2024 Energy Conservation & Demand Management Plan

Township of Minden Hills

Contents

Table of Figures

Table of Tables

1. Executive Summary

This Energy Conservation and Demand Management Plan (ECDMP) was prepared for the Township of Minden Hills and serves as the latest update to the Township's energy management endeavours. This report provides an overview of Township energy consumption, performance over the previous year and comparison with the prior ECDMP, and includes potential energy conservation measures (ECMs) to help the Township reach its energy reduction goals.

Utility data was provided by the Township spanning the period of 2017 through 2023 in conjunction with building data including building function, drawings, operating hours, and layout. This data was combined with both in-person and remote site audits to:

- Evaluate performance against targets set in the 2019 ECDMP,
- Identify and prioritize potential ECMs,
- Determine a suitable energy reduction target for the next ECDMP reporting period.

Identified measures that are recommended for consideration over the next reporting period are summarized in the following table, with a complete measures table in Appendix C:

Site	ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
Arena	1	Quonset Hut Insulation - R20	-	32,437	$ 3,075	$ 12,144	3.9
	2	Insulate Hot Water Lines	-	1,563	$ 148	$ 46	0.3
	4	Light Occupancy Sensors in Mechanical Rooms	1,844	-	$ 347	$ 1,056	3.0
	5	Quonset Hut Temperature Setback	-	7,849	$ 744	$ 200	0.3
	6	Furnace Night Time Setback	-	2,015	$ 191	$ 500	2.6
	9	Arena Exhaust Controls Update	3,062	-	$ 576	$ 5,000	8.7
Admin	1	Insulate Bare Hot Water Lines	211	-	$ 40	$ 14	0.4
	3	LED Lighting Replacement	8,627	-	$ 1,622	$ 2,782	1.7
	5	Basement Baseboard Heater - Control Upgrades	876	-	$ 165	$ 260	1.6
Cultural	2	LED Lighting Replacement	7,773	-	$ 1,461	$ 1,353	0.9
	3	Install Occupancy Sensors	406	-	$ 76	$ 792	10.4
Fire Hall	3	Replace Remaining Non-Programmable Thermostats	482	7,597	$ 809	$ 2,500	3.1
Kinmount	1	Replace Doors	1,044	3,622	$ 557	$ 12,000	21.5
	2	Insulate Building Envelope	9,145	31,739	$ 4,881	$ 26,717	5.5
	3	Insulate Hot Water Piping	141	-	$ 27	$ 37	1.4
	5	Lighting Replacement	1,223	-	$ 230	$ 335	1.5
Lutterworth	1	Lutterworth Water Insulation - R20	8,336	-	$ 1,567	$ 2,428	1.5
	2	Install Lighting Occupancy Sensor	29	-	$ 5	$ 132	24.4
Sewer	2	Lighting Occupancy Sensors	1,407	-	$ 265	$ 1,716	6.5
	3	Lighting Replacement	9,427	-	$ 1,772	$ 874	0.5
Museum	1	Fix Outdoor Lighting Electrical	3,839	-	$ 722	$ 5,000	6.9
	2	Bank Increased Setback	-	6,131	$ 597	$ 250	0.4
	3	Bank Window Replacement	-	2,894	$ 282	$ 3,200	11.4
	5	Museum Lighting Replacement	13,500	-	$ 2,538	$ 741	0.3
		Totals	**71,371**	**95,847**	**$ 22,695**	**$ 80,077**	**3.5**

Table 1: Select Measure Summary

Implementation of the recommended measures is estimated to achieve a ~5.6% reduction in site energy consumption. Notably, this excludes high capital cost and/or long payback measures which may only be viable to implement if replacement of the underlying asset is already being considered. This figure also excludes remotely scoped measures outlined later in this report.

An additional ~11% reduction in Township facility energy use may be achieved through:

- Actioning replacement of ~5 major HVAC units nearing their end-of-life with new units that feature air-source heat pumps with condensing propane-fired backup heat,
- Incorporating short payback / low capital cost measures from the remote audits.

Based on the identified energy reduction measures, and past Township performance, the following proposed energy performance targets have been generated:

Goals		Objectives
1	Reduce energy consumption and related GHG emissions in Township facilities.	Reduce energy consumption by a minimum of 5% over the next reporting period with a stretch target of 7.5% .
2	Promote the value of energy conservation with users of Township owned and operated facilities, and with Township staff.	Promote, educate, and train Municipal staff in the benefits of energy conservation. Raise awareness on the importance of energy conservation with Munipal staff and facilitiy users, including the financial and environmental benefits to the community.
3	Monitor and review energy consumption of Township facilities.	Review normalized GHG emissions and energy consumption with senior management at least annually. Consider updating review frequency to quarterly or monthly for large and/or high energy intensity facilities. Take measures to progress facilities towards meeting Energy Star Canadian National Median Energy Use benchmarks where feasible.
4	Explore the use of alternative and renewable energy.	Consider the implementation of heat pump driven assets for domestic hot water and space heating when existing units are due for replacement.
5	Leverage funding to implement energy efficiency projects.	Prior to budgeting and implementing an energy conservation measure, research and secure available funding.

Figure 1: Recommended Performance Targets

This report subsequently details energy auding work performed, and Township performance against previous targets.

2. Introduction and Background Information

2.1 Organization Background

The Township of Minden Hills (referred to alternately as “The Township” or “Minden Hills” throughout this report), located in Haliburton County, Ontario, is an amalgamation of several historic Ontario townships including Snowdon, Lutterworth, Hindon and Minden. The Township is primarily centered around the community of Minden, however it incorporates a number of other smaller local communities, making up a population of approximately 7,000 residents in total.

The Township oversees 18 unique facilities spanning a combined floor area of ~104,000 ft^2 , with an associated combined electricity and propane energy consumption of approximately 3,000,000 kWh/year (excluding fleet and streetlighting consumption). Over the past decade, Minden Hills has made improvements in energy efficiency, upgrading lighting, HVAC, and other appliances to more energy efficient models.

The Township has set targets to further improve its energy performance, aiming to reduce energy consumption and GHG emissions in its owned and operated facilities, explore usage patterns, investigate alternative and renewable energy sources, and promote employee and community conservation.

2.2 Report Objective

The objective of this report is to present The Township of Minden Hills with an updated Energy Conservation Demand Management Plan (ECDMP) which summarizes prior energy conservation work performed by the City, outlines reasonable targets for future energy conservation, and provides a reasonable pathway to achieve these targets. This effort has been performed in alignment with the Energy Conservation and Demand Management Plan requirement outlined in Ontario Regulation 25/23, Section 9[1].

[1] https://www.ontario.ca/laws/regulation/r23025

3. Energy Consumption Overview

3.1 Township Energy Consumption & GHG Emission Summary

The Township of Minden Hills uses energy (primarily propane and electricity) to support facility operations and streetlighting. Total utility consumption and associated GHG emissions for the Township over the period of January to December 2023 are summarized in the table below:

Utility	Unit of Measure	Total Consumption	Carbon Emissions (tCO2e)
Electricity - Facilities	kWh	1,838,251	47.8
Electricity - Streetlights	kWh	137,724	3.6
Propane	kWh (Litres)	1,124,449 (158,559)	244.9
	Totals	**3,100,424**	**292.7**

Table 2: Minden Hills Utility Consumption & Intensity Data, 2023

Monthly utility usage and GHG emissions over the period of January 2019 through to December 2023 are shown in the following figure, with all energy consumption converted to identical energy units (kWh), and total GHG emissions from all utilities shown as a red line:

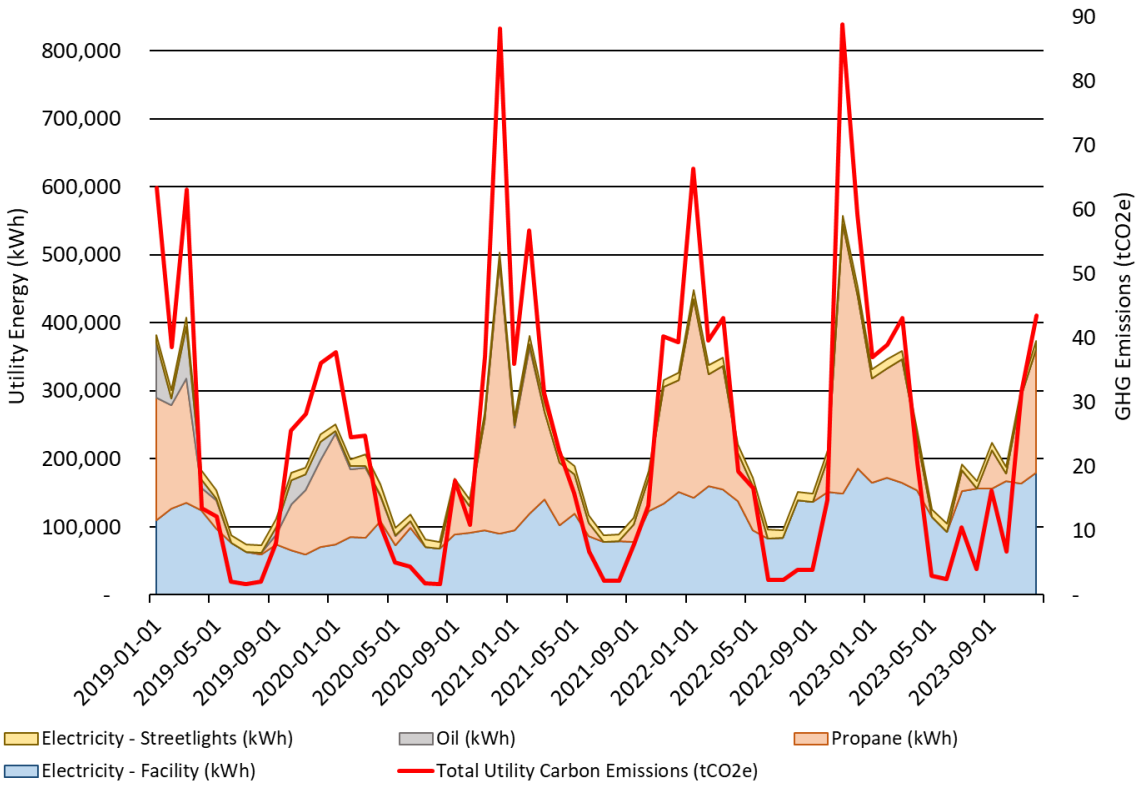

Figure 2: Minden Hills Monthly Utility Usage and GHG Emissions, 2019-2023

Propane consumption appears to show a strong seasonal variance, with most of the consumption occurring in the winter months, and relatively minor usage in warmer months. GHG emissions closely mirror propane consumption, reaching minimum values in summer months when space heating demands are minimal and the majority of energy consumption is related to electricity consumption.

Electricity shows smaller seasonal variance, notably electricity consumption appears to be driven more strongly by outdoor temperature from 2022 onward compared to prior years. This may be due to the installation of heat pumps to supplement propane heating at some buildings.

3.2 Propane

Propane consumption appears to show a strong association with outdoor air temperature. Comparing propane to Heating Degree Days with an 18ºC basis temperature (HDDs) yields a linear relationship with a coefficient of determination (R^2) of ~84%, outlined in the following figure:

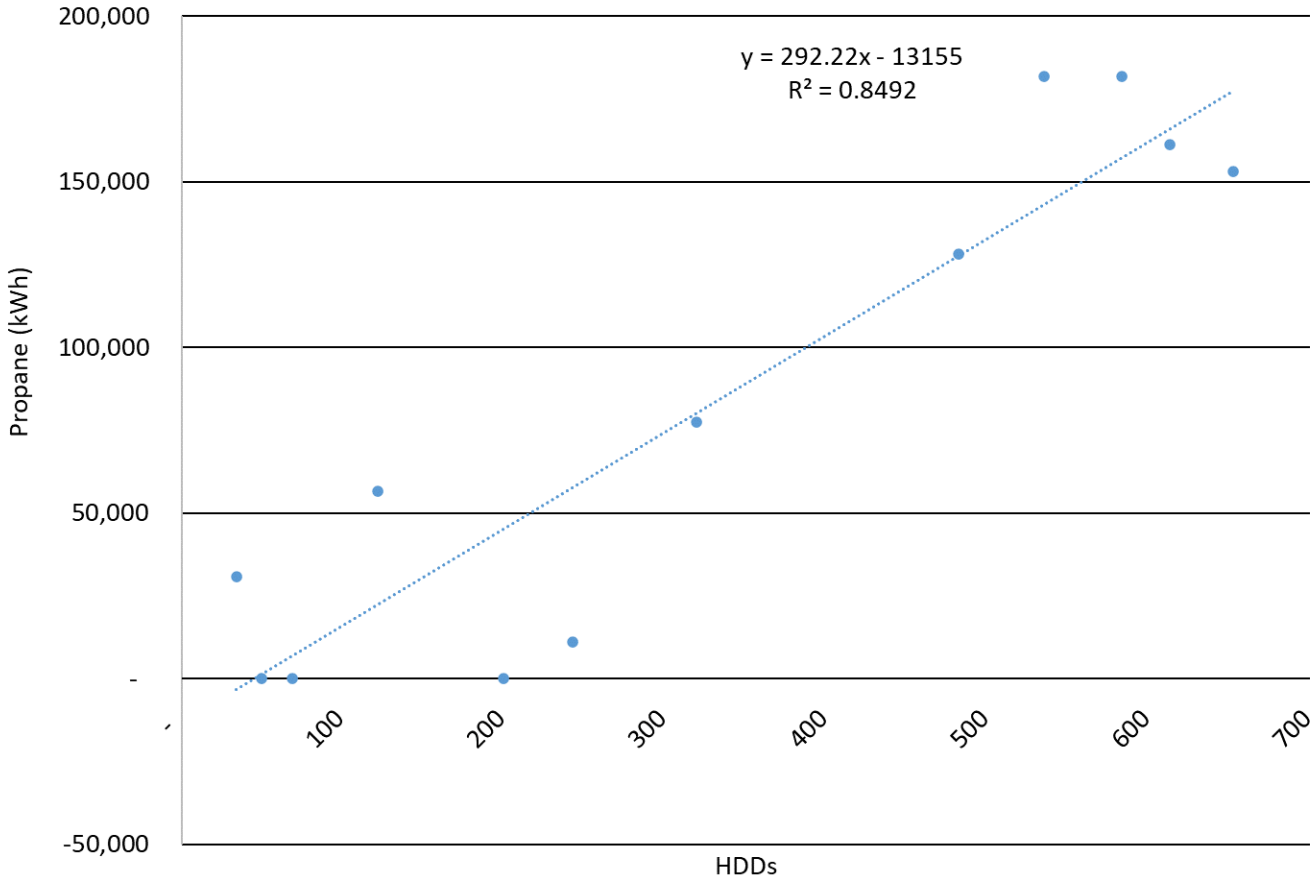

Figure 3: Minden Hills Propane Consumption vs. HDDs

Running a regression analysis over the calendar year 2023, and removing the negative intercept to eliminate the possibility of a negative propane consumption prediction, yields a model of the following form:

$$Propane\ Consumption\ (kWh) = 264.97 * (HDDs)$$

The model has an R^2 of 93%. This strong relationship is in keeping with observations during site audits, which indicated that most of the installed propane end-use capacity was for space heating.

