



# Corporate Energy Management & Conservation Plan Update

# 2019- 2023

## Township of King



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## Executive Summary

The purpose of this plan is to provide King Township (referenced as 'King') Council, staff and the public with an **overview of the changes** within the corporate energy sector, opportunities for the reduction of Greenhouse Gas (GHG) emissions at a corporate level and the province mandated update of Kings Corporate Energy Management Plan.

King staff continues to implement projects and initiatives related to energy as directed by the Integrated Community Sustainability Plan (ICSP) and the 2014 King Energy Management Plan, integrating energy efficiencies into our daily operations and educating staff on how to better conserve energy.

**In 2018 King spent just under \$1.3 million on energy (natural gas and electricity) at a corporate level; this is a significant cost to a Township with less than 27,000 residents. The energy use contributed to 772,140.94 Kg of CO<sub>2</sub>e of greenhouse gasses released into the atmosphere, directly contributing to climate change in Canada and around the world.** This number emitted does not equate to an amount that includes our fast growing fleet in King. Kings fleet emitted ~599,043 Kg of CO<sub>2</sub>e in 2018 based on fuel consumption.

**At a corporate level, Kings GHG emissions in 2018 totalled 1,371,183.94 Kg of CO<sub>2</sub>e.**

**At a corporate level, Kings GHG emissions in 2012 King totalled 1,406,186.95 Kg of CO<sub>2</sub>e.**

Based on the above information, **King has reduced emissions by 3% since 2012. While this number seems small, it must be considered that the Township increased infrastructure over this period which led to a gross increase to GHG emissions.**

**This plan identifies where our emissions are coming from and sets out recommendations to help reach the overall 45% decrease by 2030. Understanding that the Township is expected to similarly see increases in operational infrastructure, the 45% reductions should be fixed at the current infrastructure energy levels to be attainable.**

Based on Canadian census data from 2011 to 2016, King was the fastest growing municipality in York Region, increasing by 23% representing 4,623 residents and is forecasted by York Regions Official Plan to grow to 34,900 residents by 2031. Historically, as municipalities grow so do the GHG emissions they create, both at a corporate and community level. With this in mind, King Council recognizes that increasing energy efficiency and mitigating GHG emissions is essential to reducing the

impacts and effects of climate change as well as supporting environmental, social and economic prosperity of King.

## Introduction

### Overview

On January 1, 2019 a new regulation was introduced under the Electricity Act, 1998 titled O. Reg. 507/18: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans.

This regulation replaces Ontario Regulation 397/11 titled Energy Conservation and Demand Management Plans. It was enacted under the now repealed Green Energy Act, 2009. The requirements for broader public sector energy planning and reporting by Ontario agencies are identical to those under the former Regulation 397/11.

Under Ontario Regulation 507/18, all public agencies are required to report annually on energy use and greenhouse gas (GHG) emissions. The agencies are also required to prepare and make public an updated five-year energy conservation and demand management plan. The first update is due in 2019 and covers the period from 2020 to 2024.

This plan describes King's:

- Updated energy targets and actions
- Past Energy State
- Current Energy State
- Progression since the first Energy Management Plan
- Recommended Next Steps
- Financial framework to strive for targets

## Alignment with King Township Policies & Plans

### King Township Integrated Community Sustainability Plan

King has actively been pursuing approaches to reduce GHG emissions and find ways for the Township to actively save on costs associated with energy; notably through our 2014 Energy Management Plan and Kings Integrated Community Sustainability Plan (ICSP). The ICSP demonstrates that King, as a municipality, are committed to making smarter decisions about our future, based on how we use our resources, design our communities and utilize energy. This ICSP has been a resource that defines King, community groups, businesses, local organizations and the broader public sector.

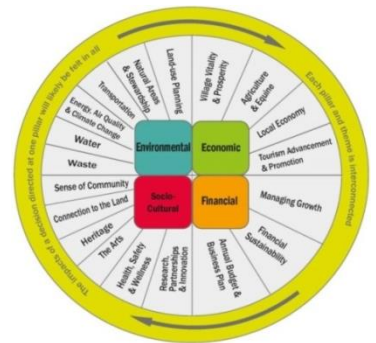
Among many of the themes of the ICSP, energy consumption, effects of climate change and the amount of GHG emissions released by King into the atmosphere are a key pillar. The ICSP in many respects falls in line with York Region’s bold and innovative Vision 2051, which aims to guide York Region in creating strong, caring and safe communities designed with sustainability in mind. As such, Vision 2051, the King Integrated Community Sustainability Plan, Sustainable Development Standards Program and King’s 2014 Energy Management Plan provides overarching direction and support for this Energy Management Plan Update.

This Corporate Energy Management Plan will be reflected in the 2019 ICSP update, to better reflect and achieve targets in future King reports, documents, policies, etc.

### Strategic Objectives based on the Integrated Community Sustainability Plan

#### Environmental Pillar

To reduce King’s GHG emissions and energy intensity, staff should incorporate best practices and focus on energy conservation and reduction with short and long term targets. Energy conservation needs to remain top of mind when making corporate development decisions on the future of energy in King. Reductions in GHG emissions have clear and positive impacts on the environment, by reducing the effects and impacts of climate change, aiding to protect limited natural resources and improving air quality.



#### Financial & Economic Pillar

Reducing energy consumption and becoming more energy efficient at a corporate level allows for energy savings and long term financial sustainability. Investing in upgrades and retrofits to existing facilities and equipment has the potential to save more money than that invested in the long run and must be supported by a strong business case demonstrating the payback period and return on investment. Long term payback and operational savings over time will make large capital costs of new energy efficient technology worthwhile and feasible.

#### Socio-Cultural Pillar

By reducing GHG Emissions and energy consumption, King contributes to a healthier quality of employment and life. Through reductions in emissions from fleet vehicles impacts to air quality are reduced in King Township.

*King Township is an idyllic countryside community of communities,  
proud of its rural, cultural and agricultural heritage.  
We are respected for treasuring nature, encouraging a responsible local economy,  
and celebrating our vibrant quality of life.*



## **Township of King Official Plan: Our King (2019)**

The King Official Plan (referred to as 'Our King') is the guiding document establishing comprehensive sets of policies to guide and develop all aspects of sustainable growth in King. Our King is currently undergoing an update however, the vision and goals for King's environment and energy future remains steadfast. King aims to be a leader and steward in environmental conservation in Ontario and reduce our carbon footprint and increase resiliency to climate change in the province. Some key components in Our King regarding the future of energy are:

- Promoting energy efficient design
- Use of green infrastructure
- Design that maximizes energy efficiency and conservation
- Design that maximises opportunities for the use of renewable and alternative energy sources and systems

## **Endorsed Facilities Master Plan (2019)**

King has put forward a 2018 update to the Parks, Recreation & Culture Master Plan for Facilities Services. This update is a tool among others used to guide the direction of facilities services over the 5 year period of 2018-2022. Exploring current service levels and identified future needs, including the implementation of energy conservation retrofits and projects, as well as capital projects such as geothermal, solar PV and Electric Vehicle (EV) charging stations among others. As described in the update, these projects could be implemented where feasible and possible to incorporate outside funding through grants and utility company incentives.

## **Energy Plan (2014)**

In 2014 King hired BOLD Engineering as consultants to complete the Ontario government mandated completion of a 5 year Corporate Energy Management Plan. This plan provided the basis and baseline of this plan (2019), using 2012 data to compare our progress and achievements to King's vision and goals set out in the 2012 King Sustainability Plan and 2014 Energy Management Plan.

## Background

### Climate Change

Climate Change is making headlines around the world on a daily basis, from extreme heat to extreme weather, wildfires, floods and sea ice melting among a flurry of other effects. Climate Change is Canada's and the world's most pressing and defining challenge of the 21st century. How we deal with this challenge will shape our home and the way we live, work and play here in King and Canada. In a recent Environment & Climate Change Canada report, scientists have stated that Canada has been, and will continue to warm at two times the global average. The primary cause of this unprecedented global warming is the human influenced release of GHG emissions into our atmosphere. Based on data from both NASA (National Aeronautics and Space Administration) and NOAA (National Oceanic and Atmospheric Administration), 2018 was the 4th hottest year on record since 1880, with 2016, 2015 and 2017 taking the top 3 hottest years on record, respectively. Based on current models and a recent report from the Intergovernmental Panel on Climate Change (IPCC) the world as a whole has 12 years (as of this report) to curb our emissions output to prevent a +1.5 Degree Celsius net increase globally before setting in action an irreversible chain of events that will change our planet and the lives of its inhabitants (sea level rise, extreme weather events becoming normal, drought, flooding, water & food insecurity).

"12 years isn't a deadline, and climate change isn't a cliff we fall off — it's a slope we slide down" - Kate Marvel, climate scientist at NASA. We are sliding now.

Furthermore the world is running out of time to prevent the effects of climate change, it is happening. What King does matters. Every action, every year, every bit of warming, matters.

It now depends on what we as a community among many in the world do to change our corporate course to curb our emissions. Leading climate scientists have already determined that there is no going back to "normal" but there is still hope to correct our course and prevent further warming. Based on the over abundant science on human influenced climate change, King is taking this global challenge seriously when it comes to curbing our own GHG emissions produced by Township owned-facilities and our fleet. It is important, no matter our size or population, as a municipality, that we do our part to reduce emissions and protect the environment for future generations.

The time for blaming other industries, communities and countries is over, we must all strive to work together.

In June 2019, Council passed a resolution declaring a Climate Emergency and set an aspirational target for **overall GHG reduction** at 45%.



## Targets and Actions

### Targets

The target identified by Council is more aggressive than the original target set in the 2012 Integrated Community Sustainability Plan (set at 30%), The Regional Municipality of York Corporate Energy Conservation and Demand Management Plan Update 2016, York's Vision 2051 guiding document and taking into consideration currently available science, research, public support, energy and renewable technology.

As with any entity setting a target for the future, the goal is to over achieve and succeed thus moving past a target is encouraged, and warranted.

**45% Reduction in Energy Emissions (Kg of CO<sub>2</sub>e) correlating to 630,000 Kg at current infrastructure levels by 2030\***

*It is important to note that the 45% reduction or offsetting of GHG is the over-arching target and can be achieved through a number of efforts. It is acknowledged that the initial focus will be based upon the actions identified in this plan.*

### Actions

With respect to the implementation of the Energy Management Plan, the actions listed below are reachable and aligned using best practices within the 5-year window of this plan and long term targets determined.

- **Reduce GHG emissions by 35% at a corporate level**
- **Improve** energy efficiency within Township facilities, both day-to-day and extending facilities life cycle, when feasible and possible
- **Development of a Green Fleet Strategy, in alignment with an overall corporate fleet management program**
- Develop corporate commitment to energy efficiency through internal incentives, initiatives and policy implementation.
- **Promote energy responsibility & knowledge to municipal staff**

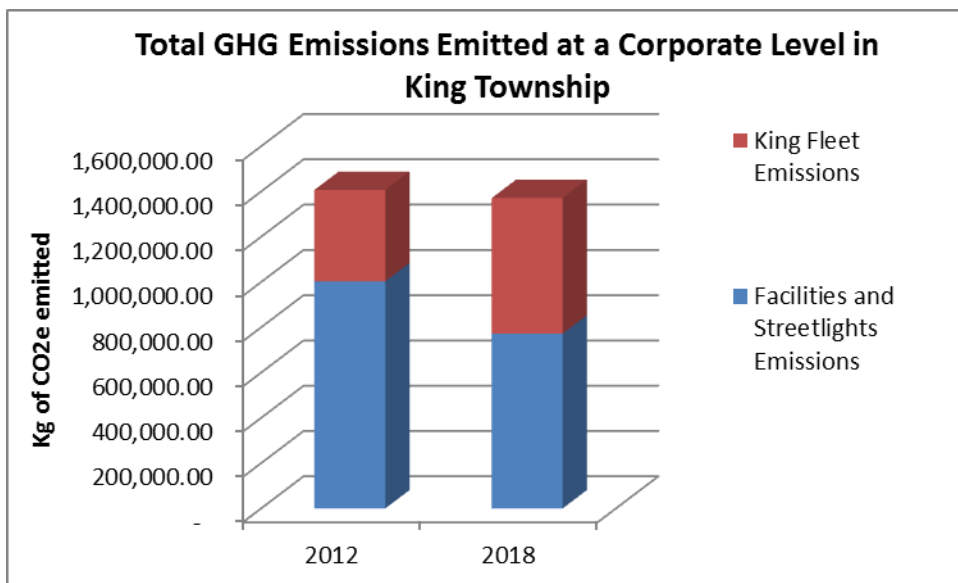


Figure 1: Total Emissions by King Township at a Corporate Level in 2012 & 2018

\*based on 2012 baseline data, future buildings will be calculated separately however, their energy intensity will be targeted to be in line with current infrastructure improvements and new development standards.

