



## The City of North Bay

# Energy Conservation and Demand Management Plan



**June 2022**

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## 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 2013-2017 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 2021 versus the baseline year. Detailed annual consumption data is summarized in Appendix 2.

**Table 1: City of North Bay 2021 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>2021</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>	17,531,688	607,816	1,338,232	
<b>Total GHG Produced (tonnes CO<sub>2e</sub>)</b>	12,395	1,170	13,623	27,188
<b>Annual Quantity Targets</b>	15,533,113		942,279	
<b>2021 vs. 2007 Reduction Quantity Achieved</b>	6,053,090	751,644	171,047	
<b>Percent Reduction Achieved</b>	26.21%	55.29%	11.13%	
<b>GHG Reduction Achieved in 2021 (tonnes CO<sub>2e</sub>)</b>	4,786	1,471	1,723	7,980

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 2021 relative to the 2007 baseline is presented in Appendix 4.

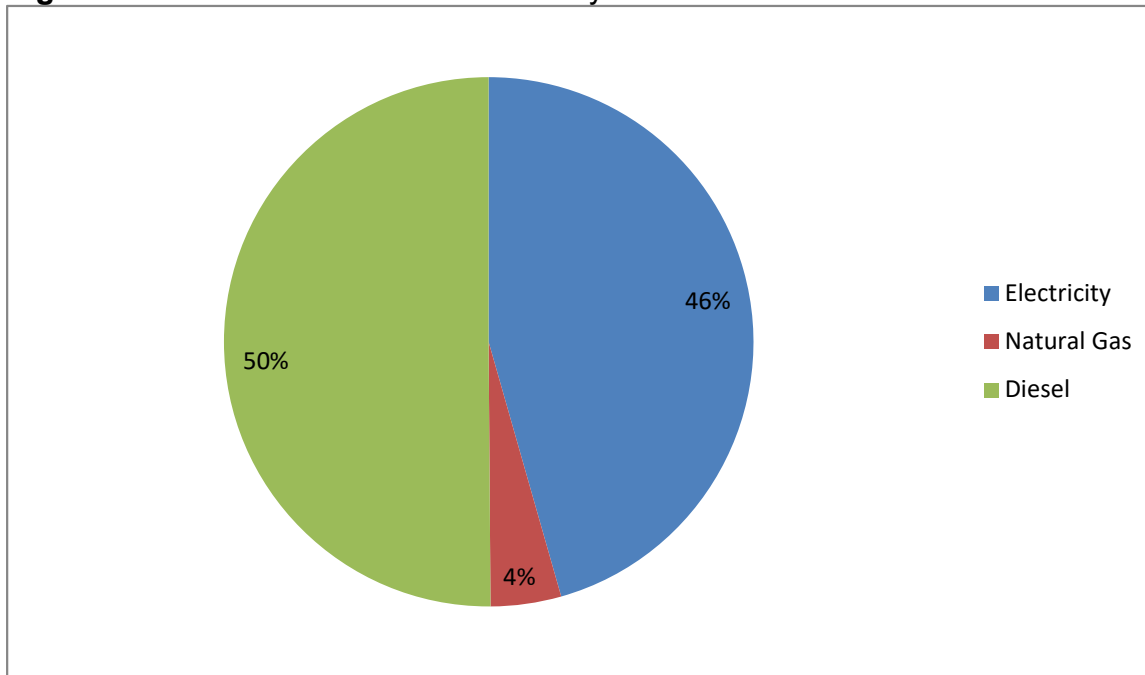
Table 2 below summarizes the greenhouse gases generated in 2021 by the City of North Bay.

**Table 2:** City of North Bay 2021 Energy Use – All Sectors

2021	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Total
<b>Total Quantity used</b>	17,531,688	607,816	1,338,232	
<b>Total GHG Produced (tonnes CO<sub>2e</sub>)</b>	12,395	1,170	13,623	27,188
<b>Annual Quantity Targets</b>	15,533,113		942,279	
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<b>GHG Reduction Achieved in 2021 (tonnes CO<sub>2e</sub>)</b>	4,786	1,471	1,723	7,980

Figure 1 provides a summary of energy used and overall greenhouse gas emissions for the City of North Bay in 2021. Electricity and Transportation Fuel comprise the majority of emissions. In 2021 The City of North Bay produced 27,188 tonnes of CO<sub>2e</sub>, a decrease of 7,980 tonnes compared to 2007.

**Figure 1: 2021 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
- Elimination Janey Avenue Pumping Station

- Education and Awareness Training Pilot with LAS/AMO
- City Energy Park
- Upgraded bus barn overhead doors to improve building envelope performance
- Purchase of Fully Electric Zamboni

### **Current Projects**

- Parking lot lighting review
- Improve traffic flows/automate signalization systems
- Quantitative energy audit of the City Hall building envelope
- Narrow AI HVAC Control System at City Hall
- Renewing the Pete Palangio Ice Plant chiller

### **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
- Investigating a new low energy filter technology for the Aquatics Centre

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 2021, 52.28 kWh of solar power energy was produced, and resulted in \$4,192.51 revenue. Since commissioning to the end of 2021, the system generated 85,129 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.

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 2021, the landfill gas to electricity operation produced total revenue of 3,093,041 kWh. Each kWh is sold with a unit price of 0.038 cents. This generated a total income of \$117,535.56 in 2021. It has produced a total income of \$1,946,132.54 since its commissioning.

**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 (2021 average/month)	257,753 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 2011-2021

<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
<b>2019</b>	7,475,978	20,482
<b>2020</b>	7,152,145	19,541
<b>2021</b>	7,521,563	20,607

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 m<sup>3</sup> 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 2019-2021. 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.