Plotting predicted and actual propane consumption together yields the following figure:

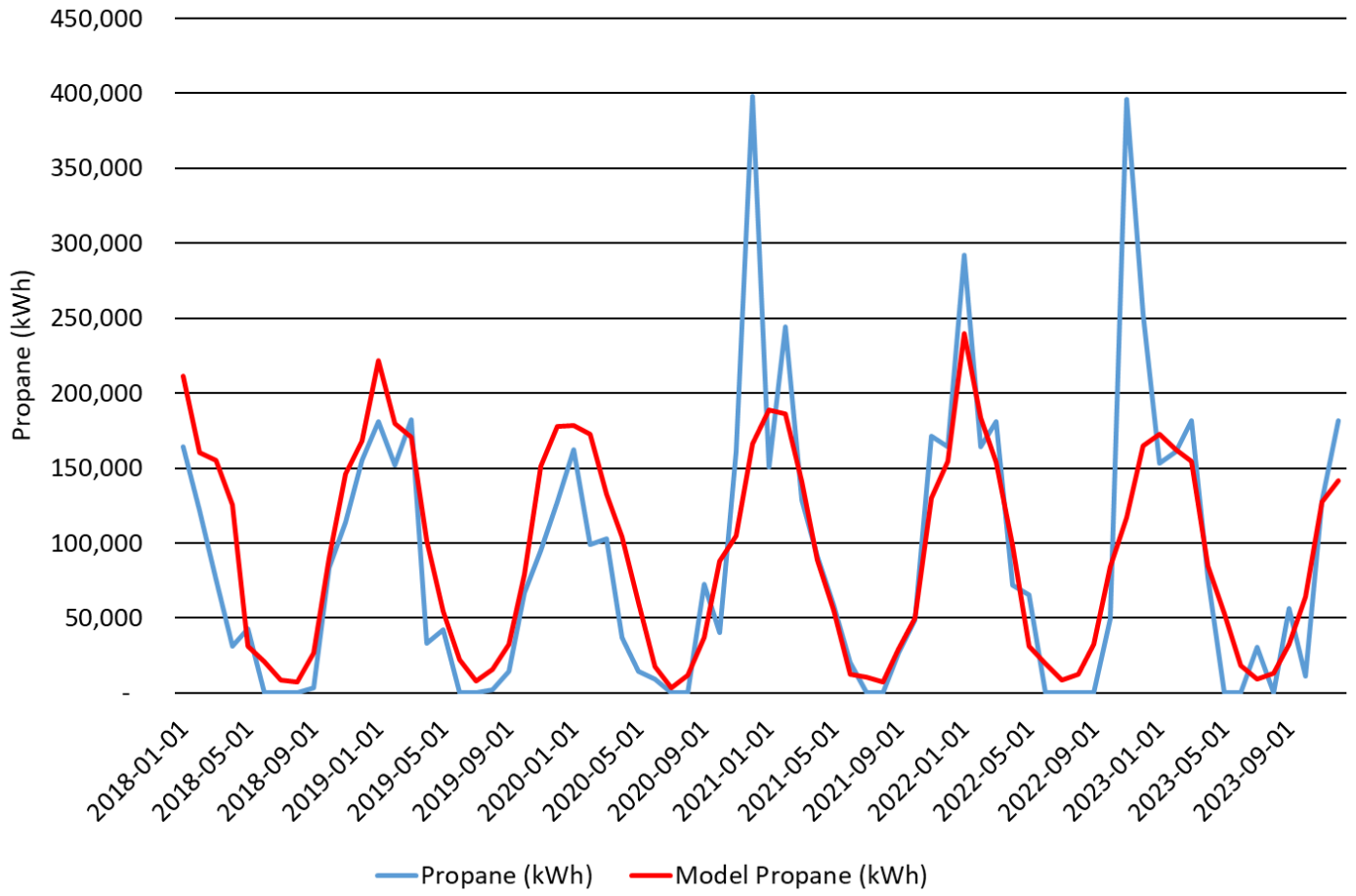

Figure 4: Minden Hills Actual Propane Consumption vs. Modelled

Despite the regression being developed using a baseline period of only 2023, the relationship appears to be applicable to prior years.

It should be noted that the large spikes in consumption that appear after the warmer months are likely due to the need to refill propane tanks. With a small but sustained usage over the summer months and then a large demand during the first cold months, it may be required to purchase a significant amount of propane at once to fill existing tanks.

3.3 Electricity

In contrast to propane, electricity consumption is only weakly associated with outdoor air temperature. The following figure shows the association between electricity consumptions and HDDs:

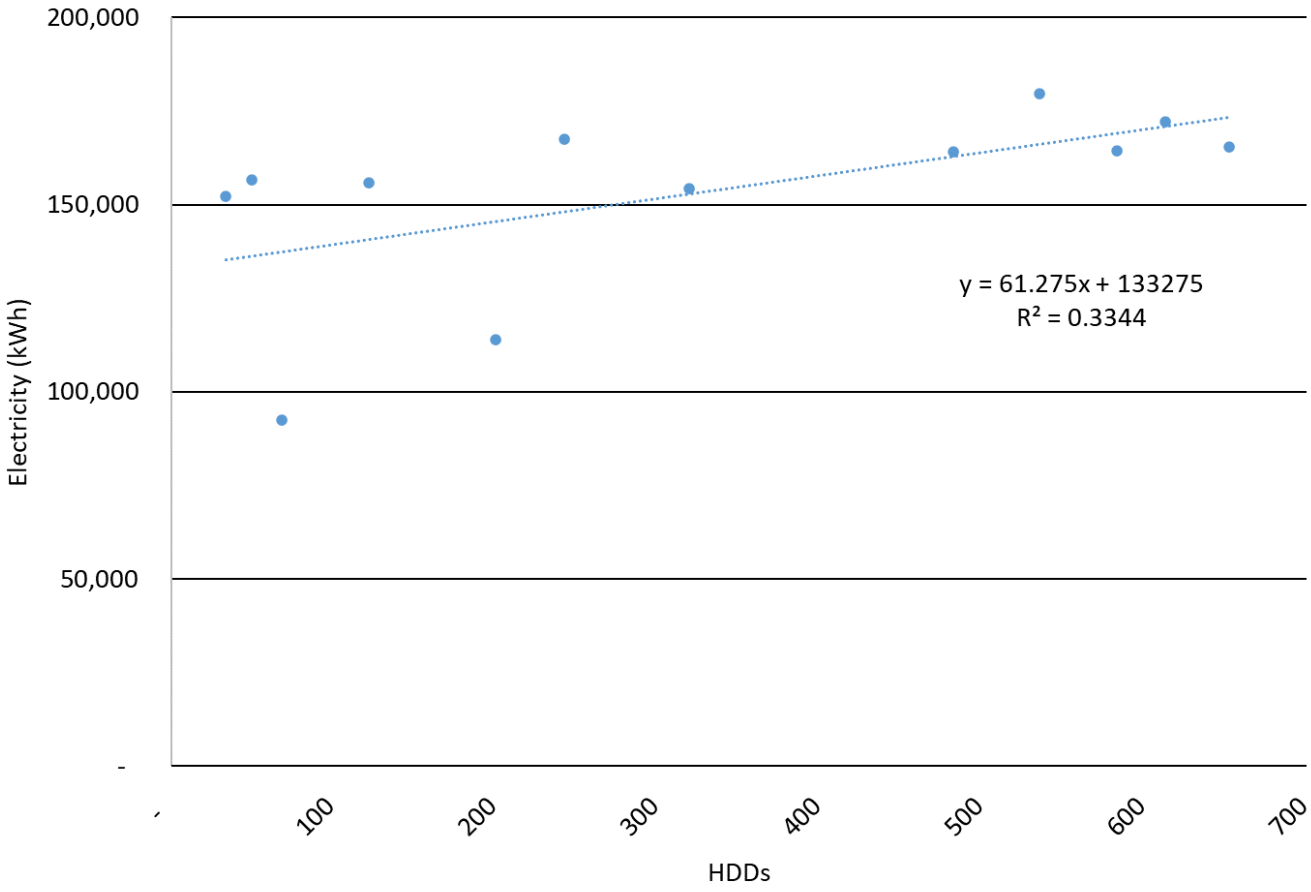

Figure 5: Minden Hills Electricity Consumption vs. HDDs

While there appears to be some interaction between electricity and HDDs, an R^2 of ~33% indicates that heating explains very little of the month-to-month variance in electricity usage.

Cooling Degree Days with an 18ºC basis temperature (CDDs) show a similarly weak association:

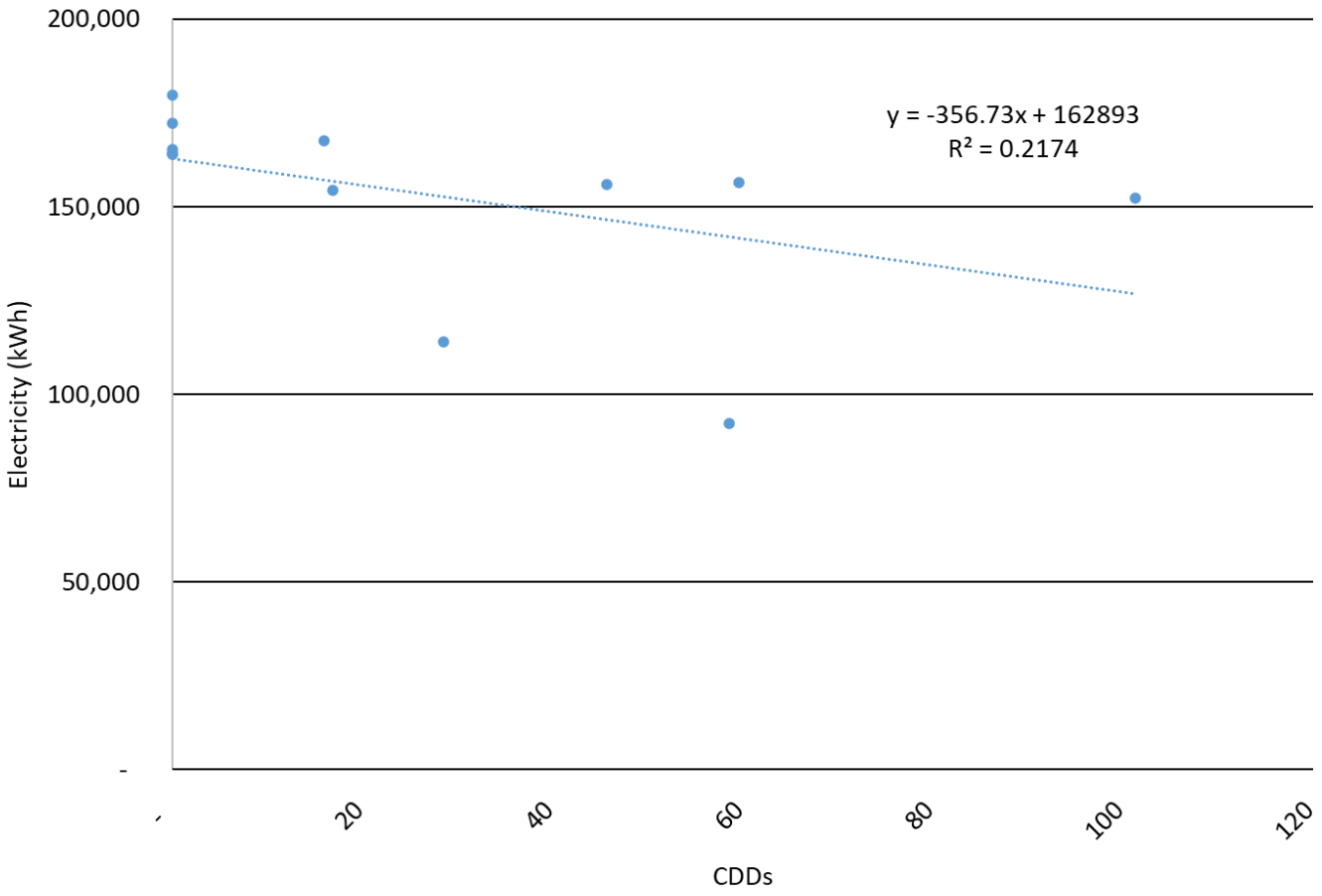

Figure 6: Minden Hills Electricity Consumption vs. CDDs

These trends are preserved when streetlighting data is excluded from total electricity consumption.

A confounder in this association is the status of the Arena. The Arena typically closes for two summer months annually. Since the Arena accounts for such a large proportion of portfolio electricity usage, its closure during a period when demand for space cooling is generally high significantly reduces overall electricity consumption. This reduced consumption can override other potential drivers of electricity usage.

3.4 Streetlighting

Dedicated streetlighting accounts for a small portion of overall Township electricity use. A breakdown of the relative contributions of facility and streetlight electricity from January 2018 through to December 2023 can be seen in the following figure:

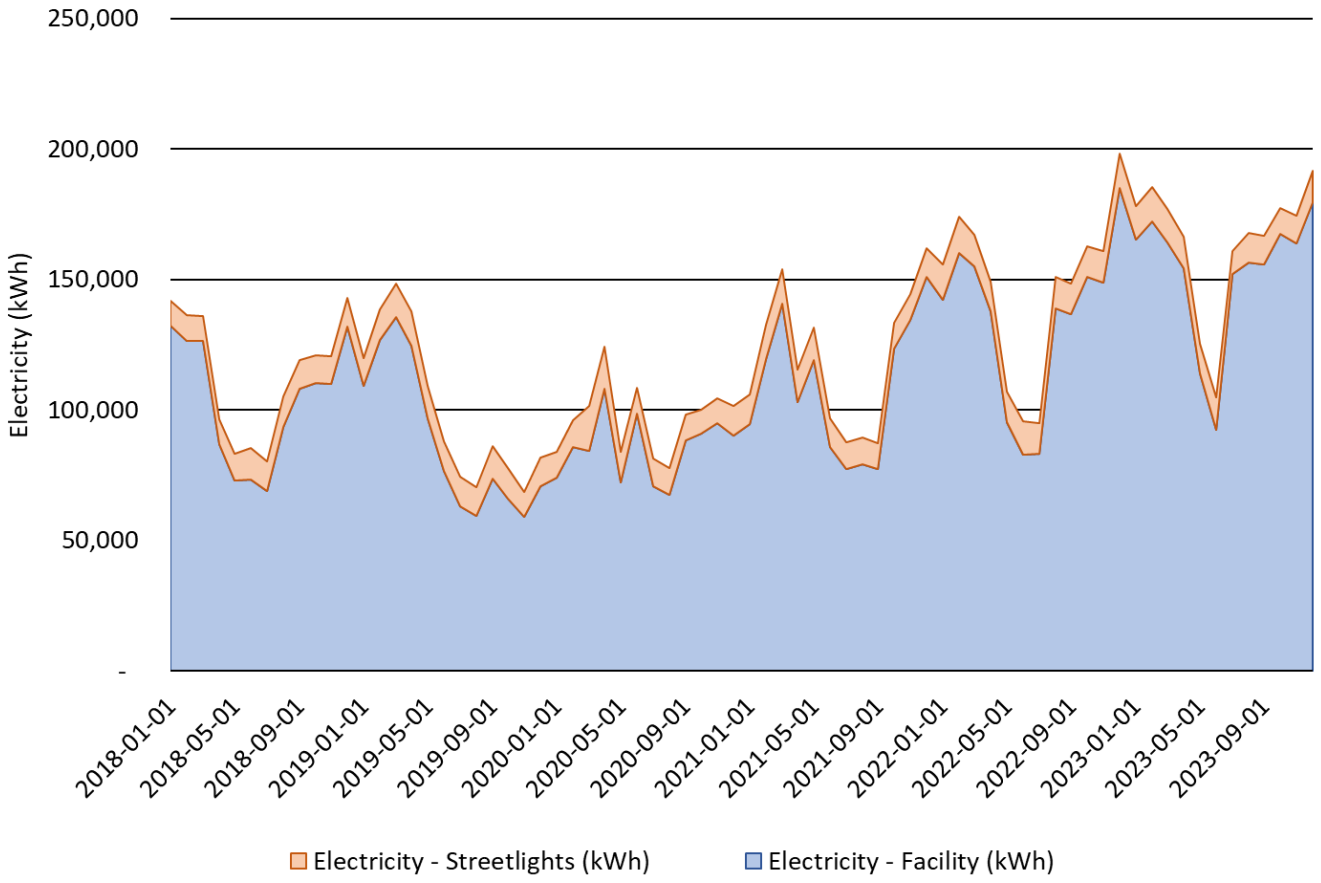

Figure 7: Minden Hills Electricity Consumption - Streetlight vs. Facility Contribution

Note that the above split does not account for any streetlights that are fed from a facility's main incomer.

