



## The City of North Bay

# Energy Conservation and Demand Management Plan



June 2019

## Table of Contents

Executive Summary .....	3
Background.....	4
CDM Results.....	4
Plan Development.....	5
Mission Statement .....	6
Objectives .....	6
Goals .....	6
Targets .....	7
Baseline Year .....	8
Greenhouse Gas Emissions.....	9
North Bay’s Energy Projects .....	10
Completed Energy Projects.....	10
Current Projects .....	10
Future Energy Projects.....	11
Renewables .....	12
Solar Initiatives.....	12
Landfill Gas to Electricity .....	12
Sewage Treatment Plant Digester Gas Utilization .....	14
On-Demand Bus System.....	15
Water Meter Installation and Water Conservation .....	15
Community Energy Park .....	16
Education, Training, and Awareness.....	16
Demand Response Initiatives.....	18
Interval Metering .....	18
Action Items, Responsibilities and Timelines.....	19
Appendix 1: City of North Bay’s Expanded Objectives and Goals .....	20
Appendix 2: City of North Bay Detailed Energy Consumption Data.....	1
2.1 Electricity.....	1
2.2 Natural Gas.....	1
2.3 Transportation Fuel .....	1
2.4 Isometrics.....	2
Appendix 3: Energy Intensity per Building .....	1
Appendix 4: Greenhouse Gas Emissions Reductions .....	1
Appendix 5: Initiated, Completed, and Future Major Energy Projects.....	1

## Executive Summary

The City of North Bay recognizes that energy conservation and demand management is an integral part of the organization's long term sustainability as it strives to build a healthy and vibrant community. In 2008, the City established its initial Green Plan. During the life of the plan (2008 to 2012) the City reduced its greenhouse gas (GHG) footprint on the environment from the consumption of fossil fuels by a reduction of approximately 5% from the base year (2007), while adding and expanding assets to the organization.

In 2013, the City of North Bay used as its base its experience working through its initial plan to establish a Conservation and Demand Management Plan that not only meets its regulatory requirements under the Electricity Act (1998), O. Reg. 507/18, but will continue to guide the organization as it embeds environmental awareness into the City's processes and decision-making in order to minimize its carbon footprint on the environment while meeting social and economic responsibilities. During the life of the initial CDM plan (2013-2017) the City reduced its GHG footprint from the consumption of fossil fuels by a reduction of 13.7% from the base year (2012), while adding and expanding assets to the organization. This exceeds the 2.5% per year reduction of GHG goal from the initial plan.

The City of North Bay's Conservation and Demand Management (CDM) Plan establishes a commitment to improve monitoring, tracking and reporting systems, embeds conservation into departmental planning and budgeting, and identifies energy conservation opportunities throughout the corporation. A central consideration of the City of North Bay's Conservation Management Plan was to ensure it was aligned to the City's Corporate Business Plan's Vision and Mission.

Successful implementation of the CDM Plan will support economic and community development, demonstrates financial responsibility, promote a healthy community, support the organization's goal to foster a culture of continuous improvement and enhance communication to our stakeholders.

The City has demonstrated that it is capable of reducing energy consumption despite pressures that include growth in services, addition of assets and year-to-year weather variations. The objectives, goals, and targets detailed in the CDM Plan were established recognizing the need to balance competing environmental, economic and social aims of the community.

Over the life of the CDM Plan the City has targeted to annually reduce its greenhouse gas emissions into the environment by 3% per year (429 tonnes of CO<sub>2</sub>e equivalent gases). The path to achieving this target is detailed in this Plan.

The Plan articulates the City of North Bay's commitment to reducing its impact on global climate change by making energy and demand management an integral part of the City's operations, planning and the way it delivers services to the community.

## Background

The Conservation and Demand Management Plan is the City's roadmap to reduce its impact on the environment through energy reduction and process improvements to improve the City's long term sustainability.

In 2008, the City of North Bay developed and implemented a corporate wide Green Plan. The five year plan established in 2008 used 2007 as its baseline. Targets and objectives were established. The City reported its progress through an annual report summarizing its performance against the baseline and the previous year. In 2013, the City committed to establishing a new Green Plan that built on the previous Green Plan and would meet the requirements established by the Electricity Act (1998).

The initial City of North Bay Energy and Conservation Demand Management Plan (2013 – 2017) used 2012 as its baseline. The City of North Bay developed an updated CDM Plan which outlines energy the City's energy management plan for the next 5 years (2018-2022). The plan uses 2007 as its baseline to realize Ontario's commitment to meet the reductions promised in the Paris Accord of a 30% reduction in GHG emissions from 2005-2030 and progress against the plan will be reviewed annually.

The plan will assist the City of North Bay to meet its regulatory requirements under the Energy and Demand Management Regulation under the Electricity Act (1998). The above requirement came into effect on December 12, 2018. Under the new regulation public agencies are required to report annually to the Ministry of Energy their energy use and greenhouse gas emissions, develop and implement energy management plans and report on results.

## CDM Results

The initial Conservation and Demand Management Plan (2013-2017) was the City's roadmap to reduce its impact on global climate change by making energy and demand management as an integral part of the City's operations, planning, And the way it delivers services to the community. The City has demonstrated that it is capable of reducing energy consumption despite pressures that include growth in services, addition of assets and year-to-year weather variations.

The initial CDM plan sought to reduce electricity from the grid by 2.5% per year (540,000 kWh/year), reduce natural gas consumption by 2% per year (29,500 m<sup>3</sup>/year), reduce the use of traditional fuels by 3% per year (40,500 L/year), and realize a 2.5% reduction of GHG or 300 tonnes of CO<sub>2e</sub> gases annually. From the baseline year (2012), the City met 3 of the 4 targets by reducing the use of traditional fuels by 3.43% per year (71,600 L/year), reducing electricity from the grid by 2.95% per year (643,568 kWh/year), and reducing greenhouse gasses by 2.73% per year (1,078 tonnes CO<sub>2e</sub>/year). The City did not realize the natural gas target and realized an increase of 3.70% in natural gas consumption per year (54,650 m<sup>3</sup>/year).

## Plan Development

The City of North Bay's Energy Conservation and Demand Management Plan utilized a framework established in the development of its original Green Plan. The City utilized its experience over the period of 2013 to 2017 to establish objectives, goals and targets for the new Energy CDM Plan.

The development of the initial draft was completed by department managers and directors. It was presented and discussed by senior managers to ensure it was aligned with the City of North Bay's Strategic Plan to ensure input from leaders and doers of the organization was included.

The plan was developed using the Ontario Provincial Government's Guide to Preparing Conservation and Demand Management Plans.

Key steps in developing the plan are illustrated in the following figure



Through the process the City of North Bay's Corporate Mission Statement, Goals, Objectives and Targets were established. To establish new Goals, Objectives, and Mission Statements, the City analyzed the data from the initial CDM plan period of 2013-2019 to establish a better and more targeted plan to reduce its GHG emissions.

## Mission Statement

North Bay commits to actively and sustainably reduce its impact on global climate change by making energy and demand management an integral part of the City's operations, planning and the way it delivers services to the community.

## Objectives

- Reduce corporate dependency on conventional (GHG intensive) forms of energy (electricity, natural gas and transportation fossil fuels) through smart management of all assets.
- Use renewable forms of energy where feasible to reduce GHG impacts.
- Support and enhance the City's corporate culture with respect to energy conservation through management leadership and employee engagement.
- Incorporate life-cycle and global climatic impact analysis into business plans and policies.
- Engage and develop community partners.
- Exemplify energy conservation leadership that can be emulated by ABC's and the community at large.
- Communicate progress to all stakeholders.

## Goals

- Re-mandate steering and working committees.
- Develop Energy Management Systems to establish a more effective energy measuring, tracking and monitoring system.
- Establish a Sustainable Buildings Program.
- Integrate Energy Conservation & Demand Management Programs into the Wastewater and Water Distribution and Facilities operations and modernization plans.
- Review and update the Green Fleet Plan to continue to improve energy efficiency of the municipal fleet.
- Support energy conservation training and education to expand corporate ability to better address global warming impacts on the corporation.
- Reduce energy related costs.
- Make energy conservation and demand management an element of departmental budget and purchasing processes.
- Meet regulatory requirements.
- Establish a funding plan to help finance energy conservation and demand management projects including expanding renewable energy projects.
- Develop a Communication Plan to spread information to the corporation and to the community.

## Targets

- Reduce electricity from the grid by 2.5% per year (540,000 kWhr/year)
- Reduce the use of traditional transportation fuels by 4% per year (40,500 L/year)
- Realize a 3% reduction of GHG or 429 tonnes of CO<sub>2e</sub> gases annually.

An expanded discussion of the City of North Bay's Objectives and Goals is presented in Appendix 1.

## Baseline Year

The City of North Bay's Green Plan (2008-2012) utilized 2007 as its baseline. The initial CDM Plan (2013-2017) utilized 2012 as its baseline for comparison due to the availability of data and a re-confirmation of the commitment to reduce energy. The new CDM Plan (2018-2022) has established 2007 as its baseline for comparison due to availability of data and Ontario's commitment to meet the reductions promised in the Paris Accord of a 30% reduction in GHG emissions from 2005-2030.

The baseline year will be used for analysis and measurement of progress for future energy and emission reduction calculations.

Table 1 below is a high level summary of 2016 versus the baseline year and 2017 versus the baseline year. Detailed annual consumption data is summarized in Appendix 2.