\*Due to operation changes during the covid pandemic, this action date will be updated in the 2024-2028 plan.

### 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: Establish a corporate subcommittee mandated to establishing a Sustainable Buildings Program in 2019-2021.

\*Due to operation changes during the covid pandemic, this action date will be updated in the 2024-2028 plan.

#### **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.

\*Due to operation changes during the covid pandemic, this action date will be updated in the 2024-2028 plan.

#### **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 2021
- 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 2021.
- 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. Timing: Ongoing.

## **10. 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.

\*Due to operation changes during the covid pandemic, this action date will be updated in the 2024-2028 plan.

## **11. 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 (2019-2021).

\*Due to operation changes during the covid pandemic, this action date will be updated in the 2024-2028 plan.

## **12. 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 2007-2021

<b>Activity</b>	<b>Baseline 2007 kW-hrs</b>	<b>2018 kw-hrs</b>	<b>2019 kW-hrs</b>	<b>2020 kW-hrs</b>	<b>2021 kW-hrs</b>	<b>Variation 2007 vs. 2021 kW-hrs</b>
Trout Lake WTP	4,944,149	3,630,295	3,715,303	3,588,838	3,782,466	-1,161,683
Sewage Plant	3,499,040	3,227,922	3,212,726	2,983,046	2,933,053	-565,987
Street Lights	3,306,186	2,031,595	2,036,369	2,042,502	2,036,369	-1,269,817
Pete Palangio Arena	1,610,640	1,093,184	1,067,263	657,671	788,275	-822,365
City Hall	1,624,320	1,374,508	1,407,404	1,371,535	1,304,548	-319,772
Public Works	1,421,790	671,587	670,879	650,305	615,156	-806,634
Memorial Gardens Arena	1,231,920	1,836,267	628,314	1,959,764	1,632,663	400,743
Reservoirs/ Water PS	1,087,204	905,458	819,452	531,120	643,115	-444,089
Aquatic Centre	933,840	891,338	285,000	730,621	644,233	-289,607
Parks/Beaches	825,000	825,000	825,000	825,000	825,000	0
Sewage Lift/ Pump Stations	495,138	434,498	464,352	428,123	497,886	2,748



<b>Activity</b>	<b>Baseline 2007 kW-hrs</b>	<b>2018 kw-hrs</b>	<b>2019 kW-hrs</b>	<b>2020 kW-hrs</b>	<b>2021 kW-hrs</b>	<b>Variation 2007 vs. 2021 kW-hrs</b>
West Ferris Arena	590,600	387,731	349,517	200,972	278,418	-312,182
Fire Stations	287,326	279,408	328,628	232,494	66,300	-221,026
Other Parking Lots	195,000	195,000	195,000	195,000	195,000	0
Parking Garage	151,412	60,146	79,217	61,120	43,598	-107,814
Traffic Lights	269,138	170,341	160,254	157,874	164,058	-105,080
Merrick Landfill	126,532	451,034	536,406	215,672	589,973	463,441
Marina	135,828	117,369	124,837	116,316	123,163	-12,665
Lee Park	125,200	89,018	80,475	73,722	67,349	-57,851
Marsh Landfill	86,850	132,045	176,466	176,466	128,991	42,141
Other Waterfront	75,000	75,000	75,000	75,000	75,000	0
Transit/Shelters	70,000	102,840	98,100	101,580	97,074	27,074
<b>Annual Total</b>	<b>23,092,113</b>	<b>18,981,584</b>	<b>17,335,962</b>	<b>17,374,742</b>	<b>17,531,688</b>	<b>-5,560,425</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 2021. 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 (2008-2021)**