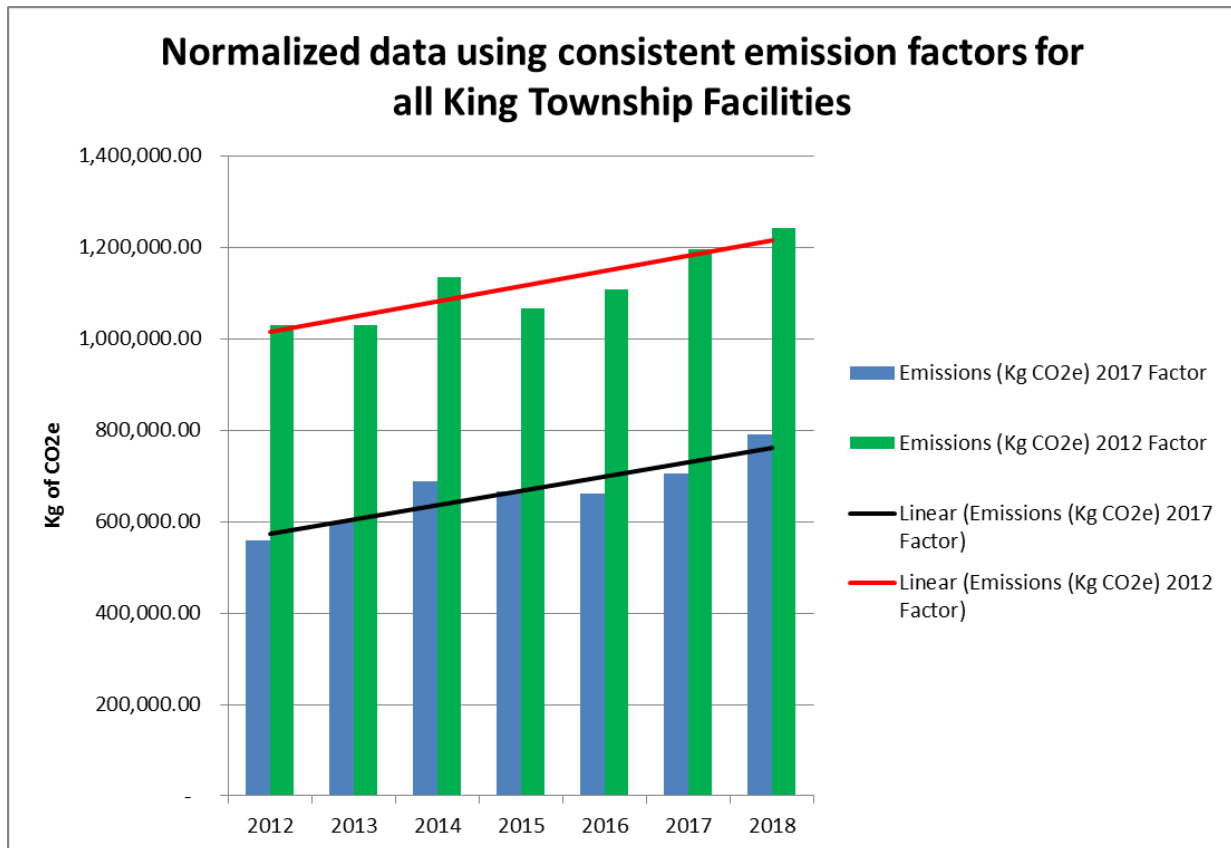
King has reduced emissions in corporate facilities most years since 2012. This reduction is primarily caused by the provincial government's choice in 2007 to eliminate coal fire power plants as a source of electricity generation. This elimination of a energy source has made the Ontario electricity grid one of the cleanest in North America. When comparing King's energy usage since 2012 using consistent emission factors

(2012= 0.096096, 2017= 0.017298) as seen in figure 13 it shows that, as a whole, due to a number of factors (including growth) King is actually increasing our corporate facilities emissions annually.

King's fleet regardless of utilities emission factors has been increasing emissions since 2012 due to addition of fleet vehicles as King grows in size requiring larger accommodation of services. This increase as seen in King Fleet is by nearly 200,000 Kg of CO<sub>2</sub>e since 2012.

Overall emissions levels since 2012 when combined have dropped 34,000 Kg of CO<sub>2</sub>e to 1,371,183.94 Kg of CO<sub>2</sub>e from 1,406,186.95 Kg of CO<sub>2</sub>e. With these emissions reductions in mind relating to Kings updated target of 45% emissions reductions and the minimal reductions seen since 2012, energy efficient retrofits, deep building retrofits, renewable energy generation and fleet transition to alternative fuels must be top of mind when making corporate infrastructure and fleet decisions.

In order to ensure accountability and commitment to the long term targets, it is recommended that short term goals are set. These goals will range between 2% reduction and 5% reduction over the next five years.



**Figure 2: Township of King Facilities emission data using the same emission factor throughout the time frame showing King Emissions have been steadily on the rise when data is normalized and made consistent**

## Current Measures & Past Successes

The Township has undertaken a number of initiatives over the five year term of the original energy management plan to align with previously established targets and goals. At this point, due to the timing of the projects (some are recently complete or on-going) we have not yet even realized the correlating reductions which will assist in meeting the identified targets. The next few pages detail current efforts.

### **LED Streetlight retrofit**

In 2018 King began a Township wide LED retrofit of all Township owned streetlights, converting 2,111 streetlight fixtures to LED. The purpose of this retrofit is to reduce energy consumption resulting in reduced GHG emissions, improve energy efficiency and save on both energy costs associated with energy supply and light fixture operational upkeep. This retrofit is approximately 85% complete as of mid-2019 and is set to be completed by years end. King is currently verifying the savings of completed retrofitted lights through metered values. In addition to retrofitting all existing streetlights, Council approved the 5-year license purchase of an adaptive control system (from the vendor) used to allow remote monitoring and dimming control of streetlights and scheduling allowing for additional savings. This adaptive control system allows managers to change from the current Hydro One sunrise and sunset schedule to an astrological clock, which reduces overall annual hours of operation by 25%.

Considering electricity cost trends in the Province of Ontario, King is forecasted to see a 72-76% energy cost reduction, following the retrofit's completion. Due to life expectancy of LED lamps versus non-LED King is estimated to save \$30,000 annually on maintenance.

In 2018 King streetlights consumed 1,577,977 kWh of electricity, with the LED conversions and adaptive control system based on a monthly blended rate from Hydro One. King streetlights are forecasted to consume approximately 367,063 kWh of electricity leading to annual energy consumption savings of 1,210,914 kWh of electricity, a 76% energy reduction. These effects are likely to be seen in 2019 and more thoroughly in 2020 following 100% completion of the project and effective use of the adaptive control system.

## **King Township Municipal Center: Opened Fall 2018**

King recently moved from the Old Town Hall at 2075 King Road, King City and associated satellite offices throughout the township to a new location. The move took staff to a new 40,000 square foot Municipal Centre located at 2585 King Road, King City in Fall of 2018.

This new facility was built with sustainability and energy conservation in mind; with features such as permeable paving, low flow water fixtures, electric vehicle charging stations, geothermal exchange system, building automation system, LED Lighting and roof orientation that will allow for the easy retrofit of solar PV in the future.

- **Electric Vehicle Charging Stations:**

The new King Township Municipal Centre has three level 2 chargers installed in the parking lot for staff, fleet and public use. These charging stations include one (1) Tesla station universal wand, one (1) Tesla station with dual Tesla wands and one (1) universal EV charger with a single wand.

- **Geothermal Exchange system:**

System information currently being compiled, will be reflected in final plan update

- **Lighting:** The Municipal Centre is completely outfitted with LED lighting to help save costs associated with energy, reduce emissions, consume less electricity and reduce maintenance. King does not have our Municipal Centres lighting connected to the Building Automation System (BAS), instead a commercial lighting control system known as WattStopper has been implemented to best manage the intricate lighting system. In addition, overhead hanging lighting in departmental work spaces are outfitted with smart sensors, allowing for more efficient electricity consumption throughout the work day. An example of this combination use of commercial lighting smart system and smart sensors, the entire building automatically turns off lightning from 8pm to 9pm on earth day, without the need for staff to be in the office.



Figure 3: Dual Pump Geothermal Exchange System

*NOTE: While data is still being analyzed, early projections for reductions in GHG compared to the emissions of the former municipal offices are conservatively set at 6%, or 40,000 Kg. This will directly contribute to the identified 35% corporate reduction target.*

- **Building Automation System (BAS):** Information and details on this system is being compiled and facilities staff are being trained on how to best utilize the system to conserve energy and manage the buildings features. Specifically optimizing the use of our geothermal exchange system and heat pumps.

### **Mayors Megawatt Challenge**

The Mayors Megawatt Challenge is a program that brings together different municipalities to improve energy efficiency and environmental performance, reduce GHG emissions and save on costs related to energy in corporate facilities. King is a current member of this program and currently has 10 facilities enrolled in the program that will provide King staff with potential energy saving and achievable targets on an individual building level, as well as benchmarking buildings against similar facilities.

The 10 buildings currently enrolled are:

- Trisan Centre
- Dr. William Lacey Nobleton Community Centre & Arena
- King Township Municipal Centre
- King Township Parks Depot
- King Township Works Yard
- Nobleton Firehall
- King City Firehall
- Schomberg Firehall
- Schomberg Community Hall

### **Equipment efficiency upgrades from 2014-Present**

#### **2015:**

- King City Arena: Ice surface lights upgraded to LED from 400 watt metal halide
- Nobleton Library: Library Main public space replaced all 4ft T12 tubes with T8 LED's

#### **2016:**

- Nobleton Pool: New high efficiency pool water heater and building water heater

#### **2017:**

- Nobleton Arena: Ice surface lights upgraded to LED from 400 watt metal halide
- Nobleton Arena: Installation of 3 high efficiency natural gas hot water on-demand tanks



- Trisan Centre: Parking lot pole lights converted to LED from, 175 watt metal halide

**2018:**

- King City Seniors Centre: Installation of 2 new high efficiency natural gas furnaces and hot water on-demand natural gas tanks
- Laskay Hall: Installation of 2 new high efficiency natural gas furnaces and condensing units
- Laskay Hall: Installation of high efficiency natural gas hot water tank

**King Township Generation Facilities**

King currently only has one standalone generation facility located at the Trisan Centre. This generation facility is a 10KW Solar PV Microfit program running a feed and tariff program with the IESO and Hydro One. The Trisan Centre Microfit consumes 720 kWh annually and produced 12,010 kWh in 2018.

As mentioned previously, geothermal heat pumps are being used by the municipality to heat and cool the municipal centre and are a technology that will be reviewed for use in future facilities.

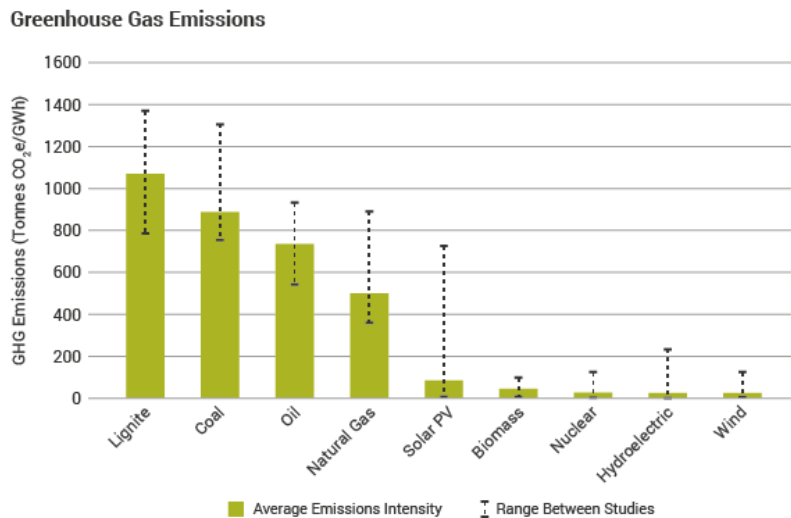


Solar MICROFIT array at Trisan Centre  
Photo taken by HAV Photography

**Where do our emissions come from?** Township facilities much like a regular home don't have a smoke/steam stack that is directly releasing CO<sub>2</sub>e (Atmospheric Carbon Dioxide) into the air or a tailpipe like a car on the roof releasing GHG's.