**Table 1: City of North Bay 2018 versus 2007 Energy Use – All Sectors**

<b>2007 Baseline</b>	<b>Electricity (kWh)</b>	<b>Natural Gas (m<sup>3</sup>)</b>	<b>Transportation Fuel (L)</b>	<b>Total</b>
<b>Total Quantity Used</b>	23,093,113 kWh	1,359,460 m <sup>3</sup>	1,509,279 L	
<b>Total GHG Produced (tonnes of CO<sub>2e</sub>)</b>	17,181	2,641	15,346	35,168

<b>2018</b>	<b>Electricity (kWh)</b>	<b>Natural Gas (m<sup>3</sup>)</b>	<b>Transportation Fuel (L)</b>	<b>Total</b>
<b>Total Quantity used</b>	18,981,583	1,518,862	1,582,445	
<b>Total GHG Produced (tonnes CO<sub>2e</sub>)</b>	13,419	2,937	16,109	32,465
<b>Annual Quantity Targets</b>	16,742,505		1,094,238	
<b>2018 vs. 2007 Reduction Quantity Achieved</b>	4,111,530	-159,402	-73,166	
<b>Percent Reduction Achieved</b>	-17.80 %	-11.72%	-4.85%	
<b>GHG Reduction Achieved in 2018 (tonnes CO<sub>2e</sub>)</b>	3,762	-296	-744	2,722

Future reporting will provide annual consumption data by major activity versus baseline year of 2007 highlighting progress of data versus the overall goals.



## Greenhouse Gas Emissions

Another important metric that the City will measure to monitor its progress is through the reduction of greenhouse gas emissions to the environment. The City has established a target of reducing its greenhouse gas emissions by 3% per year or the approximate equivalent of 429 tonnes of CO<sub>2e</sub> gases to the environment.

A summary of its performance from 2007 through 2018 relative to the 2007 baseline is presented in Appendix 4.

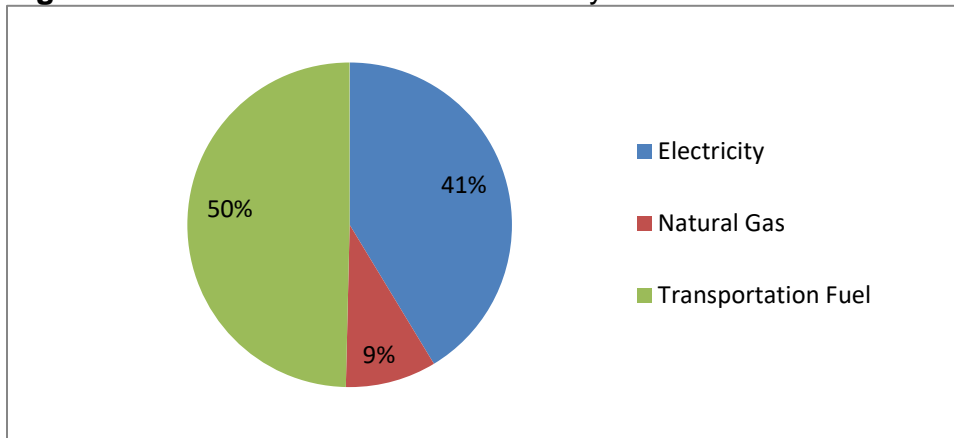
Table 2 below summarizes the greenhouse gases generated in 2018 by the City of North Bay.

**Table 2:** City of North Bay 2018 Energy Use – All Sectors

2018	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Total
<b>Total Quantity used</b>	18,981,583	1,518,862	1,582,445	
<b>Total GHG Produced (tonnes CO<sub>2e</sub>)</b>	13,419	2,937	16,109	32,465
<b>Annual Quantity Targets</b>	16,742,505		1,094,238	
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<b>GHG Reduction Achieved in 2018 (tonnes CO<sub>2e</sub>)</b>	3,762	-296	-744	2,722

Figure 1 provides a summary of energy used and overall greenhouse gas emissions for the City of North Bay in 2018. Electricity and Transportation Fuel comprise the majority of emissions. In 2018 The City of North Bay produced 32,465 tonnes of CO<sub>2e</sub>, a decrease of 2,722 tonnes compared to 2007.

**Figure 1: 2018 GHG Emissions Summary**



## North Bay's Energy Projects

Since 2007, the City of North Bay has investigated, developed and implemented many energy efficiency projects.

During the initial Green Plan (2008 through 2012) the City investigated and evaluated over 30 potential projects and/or programs throughout the corporation. The City implemented over 15 projects. A summary of major initiated, completed, and future energy related projects is presented in Appendix 5.

Listed below is a sampling of some of the projects / programs.

### Completed Energy Projects

- Replacement of HPS Street Lights with LED Fixtures
- Converting traffic lights to LED's
- Evaluating and replacing decorative lights
- Lighting and heating upgrades at City/YMCA Aquatics Center
- Utilization of Landfill Gas for the production of electricity
- Evaluation of Cogeneration Project at Wastewater Treatment Plant
- Installation of Residential Water Meters
- Reduce the City's fleet size
- Potential elimination of Janey Avenue Pumping Station
- Education and Awareness Training Pilot with LAS/AMO
- City Energy Park

### Current Projects

- Parking lot lighting review
- Improve traffic flows/automate signalization systems

### **Future Energy Projects**

Going forward, the City has identified several potential projects. These include:

- Improved use of Building Automation Systems
- On-demand Transportation
- Landfill Gas Well System Expansion

For the full listing of major projects see Appendix 4.

## Renewables

### Solar Initiatives

In 2008, the City commissioned a 60 panel (10-kilowatt) solar photovoltaic array on the roof of City Hall (shown in Figure 2). In 2018, 342.54 kWh of solar power energy was produced, and resulted in \$11,719.30 revenue. Since commissioning to the end of 2017, the system generated 85,077 kWh of electricity. The electricity was originally sold to the Ontario Power Authority under the Renewable Standard Offer Program (RSOP) for 42¢ per kilowatt hour. Beginning in November 2010 the City applied and was approved to transfer the RSOP to the OPA's microFIT program and received 80.2¢ per kWh for all power produced until May 2028.

The power produced by the solar PV system on City Hall in 2018 (342.54 kWh) was enough power to offset 4.21 tonnes of CO<sub>2e</sub>. Solar energy offsets peak power which is more reliant on hydrocarbon sourced energy and thus it has enhanced green benefits. Live and historic solar production from this site is available for viewing at [AuroraVision.net](https://easyview.auroravision.net/easyview/index.html?entityId=111914).

<https://easyview.auroravision.net/easyview/index.html?entityId=111914>



**Figure 2:** 10 kWh solar panels on the roof of City Hall. **Figure 3:** Solar Hot Water on roof of new Water Plant

In 2010 the City commissioned its new Water Filtration Plant which uses a solar hot water system on its roof (shown in Figure 3) to heat water used for filter cleaning.

### Landfill Gas to Electricity

The City partnered with North Bay Hydro Services to install a power generation facility that utilizes landfill gas produced at the Merrick Landfill Site. The station was commercialized in June 2012. Prior to providing landfill gas to the power generation facility the City operated a landfill gas flaring station. In 2013, the landfill collected and supplied **7,829,552 m<sup>3</sup>** of landfill gas (LFG). Utilization of the LFG for electricity generation reduced greenhouse gas emissions by **58,829 tonnes** by the City's landfill. Without the flare and generator set in place, Merrick would have

produced approximately 2.5 times more greenhouse gas emissions than all of the energy used by the City in its operations. In its first full year of operation the project generated \$391,984 in LFG sales for the City. At its peak, the Merrick Project will generate enough electricity to satisfy the electrical power needs of approximately 1200 homes per year. In 2018, the landfill gas to electricity operation produced total revenue of 5,323,325.52 kWh. Each kWh is sold with a unit price of 0.038 cents. This generated a total income of \$202,286.37 in 2018. It has produced a total income of \$1,522,017.40 since its commissioning.

The City

**Figure 4:** Landfill Gas Utilization to Electricity Facility and Landfill Gas Flaring Station located at the City's Merrick Landfill Site



Table 3 presents a summary of the LFG to electricity project in terms of finances and energy produced.

**Table 3:** Merrick Landfill Gas to Electricity Project

Total Costs	\$4,000,000
Start Date	May 2010
Construction Start Date	July 2011
Completion Date	June 12, 2013
Electricity Generated (2018 average/month)	443,610 kWh
Projected Annualized Revenue	\$1.05 to 1.15 Million
Projected Annual Revenue to the City	\$350,000 to \$450,000
Expected Payback	10 Years

## Sewage Treatment Plant Digester Gas Utilization

Currently digester gas is utilized by the site's boiler system to supplement plant heating. In the summer, when heating demand is nominal, the digesters continue to produce gas and consequently most of this fuel is flared.

The City initially completed a Digester Gas Utilization Plan for the North Bay Sewage Treatment Plant in 2009. The report completed by J.L. Richards identified that the digester gas could be utilized to produce electricity and subsequent heat from the power production utilized for plant heating. It was determined that the primary digester produced sufficient gas to run a 250 kW engine.

In 2010, one of the primary digesters was upgraded. The upgrades resulted in an increase in gas production. In 2012, the City, funded by the Ontario Power Authority, completed a Cogeneration Feasibility Study (CRA Report – 2012) for the Waste Water Treatment Plant (WWTP). The study concluded that although it was technically feasible to support a 400 kW cogeneration facility with the digester gas produced at the WWTP the economics were not favourable under today's conditions. The best case scenario presented a 17 year payback. This will be revisited as circumstances change. In the meantime the City realizes the benefit at the Wastewater Treatment Plant of the cleaning and better utilization of the primary digester that was completed in late 2010.

## On-Demand Bus System

The City of North Bay is implementing an on-demand transit initiative to reduce the use of transportation fuel on bus routes with extremely low user use. The initiative will run in the evenings when there is the least amount of users.

A main line will run every half hour and several side routes which will be able to be accessed through an app and will only run when a user identifies that they wish to use. The side routes will only run when requested and drop off to transfer stations on the main line. This initiative will reduce the fuel consumption from the City's largest fuel consumer and reduce greenhouse gas emissions from the buses.

## Water Meter Installation and Water Conservation

In 2009, water meters are installed and used in the City of North Bay for both water and sanitary channels. A considerable decrease in water usage throughout the city has been noted after complete installation. Water meters drastically improved water usage and waste with the ability of seeing quantifiable amounts and the associated cost.