3.5 Facility Energy Consumption Summary

The Township has selected a total of 18 facilities to be included in this analysis. These facilities include administrative facilities, fire stations, cultural facilities, community centers, indoor ice rinks, storage facilities, and water and sewage treatment facilities.

Energy usage is not evenly distributed across Township buildings; the Arena has a disproportionate impact on total energy consumption, accounting for roughly 50% of total facility energy use. The contribution of the various buildings to energy use is illustrated in the following figure:

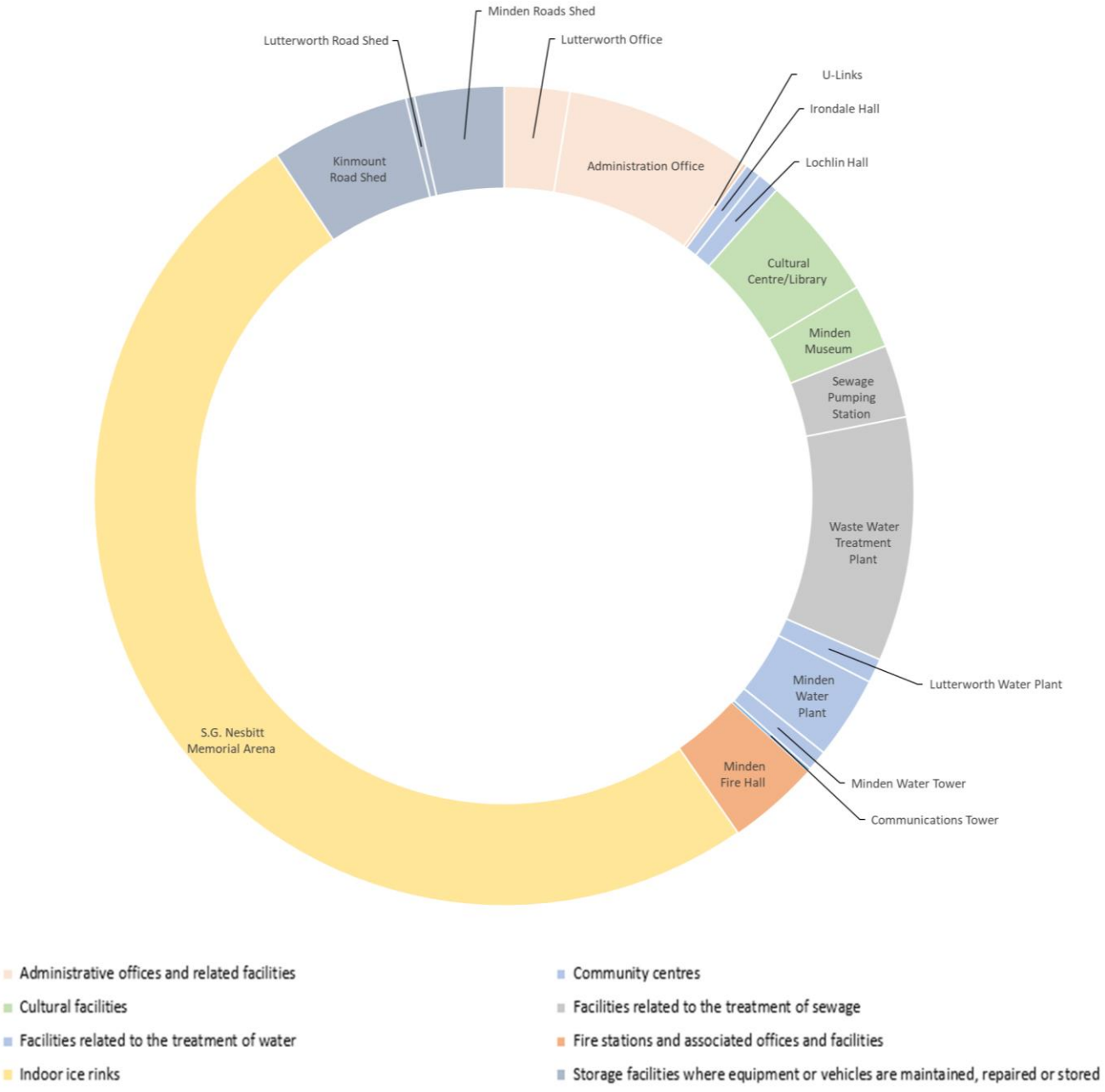

Figure 8: Minden Hills Building Energy Use Breakdown

The following table details energy consumption and GHG emissions data for each facility, and includes relevant benchmarking data where available (a larger version can be found in Appendix A):

ID	Facility Name	Operation Type	Address	Construction Year	Building Area (ft²)	Electricity (kWh)	Propane (L)	Total Energy (kWh)	Electricity Emissions (tCO2e)	Propane Emissions (tCO2e)	Total GHG Emissions (tCO2e)	EUI (GJ/m2)	E Star Ref EUI (GJ/m2)
1	Administration Office	Administrative offices and related facilities.	7 Milne St	2004 (major addition / rennovation)	8,680	101,469	16,376	217,601	2.8	25	28	0.97	0.87
2	Communications Tower	Fire stations and associated offices and facilities	2108 Scotchiine Rd		200	4,858	-	4,858	0.1	-	0	0.9	N/A
3	Cultural Centre/Library	Cultural facilities	176 Bobcaygeon Rd	2005	9,200	71,014	10,535	145,724	2.0	16	18	0.6	1.0
4	Irondale Hall	Community centres	1004 Line Drive Rd	1950	1,296	4,072	1,992	18,201	0.1	3	3	0.5	0.9
5	Kinmount Road Shed	Storage facilities where equip or vehicles are maintained, repaired or stored	4564 County Rd 21	1950	3,520	40,981	17,187	162,865	1.1	27	28	1.8	0.9
6	Lochlin Hall	Community centres	4713 Gelert Rd	1950	1,400	5,427	2,910	26,065	0.2	4	5	0.7	0.9
7	Lutterworth Office	Administrative offices and related facilities	11445 Hwy 35	1940	1,200	7,412	9,735	76,451	0.2	15	15	2.5	0.9
8	Lutterworth Road Shed	Storage facilities where equip or vehicles are maintained, repaired or stored	11445 Hwy 35	1940	2,460	9,953	-	9,953	0.3	-	0	0.2	0.9
9	Lutterworth Water Plant	Facilities related to the treatment of water	Conc 12 Lot 4 Lutterworth Twp		320	28,219	-	28,219	0.8	-	1	3.4	N/A
11	Minden Fire Hall	Fire stations and associated offices and facilities	12418 Highway 35, Minden Hills, ON, K0M 2K0	2018	7,632	35,666	9,979	106,434	1.0	15	16	0.5	0.7
12	Minden Museum	Cultural facilities	176 Bobcaygeon Rd	Various	843	17,870	8,087	75,223	0.5	12	13	3.5	0.4
13	Minden Roads Shed	Storage facilities where equipment or vehicles are maintained, repaired or stored	1987 Fleming Rd	1965	7,560	15,995	12,457	104,339	0.4	19	20	0.5	0.9
14	Minden Water Plant	Facilities related to the treatment of water	142 Bobcaygeon Rd		378	97,223	-	97,223	2.7	-	3	10.0	N/A
15	Minden Water Tower	Pumping & supply of water	2 St. Germaine St		707	24,118	-	24,118	0.7	-	1	1.3	N/A
16	Sewage Pumping Station	Facilities related to the treatment of sewage	27 Orde Street	1977	278	85,000	-	85,000	2.4	-	2	11.8	N/A
10	S.G. Nesbitt Memorial Arena	Indoor ice rinks	55 Parkside St	2020	56,400	998,752	69,300	1,490,203	28.0	107	135	1.02	1.1
17	U-Links	Administrative offices and related facilities.	93 Bobcaygeon Rd	1990	370	4,700	-	4,700	0.1	-	0	0.5	0.9
18	Waste Water Treatment Plant	Facilities related to the treatment of sewage	73 Orde St	1977	2,415	285,522	-	285,522	8.0	-	8	4.6	N/A
				Totals	**104,859**	**1,838,251**	**158,559**	**2,962,700**	**51**	**245**	**296**	**1.1**	**0.9**

Table 3: Minden Hills Site Energy Use and GHG Emissions

There is notable variance in building energy intensity compared to third party benchmark data for similar facilities.

The listings for the Lutterworth Road Offices and Lutterworth Road Shed locations achieve intensities substantially higher and substantially lower than benchmarks, respectively. This however is likely due to energy allocation between the two buildings; they share a common propane incomer which has been allocated to the office rather than the road shed.

The Minden Museum exceeds benchmark targets significantly, however the buildings contained within the museum are heritage buildings, dating back as early as the mid-eighteen hundreds. It is expected that their performance will always be poor relative to benchmarks as the work required to modernize could destroy their historic character.

The Kinmount Road Shed exceeds benchmarks significantly as well which is likely a true representation of performance.

3.6 Renewables

3.6.1 Ground Source

The Township does not currently operate any ground source energy systems

3.6.2 Solar

The Township does not currently operate any solar energy systems

3.6.3 Heat Pump

The Township has installed air source heat pumps at several facilities with recent HVAC replacement and upgrade projects.

4. Past Targets and Measures Progress

4.1 Past Targets & Performance Review

The following table has been generated from the Township's 2019 ECDMP (Township of Minden Hill's Energy Conservation & Demand Management Plan Version 2.0, Section 6.0 Updated Goals & Objectives). It outlines the Township's energy targets and objectives for the 2019 to 2024 ECDMP analysis period:

Goals		Objectives
1	Reduce energy consumption and GHG emissions in Township owned and operated facilities.	Reduce energy consumption by a minimum of 5% by over the next reporting period as an aggregate for all municipal buildings.
2	Promote energy conservation for users of Township owned and operated facilities.	Provide promotion, education, and/or training to Municipal staff and facility users with respect to the benefits of energy conservation, explaining the benefits both financially and environmentally to the community.
3	Monitor and review energy consumption in Township owned and operated facilities.	On an annual basis and after Ministry data normalization, review GHG and energy consumption results with Municipal senior management to review performance. Take measures to meet Ministry established energy benchmarks for each municipal building.
4	Explore the use of alternative and renewable energy.	Consider the feasibility of implementing new, alternative, and renewable energy systems in Township owned and operated facilities.
5	Secure funding to implement energy efficiency savings.	Prior to budgeting and implementing an energy conservation measure, research and secure available funding.

Table 4: Minden Hills 2019 ECDMP Target & Objective Summary

The Township has outlined several goals focused on reducing energy consumption and GHG emissions, and increasing renewable energy generation, energy efficiency-related funding and energy data visibility and education.

A summary of the current status of each of these goals and targets is included in the following table:

Goals		Objectives	Status
1	Reduce energy consumption and GHG emissions in Township owned and operated facilities.	Reduce energy consumption by a minimum of 5% by over the next reporting period as an aggregate for all municipal buildings.	Energy consumption decreased 6.4% between 2018 and 2023 for the aggregate total of all buildings constructed prior to 2018.
2	Promote energy conservation for users of Township owned and operated facilities.	Provide promotion, education, and/or training to Municipal staff and facility users with respect to the benefits of energy conservation, explaining the benefits both financially and environmentally to the community.	The Township continues to promote energy conservation for staff and facility users.
3	Monitor and review energy consumption in Township owned and operated facilities.	On an annual basis and after Ministry data normalization, review GHG and energy consumption results with Municipal senior management to review performance. Take measures to meet Ministry established energy benchmarks for each municipal building.	The Township continues to review energy consuption and develop plans to achieve benchmarks.
4	Explore the use of alternative and renewable energy.	Consider the feasibility of implementing new, alternative, and renewable energy systems in Township owned and operated facilities.	The Township considers alternative / renewable energy systems and has implemented several heat pumps in tandem with new HVAC system install.
5	Secure funding to implement energy efficiency savings.	Prior to budgeting and implementing an energy conservation measure, research and secure available funding.	The Township researches funding when considering energy conservation measures.

Table 5: Minden Hills 2019 ECDMP Target Status

In general, the Township has made excellent progress towards these targets, meeting or achieving all of them. One point of complication is the addition of two new facilities that contribute significantly towards energy use. The Arena and new Fire Hall finished construction during the 2019 ECDMP period; the Arena in particular is the single largest energy user in the Township's portfolio and has been excluded from the target progress to ensure the increased building area and energy consumption do not negatively impact the review of target achievement.

4.1.1 2014-2019 ECDMP Performance Review

The Township's 2014 ECDMP (Township of Minden Hills Energy Conservation Demand Management Plan) contains limited energy performance data for analysis. However, it appears the Township collated 2011 electricity, oil and propane consumption into a report entitled "Energy Consumption and GHG Emissions Template", available on the Township's website.

Analyzed performance from the 2014 to 2019 ECDMP period is presented in the following list, which was taken directly from the Township's 2019 ECDMP (Township of Minden Hills Energy Conservation & Demand Management Plan Version 2.0, Section 4.2 Historical Data & Trend Analysis):

1. Throughout the period from 2011 to 2016, GHG emissions showed a general decrease in GHG emissions at the majority of the buildings.

2. In 2013, the Municipal Office, Kinmount Roads Shed and Minden Community Centre showed significantly increased emissions compared to other years. This could in part be due to a colder than average winter. In the years after 2013, the data has been trending in a decreasing manner from the 2013 peak year.

3. Only the Lutterworth Roads Shed, old Minden Fire Hall and Municipal Office are showing an increasing trend in GHG values. The old fire hall no longer functions as a fire hall and may be used as an unheated storage facility or be designated for demolition. Specific measures to lower GHG emissions for the Lutterworth Roads Shed and Municipal Office have been outlined in this report.

4. All of the water and sewage treatment facilities have shown a significant reduction in GHG emissions from 2011.

5. The Minden Community Centre was noted as a building with high GHG emissions. The building reached peak energy use in 2013 and then nearly reached peak levels again in 2015. The building was set for demolition in the spring and at the time this report is being written, has been demolished. The lobby and upstairs area of the community centre are to remain and be integrated into the new arena building. GHG emission levels should be monitored in the existing portion to ensure a downward trend.

Based on this excerpt, from the analysis period of the Township's 2014 to 2019 ECDMP, GHG emissions generally decreased (except for the Lutterworth Road Shed, old Minden Fire Hall and Municipal Office, which all showed an overall increase in GHG emissions). The Minden Community Centre was noted to have high GHG emissions, however, was set for demolition at the time, with an expectation that the new facility will provide better energy performance.

4.1.2 2019 ECDMP Benchmarking

A summary of performance benchmarking completed in the Township's 2019 ECDMP is presented in the below list, which was taken directly from the report (Township of Minden Hills Energy Conservation & Demand Management Plan Version 2.0, Section 4.3 Performance Benchmarking), edited slightly for readability. The list compares Minden Hills' building energy intensity values for 2016 to Ministry normalized benchmarks:

1. The majority of the applicable buildings meet the normalized benchmarks for the respective building types. There are eight (8) buildings that are below the benchmarks and five (5) that are above.

2. The Minden Museum shows an energy intensity that is more than double the Ministry benchmark value. The museum had recently been operated during the winter months which would account for the increase in energy intensity. Due to the built heritage nature of the building, there are limited measures that can be taken without affecting the overall aesthetic heritage value, however, special considerations may be available upon more detailed review.

3. The Communications Tower is consistently showing energy intensity values above the benchmark. The building has electric space heating and appears to be a temporary type of building with minimal insulation. Measures have been outlined to update the building envelope.