Instead it's the actual generation of power from the source; Coal and Nuclear plants, Wind Farms, Hydroelectric Dams etc. Through the process of creating power we use, GHGs get released into the atmosphere thus, the more power a building requires the more demand there is from the power plant to supply and more emissions released to create this power.

Below is the Average amount of GHGs emitted from various power sources



## Past State

King has chosen to use the 2012 energy baseline data for which all targets, goals and energy related conservation and improvements are based upon. Some notable mentions, in 2012 the corporate GHG inventory completed by BOLD Engineering did not contain energy consumption data for King fleet and failed to provide the raw data or calculations in appendix form or otherwise. The 2019 energy management update will continue to use 2012 as a baseline. 2012 data presented in this update will utilize 2012 data submitted by King to the provincial broader public sector reporting portal of Ontario, managed by the Ontario Ministry of Energy, Northern Development and Mines. Township streetlights energy consumption have not been previously submitted to the province, 2012 streetlight energy values and GHG emissions are accurate estimations of usage in 2012.

## Township-wide Facilities

King owns, operates and manages 33 facilities within the municipality (as of 2018), ranging from Administrative Offices and Community Centres to Fire halls and pump houses, as broken down in Table 1. All of King’s facilities are powered through Hydro or Natural gas and these resources are supplied by Hydro One and Enbridge Gas, respectively.

When GHG emissions are calculated with the provincial toolkit the emission factor of 0.096096 for Kg of CO<sub>2</sub>e in 2012 was used. This is the distribution emission factor and not consumption emission factor. Thus 2018 data will also use the provincial distribution emission factor based on required annual provincial reporting.

In 2012 King facilities consumed 6,196,331 kWh of electricity and 2,413,355.18 in equivalent kWh of Natural Gas and in total emitted 1,003,186.95 Kg of CO<sub>2</sub>e.

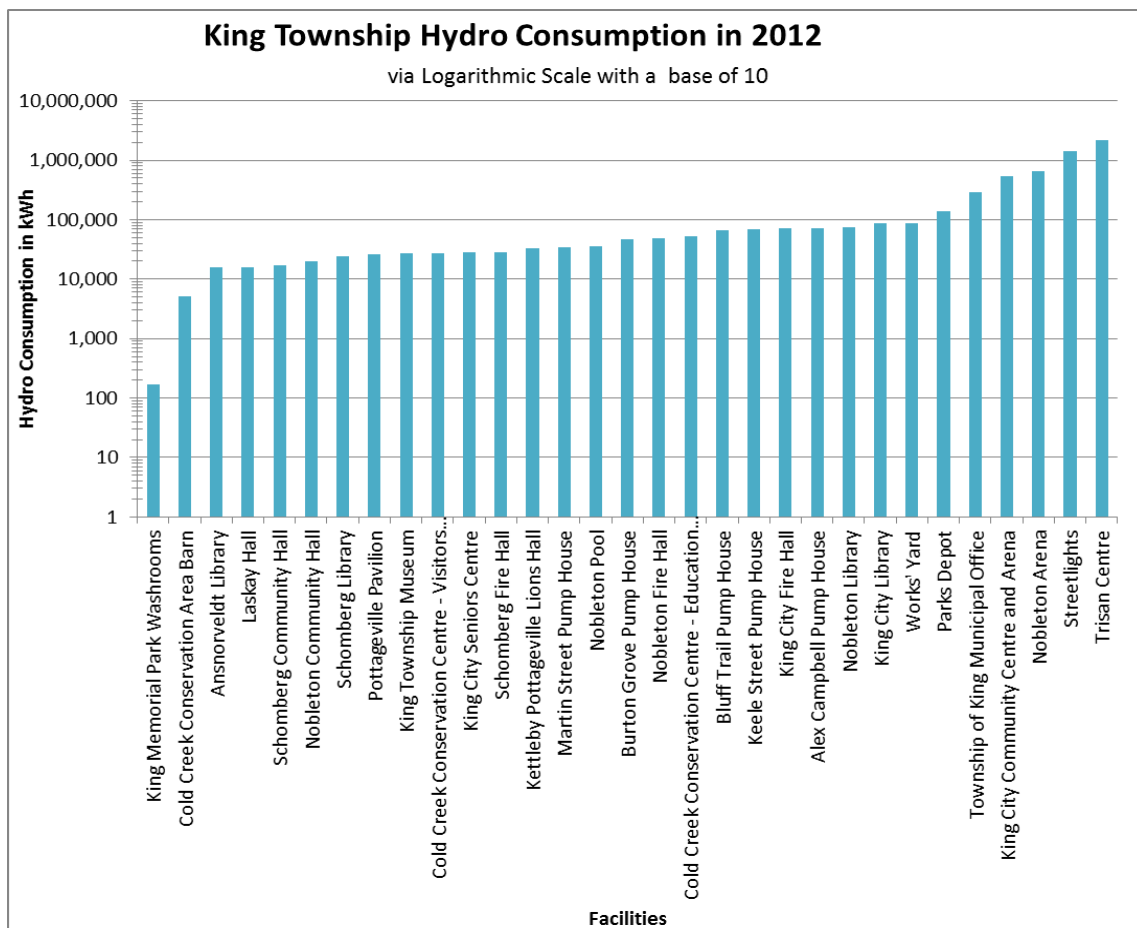


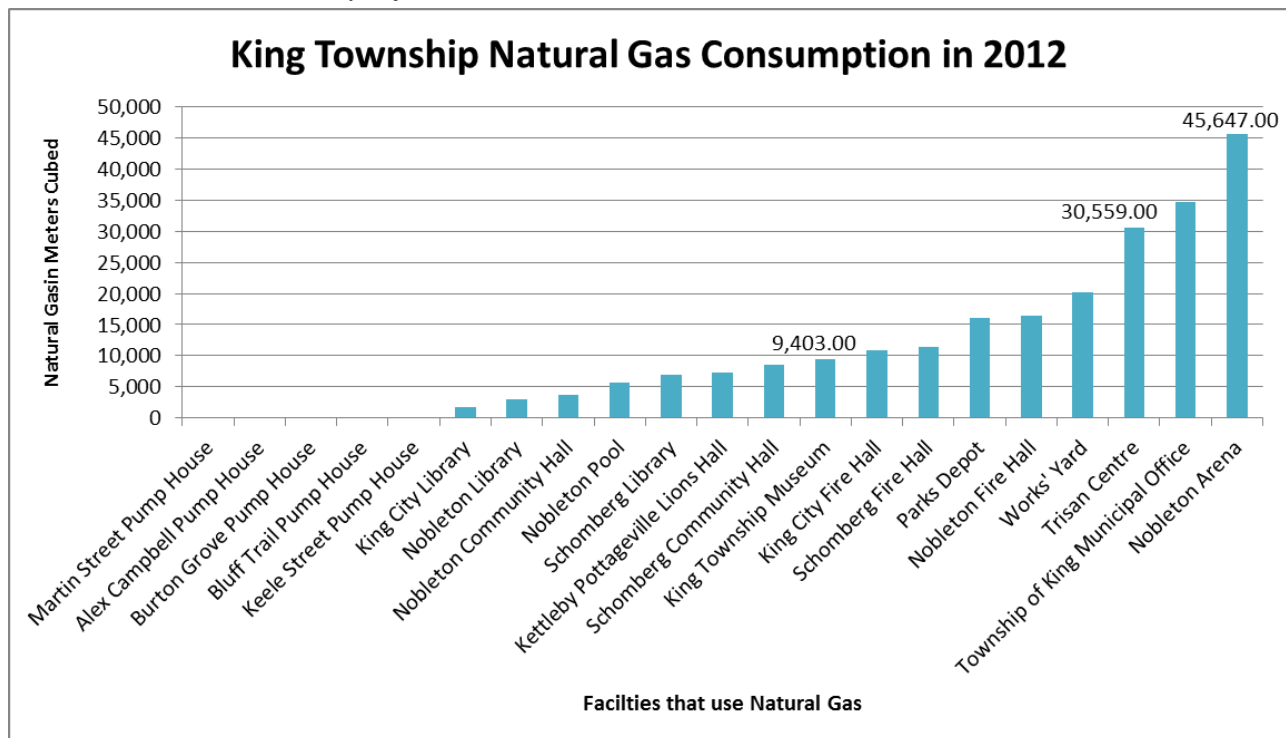
Figure 4: Shows Hydro Consumption by King Township Facilities for 2012, using a logarithmic scale to better understand and highlight the difference in consumption without using an unreasonable scale, due to the extremely varied consumption rate between facilities

Figure 1 & 2 demonstrates King’s energy consumption primarily occurring within a handful of facilities with higher energy demands. **The use of a logarithmic bar chart was used when extrapolating electricity data to better understand the consumption across various facilities.** This decision is due to the size of King facilities owned and operated; many of the buildings consume less than 50,000 kWh annually versus typical township arenas consuming several hundred thousand to millions of kWh annually skewing a classic bar chart and undervaluing the facilities consumption.

When viewing Figure 1, 21 of the 31, corporate facilities in 2012 fall in the range of consuming 17-90 thousand kWh annually and make up a core percentage of energy use. 6 facilities used over 125 thousand kWh each to the maximum consumption from the newly built Trisan Centre consuming 2,163,930 kWh.

Upon review of Natural Gas consumption at King corporate facilities (seen in Figure 2) it is easy to indicate which facilities use the majority of natural gas annually.

The Dr. William Lacey Nobleton Community Centre and Arena (indicated as Nobleton Arena) has the highest consumption, likely due to the age of the building. As stated in the Draft Facilities Master Plan, the Nobleton Arena was built in 1976 and following an intensive infrastructure project in 2006, the Draft Facilities Master Plan states the



**Figure 5: Shows Natural Gas Consumption by King Township Facilities for 2012, using a logarithmic scale to better understand and highlight the difference in consumption without using an unreasonable scale, due to the extremely varied consumption rate between facilities**

Nobleton Arena was moved from “fair” to “good” condition, identifying primary issues to address such as the roof affecting the buildings envelope. In 2018 the Nobleton Arena’s roof was repaired and energy conservation results of this will be likely seen in 2019/2020.

Figure 3 shows a graph of GHG emissions from all facilities, a similar trend can be seen among previous figures of energy consumption, with a limited number of facilities emitting the majority of CO<sub>2</sub>e emissions. To better define this, Figure 4 shows a pie chart of the Top 6 facility emitters in King in 2012. These two figures clearly illustrate that in 2012 recreational facilities such as community centres and administrative buildings have the largest effect on township wide corporate facility emissions. breakdown of greenhouse gas emissions by each facility based on the provincial reporting toolkit, please see Appendix B.