**Table 4:** Out-going treated water into the distribution system 2011-2018

<b>Year</b>	<b>Treated Water Taking Total Treated (m3)</b>	<b>Average Day (m3/day)</b>
<b>2011</b>	12,563,903	34,408
<b>2012</b>	11,659,907	31,910
<b>2013</b>	10,578,115	28,962
<b>2014</b>	10,337,724	28,335
<b>2015</b>	10,228,009	28,019
<b>2016</b>	7,564,121	20,720
<b>2017</b>	6,788,663	18,597
<b>2018</b>	7,146,560	19,573

Water usage has drastically decreased throughout the seven year period since the meters were installed. This can be attributed to the awareness of water being consumed by citizens of North Bay and increased efficiency of water and wastewater treatment processes taking place in the facilities. In 2015, water meter billing began, and a 2,663,888 m3 reduction of treated water flow

to the distribution system is seen between 2015 and 2016 which resulted in a 1,042,047 kWh decrease in electricity used by the Water Treatment Plant from 2015 to 2016.

## **Community Energy Park**

The City of North Bay operates Memorial Gardens arena and the aquatic center (YMCA). The City uses these facilities to support community wellness, the local OHL team in town, the North Bay Battalion, and to facilitate many community events such as Summer in the Park, a summer festival that was put on by the City. In 2018, the two facilities consumed a total of 2,727,605 kWh of electricity, or 14.37% of the total electricity consumed that year.

In 2017, construction started on the Community Energy Park micro grid. The Community Energy Park consists of a large, natural gas fueled generator which provide electricity and heat to both facilities and is self-sustained. This project came online in May 2019, taking both of the facilities officially off of the grid and will allow for a significant reduction in the greenhouse gas emissions from both facilities.

The Community Energy Park also comes equipped with electric car charging stations, promoting green energy transportation and reduction in use of traditional transportation fuels throughout the community.

## **Education, Training, and Awareness**

Education, training and awareness is an integral part of the project plan and is critical to the success of the projects in terms of achieving and sustaining proposed savings. They are also essential in creating, maintaining and improving a sustainable energy culture within the Corporation of the City of North Bay and throughout the community. The overall intent of the training program is to complement the technological and organizational changes proposed in the plan and maximize the energy savings resulting from projects. The City of North Bay has made numerous efforts to ensure resources and operations are assisting in meeting the goals of the CDM plan to the best of the operation's current abilities while factoring in variances shown by isometric data, feasibility studies, and concerns.

Training on building systems and energy efficiency will allow the building staff to modify operations to increase efficiencies, identify opportunities for energy savings measures and raise awareness of energy efficiency among all staff.

In 2014, the City undertook a partnership with LAS to complete an Energy Conservation Education and Awareness Training initiative. The purpose of this workshop was to help inspire the change of typical workplace behaviours from energy consuming to energy conserving. In order to do this, the workshop promoted the understanding of energy consumption as well as to offer many workplace energy conservation tips. The training also included helpful tips that participants can utilize to reduce their energy consumption in their homes.



In an office environment it is recognized that lighting can account for up to 40% of energy costs, space heating and cooling can account for between 20-40%, and plug loads for 5-10%.

Thus training sessions included ways to save costs through conservation by exploring means to reduce lighting consumption, heating and cooling demand, plug loads. In addition the training sessions will provide a vehicle to communicate past and present progress on energy conservation and demand management and introduce future conservation and demand management plans.

Recognizing beneficial advances that have been previously made towards achieving the City's goals is an important step in sustainability. These advances are continuing to be made to further increase the value and impact of these initiatives. Raising awareness through controllable environmental initiatives is implemented corporately, impacting all City assets. Staff has been given several tools to increase their own energy efficiency.

The City of North Bay website is a great resource for both staff and the public to become informed and learn more about environmental services and renewability. The website provides information on composting, recycling, pesticide use and water conservation and can be found at the following address: [City of North Bay Website - Environmental Services](#)

## Demand Response Initiatives

Since the beginning of 2011 the City of North Bay has participated in the Ontario Power Authority's (OPA) Demand Response 3 (DR3) Program. The City's Water Treatment Plant (WTP) since 2011 and through to 2015 committed to shed approximately 600 kWh of electricity capacity as part of the OPA DR3 program. From 2015-2017 the City's Water Treatment Plant has committed to shed 300 kWh of electricity due to the drop in water usage in the city. Over the life of the program the City will earn between \$120,000 and \$200,000 depending on the number of demand response events participated in by the WTP.

The City has investigated and evaluated the opportunity to enroll other facilities in the program. To date no other facility has been identified an attractive opportunity to aggregators of the OPA Demand Response (DR) Program. The City continues to explore potential DR Programs including a program developed by North Bay Hydro for local businesses. In addition to providing a small revenue stream the locally driven North Bay Hydro program provides tools that will improve electrical usage management to allow for opportunities to reduce electrical consumption and therefore realize electrical cost savings. The program will allow for smaller blocks of commitment to the OPA's DR Programs. The City is committed to participating in this program if it is confirmed that it is eligible. The potential benefits to the City beyond the financial include broadening its partnership with the local utility and demonstrating the benefits to the broader business community. Benefits are on-going as of 2017.

This program has the potential to be an additional tool to assist North Bay in achieving its conservation targets while generating a nominal financial return. Participation with this program demonstrates that the City is committed to showing leadership in energy conservation and demand management.

## Interval Metering

Expanding our participation in the Demand response program offered by North Bay Hydro will also provide opportunities to expand the number of interval meters installed at our top ten electricity consuming assets at nominal or no cost. Expanding interval metering in our large electricity consuming facilities will improve our ability to monitor and act on electrical power anomalies as they occur to better manage our electricity demand.

## **Action Items, Responsibilities and Timelines**

Appendix 1 expands the City of North Bay's Objectives and Goals previously presented. It also provides for responsibilities and timelines.

## Appendix 1: City of North Bay's Expanded Objectives and Goals

### 1. Re-Mandate steering committee and working committee.

- a. Steering committee meets 1-2 times per year to review corporate and departmental progress, exchange CDM information, learn about new opportunities etc.

Timing: Ongoing.

### 2. Update Energy Data Management System to establish a more effective Monitoring and Tracking System that includes:

- a. Efficient Data Collection
- b. User Friendly Interface for major asset groups
- c. Annual Reports
- d. Identify, investigate and implement where viable sub-metering capabilities

Timing: Bulk of the effort will take place in 2019/2020. Once established the system will be modified as required to improve its effectiveness. Responsibility is shared between the Senior Facilities and Environment Engineer and the Director of Information Technology.

### 3. Establish a Sustainable Buildings Program

- a. Develop a Sustainable Building Policy.
- b. Complete 2 Building Energy Studies targeted on major energy consumers with potential for significant improvement over the next 5 years.
- c. Integrate Sustainable Building Best Practices into all new building construction and retrofit projects.
- d. Improve utilization of BAS where available
- e. Investigate feasibility of a corporate wide open protocol BAS
- f. Identify peak demand for development of peak demand management strategies
- g. Include major departments and ABC's
- h. Promote (improve) energy efficiency for new and existing residential and commercial buildings in the community.

Timing: Established a corporate subcommittee mandated to establishing a Sustainable Buildings Program in 2019/2020.

#### **4. Wastewater and Water Distribution and Facilities**

- a. Integrate CDM into operations and modernization plans.

Timing: Driven by the Senior Facilities and Environment Engineer, Director of Public Works, Manager Water/Wastewater, and Manager Distribution/Collection the CDM plan will be integrated in current operations planning modernization plans. Plan development is targeted for 2020/2021.

#### **5. Establish key partners and relationship.**

- a. To identify and develop viable projects
- b. To fill technical and resource gaps where applicable
- c. To effectively utilize all available funding avenues to finance best in class projects that meet the corporation's goals.

Timing: Ongoing.

#### **6. Improve the energy efficiency of the municipal fleet.**

- a. Establish goals to be achieved by 2020
- b. Establish plan for switching to more efficient vehicles during the normal replacement cycle
- c. Investigate and evaluate potential of alternative fuels

Timing: Ongoing.

#### **7. Renewable Energy Project to reduce Corporations GHG impact.**

- a. Work with local partners (LDC or other) to identify and implement small-scale local renewable energy projects with the objective of obtaining/displacing 3% of energy consumed by the Corporation from low-impact renewable sources by the year 2020.
- b. Continue to supply landfill gas for destruction through the Electricity from LFG Utilization Plant at Merrick Landfill

- c. Establish a plan for future projects with targeted paybacks that will sustainably fund projects while reducing GHG impacts by the City.

Timing: The City has previously implemented a microFIT solar rooftop project and installed (2008) and operated a Landfill Gas Flaring station (2007-2012) to reduce the greenhouse gas generation from the municipal landfill. In 2012 the City worked with North Bay Hydro Services to complete the installation of electricity from landfill gas utilization plant. Supply landfill gas to Electricity from LFG Utilization Plant. The City continues to upgrade the LFG Collection System as the landfill expands.

The City will explore other potential opportunities during the life of the plan. (c) 2019 and beyond.

#### **8. Update Green Fleet Plan**

- a. Identify new potential projects
- b. Audit operating practices

#### **9. Establish a funding plan to help finance energy conservation and demand management projects including expanding renewable projects.**

- a. Utilizes multiple funding options.
- b. Wherever possible funding for projects should include all available sources including other government incentives, utility and/or equipment incentives etc.
- c. Develop policy and guidelines for the CDM Project Fund.

Timing: 2019-2020.

## **10. Facilitate communication to the corporation and to the community**

- a. Communication of performance
- b. Continue to enhance energy conservation culture
- c. Communication to Developers/Builders for new construction

Timing: Items (a) and (b) are ongoing. Develop a communication plan to communicate results to other local groups (2019-2020).

## **11. Meet all provincial regulatory requirements.**

- a. The Electricity Act

Timing: Ongoing.