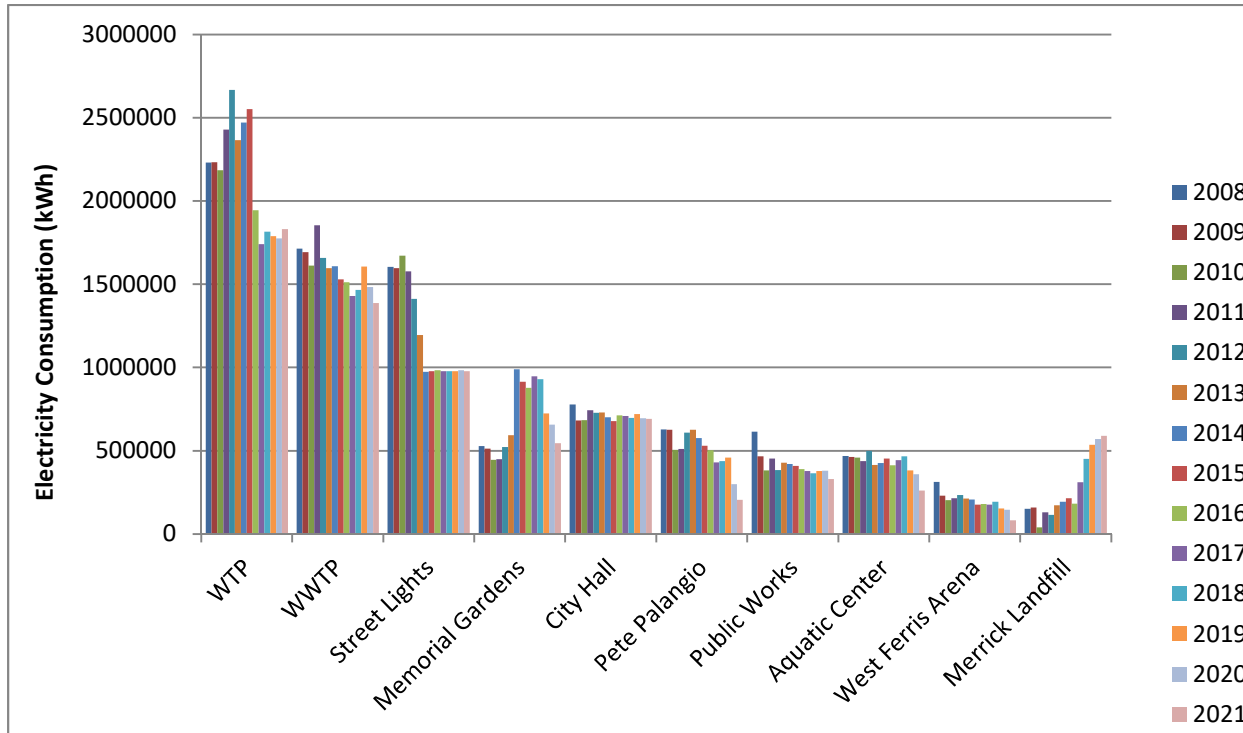
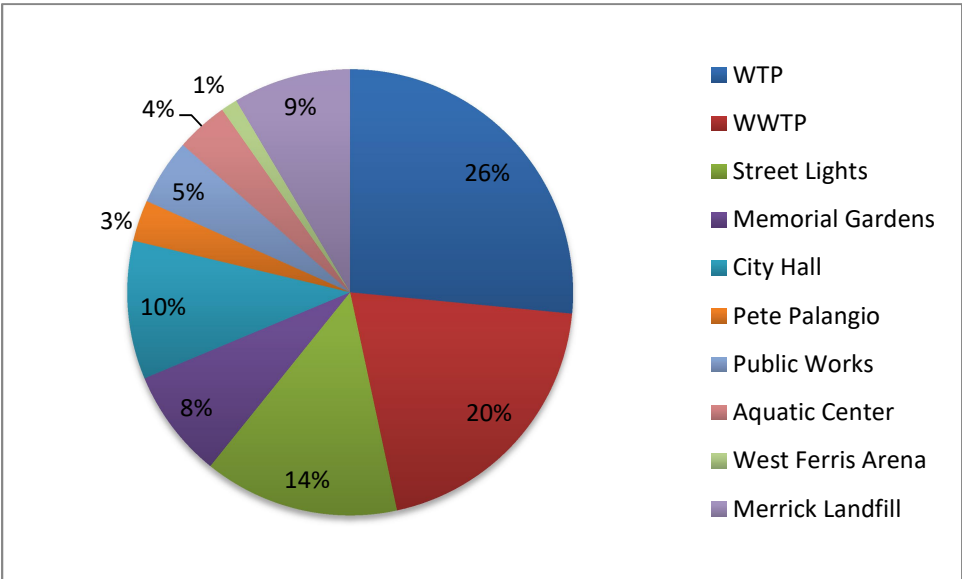


Figure 6 presents the electricity used by facility by the percentage of total used in 2021 by the City of North Bay. The top 10 users are identified.

**Figure 6:** Breakdown by Facility of 2021 Electricity Consumption



## 2.2 Natural Gas

**Table 6:** The City of North Bay's Natural Gas Annual Consumption Data 2007-2021

Facility	2007 m3 Baseline	2018 m3	2019 m3	2020 m3	2021 m3	2007 vs 2021 Variation m3
Public Works - Franklin	299,538	247,415	280,871	189,401	107,468	-192,070
Aquatic Center	320,024	306,551	278,799	667,063	55,499	-264,525
Memorial Gardens Arena	186,361	260,491	275,242	288,717	50,128	-136,233
Sewage Treatment Plant	161497	192,928	285,616	519,687	109,987	-51,510
Pete Palangio Arena	102,424	157,782	170,393	134,804	70,813	-31,611
West Ferris Arena	64,681	51,311	50,902	47,386	32,231	-32,450
City Hall	54,996	101,999	87,502	81,330	48,703	-6,293

<b>Facility</b>	<b>2007 m3 Baseline</b>	<b>2018 m3</b>	<b>2019 m3</b>	<b>2020 m3</b>	<b>2021 m3</b>	<b>2007 vs 2021 Variation m3</b>
Fire Stn 1 - Princess	49,740	37,301	37,908	35,177	23,052	-26,688
Lee Park - Memorial Dr	22,441	17,772	19,283	17,852	12,268	-10,173
Fire Stn 2 - McKeown	18,117	11,184	12,040	12,526	8,772	-9,345
352 McIntyre (Rented)	2,470	0	0	0	0	-2,470
Fire Stn 3 - Marshall	15,270	13,380	13,332	10,073	7,848	-7,422
New Bus Trml - Oak	12,993	19,053	15,256	14,187	8,713	-4,280
NB Water Treatment Plant	11,966	26,883	35,523	50,481	19,680	7,714
Fire Stn 4 - Duxford	12590	4,685	6,685	7,523	6,633	-5,957

<b>Facility</b>	<b>2007 m3 Baseline</b>	<b>2018 m3</b>	<b>2019 m3</b>	<b>2020 m3</b>	<b>2021 m3</b>	<b>2007 vs 2021 Variation m3</b>
Kinnette Playground	5,713	6,784	7,653	4,898	6,545	832
Circle Lake Playground	6,590	0	0	0	0	-6,590
Police Playground	3,680	4,832	4,744	4,072	4,408	728
Parks - First Ave Unit 1	2,950	0	0	0	0	-2,950
Marathon Beach	-	1562	1,453	1,411	303	303
Parks - First Ave Unit 2	1,800	0	0	0	0	-1,800
Laurentian Playground	1256	1,522	1,563	1,416	1,351	95
Graniteville Playground	1,077	1,259	819	1,298	773	-304