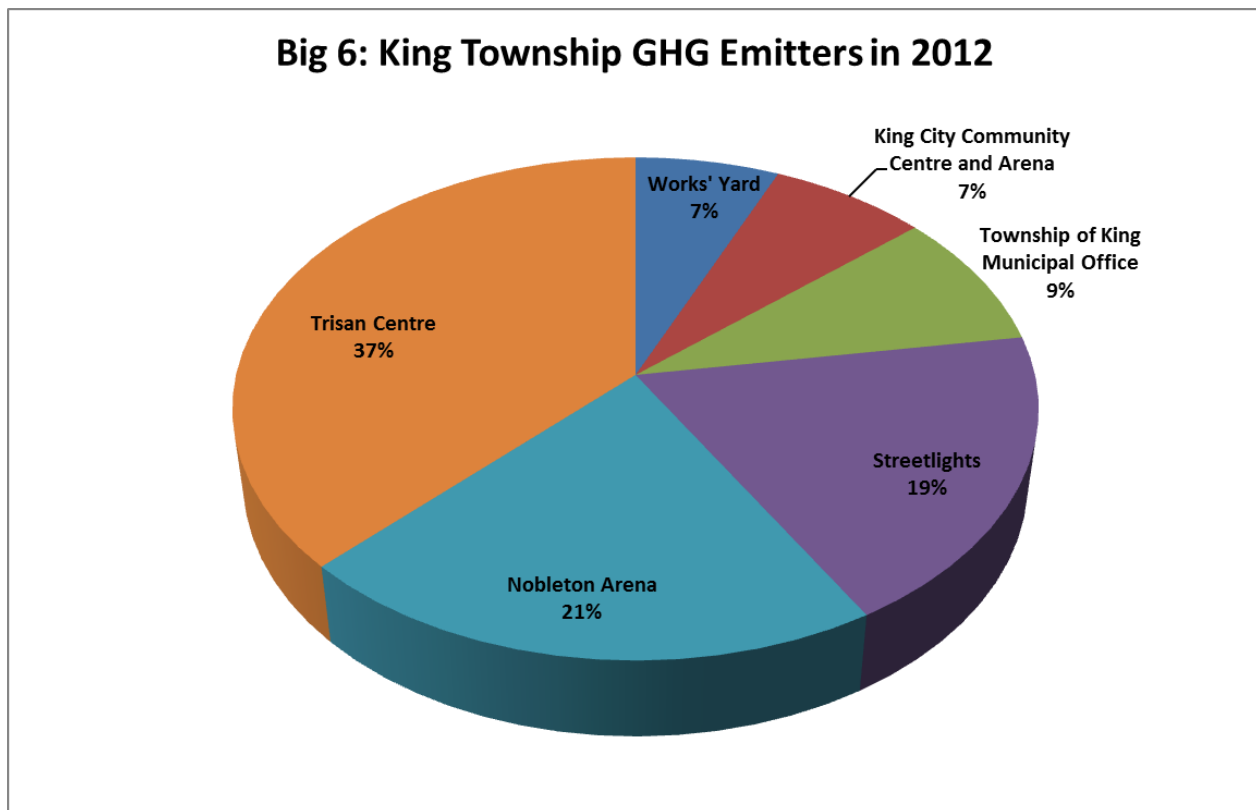


Figure 6: Pie chart of King Townships 6 largest GHG emitting facilities in 2012

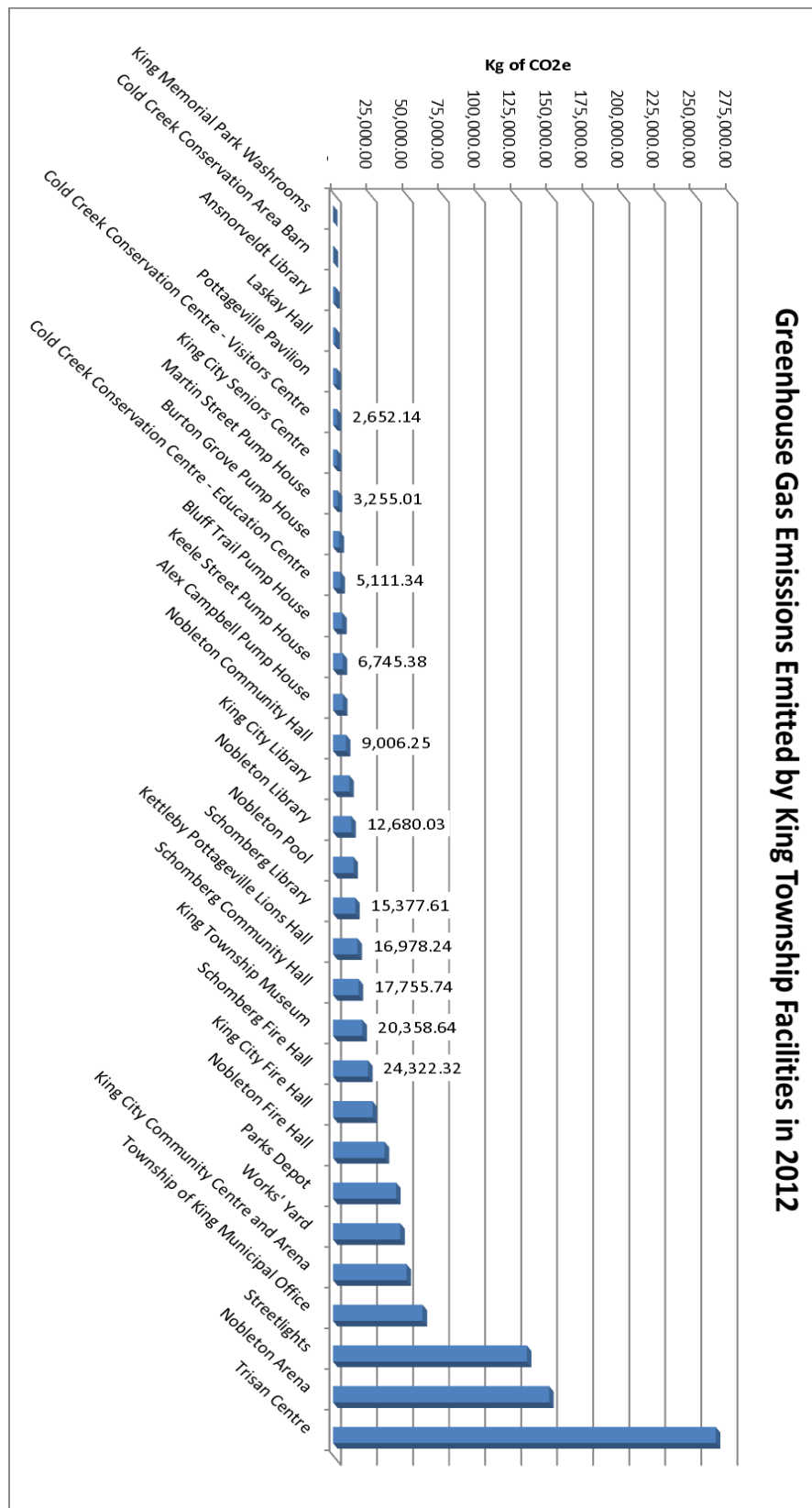


Figure 7: GHG emissions emitted by Township of King facilities in 2012 sorted from smallest to largest



## Current State:

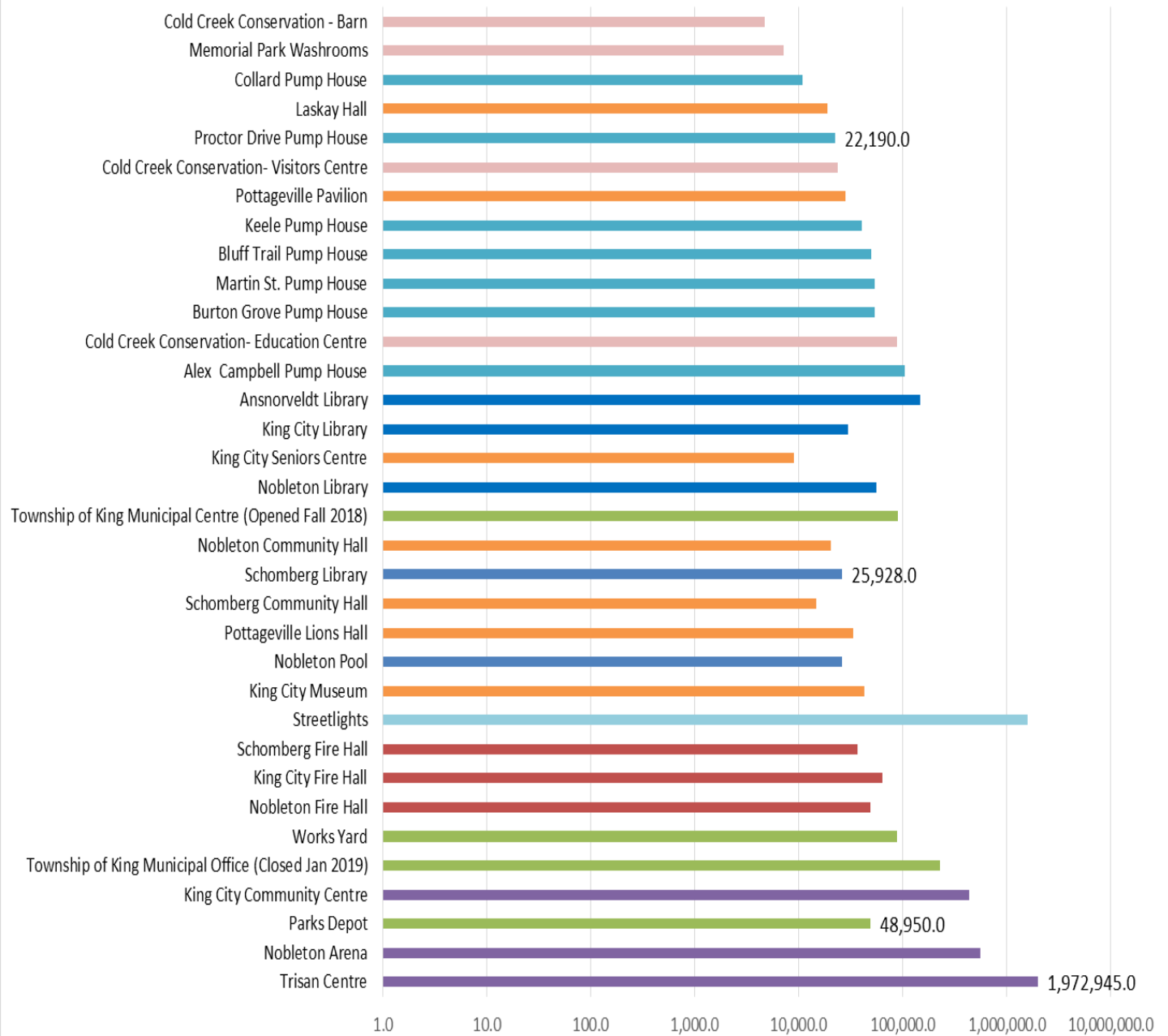
### Township-wide Facilities

In 2018 facilities and streetlights in King consumed 6,054,826 kWh of electricity and 353,007 m<sup>3</sup> of natural gas. The energy cost of this was \$1,298,234.88 broken down by \$1,176,336.51 and \$121,898.37 for electricity from Hydro One and natural gas from Enbridge respectively. Similarly, the 2012 King facilities energy use is primarily seen in a handful of facilities using the large majority of consumed energy. Figure 5 shows the electricity consumption across all facilities (including streetlights).

**Table 1: Table of King Township Corporate Facilities by grouping**

Building Type	Number	Total Indoor Area (sq metre)	Total GHG Emissions (Kg)
Library	4	1479.43	27,840.32
Fire Halls	3	2027.13	89,258.33
Municipal Admin	4	9802.54	222,194.17
Arenas	3	10350	302,508.86
Pumping House	7	262	6,018.00
Community Centres	7	2165	72,444.74
Lighting	1	0	27,295.85
Other	5	507	23,440.83

### Electricity Consumption by Facility in 2018



**Figure 8: King Township corporate facilities electricity consumption in 2018, displayed logarithmically to better display variation among facilities**

(Similar to graphs shown in “past state”) are displayed logarithmically to better understand the electricity usage among King Facilities. 14 of 34 facilities are consuming more than 50,000 kWh on average annually, with 7 of those 14 consuming over 100,000 kWh annually. As seen in 2012 data, these facilities are directly related to one of three assets, recreational facilities with ice pads (Arenas), administrative buildings used primarily by staff and township-wide streetlights.