## Appendix 2: City of North Bay Detailed Energy Consumption Data

### 2.1 Electricity

**Table 5: The City of North Bay's Electricity Annual Consumption Data 2007-2018**

Activity	Baseline 2007 kW-hrs	2008 kW-hrs	2009 kW-hrs	2010 kW-hrs	2011 kW-hrs	2012 kW-hrs	2013 kW-hrs	2014 kW-hrs	2015 kW-hrs	2016 kW-hrs	2017 kW-hrs	2018 kW-hrs	Variation 2007 vs. 2018 kW-hrs
Trout Lake WTP	4,944,149	4,483,898	4,460,818	4,989,975	5,366,195	5,319,491	4,850,254	4,860,223	4,849,053	3,807,006	3,499,669	3,630,295	1,313,854
Sewage Plant	3,499,040	3,422,248	3,405,202	3,417,049	3,672,187	3,406,524	3,424,430	3,481,070	3,172,180	3,126,839	3,050,911	3,227,922	271,118
Street Lights	3,306,186	3,327,501	3,322,759	3,324,191	3,204,120	2,790,237	2,348,268	2,026,566	2,036,369	2,042,502	2,036,369	2,031,595	1,274,591
Pete Palangio Arena	1,610,640	1,516,972	1,370,688	1,284,074	1,252,270	1,394,515	1,417,325	1,349,068	1,284,907	1,206,968	1,054,418	1,093,184	517,456
City Hall	1,624,320	1,431,251	1,318,658	1,351,874	1,413,099	1,438,746	1,402,933	1,336,316	1,301,602	1,369,273	1,367,351	1,374,508	249,812
Public Works	1,421,790	1,348,960	1,100,822	739,463	811,268	744,366	787,751	754,278	711,649	696,063	674,167	671,587	750,203
Memorial Gardens Arena	1,231,920	1,159,132	1,103,817	1,028,890	1,053,315	1,157,214	1,359,309	1,967,695	1,907,766	1,862,129	1,857,488	1,836,267	-604,347
Reservoirs/ Water PS	1,087,204	1,100,853	1,375,804	1,697,232	1,410,418	1,307,494	1,042,909	1,000,710	1,062,011	962,603	980,312	905,458	181,746
Aquatic Centre	933,840	951,055	926,995	916,481	870,711	976,630	836,640	885,314	888,605	837,715	897,485	891,338	42,502
Parks/Beaches	825,000	825,000	825,000	*825,000	*825,000	*825,000	*825,000	*825,000	*825,000	*825,000	*825,000	825,000	0
Sewage Lift/ Pump Stations	495,138	597,505	597,226	554,558	451,236	503,205	497,732	569,506	504,729	433,204	460,104	434,498	60,640



Activity	Baseline 2007 kW-hrs	2008 kW-hrs	2009 kW-hrs	2010 kW-hrs	2011 kW-hrs	2012 kW-hrs	2013 kW-hrs	2014 kW-hrs	2015 kW-hrs	2016 kW-hrs	2017 kW-hrs	2018 kw-hrs	Variatio n 2007 vs. 2018 kW-hrs
West Ferris Arena	590,600	559,567	500,160	482,813	454,044	470,681	519,075	466,941	416,102	413,664	389,430	387,731	202,869
Fire Stations	287,326	292,639	297,847	275,375	296,444	272,730	344,203	346,901	343,813	303,763	283,420	279,408	7,919
Other Parking Lots	195,000	195,000	195,000	*195,000	*195,000	*195,000	*195,000	*195,000	*195,000	*195,000	*195,000	195,000	0
Parking Garage	151,412	153,388	149,299	144,888	119,783	73,794	68,192	70,884	68,829	66,018	54,091	60,146	91,266
Traffic Lights	269,138	168,472	138,507	104,675	160,103	104,927	194,319	161,218	158,670	164,116	168,128	170,341	98,797
Merrick Landfill	126,532	150,710	159,904	39,596	130,589	120,528	4,699	193,689	215,672	182,014	311,294	451,034	-324,502
Marina	135,828	138,201	136,420	108,626	134,071	136,623	130,032	126,123	121,962	113,299	101,807	117,369	18,459
Lee Park	125,200	121,840	116,480	107,610	123,212	124,212	83,440	77,064	107,558	107,201	80,589	89,018	36,182
Marsh Landfill	86,850	100,826	79,646	55,119	68,032	70,245	93,004	134,254	138,447	112,637	99,500	132,045	-45,195
Other Waterfront	75,000	75,000	75,000	*75,000	*75,000	*75,000	*75,000	*75,000	*75,000	*75,000	*75000	75,000	0
Transit/Shelter s	70,000	70,000	70,000	121,680	107,880	100,920	81,520	106,020	105,120	100,080	95,100	102,840	-32,840
<b>Annual Total</b>	<b>23,092,11 3</b>	<b>22,190,01 8</b>	<b>21,726,05 2</b>	<b>21,839,16 9</b>	<b>22,193,97 7</b>	<b>21,608,08 2</b>	<b>20,581,03 5</b>	<b>21,008,84 0</b>	<b>20,490,04 4</b>	<b>19,002,09 4</b>	<b>18,556,63 3</b>	<b>18,981,58 4</b>	<b>4,110,530</b>

Note: Numbers with an asterisk (\*) are estimate.

Figure 5 presents annual electricity consumption of the top 10 users of the City from 2007 to 2018. These locations plus the Public Library consume most of the City's electricity and this is where the majority of energy efficiency recommendations are focused.

**Figure 5: Electricity Consumption by Facility (2008-2018)**

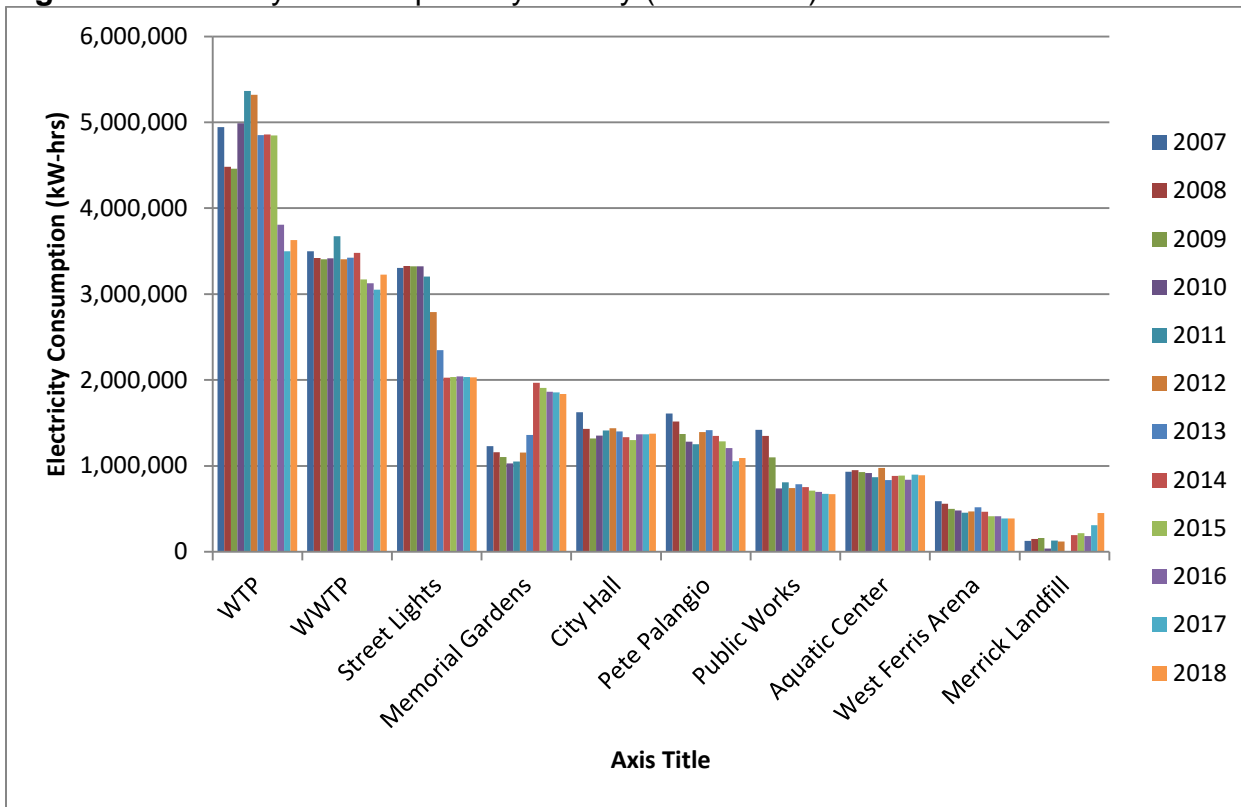
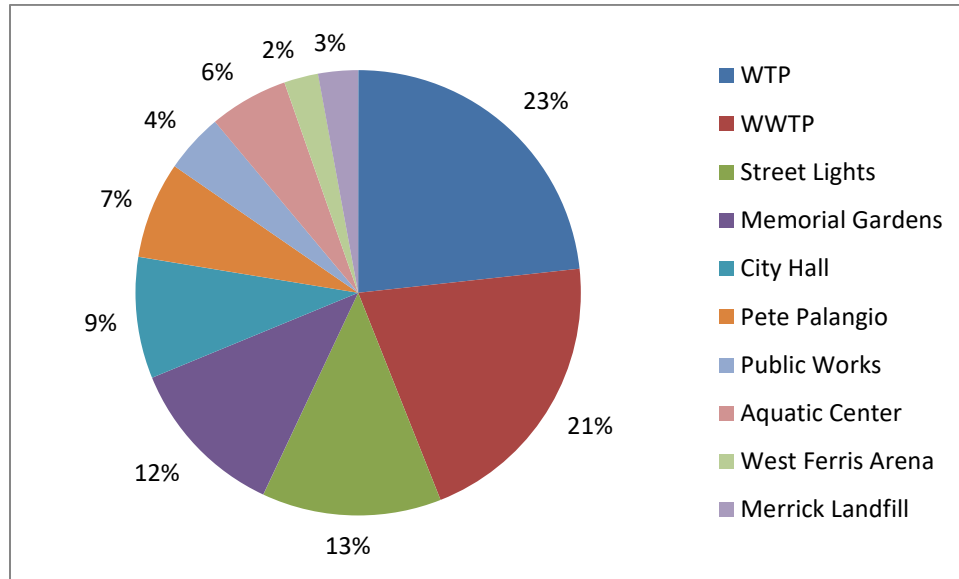


Figure 6 presents the electricity used by facility by the percentage of total used in 2018 by the City of North Bay. The top 10 users are identified. All other facilities such as Parks, Marina, Merrick Landfill, etc. are combined as “Other”.