Facility	2007 m3 Baseline	2018 m3	2019 m3	2020 m3	2021 m3	2007 vs 2021 Variation m3
Thompson Park	1,102	0	0	0	0	-1,102
ONR Field	184	77	78	361	328	144
330 Main East	0	11,580	12,314	11,253	7,966	7,966
1105 Lakeshore Drive	0	6,280	7,084	6,670	4,825	4,825
Library	-	36,231	35,704	30,802	19,522	19,522
<b>Total m<sup>3</sup></b>	1,359,460	<b>1,518,862</b>	<b>1,640,764</b>	<b>2,138,388</b>	<b>607,816</b>	-751,644

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 (2007-2021)

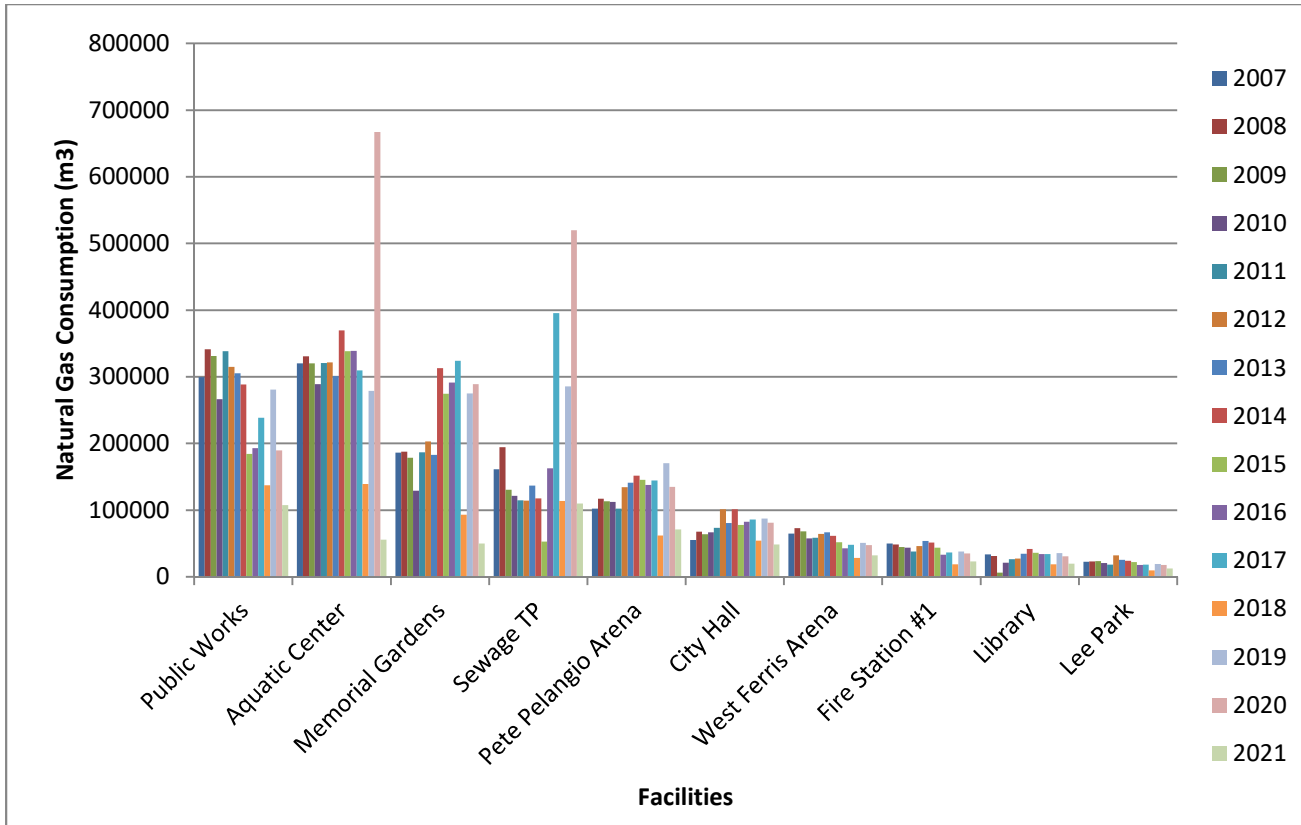
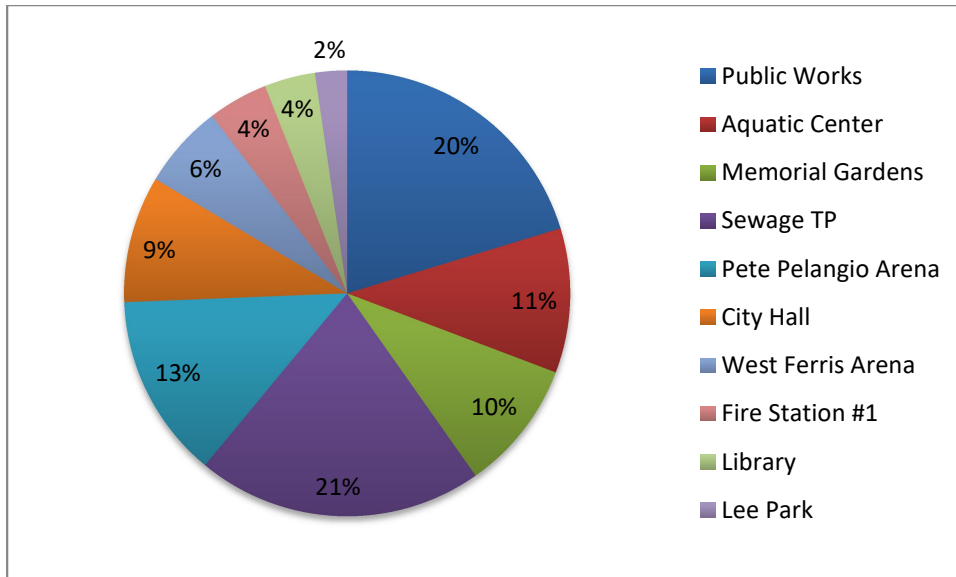