4. The Kinmount and Lutterworth Road Sheds show values that are constantly above the benchmark value for a storage garage. Along with building envelope measures, building staff should be more energy conscious in the everyday operation with respect to energy conservation.

5. The peak energy intensity for most buildings was in the year 2015. In 2016, the energy intensity was significantly decreased.

According to this excerpt from the Township's 2019 ECDMP, most of its facilities meet Ministry normalized benchmarks, with eight falling below and five above the benchmark value. Facilities with energy intensity values significantly above benchmark are the Minden Museum, Communications Tower, and the Kinmount and Lutterworth Roadsheds. Building envelope and insulation measures appear to be a significant consideration in improving the performance of these facilities.

4.2 Past Measures Progress

4.2.1 2014 ECDMP Proposed Measures and Progress

Energy conservation measures were proposed in the Township's 2014 ECDMP on a per-facility basis. Below is a high-level overview of common measures identified across most of the facilities, summarized from the proposed measures in the 2014 ECDMP (Township of Minden Hills Energy Conservation & Demand Management Plan, Appendix B – Facility Energy Conservation and Demand Management Measure Summary):

- Upgrade lighting technology to LED / higher efficiency lighting with sensors
- Weather stripping around doors and windows
- Repair of redundant openings in walls
- Install digital thermostats, programmable thermostats
- Install programmable timers on domestic hot water tank system
- Renewable energy generation (solar, solar thermal) to supplement HVAC systems
- Insulate existing domestic hot water service pipework in basements
- Install VFD pumps
- Install ground-source / air-source heat pumps to replace HVAC systems
- Ventilation control
- Roofing repairs
- Building envelope insulation
- Improved education
- Heat recovery ventilation

In the Township's 2019 ECDMP (Township of Minden Hills Energy Conservation & Demand Management Plan Version 2.0, 4.1 Past Measures and Energy Demand), the 2014 ECDMP measures from the 2011 to 2016 analysis period were reviewed as follows:

1. Exterior lighting updates to more energy-efficient models and controls were generally completed where proposed.

2. As proposed in 2014, programmable thermostatic HVAC controls had been installed in many of the buildings that were reviewed.

3. In buildings where domestic hot water is used/stored, none of the storage tanks had timers installed to mitigate energy consumption during non-operational hours.

4. The majority of the buildings had interior lighting upgrades completed, or were in progress as proposed in the 2014 Plan.

5. In the water treatment and sewage facilities, variable frequency drive (VFD) equipment was installed in the majority of the buildings, which is anticipated to have a moderate to significant reduction in energy consumption.

6. There has been a recommendation to replace kitchen appliances and office equipment at the end of their respective service lives with Energy Star rated equipment. During the time between the previous report and the 2019 reviews, there were several appliances/equipment that reached the end of their service life and were replaced with Energy Star rated appliances/office equipment.

7. In the previous report, there was a recommendation to lower the setback temperatures on buildings with programmable thermostats. During the review, it was apparent that this recommendation has not been fully complied with as there were buildings that were set at a temperature much higher than the recommended 15°C (59°F) during typical unoccupied times.

Based on the above excerpt, the following measures from the 2014 to 2019 ECDMP period were completed in many buildings:

- Interior and exterior lighting upgrades,
- Programmable thermostatic HVAC controls,
- VFDs implementation in water treatment and sewage facilities.

Measures that remain mostly incomplete for many of the facilities are:

- Timers for hot water storage tanks,
- Energy Star-rated appliance replacements at end-of-life,
- Lowering setback temperatures.

The progress of each of the proposed 2014 ECDMP measures is displayed in the 2019 ECDMP report for each facility. To note measure progress, each measure is classified as either Completed or Not Completed, and its interpreted benefit on overall decreases in GHG emissions and energy consumption is stated as Minimal, Moderate, or Significant Improvement.

From a high-level analysis of the 2019 ECDMP measures progress, it appears most measures have not been classified as either Completed or Not Completed. The most common measure to have been completed appears to be exterior lighting upgrades to LED, followed by higher efficiency interior lighting systems and HVAC controls. Most of the measures' interpreted benefits appear to be Minimal Improvement.

4.2.2 2019 ECDMP Proposed Measures and Progress

Energy conservation measures were proposed in the Township's 2019 ECDMP on a per-facility basis. Below is a high-level summary of the measures, taken directly from the report (Township of Minden Hills Energy Conservation & Demand Management Plan Version 2.0, Section 4.4 Proposed Measures), edited slightly for conciseness:

1. Exterior lighting should be replaced with photocell-controlled LED fixtures where applicable.

2. Improvement of condition and / or performance of windows and doors.

3. Interior lighting upgrades to LED or energy efficient fluorescent tubes (T5 or T8).

4. Programmable thermostatic controls.

5. All buildings that are conditioned should have at least the minimum level of thermal protection to mitigate energy consumption, primarily in the heating season.

6. Inefficient and aging HVAC systems should be replaced at the end of their operating life. Typical lifecycle for an HVAC plant is not more than 25 years.

7. With the replacement of the HVAC systems in progress, the ventilation systems of the buildings must similarly be improved. In the water treatment and works garage facilities, demand control ventilation (DCV) equipment should be installed to provide the required ventilation to these buildings. In nonindustrial buildings, heat recovery or energy ventilators (HRV or ERV) should be installed for energy efficient ventilation.

In total, 178 measures were identified for consideration by the Township with a total identified capital investment of $341,850 and annual savings of $42,115. A detailed summary can be seen in Appendix B.

Below is a table outlining the previously mentioned proposed measure summary, with current measure status and description for the Township's facilities:

	Proposed Measure	Status	Description
1	Exterior lighting should be replaced with photocell-controlled LED fixtures where applicable.	Complete / In Progress	Exterior LED lighting with control sensors installed at 5 Township facilities.
2	Improvement of condition and / or performance of windows and doors.	In Progress	Township has requested and received quotes to repair / replace select doors & windows.
3	Interior lighting upgrades to LED or energy efficient fluorescent tubes (T5 or T8).	In Progress	In-progress at 4 facilities. Complete at: ➢ Arena ➢ Fire Hall.
4	Programmable thermostatic controls.	Complete / In Progress	Complete at 7 facilities.
5	All buildings that are conditioned should have at least the minimum level of thermal protection to mitigate energy consumption, primarily in the heating season.	In Progress	Under investigation as part of this report at 3 facilities.
6	Inefficient and aging HVAC systems should be replaced at the end of their operating life. Typical lifecycle for an HVAC plant is not more than 25 years.	N/A	System replacements slated for end of asset life.
7	With the replacement of the HVAC systems in progress, the ventilation systems of the buildings must similarly be improved. In the water treatment and works garage facilities, demand control ventilation (DCV) equipment should be installed to provide the required ventilation to these buildings. In nonindustrial buildings, heat recovery or energy ventilators (HRV or ERV) should be installed for energy efficient ventilation.	In Progress	ERV / HRV installed with HVAC replacement / upgrade and present at 4 buildings surveyed. To be included in future projects

Table 6: 2019 ECDMP High-Level Measure Progress Summary

4.3 Updated Targets

The Township achieved its target of a 5% reduction in facility energy set in the 2019 ECDMP for all facilities that pre-date the 2019 report, with the exception of buildings built in or after the baseline year.

Low cost & short payback measures identified and prioritized from the Category 1 and Category 2 audits as part of this report total ~5.6% of current facility energy consumption, with additional savings available by actioning short payback and low capital cost measures from the remote site audits or implementing some of the identified larger capital projects.

The following objectives and targets are recommended to build on the Township's past achievements:

Goals		Objectives
1	Reduce energy consumption and related GHG emissions in Township facilities.	Reduce energy consumption by a minimum of 5% over the next reporting period with a stretch target of 7.5% .
2	Promote the value of energy conservation with users of Township owned and operated facilities, and with Township staff.	Promote, educate, and train Municipal staff in the benefits of energy conservation. Raise awareness on the importance of energy conservation with Munipal staff and facilitiy users, including the financial and environmental benefits to the community.
3	Monitor and review energy consumption of Township facilities.	Review normalized GHG emissions and energy consumption with senior management at least annually. Consider updating review frequency to quarterly or monthly for large and/or high energy intensity facilities. Take measures to progress facilities towards meeting Energy Star Canadian National Median Energy Use benchmarks where feasible.
4	Explore the use of alternative and renewable energy.	Consider the implementation of heat pump driven assets for domestic hot water and space heating when existing units are due for replacement.
5	Leverage funding to implement energy efficiency projects.	Prior to budgeting and implementing an energy conservation measure, research and secure available funding.

Table 7: Minden Hills 2024 ECDMP Target Update

5. Energy Audits Overview

For this report, the Township's 18 facilities were audited at varying levels of detail of energy and GHG emission analysis, broken down into three different categories:

Category 1: Detailed Energy Audits

Category 2: Walkthrough Energy Audits

Category 3: Remote Assessment Energy Audits

These audits will be used to understand energy consumption breakdowns and trends at each facility and help guide the design of proposed energy and GHG emissions conservation measures. A summary of each audit category, is provided as follows, detailing relevant facilities and scope:

Category 1: Detailed Energy Audits

The singular facility being considered in Category 1: Detailed Energy Audits is the S.G. Nesbitt Memorial Arena. Below are the criteria for this energy audit:

- Site time will be allocated to build a complete electricity and fuel asset list and consumption balance for the building, including review of any controls / Building Automation Systems (BAS) which may exist,
- Detailed measures will be recommended for all electricity & fuel end-users,
- Detailed costs will be gathered from suitable vendors for feasible measures and will be specific to the building i.e. sufficient for the Township to action if of interest.

Category 2: Walkthrough Energy Audits

The following facilities are being considered in this audit category:

1. Administration Building
2. Cultural Centre / Library
3. Fire Hall
4. Kinmount Road Shed
5. Lutterworth Water
6. Sewer Plant

Below are the criteria for the energy audits for the above facilities:

- Electricity and fuel asset lists and balances will be built, however a BAS is not expected to be available for these buildings,
- Detailed measure scoping will be performed where possible (such as for lighting, simple furnace replacement measures, building envelope upgrades), with any additional measures scoped to a budgetary level,
- Budgetary costs will be provided for these measures.

Category 3: Remote Assessment Energy Audits

The following facilities are being considered in this audit category:

1. Communications Tower
2. Irondale Hall
3. Lochlin Hall
4. Lutterworth Office
5. Lutterworth Road Shed
6. Minden Museum
7. Minden Roads Shed
8. Minden Water Plant
9. Minden Water Tower
10. Sewage Pumping Station
11. U-Links

Below are the criteria for the energy audits for the above facilities:

- Electricity and fuel asset lists and balances will be built where useful; streetlight counts will not be performed,
- Measures will be scoped for individual buildings similar to Category 2, however in cases where technology is identical between the buildings / assets (such as streetlights, simple buildings, etc.), measures will be sized and recommended at a budgetary level without vendor or auditor visit to the asset.

6. Arena Energy Audit

6.1 Facility Overview

The S.G. Nesbitt Memorial Arena (Arena) is an NHL regulation-sized ice pad, located at 55 Parkside St., Minden. The Arena has an indoor area of roughly 56,400 ft^2 and is typically open from 8:00 AM to 10:00 PM, 7 days per week, with occupied hours extending beyond this for certain administrative and support staff as needed. Newly built in 2020, the location has an ice rink for skating events, which are held from late August to Easter Weekend. Arena facilities include warm viewing areas on the lower and upper floors, six change rooms, seating for close to 300, standing viewing for 90 and 6 accessible seats. The Arena encompasses an older Community Hall facility with several community rooms built in 1973. The Arena also includes an out-building, which is a steel Quonset Hut used for equipment storage, also built in 1973.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, assuming an occupied building area of 56,400 ft^2:

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	998,752	26	17.7
Propane	464,842	101	8.2
Totals	**1,463,594**	**128**	**26.0**

Table 8: Arena - Analysis Period Utility Consumption & Intensity Data

The above energy consumption equates to roughly 50% of the Township's total annual energy use across all buildings.

6.2 Historical Energy Performance

The following table demonstrates the Arena's utility consumption (electricity and propane usage), carbon emissions (Scope 1 & Scope 2 only), and energy intensity from the Baseline Period (2018, old facility) to the Analysis Period (2023, newly built facility):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	365,040	998,752	-173.6%
Propane (kWh)	321,266	464,842	-44.7%
Total Energy (kWh)	686,306	1,463,594	-113.3%
Building Area (ft2)	31,000	56,400	-81.9%
Carbon Emissions (tCO2e)	80	128	-66.8%
Intensity (kWh/ft2)	**22.1**	**26.0**	**-17.2 %**

Table 9: Arena - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have increased roughly 113% from the baseline period (when only the old facility was operational). Facility area increased by roughly 81.9% due to the construction of the new Arena, yielding a net intensity increase of approximately 17.2% between these periods. Building carbon emissions increased by ~67% over this same period. The increase in energy intensity and carbon emissions is confounded somewhat with the changes in building usage and amenities.

6.3 Energy Benchmark Comparison

The Arena has been classified as an “Ice/Curling Rink” with respect to Energy Star’s Canadian National Median Energy Use Intensity (EUI)[2] reference table. The following table provides a comparison of the building’s actual EUI against the August 2023 Energy Star “Site” EUI reference value for this facility classification:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Entertainment / Public Assembly *(Broad Category)* Recreation – Ice/Curling Rink *(Primary Function – Further Breakdown)*	1.10	1.02	-8.6%

Table 10: Arena - Facility Performance Comparison vs. Energy Star Site Reference EUI

The above benchmark comparison can be used as a rough analysis tool to assess building performance and the potential for improvement; however, it should be noted that unique building constraints and intricacies may exist which make this comparative analysis less valid. It appears that the Arena consumes roughly 9% less energy than the Energy Star reference value. This indicates generally good energy performance compared with other similar facilities, especially when considering the Quonset hut and older community centre buildings that are included in this calculation.