**Figure 6:** Breakdown by Facility of 2018 Electricity Consumption



## 2.2 Natural Gas

**Table 6:** The City of North Bay’s Natural Gas Annual Consumption Data 2007-2018

Facility	2007 m3 Baseline	2008 m3	2009 m3	2010 m3	2011 m3	2012 m3	2013 m3	2014 m <sup>3</sup>	2015 m <sup>3</sup>	2016 m3	2017 m <sup>3</sup>	2018 m3	2007 vs 2018 Variatio n m3
Public Works - Franklin	299,538	341,321	331,209	266,450	338,148	315,001	305,025	288,632	184,215	192,941	238,662	247,415	19,035
Aquatic Center	320,024	330,775	319,940	289,051	320,784	321,417	301,016	369,495	338,466	339,000	309,552	306,551	-17,500

Facility	2007 m3 Baseline	2008 m3	2009 m3	2010 m3	2011 m3	2012 m3	2013 m3	2014 m <sup>3</sup>	2015 m <sup>3</sup>	2016 m3	2017 m <sup>3</sup>	2018 m3	2007 vs 2018 Variatio n m3
Memorial Gardens Arena	186,361	187,509	178,500	129,138	186,744	202,858	182,829	313,080	274,389	291,146	324,157	260,491	-131,353
Sewage Treatment Plant	161497	194,383	130,420	121,524	114,901	114,080	136,965	117,668	52,954	162,568	395,452	192,928	-71,404
Pete Palangio Arena	102,424	117,073	113,178	112,195	102,383	134,439	141,336	151,754	145,466	137,934	144,668	157,782	-45,587
West Ferris Arena	64,681	72,846	68,373	57,471	58,582	64,343	66,637	61,302	52,018	42,474	47,980	51,311	6,160
City Hall	54,996	67,460	63,762	66,707	73,563	101,140	80,504	101,053	77,523	82,458	86,132	101,999	-35,292
Fire Stn 1 - Princess	49,740	48,270	44,453	43,476	37,865	46,012	53,562	51,176	43,489	33,263	36,522	37,301	6,175
Lee Park - Memorial Dr	22,441	22,885	23,480	20,874	18,354	32,157	25,386	24,215	22,110	17,794	18,027	17,772	3,102
Fire Stn 2 - McKeown	18,117	18,170	18,769	16,669	16,522	12,584	13,994	13,590	10,937	9,134	8,492	11,184	5,485
352 McIntyre (Rented)	2,470	15,059	14,396	11,588	12,372	6,005	0	0	0	0	0	0	11,588
Fire Stn 3 - Marshall	15,270	14,539	14,944	13,743	11,982	13,440	12,794	13,126	12,216	11,717	12,399	13,380	363
New Bus Trml - Oak	12,993	13,061	14,385	12,503	14,687	13,712	14,798	18,941	21,207	22,332	23,779	19,053	-6,550

Facility	2007 m3 Baseline	2008 m3	2009 m3	2010 m3	2011 m3	2012 m3	2013 m3	2014 m <sup>3</sup>	2015 m <sup>3</sup>	2016 m3	2017 m <sup>3</sup>	2018 m3	2007 vs 2018 Variatio n m3
NB Water Treatment Plant	11,966	11,605	12,460	18,689	38,293	36,826	17,365	90,648	109,742	31,529	32,775	26,883	-8,194
Fire Stn 4 - Duxford	12590	10,515	10,536	10,856	10,000	6,911	6,752	6,651	2,110	3,424	3,858	4,685	6,171
Kinnette Playgroun d	5,713	7,399	7,235	5,658	6,872	6,287	7,416	6,504	6,554	6,419	7,104	6,784	-1,126
Circle Lake Playgroun d	6,590	6,565	5,875	2,576	2,404	0	0	0	0	0	0	0	2,576
Police Playgroun d	3,680	4,006	3,778	3,360	4,994	3,781	5,354	5,323	4,367	3,804	3,902	4,832	-1,472
Parks - First Ave Unit 1	2,950	1,934	2,417	1,921	2,191	2,831	2,544	0	0	0	0	0	1,921
Marathon Beach	-	2,139	2,847	1,732	1,879	1,416	1,584	1,340	1,078	10	891	1562	170
Parks - First Ave Unit 2	1,800	3,110	2,924	2,321	2,104	1,404	0	0	0	0	0	0	2,321
Laurentian Playgroun d	1256	1,284	1,441	1,210	1,278	1,217	1,293	1,638	1,228	1,364	1,322	1,522	-312
Granitevill e Playgroun d	1,077	1,006	800	914	1,311	1,148	1,349	1,376	1,167	1,234	1,133	1,259	-345
Thompson Park	1,102	981	935	924	994	816	205	0	0	0	0	0	924

Facility	2007 m3 Baseline	2008 m3	2009 m3	2010 m3	2011 m3	2012 m3	2013 m3	2014 m <sup>3</sup>	2015 m <sup>3</sup>	2016 m3	2017 m <sup>3</sup>	2018 m3	2007 vs 2018 Variatio n m3
ONR Field	184	62	73	84	144	97	192	67	0	183	66	77	7
330 Main East	0	0	1464	7828	11,591	12,009	13,789	15,840	13,388	11,282	11,826	11,580	-3,752
1105 Lakeshore Drive	0	0	1755	5828	5,060	5,502	6,039	6,433	6,338	5,815	5,134	6,280	-452
Library	-	31330	6,236	21,048	31,920	28,406	34,523	41,645	36,147	34,094	34,200	36,231	-15,183
<b>Total m<sup>3</sup></b>	1,359,46 0	1,525,28 7	1,396,58 5	1,246,33 8	1,427,92 2	1,485,83 9	1,433,25 0	1,701,48 7	1,417,10 9	1,441,92 1	1,748,03 4	1,518,86 2	-272,524

Figure 7 presents the annual Natural Gas consumption of the top 10 users of the City since 2007.

**Figure 7: Natural Gas Consumption by Facility (2007-2018)**

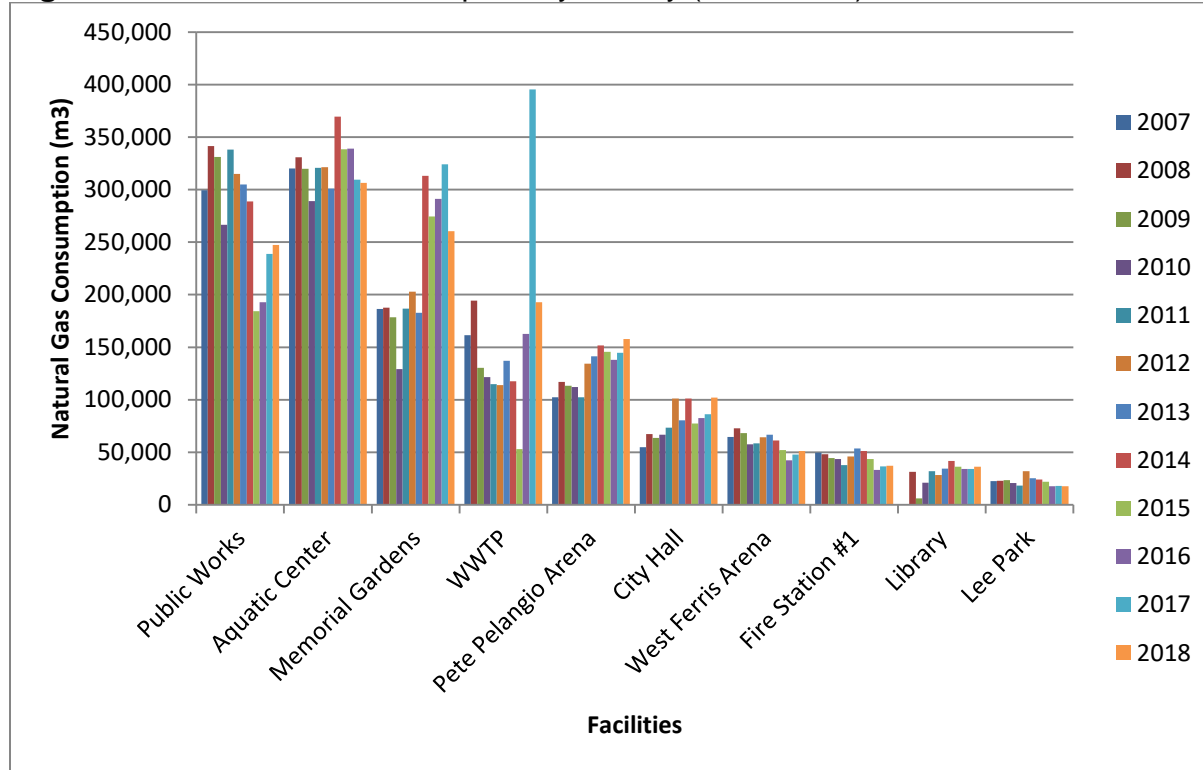
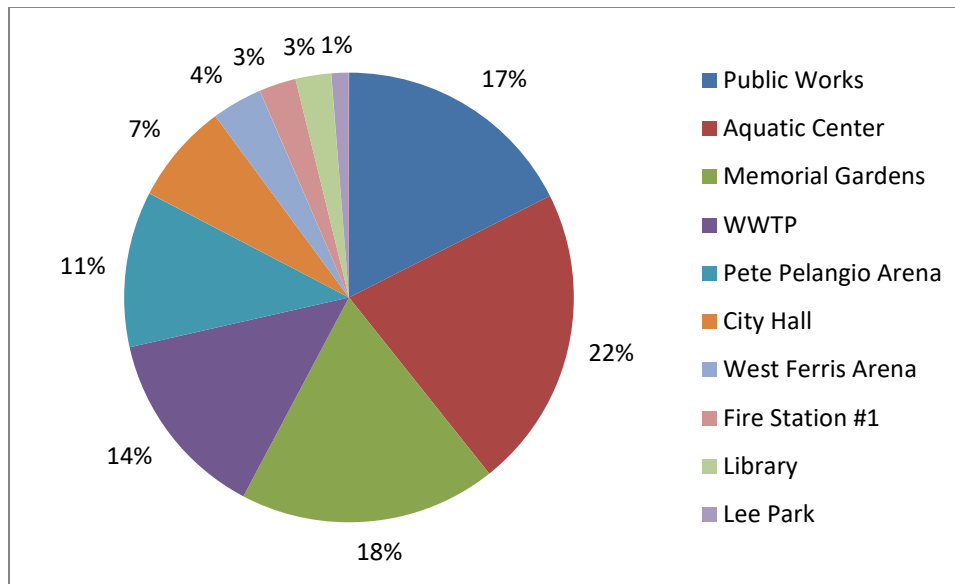