Figure 8 illustrates natural gas consumed by facility by the percentage of total used in 2021 by the City of North Bay. The top 10 users are identified.

**Figure 8:** Breakdown by Facility of 2021 Natural Gas Consumption



## 2.3 Transportation Fuel

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

Function	2007 (L)	2018 (L)	2019 (L)	2020 (L)	2021 (L)
Fleet/Garage	See Misc.	15,254	10,724	12,687	9,674
Police	See Misc.	138,639	131,490	126,505	124,266
Parks	70,174	59,665	66,860	57,982	63,736
Transit	868,826	727,630	717,278	482,853	417,752
Ambulance	See Misc.	96,416	95,583	102,237	109,194
Public Works	501,824	403,063	557,113	450,677	451,199
Hydro	See Misc.	83,148	91,066	99,930	100,881
Water/Waste Water Plant	See Misc.	8,792	10,215	9,805	9,272
By-law, Parking, Survey	2,447	14,556	17,482	16,162	17,327
Fire	46,507	34,283	38,551	33,876	34,931
Misc.	868,826	See Above	See Above	See Above	See Above
<b>City Total</b>	<b>1,489,778</b>	1,582,445	1,738,683	<b>1,392,716</b>	<b>1,338,232</b>
<b>Reduction</b>		-92,667	248,905	97,062	<b>-151,546</b>
<b>CO<sub>2e</sub> (tonne)</b>	15,346	16,109	17,700	14,178	<b>13,623</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 2019 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 (2007-2021)

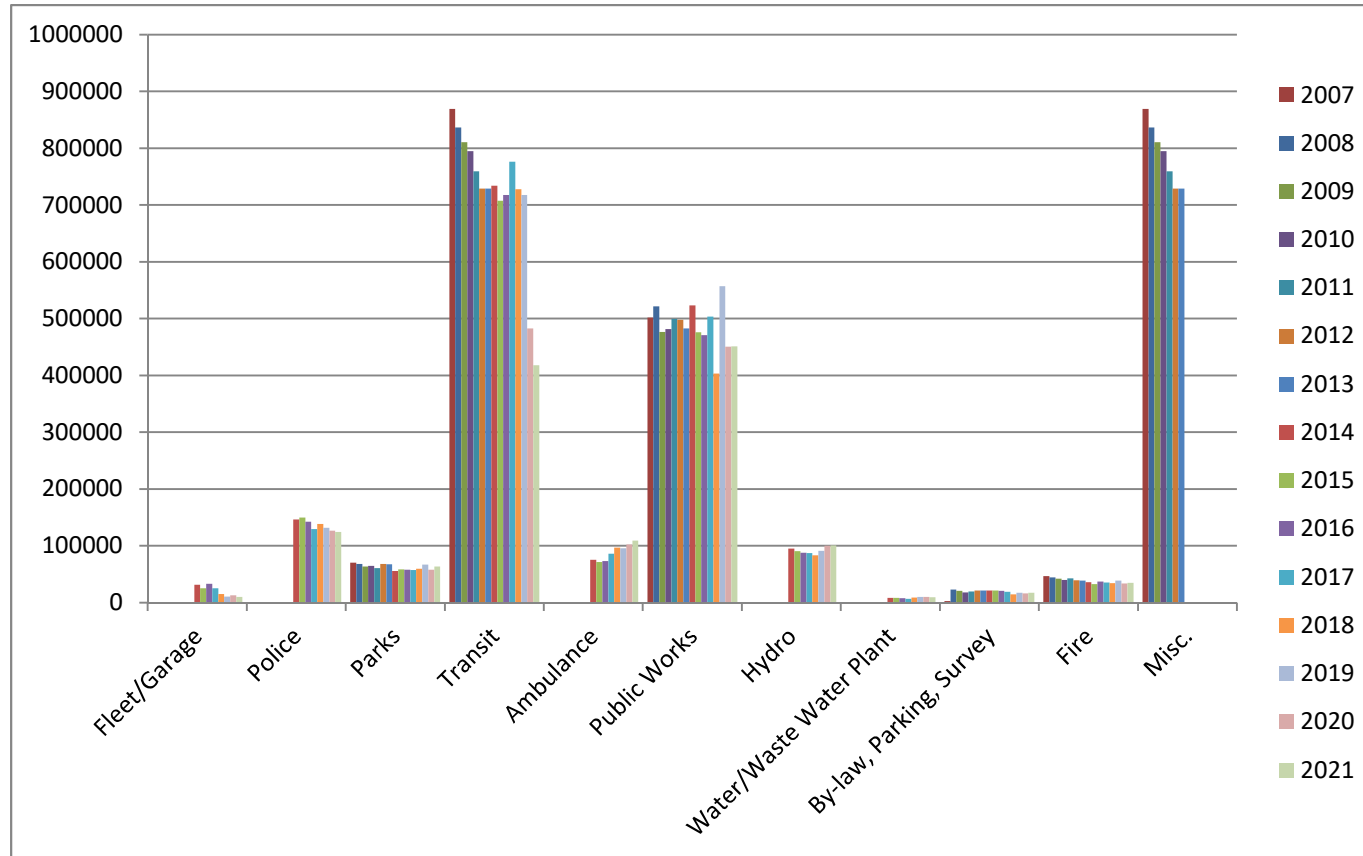
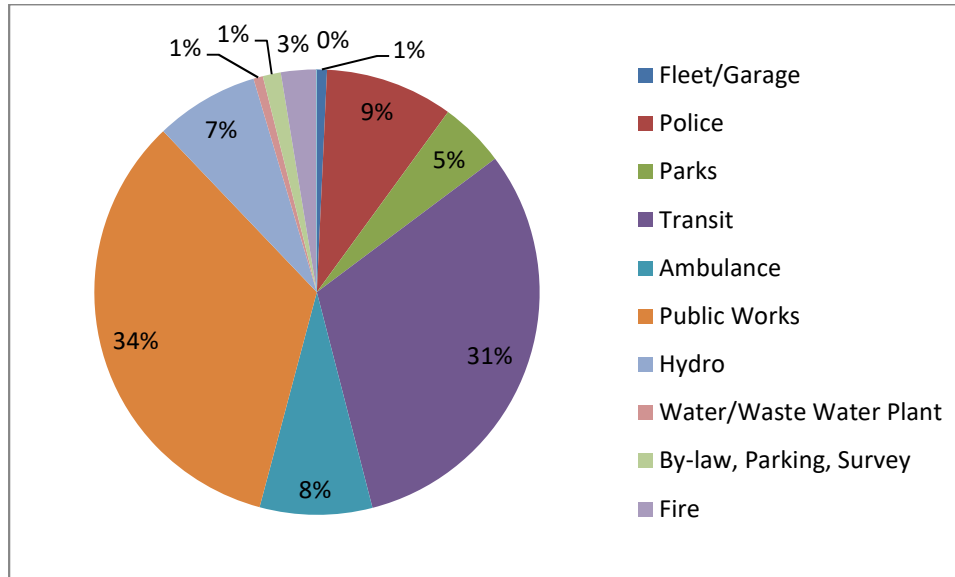