[2] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

6.4 Utility Consumption Review

6.4.1 Propane

Propane consumption at the Arena was roughly 465,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed propane consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

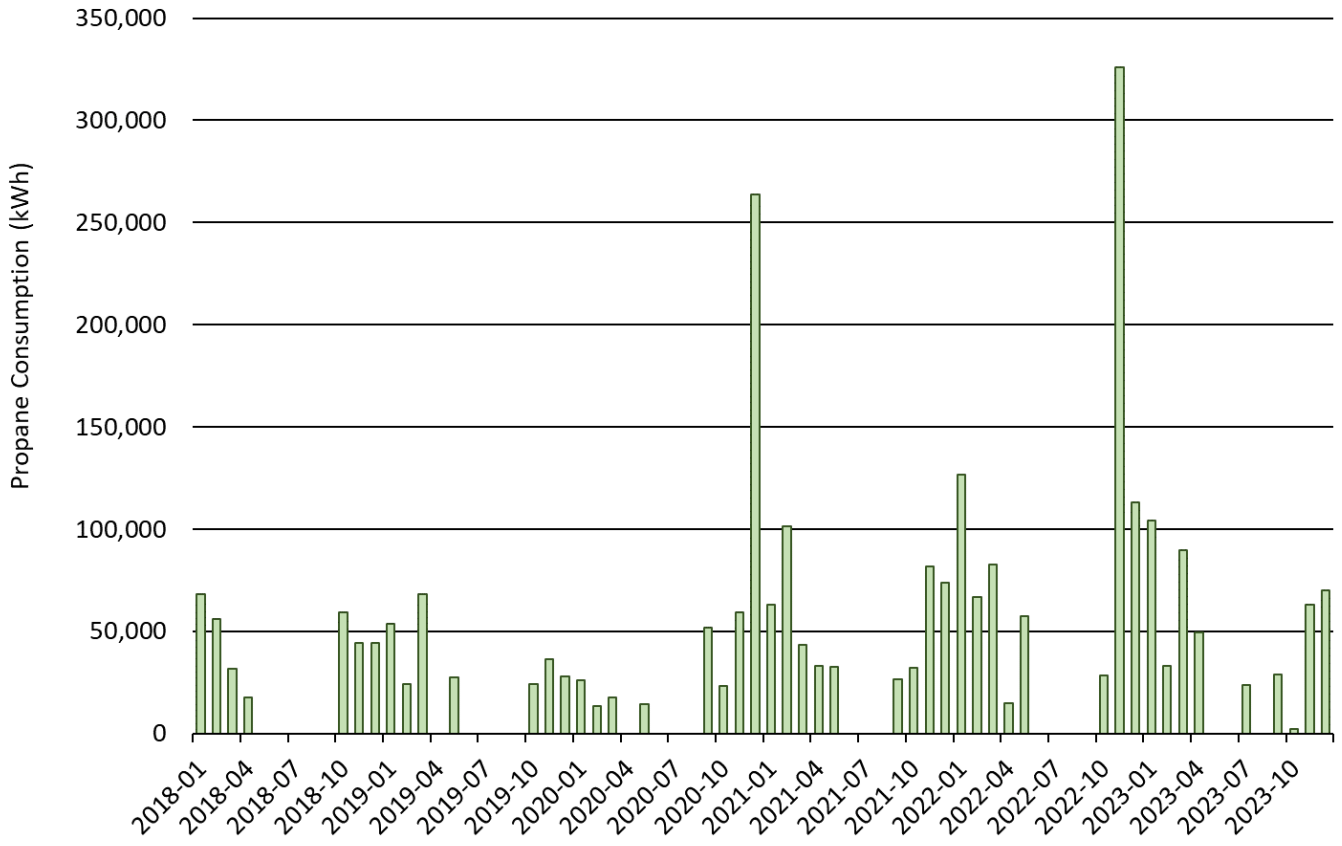

Figure 9: Arena - Propane Consumption, January 2018 to December 2023

The above trend appears to show significant weather-driven variance, which is generally expected given that the facility's primary propane end-users are used to maintain the rink (which is only open in the winter), and for space heating. Consumption appears to be higher overall during winter periods from 2020 onwards, when the new, larger facility was built.

A site visit was undertaken in May 2024 to identify all propane consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's propane consuming assets:

Asset ID	Description	Location	Maximum Propane Input (BTUH)	Maximum Propane Output (BTUH)	Nameplate Efficiency
Rink DHW-1	DHW Heater	Chiller Mechanical Room	199,000	193,030 (Est.)	97%
Rink DHW-2	DHW Heater	Chiller Mechanical Room	199,000	193,030 (Est.)	97%
Maintenance 1 DHW	DHW Heater (Condensing Furnace)	Maintenance Room 1	199,900	193,903 (Est.)	97%
Maintenance 1 Furnace	Furnace	Maintenance Room 1	80,000	78,000	97.5%
RTU-1 (Gym and Fitness)	Central Forced Air Furnace	Outdoor Unit Enclosure	270,000	218,700	81%
MUA-1 (Changeroom)	Central Forced Air Furnace	Outdoor Unit Enclosure	195,000	156,000	80%
RTU-2	Central Forced Air Furnace	Roof	195,000 (Est.)	156,000 (Est.)	81% (Est.)
Unit Heater	Unit Heater	Zamboni Storage Area		100,000 (Est.)	80% (Est.)
Quonset Unit Heater	Unit Heater	Quonset Hut		100,000 (Est.)	80% (Est.)

Table 11: Arena - Propane Asset List

Two domestic hot water heaters are located together in a mechanical room close to the rink chiller, along with a water heater used for rink resurfacing. These units appear to be relatively new and generate hot water at roughly 140°F (~60°C). A third propane fired domestic hot water heater was noted in Maintenance Room 1 generating hot water at roughly 123°F (~51°C).

One propane-fired furnace was identified in Maintenance Room 1, along with two large air handling units located on the ground outside in an outdoor enclosure.

A small unit heater was observed in the Zamboni storage area of the rink, along with another in the Quonset Hut.

Nameplate data gathered from all propane consuming assets was combined with estimates of annual hours and asset loading to develop an estimated propane end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

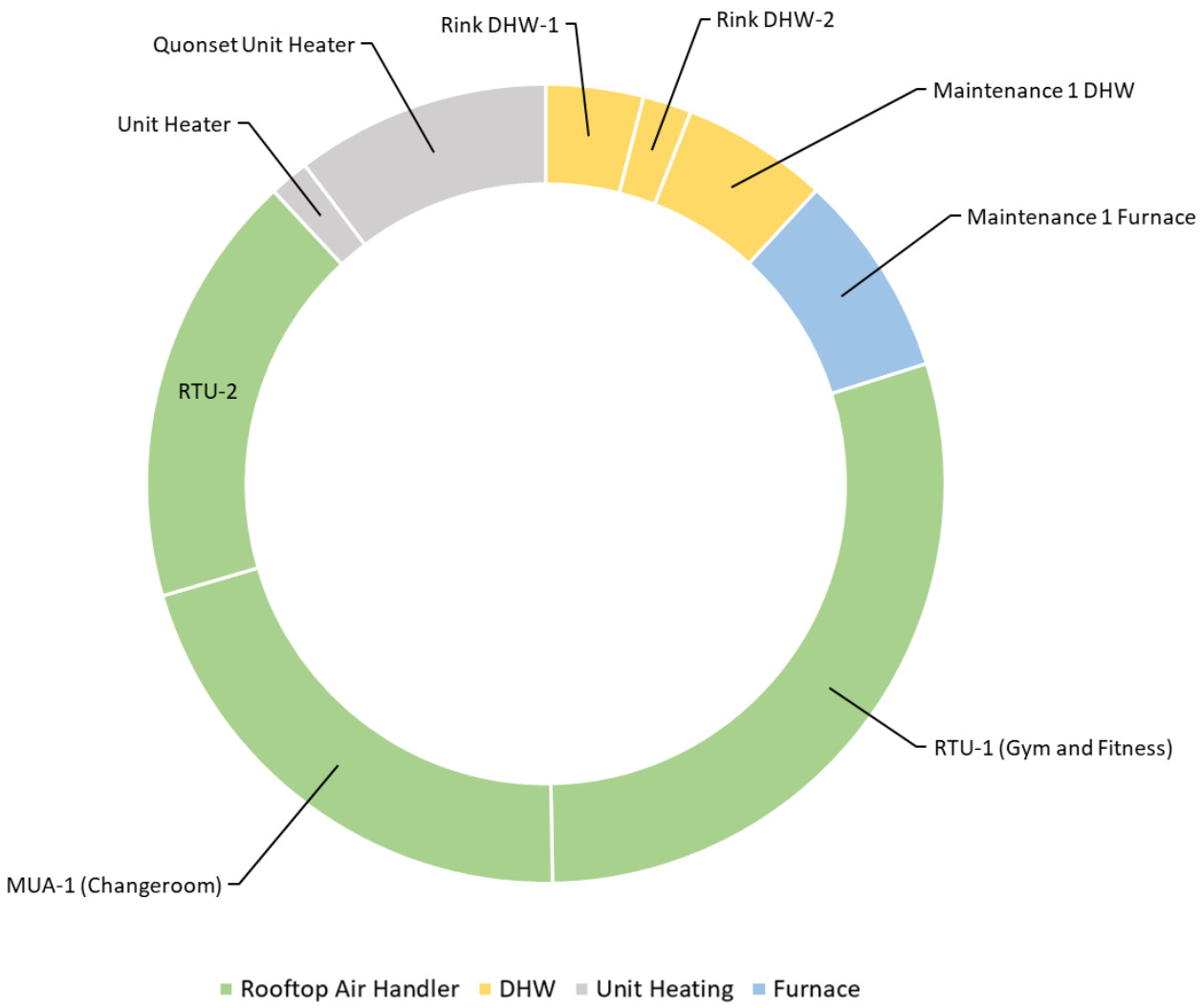

Figure 10: Arena - Estimated Propane End-Use Breakdown

Propane used by the facility's rooftop air handling units is estimated to account for roughly 53% of total site propane consumption, with unit heating, domestic hot water and the furnace accounting for the remaining 24%, 12%, and 11%, respectively. Overall, nearly 88% of the propane consumed by the facility appears to satisfy space heating requirements.

6.4.2 Electricity

Electricity consumption at the Arena was roughly 998,800 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

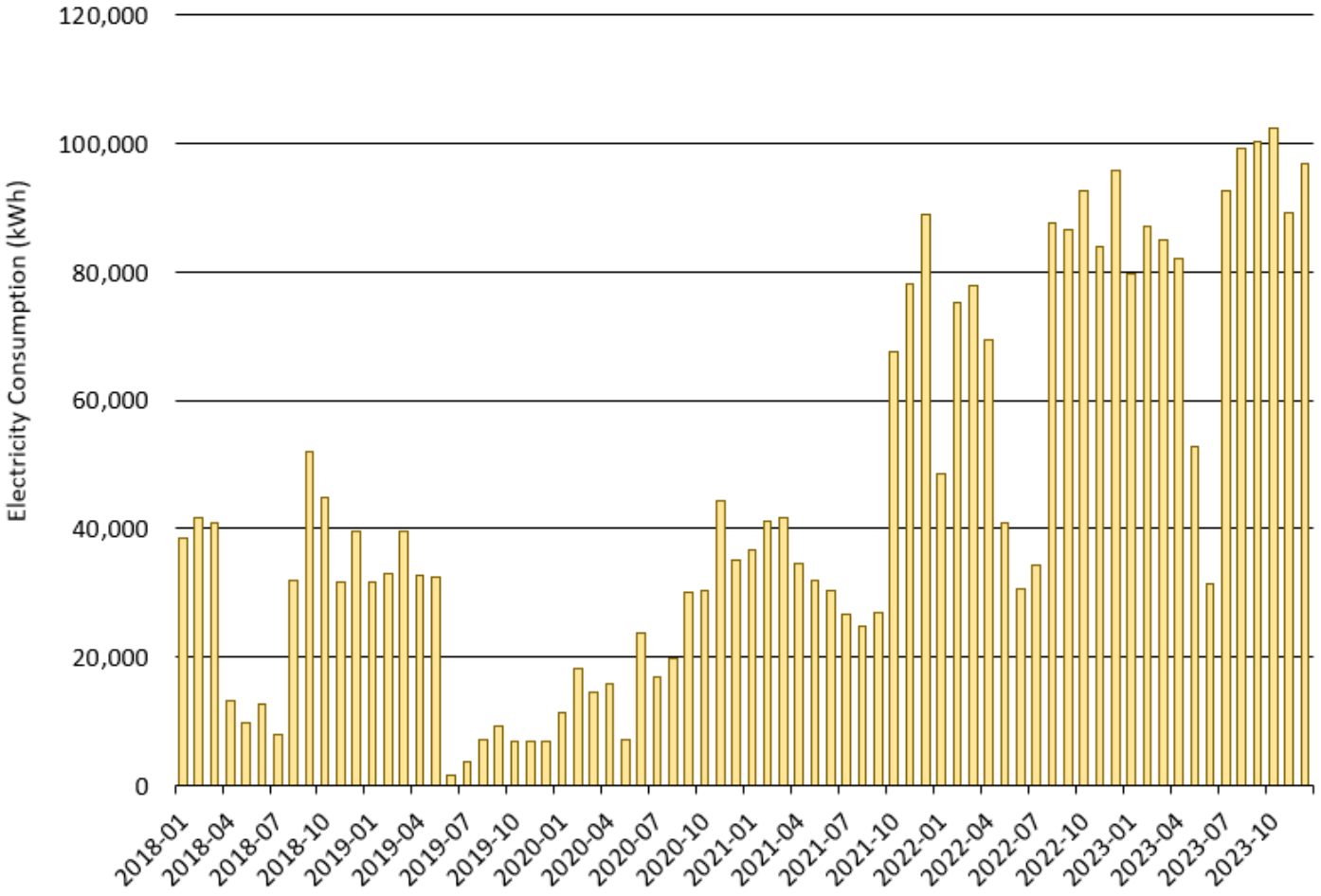

Figure 11: Arena - Electricity Consumption, January 2018 to December 2023

The above trend appears to show significant weather-driven variance, which is generally expected given that the facility's primary electric end-users are used to cool / dehumidify the rink (which is seasonally only open in the winter).

During winter periods from 2020 onwards, consumption appears to be significantly higher overall, aligned with when the new, larger facility was built.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered:

Asset ID	Description	Location	Size (HP)
Chiller P-1	Rink Glycol Pump	Chiller Room	15
Chiller P-2	Condenser Glycol Pump	Chiller Room	10
Chiller P-3	Underfloor/Snow Melt Pump	Chiller Room	25
Chiller P-4	Oil Cooling Pump	Chiller Room	10
Chiller P-5	Cooling Tower Pump	Chiller Room	10
Chiller CF-1	Cooling Tower Fan	Chiller Room	3
Motor	Motor	Chiller Room	1
Motor	Motor	Chiller Room	1
Chiller C-1	Compressor	Chiller Room	
Chiller C-2	Compressor	Chiller Room	
EF-1	Exhaust Fan	Workshop	3
D-1	Dehumidifier	Rink Mezzanine	15
D-2	Dehumidifier	Rink Mezzanine	15
HP-1	Heat Pump	Rink Mezzanine	5
HP-2	Heat Pump	Rink Mezzanine	5
BPB-1	Plenum Box	Fitness Room	5
MS-1	Minisplit Heat Pump		
ERV-1	ERV	Rink	5
ERV-2	ERV	Rink	5
Changeroom DHW	DHW Heater	Changeroom Mechanical Room	5
Maintenance 1 Furnace Motor	Furnace Motor	Maintenance Room 1	0.75
RTU-1 Compressors	Compressor	Outdoor Unit Enclosure	5
RTU-1 Condenser Motor	Condenser Motor	Outdoor Unit Enclosure	1.5
RTU-1 Supply Air Motor	Supply Air Motor	Outdoor Unit Enclosure	7.5
RTU-1 Power Exhaust	Power Exhaust	Outdoor Unit Enclosure	2
RTU-1 Heatwheel Motor	Heatwheel Motor	Outdoor Unit Enclosure	0.17
RTU-1 Combustion Motor	Combustion Motor	Outdoor Unit Enclosure	0.25
MUA-1 Compressors	Compressor	Outdoor Unit Enclosure	5
MUA-1 Condenser Motor	Condenser Motor	Outdoor Unit Enclosure	0.66
MUA-1 Supply Air Motor	Supply Air Motor	Outdoor Unit Enclosure	2
MUA-1 Power Exhaust	Power Exhaust	Outdoor Unit Enclosure	2
MUA-1 Heatwheel Motor	Heatwheel Motor	Outdoor Unit Enclosure	0.08
MUA-1 Combustion Motor	Combustion Motor	Outdoor Unit Enclosure	0.09
Cabinet Unit Heaters	Unit Heaters		

Table 12: Arena - Electricity Asset List

A significant number of electrical assets at the facility are related to operation of the chillers to service cooling demand on the ice rink including pumps, motors, and compressors. There were also two major exhaust fans observed onsite, two large dehumidifiers for the rink, several heat pumps for space heating and cooling, ERVs, furnaces and a domestic hot water heater in the changerooms to provide dedicated hot water for the Haliburton Huskies.