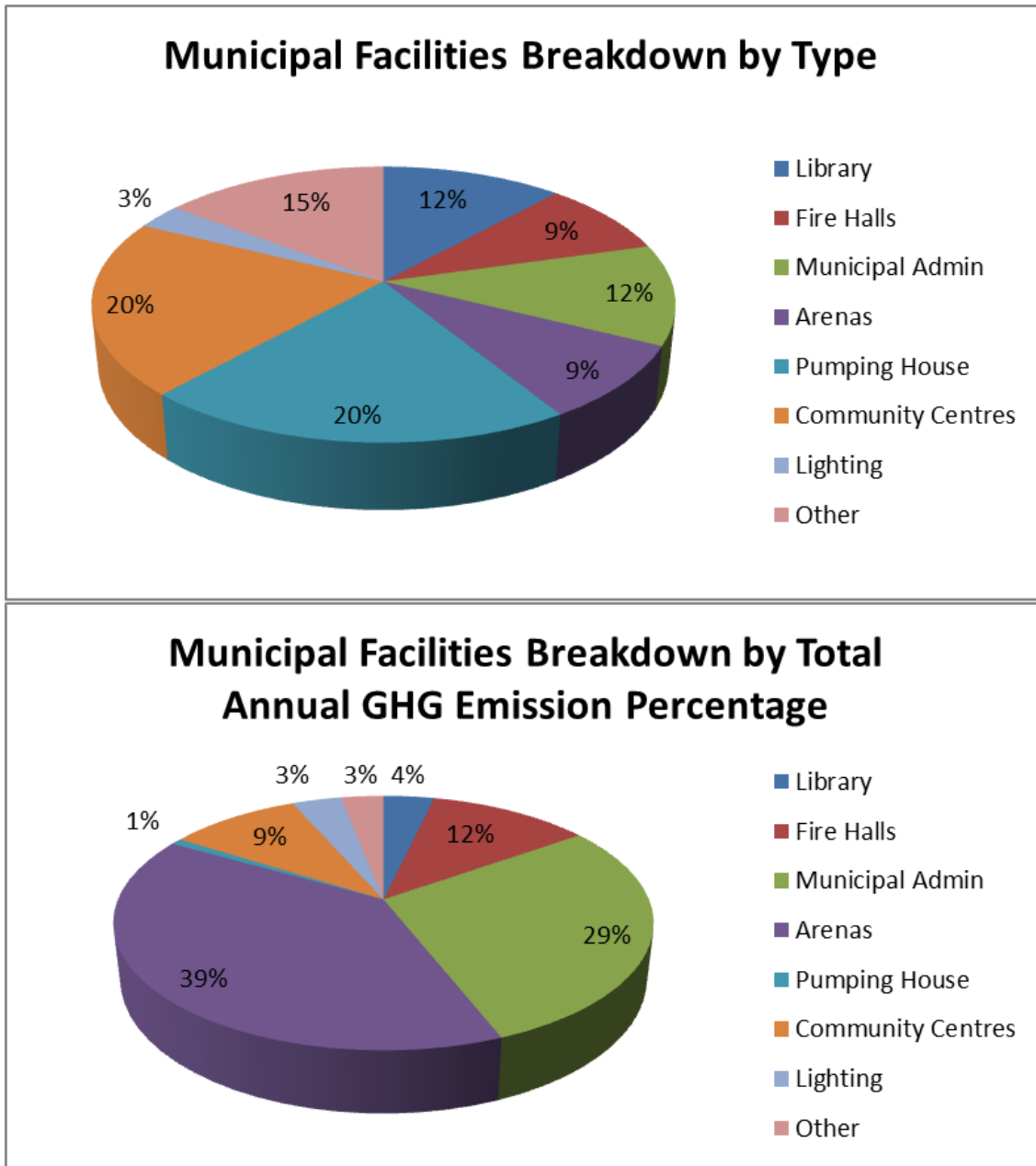


Figure 9: Breakdown of municipal facilities by type and GHG emissions emitted per type as a percentage

The difference between facilities can be seen in Figure 6 or outlined in Table 1, showing that while arenas only make up 9% of facilities, they are contributing to 39% of King’s emissions.

These numbers are due to sheer size, complexity and functions in the community and are likely mirrored across other municipalities.

The breakdown of Natural Gas in corporate facilities in 2018 can be seen in Figure 7 and in Appendix B, the displayed data is similar to 2012 in that there are a limited number of key facilities using the majority of King’s natural gas consumption.

This has stayed relatively consistent since the previous Energy Conservation and Demand Management Plan in 2014.

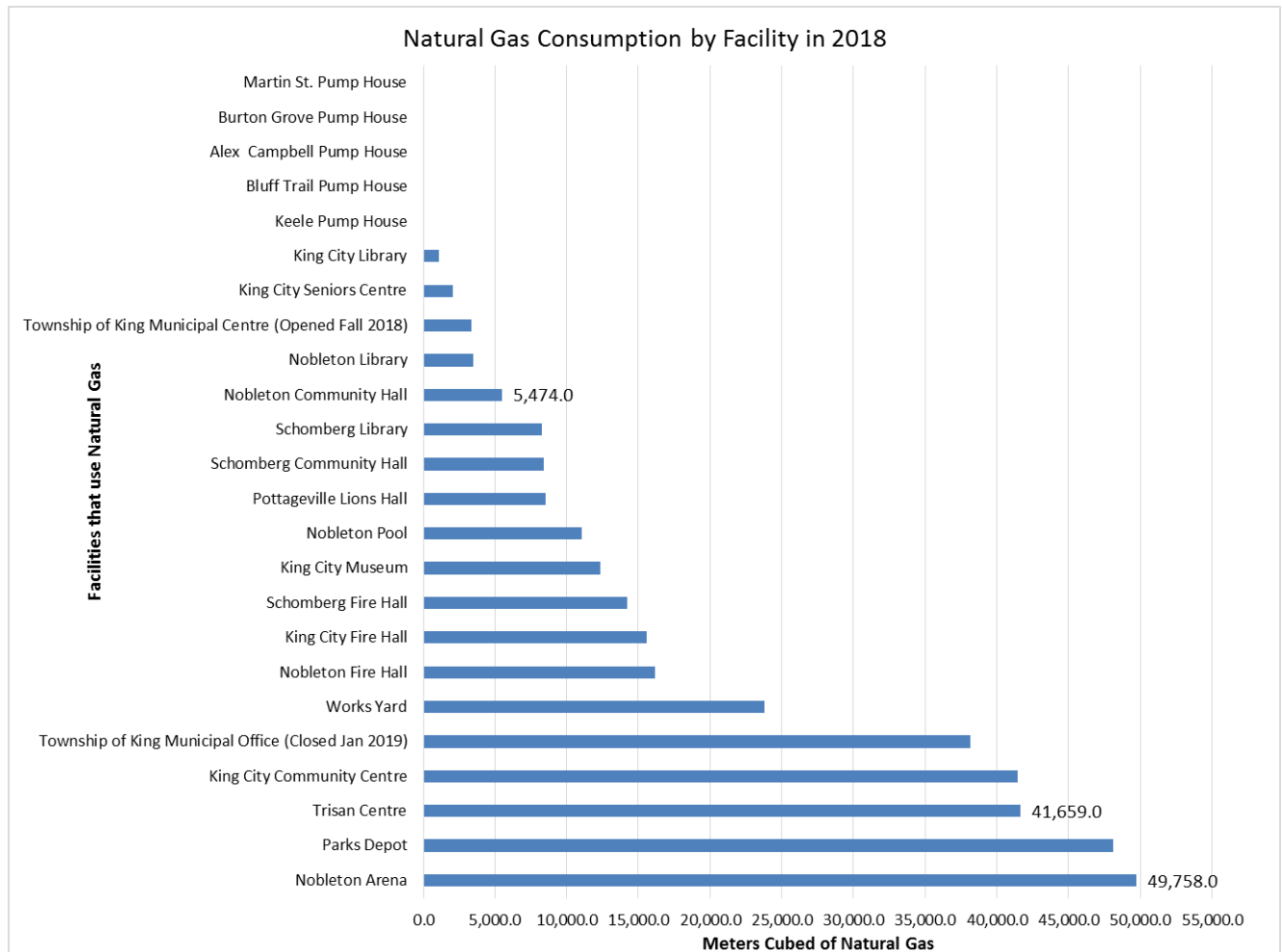


Figure 10: Natural Gas consumption by King Facilities in 2018, displaying only facilities with a natural gas account

## Big 6: King Township's Largest Emitters in 2018

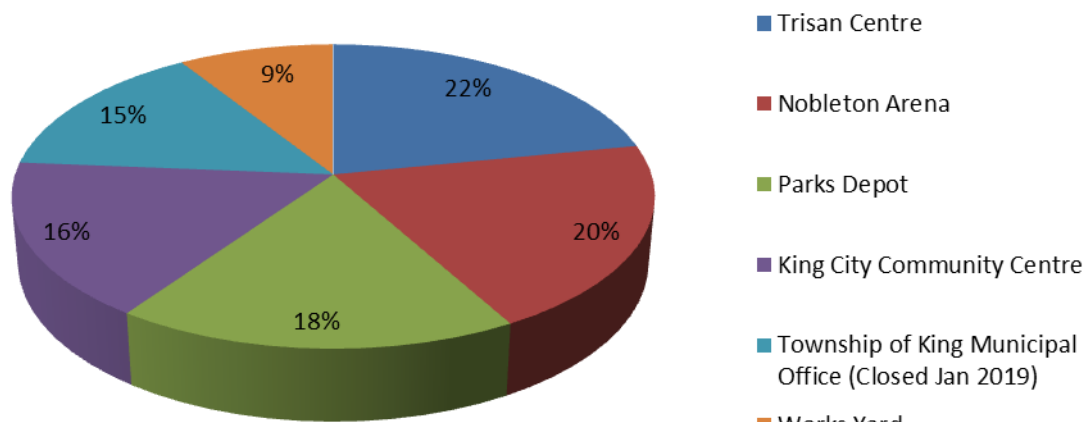


Figure 11: King Township's 6 largest emitters based on total emissions

When moving forward with recommendations and developments on facilities that should prioritize energy conservation, efficiency and renewable energy, in principle King's top emitters should be considered first. By capitalizing on both internal and external funding the retrofitting of specific facilities to better conserve energy could have a dramatic effect on the overall emissions emitted by King. Figure 8 displays the 6 largest emitters among King Facilities; these "Big 6" are similar to 2012 data.

## King Energy Baseline & Now: 2012 to 2018

### Facilities and Streetlights

From 2012 to 2018 King has grown substantially increasing by 6,800 to a population of 27,000 people. This growth has seen a correlating growth in the number of facilities King manages and operates, including the addition of two pump houses, various streetlights and a new Municipal Centre. With these increases in facilities and population, pressure on facilities energy consumption would be predicted to increase as well. Surprisingly with growth across the board, energy consumed while increasing in some aspects has decreased in others. As can be seen in Table 2 electricity has decreased by 2.3% whereas natural gas consumption has spiked by 34.2%. The cause of this has been the transition from electric space heaters to more energy efficient natural gas water heaters. In addition to this, the acquisition of two pump houses has increased natural gas usage.

**Table 2: King facilities energy comparison through percent change**

Facilities Energy Consumption, 2012 vs. 2018			
	2012	2018	% Change
Electricity (kWh)	6,196,331.00	6,054,826.00	-2.3%
Natural Gas (m3)	232,165.00	353,007.00	34.2%
Total ekWh	8,609,686.18	9,724,333.77	11.5%

From an emissions standpoint, King Facilities emitted 1,003,186.95 Kg of CO<sub>2</sub>e in 2012 compared to emitting 772,140.94 Kg of CO<sub>2</sub>e in 2018, decreasing by 232,185.85 over that period. However, this decrease is predominantly due to the Provincial Government choosing to close all coal fire power plants producing electricity and thus “greening” the electricity grid.

### Ontario and Coal

Canada’s built environment is a significant contributor to GHG emissions, with 17% of GHGs coming from residential, commercial and institutional buildings.

Living in Ontario we are lucky to have been one of the first jurisdictions in North America to phase out coal powered electricity which had contributed greatly to Ontario’s GHG emissions. In 2003 the province was using coal plants to supply 25% of Ontarians electricity needs and following the case for eliminating coal, the province of Ontario eliminated all coal-fired generation by 2014. This “cleaned” up Ontario’s power grid and significantly improved air-quality with 2018 only advising one (1) Smog and Air Health Advisory versus 2012 advising thirty (30) smog advisories across the province.

When comparing facilities and streetlight emissions (in Figure 9) from 2012 to 2018 it can show that over time numerous facilities emissions have dropped. The emission reduction in almost all cases is due to the calculation used by the province and when energy sources are calculated using the same emission factor across all years it can be seen in figure 13, that King would have continued to increase emissions since 2012 steadily.



