
Grand Total		1,922.8	62,008	\$1,662,442

Figure 29 2017 Emissions Summary by Fuel and Vehicle Class for CARIP Reporting (using to the Excel template provided by the Province)

Stationary Emission Sources:				
Building Fuel		Unit of Measure	Quantity	Emissions (tCO2e)
Electricity		KWh	7,916,792	84.47
Natural Gas		GJ	17,439	869.67
Mobile Emission Sources:				
Vehicle Class	Vehicle Fuel	Unit of Measure	Quantity	Emissions (tCO2e)
Heavy Duty Truck	Diesel	L	239	0.63
Heavy Duty Truck	Gasoline	L	25,279	57.18
Light Duty Truck	Gasoline	L	52,528	124.96
Light Duty Vehicle	Gasoline	L	434	1.02
Off Road Vehicle	Diesel	L	100,351	289.41
Off Road Vehicle	Gasoline	L	6,655	15.19
Off Road Vehicle	Propane	L	13,240	20.61
Light Duty Truck	Gasoline	L	3,471	8.26
Total Emissions (all Sources)				1471.41