Nameplate data gathered from all electrical assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

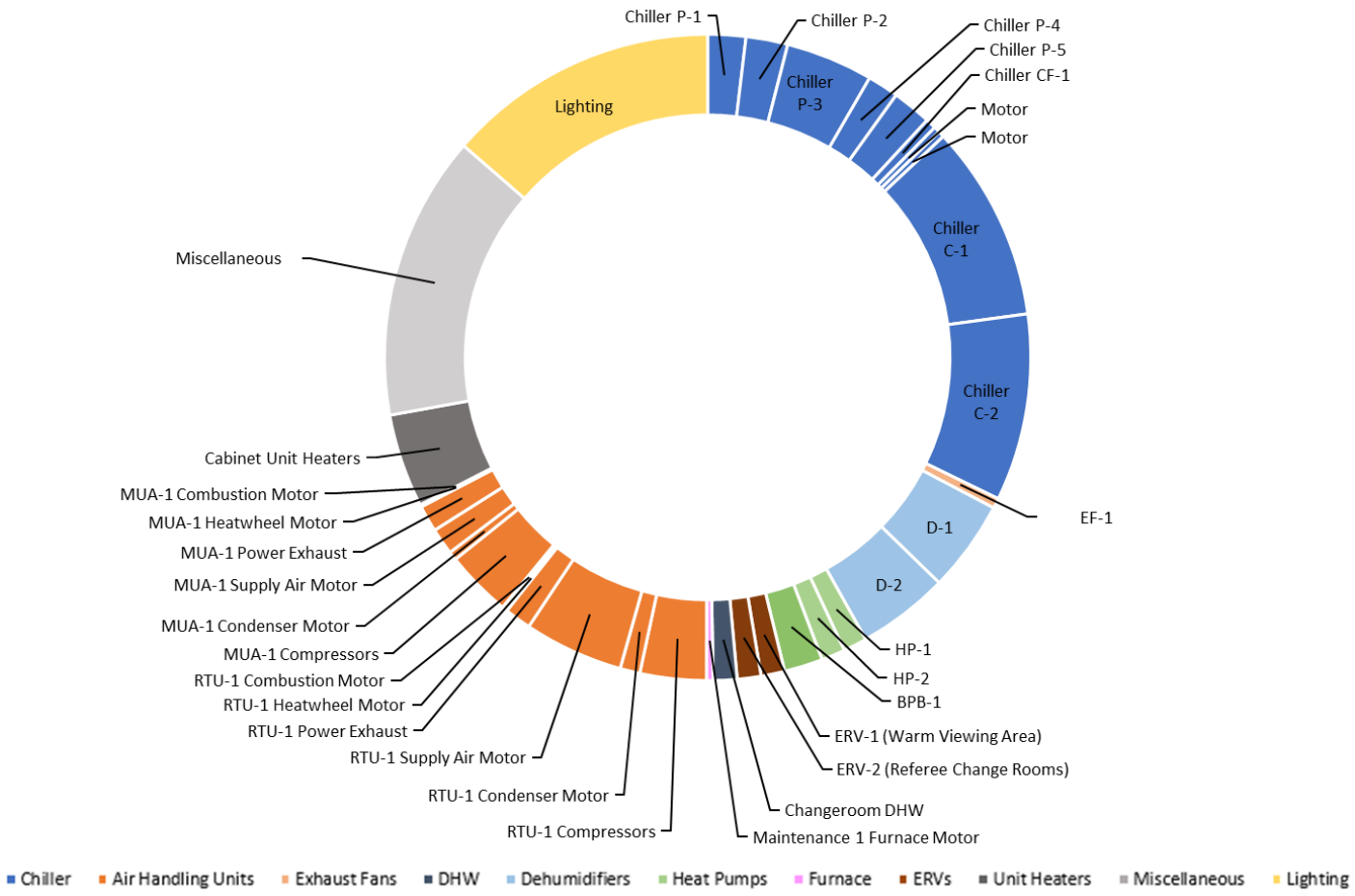

Figure 12: Arena - Electricity End-Use Breakdown

Electricity required for the Arena is modelled to account for roughly 42% of total site electricity consumption, with another 21% allocated to general HVAC usage. Rooftop units including the chiller and related pumps are together modelled to account for roughly 35% of total site electricity and space cooling accounting for ~11%. The remainder is primarily Lighting and distributed plug loads (i.e. office use, equipment etc.)

6.5 Energy Conservation Measures

6.5.1 Building Envelope

The building envelope of the Arena is quite new, and likely has little room for cost-effective improvement; as such no measures in this category are recommended for the Arena.

A survey of the Quonset hut was performed indicating that there was minimal to no insulation present, and in some areas, the building envelope had been compromised by physical damage. An analysis of propane data used solely at the hut and review of the installed unit heater was performed, and an R-value of 4 was developed as an estimate of the current effective thermal resistance of the building.

It is suggested that the building be insulated to R20; quotes were requested and received yielding the following project business case:

ID#	Measure Description	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Quonset Hut Insulation - R20	32,437	$ 3,075	$ 12,144	3.9

Table 13: Quonset Hut - Insulation Project Economics

6.5.2 Domestic Hot Water

Domestic hot water at the Arena is provided by three propane-fired unit in the rink mechanical room and in Mechanical Room 1 along with one electric unit in the locker room. Pertinent technical details gathered from these domestic hot water heater nameplates is provided below:

Manufacturer	Rheem	Rheem	AO Smith	AO Smith
Model No.	GHE100SU-200 LP	GHE100SU-200 LP	BTH-199 301	DRE-120 100
Max. Input	199,000 BTUH	199,000 BTUH	199,900 BTUH	40.5 kW
Tank Capacity	100 gallons	100 gallons	100 gallons	119 Gallons
Location	Arena Mechanical	Arena Mechanical	Mechanical 1	Locker Room
Energy Source	Propane	Propane	Propane	Electric
Nameplate Efficiency	97%	97%	97%	N/A

Table 14: Arena - Domestic Hot Water Heater Nameplate Information

All three propane fired units are direct-vent condensing hot water heaters with a combustion efficiency of approximately 97%. These units are new and highly efficient. The two units in the arena mechanical room are heated partly using the refrigeration system's de-superheater, meaning that system loading is already lower than typical due to the existing heat recovery.

It was noted during a site survey that the hot water piping in Mechanical Room 1 was missing insulation over two fairly long stretches of pipe. It is recommended that these piping sections are insulated. Additionally, while both the propane and electric hot water heaters are efficient, energy consumption could be reduced by switching to heat pump hot water heaters. The economics for both projects are as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)	Incremental Cost ($)	Incremental Payback (yrs)
2	Insulate Hot Water Lines	-	1,563	$ 148	$ 46	0.3	$ -	0
3	DHW Heat Pump Upgrade	- 6,885	53,340	$ 3,762	$ 66,667	17.7	$ 33,192	8.8

Table 15: Arena – Domestic Hot Water Project Economics

Insulating hot water lines has a very short payback with minimal cost, and is recommended for immediate consideration.

Upgrading the existing hot water heaters to heat pump models is not recommended; the measure has a long payback which may exceed the lift of the hot water heaters; however the incremental payback over a like-for-like replacement shows a more reasonable payback. As such it can be considered when the current heaters reach end of life.

6.5.3 Lighting

Lighting at the Arena is already accomplished with LEDs. In addition, there is some ability to schedule lighting. As a result, lighting systems are already highly efficient.

It was noted during the site audit that lights were energized in some of mechanical rooms despite the areas being unoccupied. Since the rooms are lit by LEDs, the energy loss is relatively small, however this can be avoided completely by implementing occupancy sensors. The economics for this measure are as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
4	Light Occupancy Sensors in Mechanical Rooms	1,844	$ 347	$ 1,056	3.0

Table 16: Arena – Lighting Occupancy Sensors Project Economics

The economics above consider only four rooms, and based on the quantity and simplicity assumes that consumer sensors will be viable and can be installed by Township staff.

6.5.4 HVAC

The Arena's major HVAC units are primarily housed in an outdoor ground-level enclosure, on the building roof, and in the Maintenance Room 1 with additional units distributed throughout the building. Most heating demand is serviced through three main propane-fired RTU/MUA units, with some smaller heat pump and propane fired units distributed around the building. The following table provides details on these assets, including the stated "area served" for each:

Asset ID	Area Served	Description	Heat Source	Heating Input Capacity (BTUH)	Cooling Output	Unit Efficiency
RTU-1	Gym & Fitness Room	Major HVAC Unit	Propane	270,000	16 Ton	81%
RTU-2	Front Lobby	Major HVAC Unit	Propane	195,000 (EST.)	9 Ton (Est.)	80% (Est.)
MAU-1	Change Rooms	Major HVAC Unit	Propane	195,000	9 Ton	80%
ERV-1	Warm Viewing Area	Energy Recovery Ventilator	Heat Pump	44,400 (Output)	4 Ton	18 SEER 10.2 HSPF
ERV-2	Referee Change Room	Energy Recovery Ventilator	Heat Pump	22,133 (Output)	2 Ton	14 SEER 9.0 HSPF
MS-1	Fitness Room	Minisplit Heat Pump	Heat Pump	Minor	Minor	N/A
BPB-1	Fitness Room	Plenum Box	N/A	N/A	N/A	N/A
F1	Old Building	Furnace	Propane	80,000	N/A	97.5%
EF-1	Arena	Exhaust Fan	N/A	N/A	N/A	N/A
UH-1	Zamboni Storage	Unit Heater	Propane	125,000	N/A	80% (Est.)
UH-2	Quonset Hut	Unit Heater	Propane	125,000	N/A	80% (Est.)

Table 17: Arena – HVAC Unit Summary & Areas Served

There are additional small electric baseboard heaters and electric cabinet heaters located throughout the building which have been excluded from the above list.

Quonset Hut

The Quonset hut is serviced by one propane-fired unit heater. Exact sizing and efficiency could not be confirmed during visits to the site, and capacity and efficiency have been estimated using similar units. Temperature is controlled by one non-programmable thermostat that was set to 65ºF during the time of survey. Feedback from site staff indicated that the primary concern around heating was the maintenance of batteries and equipment stored in the shed; occupancy is very low and as such occupant comfort is not a factor.

It is expected that the temperature in the Quonset hut can be reduced to the range of 55ºF to 60ºF without negatively impacting the stored equipment, especially if the hut is first insulated (as identified in a prior measure). Savings and costing are provided as follows:

ID#	Measure Description	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
5	Quonset Hut Temperature Setback	7,849	$ 744	$ 200	0.3

Table 18: Quonset Hut - Temperature Setback Project Economics

The costing above allows for the installation of a programmable thermostat (installed by Township staff), and savings are incremental on insulation improvements provided in a previous measure.

Furnace

The furnace located in Maintenance Room 1 is a condensing propane-fired unit, and is relatively efficient. During a site visit, it was noted that thermostats that appeared to be controlling the furnace were likely not programmable or programmed to provide setback during unoccupied hours. Verification is currently in-progress with the facility's preferred HVAC vendor and pending the results, installation of a programmable thermostat should be considered.

As an additional measure, the addition of an air-source heat pump to the furnace to provide cooling in the summer months and to offset propane use in the winter can be considered. The economics for both measures are summarized in the following table:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
6	Furnace Night Time Setback	-	2,015	$ 191	$ 500	2.6
7	Furnace Heat Pump Retrofit	- 17,717	48,855	$ 1,300	$ 40,000	30.8

Table 19: Arena – Maintenance Room 1 Furnace Project Economics

Savings for the setback measure are based on a 2ºC setback during unoccupied hours and assume the purchase of two programmable thermostats to be installed by Township staff.

Based on the economics of the heat pump project, it is not recommended for action at this time and should only be considered compared to incremental costs to add or replace air conditioning to the unit.

Major HVAC Units

Information was collected from site staff, the Township's preferred HVAC vendor, and from observation of installed controls. It was noted that the major HVAC Units (RTU-1, RTU-2, MAU-1, ERV-1, ERV-2) were integrated into the Arena's building automation system with setback programmed during unoccupied hours. These units are quite new with energy conserving features including exhaust energy recovery, economizers, heat pumps, premium efficiency blower motors, supply air blower VFDs, and high efficiency compressors. Minor areas for efficiency improvement were identified including:

- Condensing Burners
- Air Source Heat Pumps

Implementation of condensing burners would serve to increase combustion efficiency from 80% to ~91% and reduce propane required by the system to provide heating, while air source heat pumps would allow for a more significant reduction in propane usage in the winter months. Some air source heat pump options can also achieve a slight cooling efficiency improvement over the existing units. Projected economics for both projects are as follows, shown for both the standalone and incremental payback cases:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)	Incremental Cost ($)	Incremental Payback (yrs)
8a	RTU - 1, RTU - 2, & MAU - 1 Condensing Replacement	-	36,539	$ 3,464	$ 412,500	119.1	$ 24,000	6.9
8b	RTU - 1, RTU - 2, & MAU - 1 ASHP w Gas Backup	- 86,905	288,015	$ 10,964	$ 480,000	43.8	$ 78,000	7.1

Table 20: Arena - Major HVAC Project Economics

Notably, the paybacks for both options are quite unfavourable if actioned directly and require significant capital investment, however the incremental costs and incremental paybacks are reasonable, as such it is recommended this be considered when the existing units are nearing their end-of-life.

6.5.5 Other Measures

Discussion with Arena staff indicated that there was some trouble with exhaust controls in the arena. Presently, the Arena employs distributed CO sensors to identify when CO levels reach unsafe levels caused by operation of the ice resurfacer, at which point the exhaust fan activates and dampers open inside the Arena to allow fresh outdoor air to enter.

An item of concern brought up by site staff was that the exhaust does not start until the CO levels reach a threshold value, at which point the exhaust fan's VFD ramps to 100% and does not stop running until the CO sensors read 0 PPM. When it is warm and humid outdoors, the abrupt introduction of outdoor air into the Arena can cause significant fogging despite the two large dehumidifiers. Discussion with the Arena's ice resurfacer vendor indicated that some portion of the issue may be caused by sensor placement; it was indicated that the sensor located near the snow melt pit is placed in-line with resurfacer exhaust and may cause premature triggering of the exhaust system. This could also be the case with other sensors.

Two options were considered to mitigate this issue while achieving some amount of energy savings. The first option would involve updating controls and potentially relocating sensors to allow the exhaust fan VFD to ramp more slowly, in proportion to the detected CO levels. This approach takes advantage of the reduced power consumption due to fan affinity laws, allowing dehumidifiers more time to remove moisture from the air before excessive fogging occurs.

The second measure considered was replacing the resurfacer with an electric option. This would eliminate the need for regular operation of the exhaust fan. Details for both projects can be seen in the following table:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
9	Arena Exhaust Controls Update	3,062	-	$ 576	$ 5,000	8.7
10	Resurfacer Electrification	17,497	105,631	$ 13,302	$ 150,250	11.3

Table 21: Arena - Rink Exhaust Project Economics

Since the exhaust can have impacts on rink safety, it is recommended to only be implemented after careful review with a qualified engineering firm. Costing for this measure includes an allowance of $5,000 for controls programming and sensor placement changes if required. Costing and the savings estimated are considered tentative at this time and require further investigation.

Replacing the resurfacer is less risky from a safety standpoint but carries higher financial risk. There is greater uncertainty regarding the potential energy savings for the measure and the payback is fairly long, which increases the risk of the measure not paying back over the lifespan of the new resurfacer.

7. Administration Building Energy Audit

7.1 Facility Overview

The Administration Building (Admin Building) is the federal government office of the Township, located at 7 Milne St, Minden, ON. The facility has an indoor area of roughly 8,700 ft^2 and is typically open from 8:30 AM to 4:30 PM, 5 days per week, with occupied hours extending beyond this for certain administrative and support staff as needed. Built in 2011, the facility has two storeys with council chambers, offices, and a basement for storage.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 8,686 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	101,469	3	11.5
Propane	116,133	25	13.4
Totals	**217,602**	**28**	**24.9**

Table 22: Admin Building - Analysis Period Utility Consumption & Intensity Data

Totalling 217,602 kWh/year of combined propane and electricity use, the building accounts for ~6.7% of total Township energy use.