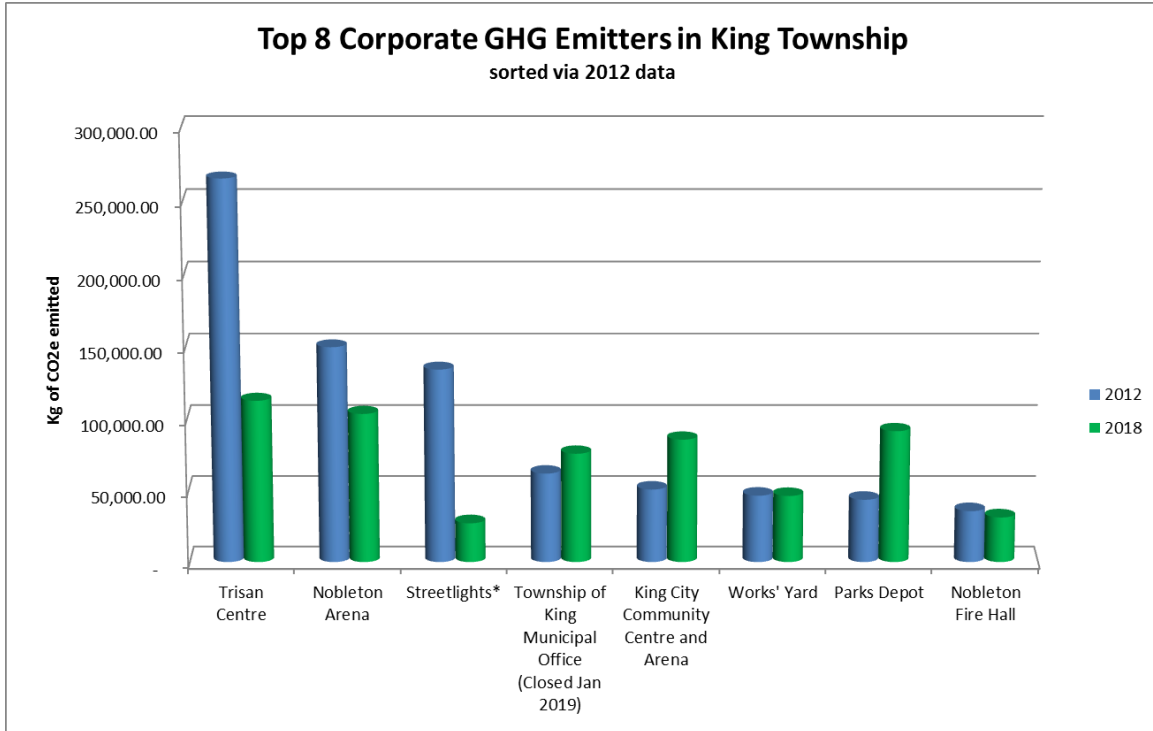


Figure 12: 8 highest corporate facility emitters benchmarked against each other; sorted via 2012 data

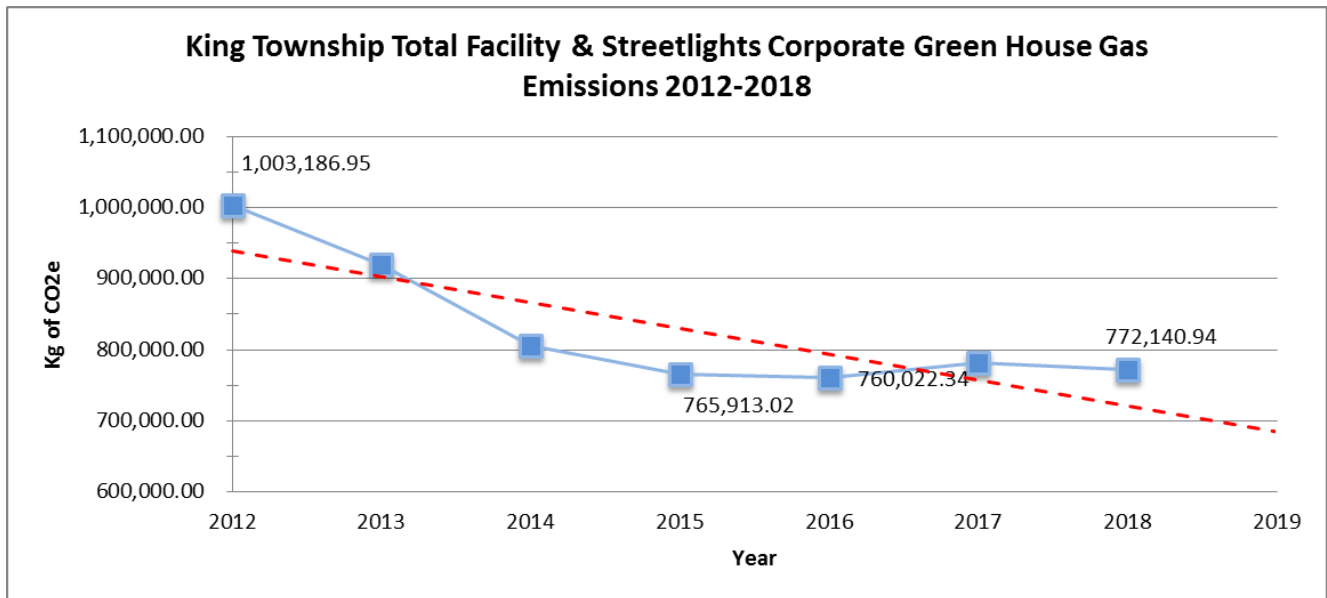


Figure 13: GHG emissions in King corporate facilities and streetlights from 2012 to 2018

**Options & Recommendations - Facilities:** As the municipality strives to reach a still ambitious targets of a 35% decrease in GHG emissions corporately, all options need to be considered including, but not limited to;

- Possible reduction of service levels
- Facility improvements
- Improvements to operations
- Divestment of surplus facilities
- Renewable energy

### **Service Level Reductions**

Currently, the top contributor to energy use and subsequent GHG production is the Trisan Centre. The Trisan Centre presently runs year round ice-time, providing ice services to King Township residents and non-residents. In order to meet targets, save energy costs and reduce effects of climate change, a consideration could be given to removing ice at the Trisan Centre for the summer season. This summer ice removal is estimated to reduce conservatively 400,000 kWh – the equivalent of 2-4% GHG - and save an estimated \$70,000 annually.

Any service level reduction should consider the impact to users, include a public consultation process and ultimately inform Council's potential future endorsement.

- 1. Recommendation** – Consider reductions to service levels or facility closures to reduce or mitigate GHG emissions.

### **Facility Improvements**

In alignment with our asset management plan, facilities will be upgraded over the foreseeable future. The simple effect of retrofitting facilities should yield results from an energy management perspective as building envelope, mechanical systems, etc. are upgraded from aging infrastructure and out-dated technology.

In addition, when capital renovations take place, additional improvements specifically aimed at internal air temperature regulation, thermal bridging and air tightness within our facilities will become the standard.

In the short term, improvements will be focused on the Schomberg Community Hall, Pottageville Pavilion and Parks Depot as these facilities are within the 2019-2022 Capital Budget.

Consideration should be given to exploring options for the Public Works Yard in the next four year cycle.

**2. Recommendation** – As renovations occur in facilities, increase capital budgets to allow for energy efficient retro-fits.

### **Operational Changes**

The method in which the Township audits facility energy usage/costs could be further optimized with changes to operational methods and the installation of new technology. These technology changes could target specific buildings within the Township that use the most energy and that emit the most GHG's. Recommendations would be to implement Building Automation Systems, undergo energy audits, implement smart thermostats and other monitoring systems.

- a. Energy Retro-fits will require facility staff training of new energy efficient software and hardware to optimize and monitor its usage in each specific facility.
- b. The recently completed LED Streetlight project includes adaptive controls to best utilize the new LED technology. It is recommended that staff be trained on the use of these controls immediately to evaluate the associated energy and cost savings with a full changeover from High Pressure Sodium (HPS) and Mercury Vapor (MV) to LED street lighting.

### **Surplus Facilities**

In alignment with the examination of service levels in this plan and previously endorsed plans (Facility Master Plan, July 2019) the Township cannot continue to acquire facilities that simply match existing service levels without consideration of divesting existing, aging infrastructure.

As such, strong consideration should be given to divesting surplus facilities where services are duplicated. Facilities that warrant review and discussion include Kettleby-Pottageville Lions Hall, King City Community Centre and Arena, Ansnorveldt Public Library and the King City Seniors Centre. By divesting surplus facilities King can reduce energy output and costs associated with operating, maintaining and servicing these

facilities. This recommendation is only feasible where services are being duplicated or facilities are below average usage.

**3. Recommendation** – Consider the option of divesting facilities and/or fleet that have been replaced or exceed the identified municipal service level(s).

## Renewable Energy

In the case of existing facilities, improvements to infrastructure can be made to reduce the impact of GHG emissions however, it will be rare that the facility will reach net zero. The implementation of renewable energy sources can further assist in meeting the specified targets.

Implementation of Solar Photovoltaic (PV) net metering retrofits on feasible facilities, offsetting either 100% or a majority of electricity usage and costs associated with the facility will greatly assist meeting Kings energy reduction targets as well as transitioning to a low carbon future. Buildings with ongoing or upcoming capital renovations will be considered for Solar PV, or other sources of renewable energy as seen fit. The average cost of Solar PV in Ontario is \$2.28 to \$2.78 per watt. Where feasible, the Township will explore storing and using power on site as part of the strategy.

Solar PV will be an essential part of the energy landscape as facilities strive for varying energy and environmental certifications and move to a net zero future.

**4. Recommendation** – Explore opportunities to use renewable energy at Township facilities to offset energy use and GHG emissions

Specific facility project recommendations will be subject to completion of a facility energy audit conducted in late 2019 and solar feasibility.

## **New Proposed Corporate Facility Construction Standards and Certifications**

As King continues to grow, with a projected population of 34,900 by 2031, corporate infrastructure will need to expand. The Township will continue to invest in parks, recreation, wastewater and pump houses, library and administrative infrastructure to meet the unique needs of the Township as a whole as well as, support and leverage pressure on current and proposed facilities.

The development of a corporate Green Building Policy is a recommendation within this plan along with the Sustainable Development Standards Program already in the

process of being established. The corporate Green Building Policy and Sustainable Development Standards Program will demonstrate to other municipalities and the public that King is leading by example and protects Township facilities against the future of climate change and associated effects such as increased energy costs, weather while improving healthy communities, green infrastructure and more.

### **Passive House**

Passive house is considered to be the most rigorous voluntary science-based energy standard in the design and international construction industry today. This style and industry of construction and development would significantly aid King in developing sustainable, energy efficient facilities with new builds becoming a leader in energy conservation.

Passive house designs can reduce heat and cooling energy needed by 90% compared to conventional buildings and are feasible at all building levels and types. Figure 14 shows an infographic on how a traditional passive house design works.

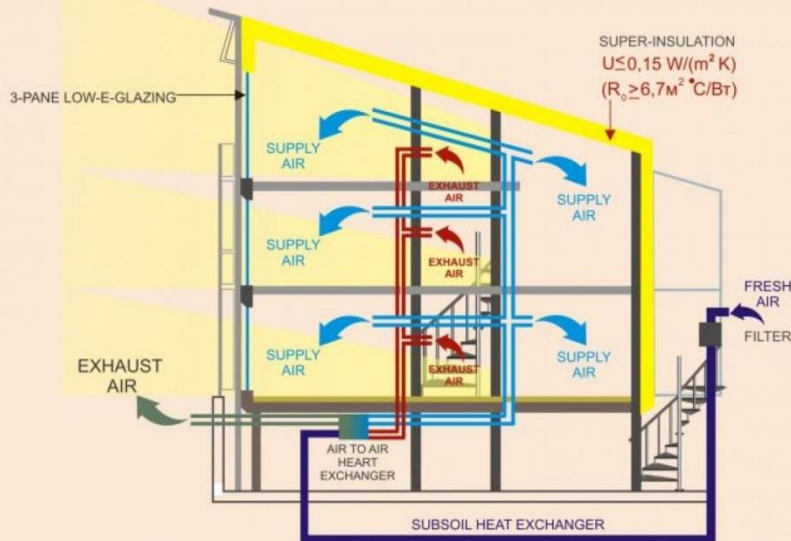
While this approach may not be fully feasible for larger scale municipal facilities, it is something that should be given consideration for smaller building footprints (community halls).

# PASSIVE HOUSE

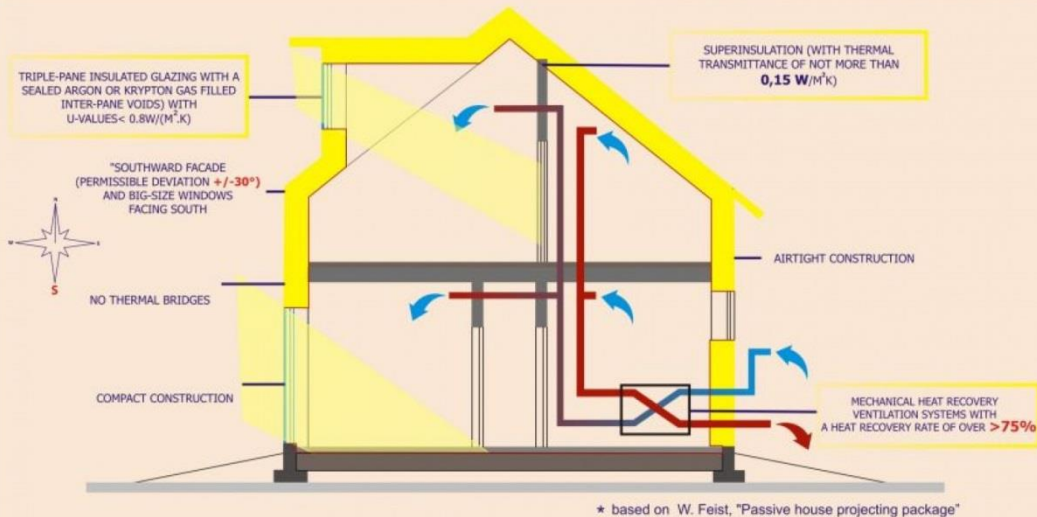


**Passive house - is a building with no need for the separate heating system due to the low energy consumption for heating. Passive house requires  $\leq 15 \text{ kWh} \cdot \text{m}^{-2} \cdot \text{year}$  for heating or cooling (relating to the living space).**

## PASSIVE HOUSE CROSS-SECTIONAL PLAN:\*



## PASSIVE HOUSE CHARACTERISTICS:\*



Infographics is prepared within UNDP/GEF project "Energy-efficient design and construction of residential buildings"

Figure 14: Passive House Infographic on building design



## **Enerphit Standard**

In regards to currently operational facilities, retrofitting to passive house standards are not feasible based on cost and structural design, however retrofitting existing facilities to the Enerphit standard, falls in line with a passive house standard retrofit certificate.