Figure 10 presents the transportation fuel used by the various functions in North Bay during 2021. Detailed annual consumption of transportation fuel data is provided in Appendix 2.3.

**Figure 10:** Breakdown by Function of 2021 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>2019</b>	-16	-11	-6.8	1.9	8.7	15.2	20.1	17.2	12.9	6.9	-4.6	-7	3.1
<b>2020</b>	-8.3	-9.5	-2.4	2.1	9.9	16.8	20.7	17.1	11.7	4.4	2.1	2.1	5.6
<b>2021</b>	-8.9	-10.5	-2.8	6.0	10.8	17.4	17.9	19.8	13.2	10.6	-0.6	-6.4	5.5
<b>Monthly Average</b>	-11.3	-10.7	-4.5	3.0	11.7	16.1	19.3	18.3	13.6	7.1	-0.8	-7.2	

**Table 9:** Heating Degree Days at North Bay Airport (number of degrees Celsius that the mean temperature is below 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	341.9
<b>2011</b>	875	960	783	622	388	120	42	11	47	151	354	530	406.9
<b>2012</b>	837	704	502	429	148	64	20	41	172	339	561	757	381.2
<b>2013</b>	890	793	679	487	202	102	48	64	174	327	613	945	443.7
<b>2014</b>	1002	854	849	478	216	70	70	73	178	340	628	761	459.9
<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	412.1
<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	360.4
<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	311.7
<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>2019</b>	1042.2	811.4	770.3	483.5	288.4	92.2	7	42.7	154.9	320.9	677.9	775.3	455.6
<b>2020</b>	814.9	796.5	632.5	476.8	272.7	75.6	5.6	60.2	188.8	409.2	475	475	390.2
<b>2021</b>	834.7	797.5	645.4	361.3	227.3	49.0	35.6	18.3	145.7	230.5	558.9	756.3	410.4
<b>Average</b>	857.7	789.8	680.1	464.2	234.5	82.4	30.1	36.7	127.6	297.0	509.4	686.6	

**Table 10:** Cooling Degree Days at North Bay Airport (number of degrees Celsius that the mean temperature is above 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	38.8
<b>2011</b>	0	0	0	1	37	73	171	113	50	14	0	0	38.3
<b>2012</b>	0	0	5	0	33	64	98	53	19	1	0	0	22.8
<b>2013</b>	0	0	0	1	26	23	76	41	8	2	0	0	14.8
<b>2014</b>	0	0	0	0	10	47	34	38	16	1	0	0	12.2
<b>2015</b>	0	0	0	0	8.1	1.6	52.7	44.9	43.1	0	0	0	12.5
<b>2016</b>	0	0	0	0	11.7	21.6	55.4	61.9	2.1	0	0	0	12.7

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Average
<b>2017</b>	0	0	0	0	0.7	1.6	24.8	11.6	30.4	0	0	0	5.8
<b>2018</b>	0	0	0	0	15.3	16	99.7	55	23.8	0	0	0	17.5
<b>2019</b>	0	0	0	0	0	7	73.6	18.3	1.9	0	0	0	8.4
<b>2020</b>	0	0	0	0	22.8	40.8	89.1	31.4	0.9	0	0	0	15.4
<b>2021</b>	0	0	0	0	11.2	30.4	31.3	72.4	0.5	2.0	0	0	12.3
<b>Average</b>	0.0	0.0	0.4	1.2	20.5	31.9	81.1	56.0	18.4	1.8	0.0	0.0	

Tables 8, 9, and 10 show that the weather in 2021 was cooler than it was in 2010. It was also cooler in temperature in 2021 relative to 2020. This impacts energy demands.