7.2 Historical Energy Performance

The following table demonstrates the Admin Building's utility consumption (electricity and propane usage), carbon emissions (Scope 1 & Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	119,103	101,469	14.8%
Propane (kWh)	114,841	116,133	-1.1%
Total Energy (kWh)	233,944	217,602	7.0%
Building Area (ft^2)	8,686	8,686	0.0%
Carbon Emissions (tCO2e)	28	28	0.7%
Intensity (kWh/ft^2)	**26.9**	**25.1**	**7.0%**

Table 23: Admin Building - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have decreased roughly 7% from the baseline period while facility area remained the same. Building carbon emissions decreased by ~0.7% over this same period.

7.3 Energy Benchmark Comparison

The Admin Building has been classified as a “Office” with respect to Energy Star’s Canadian National Median Energy Use Intensity (EUI)[3] reference table, the reference EUI for Courthouses is the same as that of an Office space so the various uses of the building are not expected to have a significant impact on benchmarking. The following table provides a comparison of the building’s actual EUI against the August 2023 Energy Star “Site” EUI reference value for this facility classification:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Office *(Broad Category)* *Office* *(Primary Function – Further Breakdown)*	0.87	0.97	10.96%

Table 24: Admin Building - Facility Performance Comparison vs. Energy Star Site Reference EUI

The above benchmark comparison can be used as a rough analysis tool to assess building performance and the potential for improvement, however it should be noted that unique building constraints and intricacies may exist which make this comparative analysis less valid. It appears that the Admin Building consumes roughly 11% more energy per unit area compared to the chosen Energy Star reference value. This indicates that there may be opportunities for energy performance improvement, but that the facility is currently fairly close to the expected benchmark.

[3] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

7.4 Utility Consumption Review

7.4.1 Propane

Propane consumption at the Admin Building was roughly 120,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed propane consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

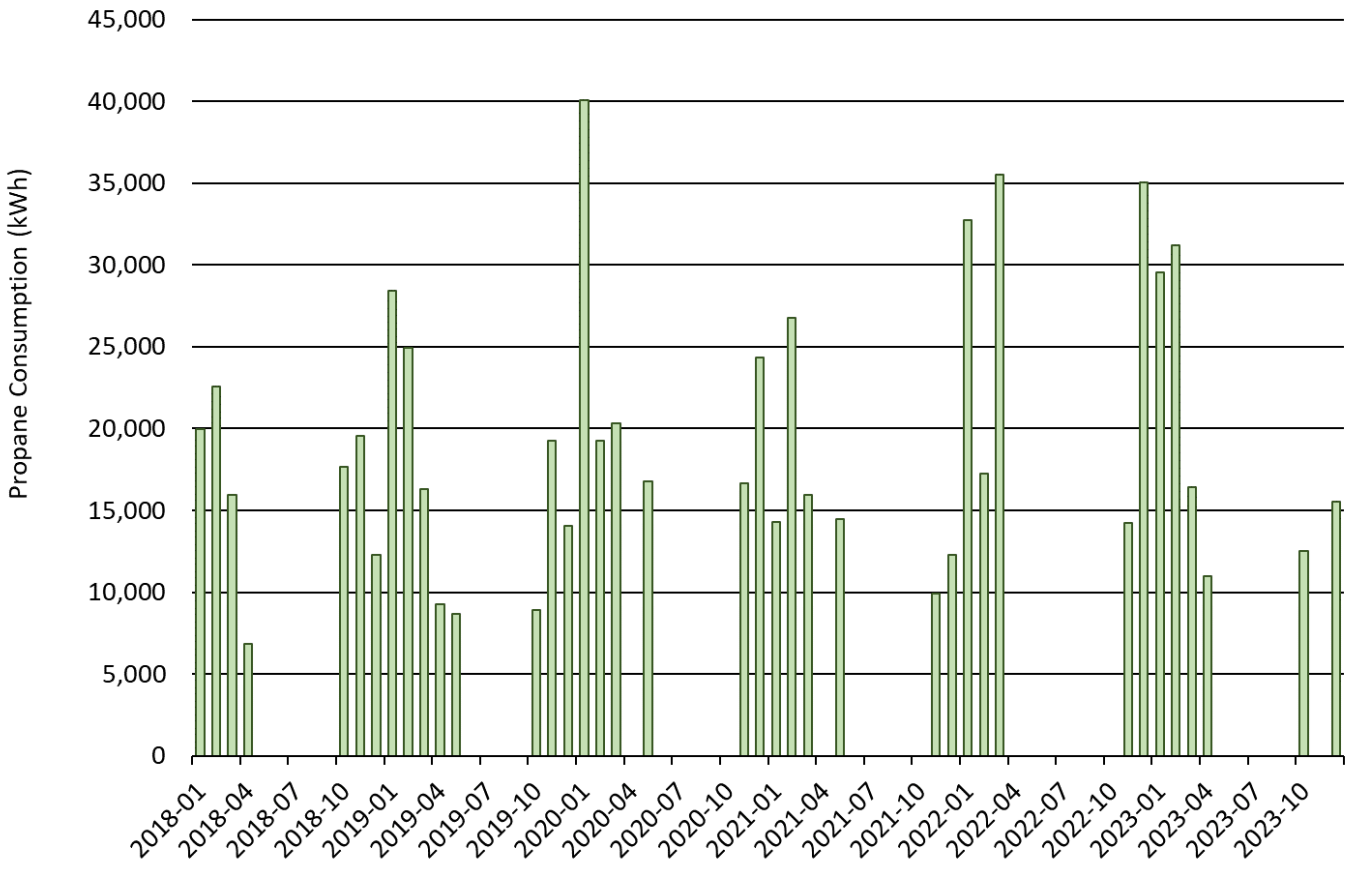

Figure 13: Admin Building - Propane Consumption, January 2018 to December 2023

The above trend appears to show significant weather-driven variance, which is generally expected given that the facility's primary propane end-users are space heating related.

A site visit was undertaken in May 2024 to identify all propane consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's propane-consuming assets:

Asset ID	Description	Location	Maximum Prop. Input (BTUH)	Maximum Prop. Output (BTUH)	Nameplate Efficiency
RTU-1	Propane-Fired AHU	Upper Rooftop	180,000	144,000	80.0%
RTU-2	Propane-Fired AHU	Lower Rooftop	240,000	192,000	80.0%
RTU-3	Propane-Fired AHU	Lower Rooftop	240,000	192,000	80.0%

Table 25: Admin Building - Propane Asset List

No other propane-fired assets were identified while onsite.

Nameplate data gathered from all propane consuming assets was combined with estimates of annual hours and asset loading to develop an estimated propane end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

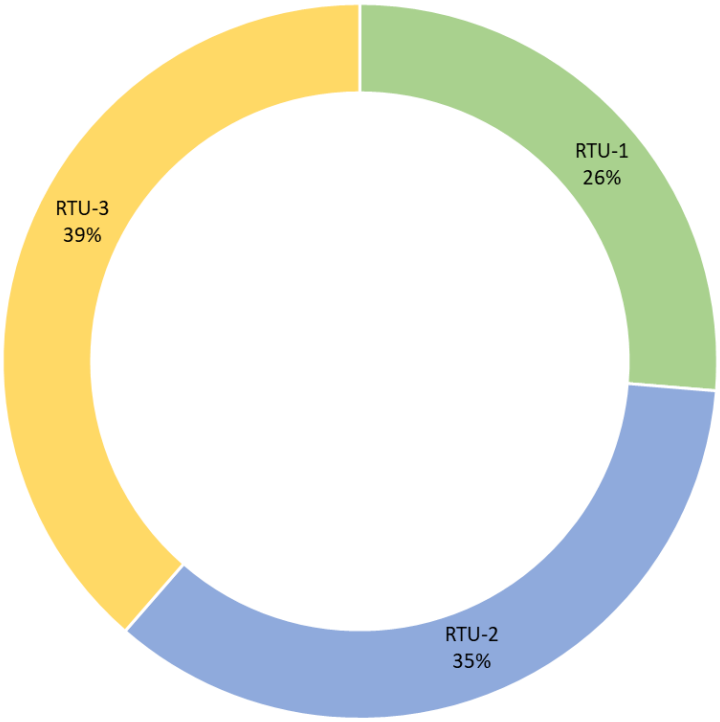

Figure 14: Admin Building - Estimated Propane End-Use Breakdown

Propane used by the facility's three rooftop air handling units is expected to account for 100% of total site propane consumption since no other propane consuming assets were identified.

7.4.2 Electricity

Electricity consumption at the Admin Building was roughly 100,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

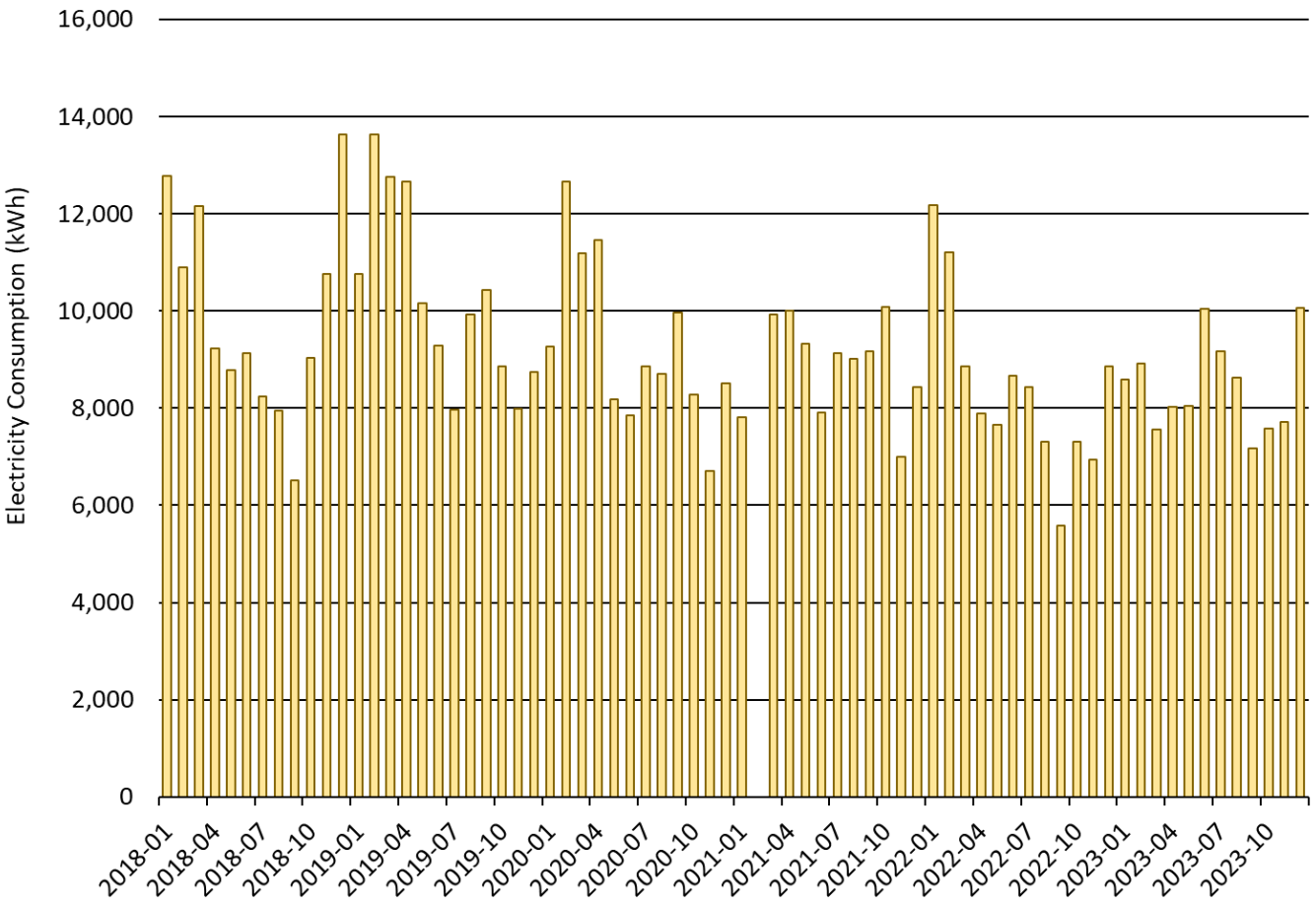

Figure 15: Admin Building - Electricity Consumption, January 2018 to December 2023

The above trend appears to be relatively steady, with variations in electricity end-use likely primarily caused by rooftop units providing both AC cooling in the summer season and heating in the winter season.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity-consuming assets:

Asset ID	Description	Location	Size (HP)
DHW	Domestic Hot Water Heater	Basement	8
Duct Heater 1	Duct Heater	Old Office	4
Duct Heater 2	Duct Heater	Duct 2	4
AC 1	Air Conditioning Unit	Office	4
AC 2	Air Conditioning Unit	Courthouse	4
RTU1 - Compressor 1	Rooftop Unit Compressor	Upper Roof	6.18
RTU1 - Compressor 2	Rooftop Unit Compressor	Upper Roof	6.18
RTU1 - Blower	Rooftop Unit Blower	Upper Roof	2
RTU1 - OD Fans	Rooftop Unit Fans	Upper Roof	0.67
RTU1 - Combustion Blower	Rooftop Unit Combustion Blower	Upper Roof	0.083
RTU-2 - Outdoor Fan	Rooftop Unit Fans	Lower Roof	0.66
RTU-2 - Combustion Air Blower	Rooftop Unit Blower	Lower Roof	0.1
RTU-2 - OPT Exhaust	Rooftop Unit Opt Exhaust	Lower Roof	0.33
RTU-2 Compressor 1	Rooftop Unit Compressor	Lower Roof	7.44
RTU-2 Compressor 2	Rooftop Unit Compressor	Lower Roof	7.44
RTU-2 Evaporator	Rooftop Unit Compressor	Lower Roof	3
RTU-3 - Outdoor Fan	Rooftop Unit Fans	Lower Roof	0.66
RTU-3 - Combustion Air Blower	Rooftop Unit Blower	Lower Roof	0.1
RTU-3 - OPT Exhaust	Rooftop Unit Opt Exhaust	Lower Roof	0.33
RTU-3 Compressor 1	Rooftop Unit Compressor	Lower Roof	7.44
RTU-3 Compressor 2	Rooftop Unit Compressor	Lower Roof	7.44
RTU-3 Evaporator	Rooftop Unit Compressor	Lower Roof	3
Baseboard Heaters	Baseboard Heaters	Distributed	N/A

Table 26: Admin Building - Electricity Asset List

Three air handling units were identified on the rooftop, along with two dedicated air conditioning units in the office and courthouse. There were also two duct heaters, distributed baseboard heaters and one electric domestic hot water heater identified.