Figure 8 illustrates natural gas consumed by facility by the percentage of total used in 2016 by the City of North Bay. The top 10 users are identified. All other facilities such as Parks, Marina, Merrick Landfill, etc. are combined as "Other".

**Figure 8:** Breakdown by Facility of 2018 Natural Gas Consumption





## 2.3 Transportation Fuel

**Table 7:** Annual Transportation Fuel Consumption Data

Function	2007 (L)	2008 (L)	2009 (L)	2010 (L)	2011 (L)	2012 (L)	2013 (L)	2014 (L)	2015 (L)	2016 (L)	2017 (L)	2018 (L)
Fleet/Garage	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	31,482	25,380	32,986	25,011	15,254
Police	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	146,348	149,601	142,168	129,595	138,639
Parks	70,174	67,741	63,461	64,609	60,642	67,836	67,536	55,556	58,418	57,695	57,536	59,665
Transit	868,826	836,213	810,395	794,827	759,058	728,874	728,954	734,086	707,329	717,464	776,136	727,630
Ambulance	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	75,306	71,130	73,006	86,192	96,416
Public Works	501,824	521,544	476,489	481,318	499,643	497,595	482,545	523,122	475,667	470,938	503,332	403,063
Hydro	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	94,898	90,528	87,741	87,143	83,148
Water/Waste Water Plant	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	See Misc.	8,247	8,097	7,526	6,487	8,792
By-law, Parking, Survey	2,447	23,046	20,775	17,578	19,787	21,441	21,241	21,419	21,016	20,524	18,952	14,556
Fire	46,507	44,357	42,176	39,906	42,394	39,047	38,797	35,662	32,599	36,817	35,283	34,283
Misc.	868,826	836,213	810,395	794,827	759,058	728,874	728,954	See Above	See Above	See Above	See Above	See Above
<b>City Total</b>	<b>1,489,778</b>	<b>1,492,901</b>	<b>1,413,296</b>	<b>1,398,238</b>	<b>1,381,524</b>	<b>1,354,793</b>	<b>1,339,073</b>	<b>1,726,126</b>	<b>1,639,764</b>	<b>1,646,863</b>	<b>1,725,667</b>	<b>1,582,445</b>
<b>Reduction</b>		-3,123	76,482	91,540	108,254	134,985	150,705	64,267	-149,986	-157,087	-235,889	<b>-92,667</b>
<b>CO<sub>2e</sub> (tonne)</b>	15,346	15,198	14,387	14,234	14,064	13,792	13,632	14,512	16,693	16,765	17,567	<b>16,109</b>

\*In years 2007 to 2013 fuel consumption data for fleet/garage, police, ambulance, hydro, and water/wastewater plant were all categorized together in the miscellaneous category. From 2014 to 2018 the miscellaneous category was separated into its respective categories.

Figure 9 presents the annual transportation fuel consumption by department in the City of North Bay since 2007.

**Figure 9:** Transportation Fuel Consumption by Function (2007-2018)

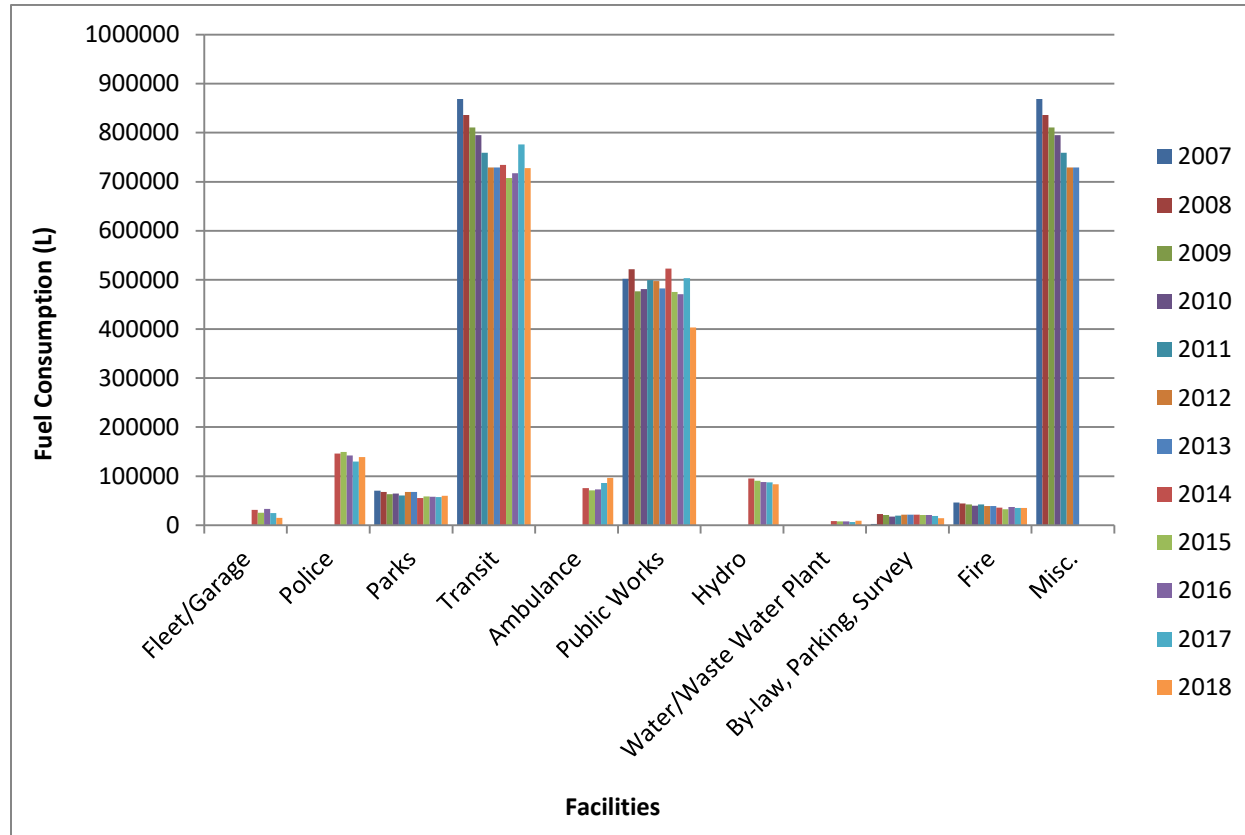
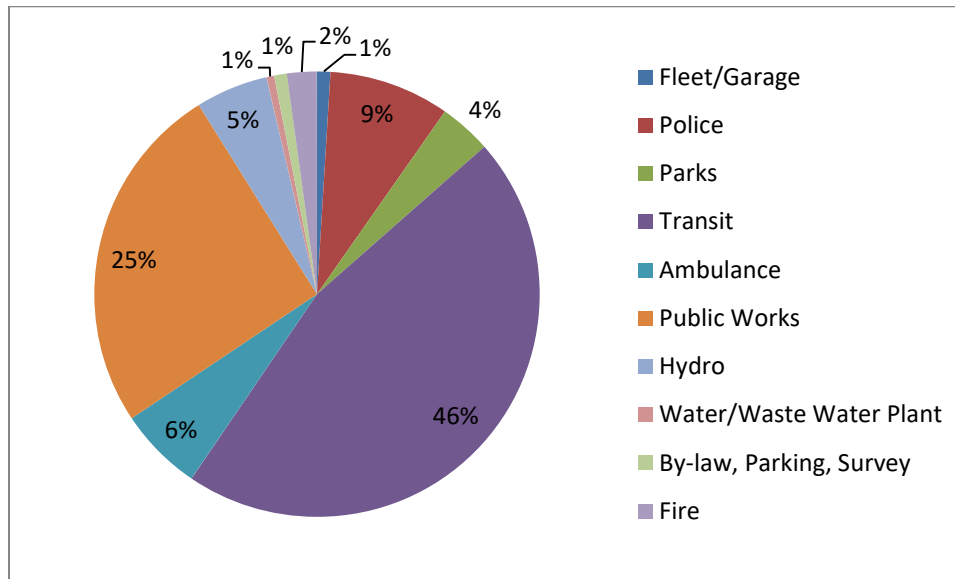


Figure 10 presents the transportation fuel used by the various functions in North Bay during 2018. Detailed annual consumption of transportation fuel data is provided in Appendix 2.3.

**Figure 10:** Breakdown by Function of 2018 Transportation Fuel Consumption



## 2.4 Isometrics

Accurately comparing energy consumption from year-to-year requires an appreciation of external factors such as weather and climatic influences. For example, hot summers drive up the demand for air conditioning, cold winters increase demand for heating, damp weather reduces water pumping but can increase pumping at sewage lift stations and at the landfill.