Enerphit is a certified Passive House retrofit that primarily focuses on improving thermal insulation, reducing thermal bridges, improved air tightness, ventilation with highly efficient heat recovery, energy efficient windows and use of renewable energy sources. By retrofitting existing facilities and buildings to Enerphit standards, heating and building energy can be reduced by 70-90%. Based on the low level of demand for heating energy with a moderate payback, facilities with poor shape/ orientation and facing other obstacles are still applicable.

A less extensive retrofit option for King Facilities is the EnerPHit Insulation System Certification aimed at cool-temperate climates. It is an insulation solution for entire building envelopes.

Other types of green building designs are seen below. These buildings are highly efficient and are able to both use and produce energy. Moving forward, the recommendation by the Intergovernmental Panel on Climate Change (IPCC) urges governments to undertake a green industrial revolution and move toward Net Zero Energy (and Net Zero global economy) by 2050. With this news, the building landscape over the next 30 years will be forecasted to move in the direction of highly efficient green buildings both from an environmental and energy standpoint and have an economic benefit as well.

# Types of green buildings

How a highly energy efficient building can use and produce energy

		Limitations		
Certainty on emissions reductions	Less	 <b>Net Zero Energy Ready</b>	<ul style="list-style-type: none"> <li>• May use fossil fuels or electricity for heating</li> <li>• Could become “net zero energy” with the addition of solar panels or other renewables</li> </ul>	<ul style="list-style-type: none"> <li>• Still emits carbon pollution if using gas on site</li> <li>• Carbon pollution from electricity use will decrease over time as coal and natural gas are replaced by renewables</li> </ul>
		 <b>Net Zero Energy<sup>1</sup></b>	<ul style="list-style-type: none"> <li>• May use fossil fuels or electricity for heating</li> <li>• Generates as much energy on site or nearby as it uses on an annual basis</li> </ul>	<ul style="list-style-type: none"> <li>• Still emits carbon pollution if using gas on site</li> <li>• Not all buildings have solar potential</li> <li>• Generation may not match demand; fossil fuel burning power plants may still be needed during peak hours, leading to higher electricity rates</li> </ul>
		 <b>Net Zero Carbon<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• May use fossil fuels or electricity for heating</li> <li>• Fossil fuel use (on-site or on the grid) is offset with the purchase or generation of low-carbon energy</li> </ul>	<ul style="list-style-type: none"> <li>• Still emits carbon pollution if using gas on site</li> <li>• Carbon offsets are achieved only if purchased clean energy displaces high-emissions energy</li> <li>• There are multiple definitions of when carbon balance is achieved</li> </ul>
		 <b>Zero Carbon</b>	<ul style="list-style-type: none"> <li>• No fossil fuel burned on site</li> <li>• Only uses clean electricity or low-carbon fuels</li> </ul>	<ul style="list-style-type: none"> <li>• Increased demand on clean electricity grids</li> <li>• Biofuels still emit carbon pollution and can only be considered carbon neutral if feedstocks are sustainably managed and fugitive emissions are addressed</li> </ul>
	More	 <b>Zero Carbon + Grid Interactive</b>	<ul style="list-style-type: none"> <li>• No fossil fuel burned on site</li> <li>• Generation and load are optimized to meet the needs of the grid</li> <li>• Provides energy storage and/or load management to relieve grid demands</li> </ul>	

1. Net-zero energy labelling and certification bodies include the [Canadian Home Builders' Association](#) and [International Living Futures Institute](#)

2. Examples of net-zero carbon standards include the Canada Green Building Council's [Zero Carbon Building Standard](#) and [Architecture 2030's ZERO Code](#)

## King Township Fleet:

In 2018 King had a municipal fleet of 73 vehicles consisting of fire vehicles, pump trucks, dump trucks, snow plows, vans, trucks and SUV's. For the purpose of this plan fire vehicles which make up 20.5% (15 vehicles) of the fleet, will not be included. Fire vehicles serve a crucial purpose to emergency response; and in relation to emissions have varied fuel efficiency based on equipment, water, crew and use. The low carbon future and transitioning to alternative fleet fuels is a developing field of technology, while reliable is not seen as crucial and feel that first responders need current reliable technology that is proven, and thus will not be considered in King's corporate fleet and calculated emissions.

Township of King Corporate Fleet Inventory for 2018							
Vehicle Type	Hybrid	SUV	Van	Pickup Truck	Heavy Utility Truck	Dump truck/Snow Plow	Fire Vehicle
Quantity	1	9	5	21	10	12	15

King owned a 2009 Ford Escape Hybrid and will be looking toward implementing a Green Fleet Strategy in late 2020. King has purchased its first fully electric vehicle, the KIA Niro, with a delivery date of late fall 2019.

The new King Municipal Centre in King City installed four level 2 EV charging stations in 2018:

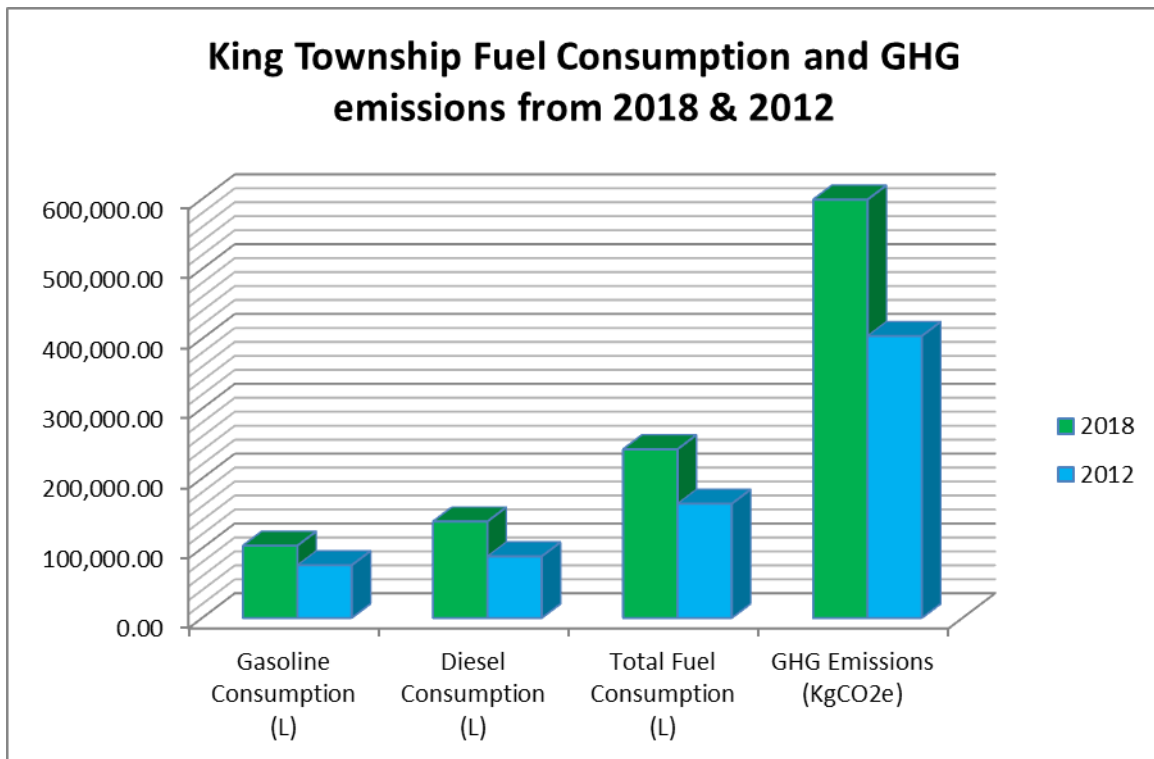
- One dual connector level 2 Tesla charger
- One single connector level 2 Tesla charger with a universal charging port to all current EV's
- One single connector level 2 universal charging station by Chargepoint

These stations are currently online and will be publically addressed in late 2019/early 2020.

King Township Fleet Fuel Consumption and Greenhouse Gas Emissions			
Year	Gasoline Consumption (L)	Diesel Consumption (L)	GHG Emissions (KgCO <sub>2</sub> e)
2018	103,397	138,058	599,043.32
2012	75,378	88,061	403,687.68

GHG emissions from King’s fleet do not currently have a baseline to base yearly changes or progression on, as fleet emissions were not included in the 2014 Corporate Energy Management Plan. Going forward, 2018 will be used as the baseline. Estimated fuel usage has been predicted for our fleet in 2012 based on 2013 data however, they are not the exact fuel consumption levels for 2012.

In 2019 King purchased its first fully electric vehicle; the 2019 KIA Niro EV. This is the first step in the progression toward the implementation of a green fleet and lays the foundation for a green fleet plan/strategy.



**Figure 15: King Township Fleet Fuel Consumption in 2018 & 2013 values estimated to be approximately the same/ similar in 2012.**

## Options & Recommendations - Fleet:

Given the context of the level of reduction required (630,000 kg), the level the fleet currently emits (almost 600,000 kg – 2018) and the speed at which technology is becoming available to modify this component of municipal infrastructure, staff are of the opinion that fleet alternatives should be a primary arm of the reduction strategy in the short term.

As companies such as Tesla and Ford make leaps in innovation and technology, costs and technology will become more affordable and innovative, reducing the current premium cost for electric vehicles that historically have been a barrier among other things such as charging infrastructure, EV battery size and thus distance on a single charge and extreme weather.

As King replaces fleet vehicles, at the designated end-of-life-cycle replacement, priority will be given to purchasing vehicles that are electric, hybrid (PHEV), or alternative fuel such as Compressed Natural Gas (CNG). The purchase of vehicles with a high degree of energy efficiency will become the “mandate”.

In order to support electrification of King’s fleet, proper infrastructure must be installed, maintained and utilized at strategic public and private locations throughout King Township. King Township will be actively pursuing exterior funding (federal, provincial and private industry) to help alleviate large capital costs of EV charging stations and associated networks.

It is recommended that priority be given to locations for King staff and members of the public:

1. Trisan Centre
2. Nobleton Arena
3. King City Library
4. King City Municipal Centre
5. Ansnorveldt Public School

When converting vehicles or transitioning end-of-life fleet vehicles from gasoline/diesel to CNG, light and heavy duty vehicles running on gasoline will be higher priority alternative fuel replacement compared to diesel vehicles due to the emission reductions in comparison from CNG to gasoline. (30-50% reduction)

Converting both gasoline and diesel fleet vehicles to CNG has varied cost savings ranging from 10-30% in fuel savings, dependant on kilometres driven by any given vehicle.

**5. Recommendation** – At time of replacement, transition vehicles to alternative fuel sources (electric, PHEV, compressed natural gas) as technology permits.

**6. Recommendation** – Construct a “network” of charging stations for public and municipal uses.

Further to alternative fuel options which will be paramount in reducing GHG emissions, consideration must be given to optimization of the fleet at the discretion of fleet managers through right-sizing of fleet vehicles.

**Right sizing** is the means of optimizing vehicles used by staff

For example, staff and departments that need a fleet vehicle(s) may currently have several large SUV’s however; smaller more fuel efficient vehicles that can continue to service staff at the same level will be implemented.

Currently, fleet is broken down by department, allowing each necessary department to have its own fleet for field work, inspections, enforcement, etc. It is recommended that the fleet be optimized as a whole and based on mileage, use and GPS data available that vehicles be removed from departmental fleets and departments share King vehicles.

For example if a department has several fleet vehicles parked at the Municipal Centre unused on a daily basis based on GPS data, these vehicles will be reduced or become interdepartmental shared vehicles allowing for reductions or right sizing in other areas, thus reducing redundant and/or underutilized fleet vehicles. Through this process fuel consumption and therefore emissions will be reduced without the need for upfront capital costs.