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

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly Average
<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>2019</b>	66.9	70	60	144.7	132.1	107.5	81.4	45.2	146.2	156.8	100.4	53.9	97.1
<b>2020</b>	56.2	37.1	113.3	69.6	76	61.2	99.3	124	151.3	120	68.6	86.4	88.6
<b>2021</b>	22.9	46.7	44.8	48.8	19.4	142.5	169.6	73.0	186.4	127.1	66.4	94.5	86.8
<b>Average</b>	49.1	39.9	54.0	80.0	63.8	88.7	93.3	98.1	102.3	104.6	65.7	58.1	

Table 11 shows a decrease in precipitation in 2021 compared to previous years, and an increase compared to the baseline (2011). The peak year for precipitation is 2019.



### Appendix 3: Energy Intensity per Building

**Table 12:** Energy Intensity of Facilities (2021)

<b>Facility</b>	<b>Energy Intensity (kWh/sqm)</b>
<b>Aquatic Center</b>	198.10
<b>City Hall</b>	168.24
<b>Fire Station #1</b>	132.88
<b>Fire Station #2</b>	101.70
<b>Fire Station #3</b>	75.32
<b>Fire Station #4</b>	64.22
<b>Lee Park Building</b>	203.65
<b>Memorial Gardens Arena</b>	311.93
<b>Merrick Landfill</b>	6,145.55
<b>Parking Garage</b>	78.55
<b>Pete Palangio Arena</b>	207.71
<b>Public Library</b>	75.95
<b>Public Works</b>	85.84
<b>Sewage Plant</b>	201.01
<b>Transit Station</b>	149.35
<b>Water Treatment Plant</b>	324.40
<b>West Ferris Arena</b>	89.29

Table 12 illustrates the energy intensity's for the City of North Bay's facilities in 2021 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 2007-2021

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

2019	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	Transportation Fuel (L)	Annual Total	Cumulative Total
Total Quantity Used	17,335,962	1,640,764	1,738,683		-
Total GHG Produced (tons CO <sub>2</sub> e)	12,257	3,174	17,700	33,131	426,247
Reduction Quantity Achieved	5,756,151	-281,304	-248,905		

<b>2019</b>	<b>Electricity (kWh)</b>	<b>Natural Gas (m<sup>3</sup>)</b>	<b>Transportation Fuel (L)</b>	<b>Annual Total</b>	<b>Cumulative Total</b>
<b>Percent Reduction Achieved</b>	24.93 %	-20.69%	-16.71%		
<b>GHG Reduction Achieved</b>	4,924	-533	-2,354	2,037	30,937

<b>2020</b>	<b>Electricity (kWh)</b>	<b>Natural Gas (m<sup>3</sup>)</b>	<b>Transportation Fuel (L)</b>	<b>Annual Total</b>	<b>Cumulative Total</b>
<b>Total Quantity Used</b>	17,374,742	2,138,388	1,392,716		-
<b>Total GHG Produced (tons CO2e)</b>	12,284	4136	14,178	30,598	456,946
<b>Reduction Quantity Achieved</b>	5,717,371	-778,928	97,062		
<b>Percent Reduction Achieved</b>	24.76 %	-56.60%	6.52%		
<b>GHG Reduction Achieved</b>	4,897	-1,495	1,168	4,570	35,507

<b>2021</b>	<b>Electricity (kWh)</b>	<b>Natural Gas (m<sup>3</sup>)</b>	<b>Transportation Fuel (L)</b>	<b>Annual Total</b>	<b>Cumulative Total</b>
<b>Total Quantity Used</b>	17,531,688	607,816	1,338,232		-
<b>Total GHG Produced (tons CO2e)</b>	12,395	1,170	13,623	27,188	484,134
<b>Reduction Quantity Achieved</b>	6,053,090	751,644	171,047		
<b>Percent Reduction Achieved</b>	26.21%	55.29%	11.13%		
<b>GHG Reduction Achieved</b>	4,786	1,471	1,723	7,980	43,487

<b>2007-2021 Cumulative</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>	300,655,061	21,440,656	22,660,099	
<b>Total GHG Produced (tons CO2e)</b>	213,866	42,468	227,800	484,134

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 2021.