Heating Degree Days (days that average less than 18° C) and Cooling Degree Days (days that average greater than 18°C) can be examined to help understand energy demand at City buildings.

**Table 8:** Average Temperature at North Bay Airport

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Average
<b>2010</b>	-10.6	-8.9	1.8	7.5	14.2	15.9	20.6	19.3	12.5	6.1	0.5	-8.2	5.9
<b>2011</b>	-8.2	-10.5	-5.9	3.2	12.6	16.6	20.7	18.9	14.7	8.5	2.5	-6.2	5.6
<b>2012</b>	-9	-7	2	4	14	18	20	19	13	7	-1	-7	6.1
<b>2013</b>	-11.6	-11.1	-3.9	1.7	11.7	15	18.3	17.2	12.2	7.2	-3.3	-13.3	3.3
<b>2014</b>	-15.6	-13.3	-10.6	1.7	11.1	16.7	16.7	16.7	12.8	6.7	-3.9	-7.2	2.7
<b>2015</b>	-16.4	-19.2	-7.9	3.4	12.1	14.7	18.5	18.6	17.1	5.6	3.3	-0.5	4.1
<b>2016</b>	-10.5	-11.5	-3.4	-0.1	11.9	15.8	19.1	20	14.7	7.3	3.2	-8.3	4.9
<b>2017</b>	-8.7	-6.5	-8.3	5.8	10.3	15.2	18.4	16.2	15	10.2	-2.6	-15.7	4.1
<b>2018</b>	-12	-9.7	-5.3	-1.7	12.9	16	20.9	19.2	13.9	4.1	-4.7	-8.2	3.8
<b>Monthly Average</b>	-11.4	-10.9	-4.6	2.8	12.3	16.0	19.2	18.3	14.0	7.0	-0.7	-8.3	

**Table 9:** Heating Degree Days at North Bay Airport (Degree Days with temperatures above 18°C)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Average
<b>2010</b>	789	670	429	390	335	88	47	18	85	254	402	596	4103
<b>2011</b>	875	960	783	622	388	120	42	11	47	151	354	530	4883
<b>2012</b>	837	704	502	429	148	64	20	41	172	339	561	757	4574
<b>2013</b>	890	793	679	487	202	102	48	64	174	327	613	945	5324
<b>2014</b>	1002	854	849	478	216	70	70	73	178	340	628	761	5519
<b>2015</b>	996.4	1041	778	438.8	191.1	100.6	37.1	27.4	68.8	358.5	426.8	481.2	4945.7
<b>2016</b>	854.9	856.7	663.4	542.1	201	85.7	24.1	9.2	75.6	213.9	324.8	473.3	4324.7
<b>2017</b>	427.9	417.1	709	269.5	170.2	66.9	15.8	59	114.2	203.9	411.1	875.6	3740.2
<b>2018</b>	928.4	775.9	720.7	592.2	173.8	75	8.9	16.5	145.5	415.8	680.3	813	445.5
<b>Average</b>	844.5	785.7	679.2	472.1	225.0	66.2	34.8	35.5	117.8	289.2	489.0	692.5	

**Table 10: Cooling Degree Days at North Bay Airport (Degree Days with temperatures below 18°C)**

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Average
<b>2010</b>	0	0	0	12	70	57	168	131	25	2	0	0	465
<b>2011</b>	0	0	0	1	37	73	171	113	50	14	0	0	459
<b>2012</b>	0	0	5	0	33	64	98	53	19	1	0	0	273
<b>2013</b>	0	0	0	1	26	23	76	41	8	2	0	0	177
<b>2014</b>	0	0	0	0	10	47	34	38	16	1	0	0	146
<b>2015</b>	0	0	0	0	8.1	1.6	52.7	44.9	43.1	0	0	0	150.4
<b>2016</b>	0	0	0	0	11.7	21.6	55.4	61.9	2.1	0	0	0	152.7
<b>2017</b>	0	0	0	0	0.7	1.6	24.8	11.6	30.4	0	0	0	69.1
<b>2018</b>	0	0	0	0	15.3	16	99.7	55	23.8	0	0	0	17.5
<b>Average</b>	0.0	0.0	0.6	1.6	23.5	33.9	86.6	61.0	24.2	2.2	0.0	0.0	

Tables 8, 9, and 10 show that the weather in 2018 was cooler than it was in 2010. It was also cooler in temperature 2018 relative to years previous. This impact energy demands.

**Table 11: Monthly and Annual Precipitation in millimeters**

	<b>Jan.</b>	<b>Feb.</b>	<b>Mar.</b>	<b>Apr.</b>	<b>May</b>	<b>Jun.</b>	<b>Jul.</b>	<b>Aug.</b>	<b>Sep.</b>	<b>Oct.</b>	<b>Nov.</b>	<b>Dec.</b>	<b>Yearly Average</b>
<b>2010</b>	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>2011</b>	62.8	60.6	73.4	133.4	51.6	90.2	62.8	43.2	79.4	126.8	106.4	81.4	81.0
<b>2012</b>	82.2	44	57	70	23.8	115.4	61.8	145.8	102	126	54.2	79.9	80.2
<b>2013</b>	72.4	37.6	32.8	90.2	57.4	59.2	82.3	91.7	68.8	102.9	63.7	31	65.8
<b>2014</b>	69.3	24.4	55.9	67.3	49.3	175.8	241.8	88.9	86.4	77.2	58.4	22.6	84.8
<b>2015</b>	0.9	3.8	20.4	74.2	79.1	57.4	53	92.3	45.2	85.7	66.5	69.1	54.0
<b>2016</b>	54.1	43.2	109	24.3	48.8	52.9	77.6	105.8	67.9	33.6	22.7	26.5	55.5
<b>2017</b>	14.2	36.8	16.1	106	92.8	86.1	71.1	149.4	70.1	104.9	59.5	41.3	70.7
<b>2018</b>	38.2	34.5	11.2	51.9	71.3	27.8	25.1	119.5	121.5	89.8	56.1	52.7	58.3
<b>Average</b>	49.3	35.6	47.0	77.2	59.3	83.1	84.4	104.6	80.2	93.4	60.9	50.6	

Table 11 shows a decrease in precipitation in 2018 compared to the two years previous, and a decrease compared to the baseline (2011). The peak year for precipitation was 2014, which had on average 26.5mm more rain per month than 2018.

### Appendix 3: Energy Intensity per Building

**Table 12:** Energy Intensity of Facilities (2018)

<b>Facility</b>	<b>Energy Intensity (kWh/sqm)</b>
<b>Aquatic Center</b>	275.98
<b>City Hall</b>	176.34
<b>Fire Station #1</b>	136.99
<b>Fire Station #2</b>	149.72
<b>Fire Station #3</b>	97.67
<b>Fire Station #4</b>	71.32
<b>Lee Park Building</b>	222.62
<b>Memorial Gardens Arena</b>	354.89
<b>Merrick Landfill</b>	3,242.65
<b>Parking Garage</b>	97.46
<b>Pete Palangio Arena</b>	277.84
<b>Public Library</b>	104.03
<b>Public Works</b>	94.07
<b>Sewage Plant</b>	209.09
<b>Transit Station</b>	146.31
<b>Water Treatment Plant</b>	300.15
<b>West Ferris Arena</b>	124.90

Table 12 illustrates the energy intensity's for the City of North Bay's facilities in 2018 to show which facilities use the most energy per square meter.

### Appendix 4: Greenhouse Gas Emissions Reductions

**Table 13:** Summary of Annual Energy Consumption and GHG Emissions from 2007-2018



2007	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	23,093,113	1,359,460	1,489,778		
Total GHG Produced (tons CO2e)	17,181	2,641	15,346	35,168	35,168

2008	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	22,190,198	1,525,287	1,492,901		
Total GHG Produced (tons CO2e)	15688	2935	15198	33,821	68,989
Reduction Quantity Achieved	902,915	-165,827	-3,123		
Percent Reduction Achieved	3.91%	-12.20%	-0.21%		
GHG Reduction Achieved (tons)	1,493	-294	148	1,347	1,347

2009	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	21,726,052	1,396,585	1,413,296		
Total GHG Produced (tons CO2e)	15,360	2,687	14,387	32,435	101,424
Reduction Quantity Achieved	1,367,061	-37,125	76,482		
Percent Reduction Achieved	5.92%	-2.73%	5.13%		
GHG Reduction Achieved	1,821	-46	959	2,733	4,080

2010	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	21,839,169	1,246,338	1,398,238		
Total GHG Produced (tons CO2e)	15,440	2,398	14,234	32,073	133,497
Reduction Quantity Achieved	1,253,944	113,122	91,540		
Percent Reduction Achieved	5.43%	8.32%	6.14%		
GHG Reduction Achieved	1,741	243	1,112	3,095	7,175

2011	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	22,193,977	1,427,922	1,381,524		
Total GHG Produced (tons CO2e)	15,691	2,748	14,064	32,503	166,000
Reduction Quantity Achieved	899,136	-68,462	108,254		

2011	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Percent Reduction Achieved	3.9%	-5.0%	7.3%		
GHG Reduction Achieved	1,490	-107	1,282	2,665	9,840

2012	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	21,608,081	1,433,250	1,354,793		
Total GHG Produced (tons CO <sub>2</sub> e)	15,277	2,758	13,792	31,827	197,827
Reduction Quantity Achieved	1,485,032	-73,790	134,985		
Percent Reduction Achieved	6.4%	-5.43%	9.06%		
GHG Reduction Achieved	1,904	-117	1,554	3,341	13,181

2013	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	19,440,951	1,433,045	1,339,073		
Total GHG Produced (tons CO <sub>2</sub> e)	13,745	2,758	13,632	30,134	227,961
Reduction Quantity Achieved	3,652,162	-73,585	150,705		
Percent Reduction Achieved	15.8%	-5.4%	10.1%		
GHG Reduction Achieved	3,436	-117	1,714	5,034	18,215