**6. Recommendation** – Optimize present and future fleet through right-sizing.

**7. Recommendation** – Inter-Departmental fleet downsizing based on individual vehicle usage.

Simply changing vehicles is only part of the solution. Behaviours also need to be modified and as such, staff recommends the implementation of Anti-Idling Policy in relation to corporate fleet. An Anti-Idling Policy will help reduce emissions from fleet tailpipes, save cost on fuel and provide a cleaner healthier environment for municipal staff and the public.

**8. Recommendation** – Implement Anti-Idling Policy to reduce emissions, save on fuel costs and make environment healthier.

### Next Steps

While the provincial regulation requires updating the plan every five years, more frequent updates can help King:

- Update goals and objectives;
- Add new conservation measures;
- Track results by creating clear targets and developing KPI's for each recommendation
- Monitor ongoing projects
- Implement recommendations

### Proposed Future Measures:

Moving forward, King will be considering numerous pilots and projects to help reach short and long term targets in this plan, as well as update the ICSP and move King toward being a leader in energy among Canadian municipalities.

Implementation of these projects will be dependent on:

- Feasibility Studies
- Allocated funding
- Internal reserve operations fund (representing savings from previous energy conservation projects and retrofits)
- Incentives from Independent Electricity System Operator (IESO) and/or utilities
- Availability of qualified staff; and
- Retaining a qualified consultant/contractor to develop and implement projects



## Technical Measures:

- Installation and use of Energy Management Information System Software: this is a performance management system that would enable King to plan, make decisions and take effective actions to manage energy use and costs in a straightforward easy to use process.
  - An EMIS makes energy performance visible to different levels of the organization by converting energy and utility driver data at energy account centres into energy performance information. It does this by using performance equations that are compared with the organization's energy targets.
  - Currently King is utilizing the Mayor's Megawatt Challenge to analyze the 4 largest, heavy-use facilities. Moving forward, the implementation of EMIS software could cut administrative costs of using this program and allow a more in-depth and interactive dashboard comparing large consumers and benchmarking similar buildings.

## Organizational Measures:

- Implementing Energy Upgrades as part of the Lifecycle Replacements;
  - Implementing Controls Upgrades at facilities with building automation systems to optimize equipment operation further; Implementing Lighting Upgrades to newer and efficient technologies such as LED, including efficient smart controls to match occupancy and natural daylight.
- Installing Metering & Sub-metering Equipment to utilize real-time data for making smarter operational decisions; this will work hand in hand with the implementation of a EMIS.
- Development of a Corporate Green Building Policy and Green Building Standards for corporate facilities on all new facility builds and major retrofits. This would require facilities to be built to a minimum efficiency or meet specific point criteria. (See new proposed Corporate Facility Construction Standards above)



## Behavioural Measures:

- Develop an interdepartmental Green Energy Team for Climate Change and Energy Conservation responsible for making diverse informed decisions on the implementation and organizational commitment to reaching near and long term targets responsibly.
- Educate Township staff on energy conservation, focusing on operations and facilities staff and how they can help reduce consumption and save costs associated with energy in daily operations.
- Implementation of a “Turn it Off” Program
  - Posting signage around Township facilities to turn off lighting, monitors, tv screens when not in use and shut down computer systems where applicable at end of day.

**Drawdown Solutions:** Project Drawdown is a climate crisis movement that discusses important topics and solutions to reversing global warming (beyond 1.5 Degrees Celsius). The following is a small list of solutions from Project Drawdown which presently or in the future may be practical for GHG reductions at the corporate municipal level.

### Buildings

- 1) Net-Zero Buildings
- 2) Green Roofs
- 3) Solar Hot Water
- 4) Heat Pumps
- 5) Retrofits

### Electricity Generation

- 1) Rooftop Solar PV
- 2) Geothermal
- 3) Micro-wind
- 4) Energy Storage

## Financial Implications and Framework

Presently, King finances energy conservation initiatives and energy retrofit projects through utility incentives such as Save ON Energy and through a facilities small energy fund in the operating budget. The purpose of this fund is to finance scalable retrofits, although given the dollar value most projects have been fairly small.

While every effort will be made to enhance funding opportunities with grants, most funding applications require matching municipal dollars as part of their proposal. At a minimum, additional funding is required to explore these possible partnership opportunities.

Staff originally reported an estimate of \$9,450,000 to \$22,050,000 depending on the types of initiatives that could or would be explored, extrapolating data from other municipal energy management plans and evaluating the per kg reduction vs. dollar value of any projects they had implemented. Staff is also aware that this is completely unmanageable from the perspective of the current municipal tax-base and funding opportunities and are hopeful that as technology advances there will be correlating price reductions as occurs on a regular basis in the tech industry.

That being said, the status quo for annual investment is severely underfunded at \$25,000 annually and staff will propose an increase to annual investment into the program for the years 2020-2022 to ignite our efforts. Consideration should be given to reallocating any savings realized to growing the program.

Following the initial phase, a re-evaluation of progress will be required to determine if additional funding is required to implement higher levels of reductions over the remainder of the timeline.

The short term initiatives will see funding used as follows:

- Enhance the existing capital program to increase opportunities for EV/CNG Vehicles
- Construction of adequate charging stations for new infrastructure
- Exploration of renewable energy projects in conjunction with existing capital works
- Building envelope improvements

A proposed project list can be found attached as Appendix 'B'.

Further to that, staff must take time to evaluate which projects provide the best return on investment to advise the 10 year forecast for enhancements to meet the reduction targets.

### **Re-allocation of Savings**

Consideration can be given to re-allocating funding from potential savings such as fuel cost reductions, electricity savings, etc. however, what must be considered is that while reductions may occur in some areas, the conversion of facilities to alternate operation methods (eg. Electric vs. Natural Gas) may have adverse funding challenges.

While staff do not propose that this will cause an increase in spending, it should be recognized that it will most likely result in cost neutrality from a year over year perspective.

### **Alternate/Grant Funding**

Given the limited size of King's tax base, significant effort will need to be given to sourcing and applying for grants to assist with implementation. As successful energy conservation and efficiency projects/retrofits are implemented within King, more grant opportunities will be available to the municipality based on experience in implementing previous measures.

Possible external funding sources for future conservation measures:

- Federation of Canadian Municipalities
- Clean Air Partnership
- Future Provincial incentives
- Canadian Federal Government grants & incentives
- Corporate shared cost models
- Utility incentive programs

### **Looking Forward**

To comply with provincial regulations King will continue to report our annual energy usage through the Broader Public Reporting Portal with the Ministry of Energy, Northern Development and Mines. These annual reports provided to the Ministry of Energy, Northern Development and Mines will also be provided to King Township senior management and council to identify areas of progress, needing improvement and successes.

Following the completion of level 2 energy audits at our major facilities, King will be able to identify specific energy conservation and reduction projects that begin in 2020 to progress towards our corporate targets.

The acquisition of EMIS will allow King staff to more effectively monitor facilities energy consumption in tandem with staff training on commercially available monitoring programs/software. Use of these software programs will allow for in house preliminary feasibility studies to be conducted.

## Appendix A: Energy Data 2012 vs 2018

Facility	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	GHG Emissions 2012 (Kg of CO2e)	Energy Intensity (ekWh/ sqft)	Electricity (kWh)	Natural Gas (m <sup>3</sup> )	GHG Emissions 2018 (Kg of CO2e)	Energy Intensity (ekWh/ sqft)
Trisan Centre	2,163,930.00	30,559.00	265,599.51	47.92	1,972,945.00	41,659.00	112,889.63	46.51
Nobleton Arena	663,693.00	45,647.00	150,042.53	40.99	559,954.00	49,758.00	103,759.90	38.84
Streetlights	1,400,000.00	-	134,534.40	-	1,577,977.00	0.00	27,295.85	-
Township of King Municipal Office (Closed Jan 2019)	286,120.00	34,698.00	62,155.44	12.60	227,572.00	38,131.00	76,028.04	27.82
King City Community Centre and Arena	530,987.00	-	50,995.99	16.89	434,583.00	41,437.00	85,859.33	27.83
Works' Yard	87,609.00	20,253.00	46,704.84	26.87	88,220.00	23,787.00	46,498.37	30.26
Parks Depot	140,980.00	16,018.00	43,823.78	12.20	48,950.00	48,095.00	91,776.44	21.96
Nobleton Fire Hall	48,941.00	16,460.00	35,820.01	51.35	48,307.00	16,170.00	31,407.05	50.50
King City Fire Hall	71,421.00	10,862.00	27,395.26	23.40	63,661.00	15,559.00	30,517.47	28.67
Schomberg Fire Hall	28,302.00	11,427.00	24,322.32	15.34	36,781.00	14,235.00	27,333.80	15.50
King City Museum	26,875.00	9,403.00	20,358.64	20.00	42,752.00	12,373.00	24,132.25	27.48
Schomberg Community Hall	17,116.00	8,522.00	17,755.74	25.85	14,819.00	8,382.00	16,103.57	24.94
Pottageville Lions Hall	32,978.00	7,305.00	16,978.24	21.82	33,326.00	8,520.00	16,684.62	24.43
Schomberg Library	24,442.00	6,892.00	15,377.61	27.13	25,928.00	8,267.00	15,895.82	24.40
Nobleton Pool	36,319.00	5,663.00	14,194.70	99.62	26,141.00	11,037.00	21,319.04	148.07
Nobleton Library	74,172.00	2,939.00	12,680.03	25.90	55,566.00	3,488.00	6,813.85	9.11

King City Library	85,632.00	1,629.00	11,303.93	13.73	29,700.00	1,106.00	2,604.78	5.53
Nobleton Community Hall	20,092.00	3,743.00	9,006.25	25.17	20,384.00	5,474.00	10,701.89	33.02
Alex Campbell Pump House	71,516.00	12.00	6,891.08	-	103,483.00	12.00	1,812.74	152.79
Keele Street Pump House	68,798.00	73.00	6,745.38	-	40,409.00	71.00	833.23	79.67
Bluff Trail Pump House	65,411.00	31.00	6,340.68	-	49,979.00	27.00	915.58	116.75
Cold Creek Conservation Area- Education Centre	53,221.00	-	5,111.34	19.78	87,288.00	0.00	1,509.91	32.44
Burton Grove Pump House	46,018.00	17.00	4,451.71	-	53,834.00	8.00	946.35	125.23
Martin Street Pump House	33,656.00	12.00	3,255.01	-	53,476.00	8.00	940.15	121.37
King City Seniors Centre	27,961.00	-	2,685.37	15.55	8,890.00	2,041.00	4,012.55	17.01
Cold Creek Conservation Area - Visitors Centre	27,615.00	-	2,652.14	19.00	23,434.00	0.00	405.36	16.13
Pottageville Pavilion	25,792.00	-	2,477.06	23.96	28,036.00	0.00	484.97	26.05
Laskay Hall	15,880.00	-	1,525.12	6.41	18,782.00	0.00	324.89	7.59
Ansnoeveldt Library	15,554.00	-	1,493.81	20.64	146,021.00	0.00	2,525.87	193.80
Cold Creek Conservation Area - Barn	5,130.00	-	492.69	52.95	4,739.00	0.00	81.98	48.92
Memorial Park Washrooms	170.00	-	16.33	0.69	7,200.00	0.00	124.55	29.08
Township of King Municipal Centre (Opened Fall 2018)			-	-	88,740.00	3,362.00	7,891.31	2.71
Proctor Drive Pump House			-	-	22,190.00	0.00	383.84	68.72
Collard Pump House			-	-	10,759.00	0.00	186.11	0.00
Totals			1,003,186.95				771,001.10	

## Appendix 'B' – DRAFT Three Year Project Listing

2020	2021	2022
Building Department Vehicle Conversion to EV	Conversion to EV premium	Increase to building envelope improvements Nobleton Arena
Improvements to CNG Charging Station (Trisan)	Installation of Solar at Pottageville Pavilion	Install BAS System – Nobleton Arena
Conversion of vehicles to CNG (Light duty) 2017-2020 Models (8) - \$15,000 each	Conversion of HVAC Systems - Cold Creek Conservation Area	Conversion to EV premium
Installation of Solar at Schomberg Community Hall	Pilot Project – Water-less Urinals/ No Flow Lavatories	
Installation of Electric Vehicle Charging Stations Network across King Township**		

\*Funded from building reserve

\*\* Funded from Infrastructure Reserves

## Appendix 'C': Sourcing

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