**Figure 11:** Annual Greenhouse Gas Emissions 2007-2021

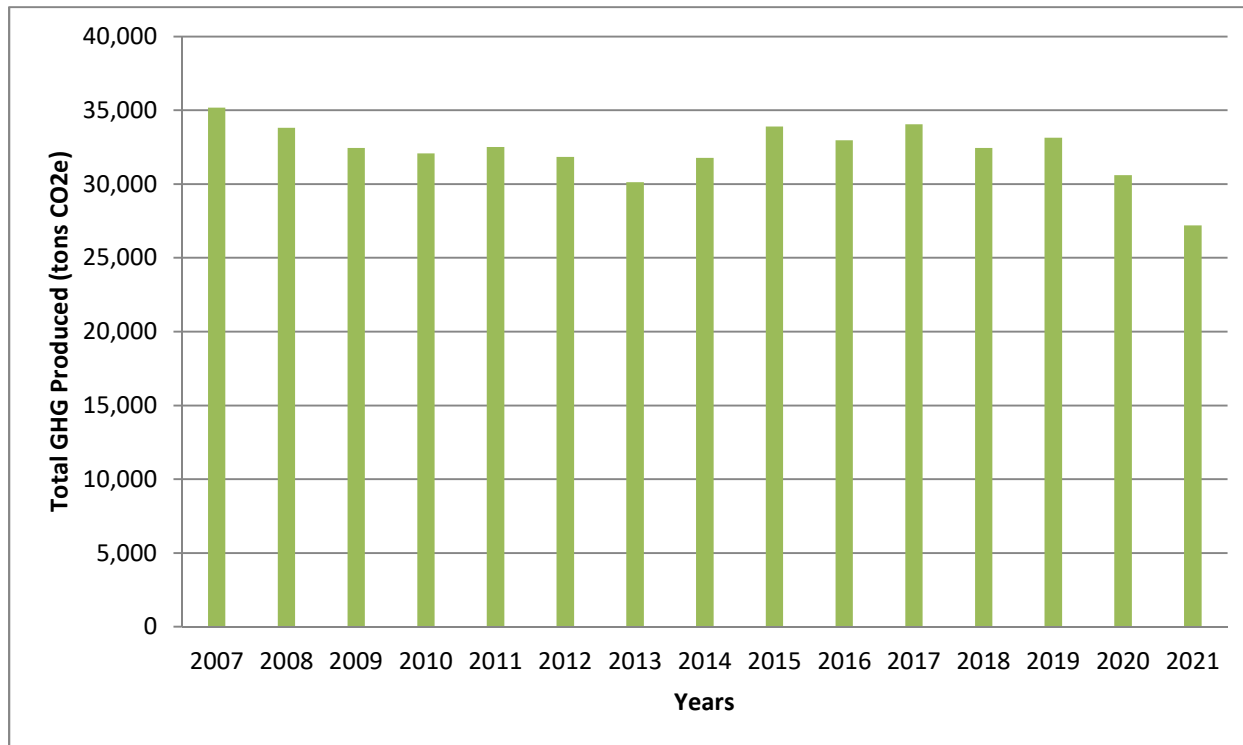
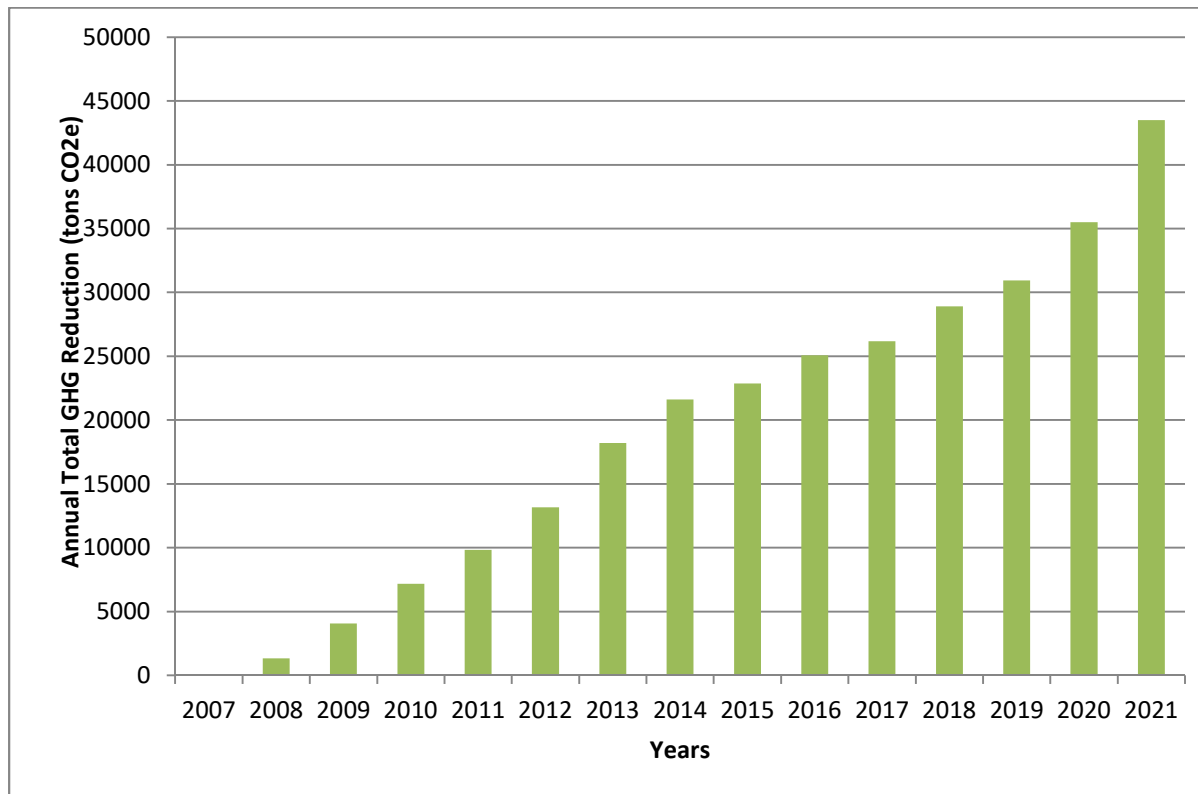


Figure 12 illustrates the cumulative annual reduction of GHG's from 2007 to 2021. By 2021, the City has decreased the amount of GHG's generated by a total of 43,487CO<sub>2e</sub> tonnes, an average of 3,106 CO<sub>2e</sub> tonnes per year.

**Figure 12:** Cumulative Reduction of GHG's from 2007 to 2021



## 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.