2014	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	19,782,437	1,701,498	1,425,511		
Total GHG Produced (tons CO <sub>2</sub> e)	13,986	3,274	14,512	31,772	259,733
Reduction Quantity Achieved	3,310,676	-342,038	64,267		
Percent Reduction Achieved	14.3%	-25.2%	4.3%		
GHG Reduction Achieved	3,195	-633	834	3,396	21,611

2015	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	20,490,045	1,417,109	1,639,764		
Total GHG Produced (tons CO <sub>2</sub> e)	14,486	2,727	16,693	33,906	293,639
Reduction Quantity Achieved	2,603,068	-57,649	-149,986		

2015	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Percent Reduction Achieved	11.3%	-4.2%	-10.1%		
GHG Reduction Achieved	2,695	-86	-1,347	1,262	22,873

2016	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	19,002,095	1,441,921	1,646,865		
Total GHG Produced (tons CO <sub>2</sub> e)	13,434	2,775	16,765	32,974	326,613
Reduction Quantity Achieved	4,091,018	-82,461	-157,087		
Percent Reduction Achieved	17.7%	-6.1%	-110.5%		
GHG Reduction Achieved	3,747	-134	-1,419	2,194	25,067

2017	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	18,556,633	1,748,034	1,725,667		
Total GHG Produced (tons CO <sub>2</sub> e)	13,120	3,364	17,567	34,051	360,664
Reduction Quantity Achieved	4,536,480	-388,574	-235,889		
Percent Reduction Achieved	19.6%	-28.6%	-15.8%		
GHG Reduction Achieved	4,061	-723	-2,221	1,117	26,184

2018	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	18,981,583	1,518,862	1,582,445	-	-
Total GHG Produced (tons CO <sub>2</sub> e)	13,420	2,923	16,109	32,452	393,116
Reduction Quantity Achieved	4,111,530	-159,402	-92,667		
Percent Reduction Achieved	17.80%	-11.73%	-6.22%		
GHG Reduction Achieved	3,761.02	-281.76	-763.29	2,715.97	28,900.01

2007-2018 Cumulative	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Total
Total Quantity Used	248,904,334	17,649,311	17,889,855	
Total GHG Produced (tons CO <sub>2</sub> e)	176,830	33,988	182,299	236,788

Figure 11 illustrates the progress made in the reduction of GHG's generated by fossil fuel consumption by the City of North Bay from 2007 to 2018.

**Figure 11:** Annual Greenhouse Gas Emissions 2007-2018

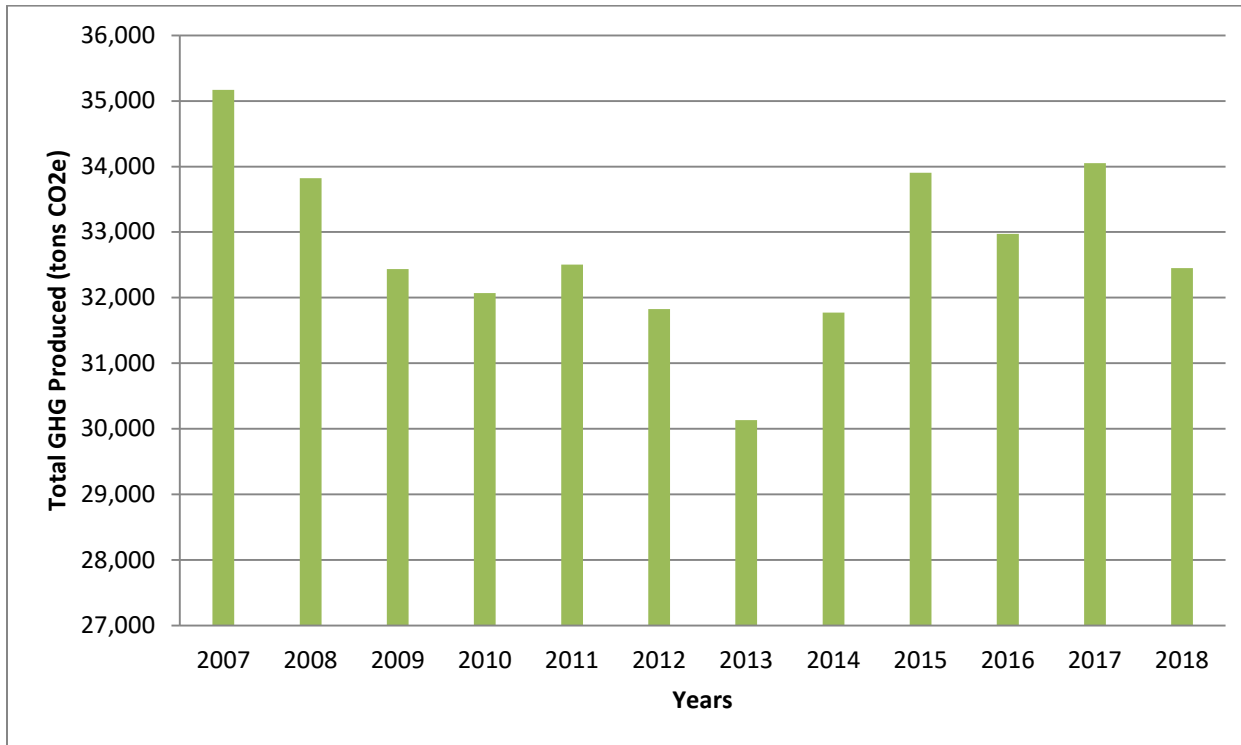
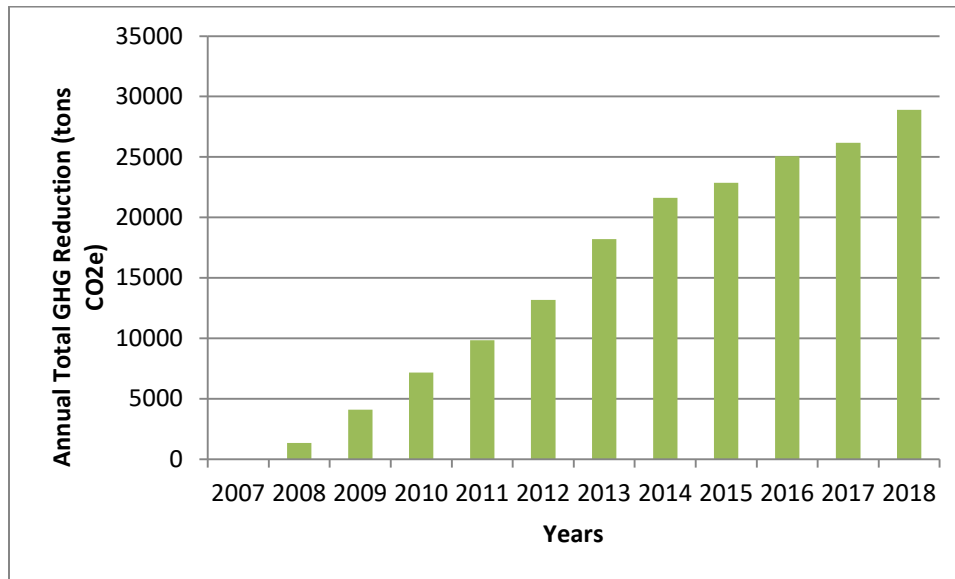


Figure 12 illustrates the cumulative annual reduction of GHG's from 2007 to 2018. By 2018, the City has decreased the amount of GHG's generated by a total of 28,900 CO<sub>2e</sub> tonnes, an average of 2,627 CO<sub>2e</sub> tonnes per year.

**Figure 12:** Cumulative Reduction of GHG's from 2007 to 2018



## Appendix 5: Initiated, Completed, and Future Major Energy Projects

**Table 14:** The City of North Bay's Completed Major Energy Projects

Project	Costs	Savings Realized	Est. Simple Payback
Replace HPS Street lights with LED Fixtures (2013)	\$2,800,800	\$281,000/yr.	13 years
Replaced Decorative lights	\$200,000	\$37,500/yr.	6 years
Lighting & heating upgrades at YMCA Aquatics Center	\$750,000	\$75,000/yr.	10 years
EMP Mini-Hybrid on City Transit Buses	\$268,000	\$151,400/yr.	2 years
Cogeneration Project at Wastewater Treatment Plant	\$3,900,000	\$150,940/yr.	26 years
Driver Training using Smart Driver Program	\$50,000	30,000 L/yr.	2 years
Install Residential Water Meters (bill based on use)	\$6,063,576	500,000 kWh/yr.	
Replace Ellendale pumps with high efficiency motors	\$831,109.35	115,480 kWh/yr.	
Eliminate Janey Avenue Pumping Station		12,650 kWh/yr.	

**Table 15:** The City of North Bay's Initiated and Future Major Electricity Reduction Projects

Projects	Potential Savings
Continue with revamping/controls in City buildings	25,000 kWh/yr.
*Parking lot lighting review	Being Evaluated
Education and Awareness Training with AMO/LAS	Being Evaluated
Study Sewage Plant low lift pumping system	Being Evaluated
Study improved use of Building automation systems	Future Evaluation
Study to improve water distribution system	Future Evaluation

**Table 16:** The City of North Bay's Future Major Natural Gas Reduction Projects

Projects	Potential Savings
Insulate/Seal Garages at Public Works/Automatic Door Closure	25,000 m3
Insulate Roof of City Hall	10,000 m3

<b>Insulate Roof at Fire Station #4</b>	5,000 m3
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**Table 17:** The City of North Bay’s Initiated and Future Major Transportation Fuel Reduction Projects

<b>Projects</b>	<b>Potential Savings</b>
<b>*Reduce Idling</b>	35,000 L/year
<b>*Reduce Vehicle Weight</b>	10,000 L/year
<b>*Cull older inefficient vehicles/ Reduce fleet size</b>	7,600 L/year
<b>*Enhance vehicle preventative maintenance</b>	5,000 L/year
<b>*Improve traffic flows/automate signalization system</b>	Being Evaluated

Note: Projects marked with an asterisk (\*) are currently ongoing.