Nameplate data gathered from all electricity-consuming assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

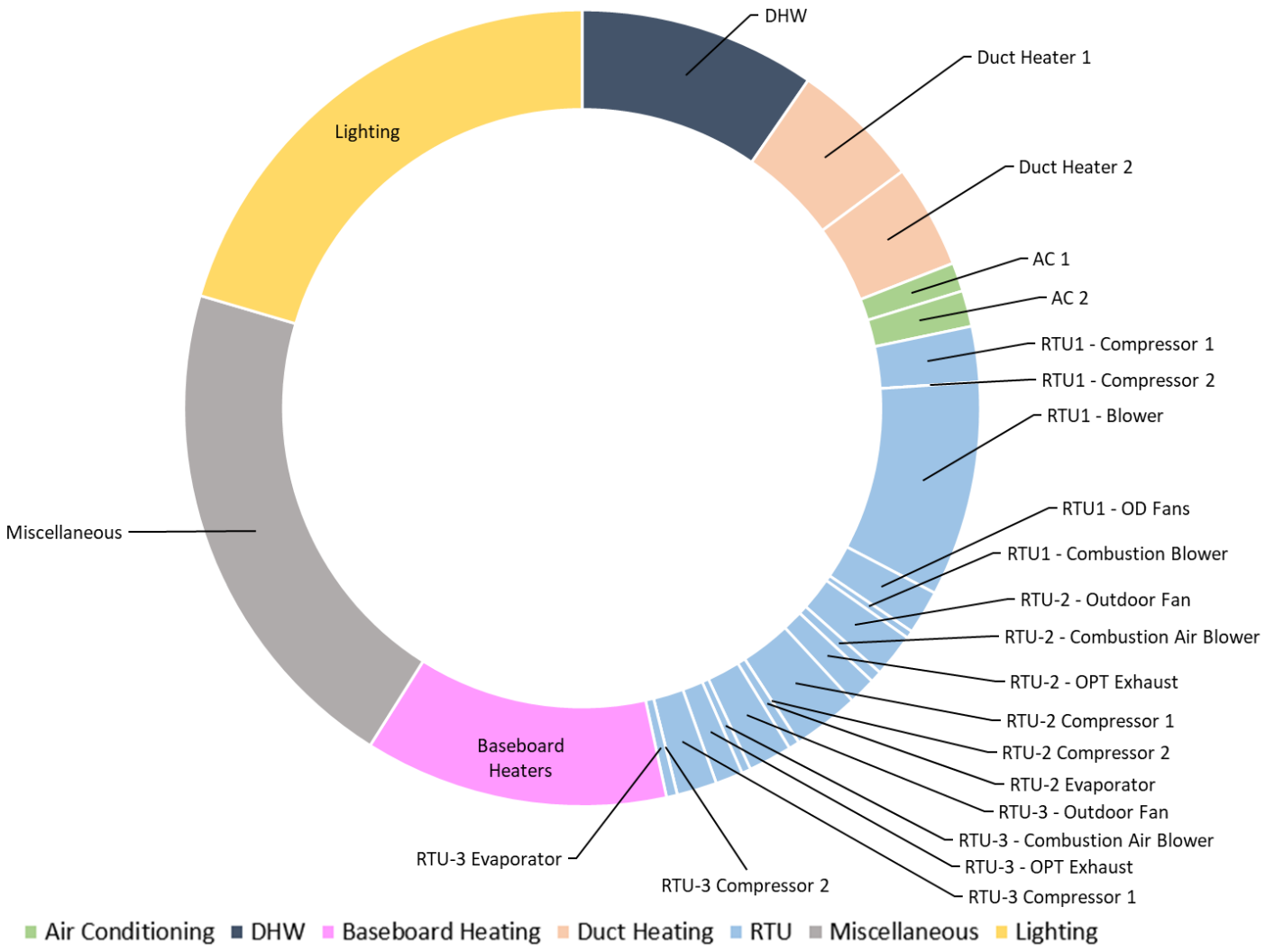

Figure 16: Admin Building - Electricity End-Use Breakdown

Electricity required for air handling regardless of season is modelled to account for roughly 16% of total site electricity consumption, with seasonal consumption accounting for an additional 33%. The remaining electricity usage is split between lighting, hot water generation, and distributed plug loads.

7.5 Energy Conservation Measures

7.5.1 Building Envelope

The building envelope for the Admin Building is somewhat new in areas, with a building addition being completed in 2004 along with renovations. Overall, both new and old portions of the building envelope are in good shape with limited room for cost-effective improvement expected; as such no measures are recommended for the Admin Building.

7.5.2 Domestic Hot Water

Domestic hot water at the Admin Building is provided by one electric heater located in the basement. Pertinent technical details gathered from the domestic hot water heater's nameplates is provided below:

Manufacturer	GSW
Model No.	6G50SDEB1
Max. Input	2 x 3,000 W
Tank Capacity	50 gallons
Location	Basement
Energy Source	Electric
Nameplate Efficiency	N/A

Table 27: Admin Building - Domestic Hot Water Heater Nameplate Information

It was noted during a site survey that the hot water piping in the basement was missing insulation on some of the pipe runs. It is recommended that these piping sections be insulated. Additionally, while the electric heater is efficient, and appears to be in good working condition, energy consumption could be reduced by switching to heat pump hot water heaters. Economics for both projects are as follows:

ID#	Measure Description	Electricity Savings (kWh/yrs)	Total Cost Savings ($/yrs)	Total Capital Cost ($)	Payback (yrs)
1	Insulate Bare Hot Water Lines	211	$ 40	$ 14	0.4
2	DHW Heat Pump Upgrade	5,907	$ 1,110	$ 6,500	5.9

Table 28: Admin Building - Hot Water Project Economics

Insulating hot water lines has a very short payback with minimal cost, and is recommended for immediate consideration. Upgrading the existing hot water heater to a heat pump model has fairly reasonable payback, however the existing unit appears to be in good working condition.

This project could be considered prior to end-of-life or actioned as a replacement when the heater reaches end of life. It has not been included in measures for this reporting cycle.

7.5.3 Lighting

Lighting in the Admin Building is serviced by a combination of LED and Fluorescent bulbs. At the time of walkthrough, it was estimated that approximately 30% of fixtures had been converted to LED or had LED swap-in bulbs used to replace fluorescent lights without fixture replacement.

It was noted that lights were generally switched off in areas that were unoccupied, however there are significant areas of the building where lighting could be accidentally left on when unoccupied (ie. Basement, office spaces, storage rooms). It is expected that targeted occupancy sensor installation could provide some energy savings. Economics for LED replacement and lighting occupancy sensor installation is as follows:

ID#	Measure Description	Electricity Savings (kWh/yrs)	Total Cost Savings ($/yrs)	Total Capital Cost ($)	Payback (yrs)
3	LED Lighting Replacement	8,627	$ 1,622	$ 2,782	1.7
4	Lighting Occupancy Control	1,815	$ 341	$ 4,884	14.3

Table 29: Admin Building - Lighting Project Economics

LED Lighting replacement accounts for replacement of ~200 bulbs with swap-in LED bulbs, without requiring replacement of the light fixture. This could be implemented as existing bulbs burn out and need to be replaced. In the case that ballasts are failing on existing fixtures, full fixture replacement should be considered as an alternative.

Proposed occupancy controls costs cover the purchase of ~37 sensors spread throughout the building and assumes installation by Township staff. These measures have been recommended for action in this ECDMP reporting period.

7.5.4 HVAC

The Admin building's major HVAC units are all located on the roof. Most heating and cooling demand is serviced through three main propane-fired RTU units. The following table provides details on these assets, including the stated "area served" for each:

Asset ID	Area Served	Description	Heat Source	Heating Input Capacity	Cooling Output	Unit Efficiency
RTU-1	Office	Major HVAC Unit	Propane	180,000 BTUH	6.5 Ton	80%
RTU-2	Office	Major HVAC Unit	Propane	240,000 BTUH	10 Ton	80%
RTU-3	Courthouse	Major HVAC Unit	Propane	240,000 BTUH	10 Ton	80%

Table 30: Admin Building – HVAC Unit Summary & Areas Served

In addition, there are smaller electric baseboard heaters located throughout as well as duct heaters which have not been included in the above.

Electric Baseboard

It was noted during the site visit that the baseboard heater in the basement was controlled by an analog thermostat. At the time of the visit, the thermostat was set to ~30ºC. It is suggested that the heater thermostat be replaced with a smart thermostat that can be scheduled and locked. The economics for this measure are as follows:

ID#	Measure Description	Electricity Savings (kWh/yrs)	Total Cost Savings ($/yrs)	Total Capital Cost ($)	Payback (yrs)
5	Basement Baseboard Heater - Control Upgrades	876	$ 165	$ 260	1.6

Table 31: Admin Building - Basement Baseboard Controls Upgrade Project Economics

Cost estimates allow for replacement of the existing thermostat with line voltage smart thermostat, and a nominal fee for installation. This ECM is recommended to be actioned.

Rooftop Units

The existing RTUs appear to be in working order, and feedback from the Township's HVAC vendor indicated that they are programmed for nighttime setback. While the units were efficient at the time they were selected, they are nearing the end of their reliable operating life and newer units can achieve better efficiency. Three efficiency options have been identified for consideration when the units are replaced:

ID#	Measure Description	Electricity Savings (kWh/yrs)	Propane Savings (kWh/yrs)	Total Cost Savings ($/yrs)	Total Capital Cost ($)	Payback (yrs)	Incremental Cost ($)	Incremental Payback (yrs)
6a	RTU Unit Replacement - Condensing Burner	1,836	20,374	$ 2,357	$ 386,250	163.9	$ 24,000	10.2
6b	RTU Unit Replacement - ASHP w Condensing Gas Backup	- 23,063	102,461	$ 5,782	$ 457,500	79.1	$ 81,000	14.0

Table 32: Admin Building - RTU Replacement Project Economics

The current units also have a nameplate combustion efficiency of ~80% which could be improved to 91% with a condensing burner. These ECMs are not recommended for action unless the current units are planned for replacement.

8. Cultural Centre Energy Audit

8.1 Facility Overview

The Minden Hills Cultural Centre (Cultural Centre) is a cultural site in the village of Minden that includes several facilities: the Agnes Jamieson Gallery, Nature's Place, and the Minden Hills Branch of the Haliburton County Public Library. The Cultural Centre has a combined indoor floor area of roughly 9,200 ft^2 and is typically open from 10:00 AM to 4:00 PM, 5 days per week, with occupied hours extending beyond this for certain administrative and support staff as needed.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 9,200 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	71,014	2	7.7
Propane	74,711	16	8.1
Totals	**145,725**	**18**	**15.8**

Table 33: Cultural Centre - Building Analysis Period Utility Consumption & Intensity Data

The energy consumption shown above in total equates to about 4.5% of the Township's total annual energy use.

8.2 Historical Energy Performance

The following table demonstrates the Cultural Centre's utility consumption (electricity and propane usage), carbon emissions (Scope 1 & Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	156,522	71,014	54.6%
Propane (kWh)	78,473	74,711	4.8%
Total Energy (kWh)	234,995	145,725	38.0%
Building Area (ft^2)	9,200	9,200	0.0%
Carbon Emissions (tCO2e)	21	18	14.5%
Intensity (kWh/ft^2)	**25.5**	**15.8**	**38.0%**

Table 34: Cultural Centre - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have decreased roughly 38% from the baseline period. Building carbon emissions also decreased by ~15% over this same period.

8.3 Energy Benchmark Comparison

The Cultural Centre has been classified as a “Library” with respect to Energy Star’s Canadian National Median Energy Use Intensity (EUI)[4] reference table. The following table provides a comparison of the building’s actual EUI against the August 2023 Energy Star “Site” EUI reference value for this facility classification:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Public Services *(Broad Category)* Library *(Primary Function)*	0.41	1.03	-40.50%

Table 35: Cultural Centre - Facility Performance Comparison vs. Energy Star Site Reference EUI

The above benchmark comparison can be used as a rough analysis tool to assess building performance and the potential for improvement, however it should be noted that unique building constraints and intricacies may exist which make this comparative analysis less valid (notably, its alternate function could be considered a “Museum” with an associated EUI benchmark of 0.41 GJ/m^2).

It appears that the Cultural Centre consumes roughly 40% less energy per unit-area than the median comparable building indicated that the building is highly efficient with potentially fewer opportunities for improvement.

[4] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

8.4 Utility Consumption Review

8.4.1 Propane

Propane consumption at the Cultural Centre was roughly 75,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed propane consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

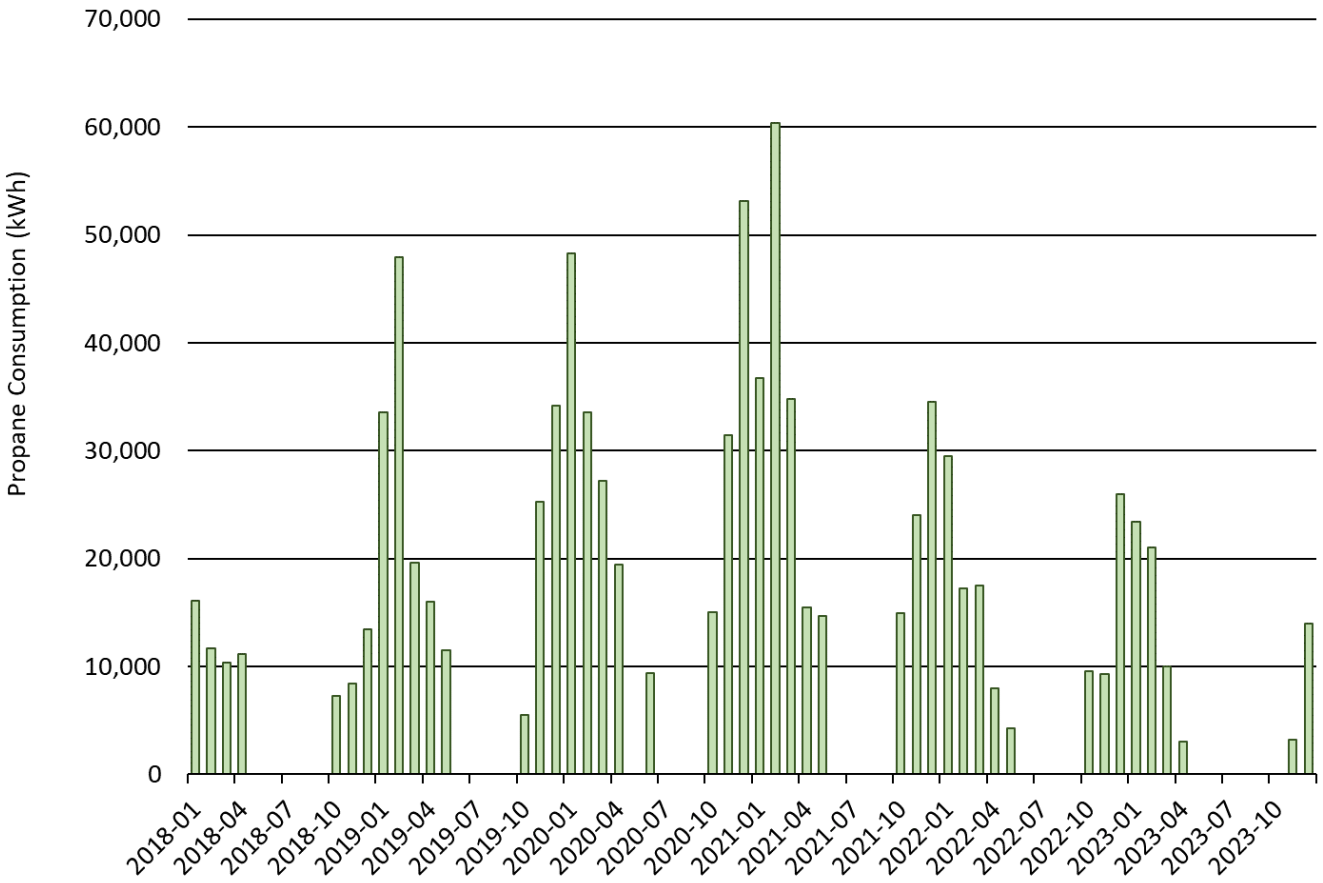

Figure 17: Cultural Centre - Propane Consumption, January 2018 to December 2023

The above trend appears to show strong weather-driven variance, which is generally expected given that the facility's primary propane end-users are space heating related.

A site visit was undertaken in May 2024 to identify all propane consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's propane consuming assets:

Asset ID	Description	Location	Maximum Prop. Input (BTUH)	Nameplate Efficiency
Furnace	Furnace	Gallery Storage Room (Top Section)	80,000	97.5%
RTU 1	RTU	Roof (Library)	100,000 (Est.)	80% (Est.)
RTU 2	RTU	Roof (Library)	100,000 (Est.)	80% (Est.)

Table 36: Cultural Centre - Propane Asset List

One condensing propane-fired furnace was identified in the Gallery storage room. Two additional propane-fired rooftop air handling units were observed on the Library roof, however access was not available at the time of survey and unit details have been estimated based on their physical size and apparent age.

Nameplate data gathered from all propane consuming assets was combined with estimates of annual hours and asset loading to develop an estimated propane end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

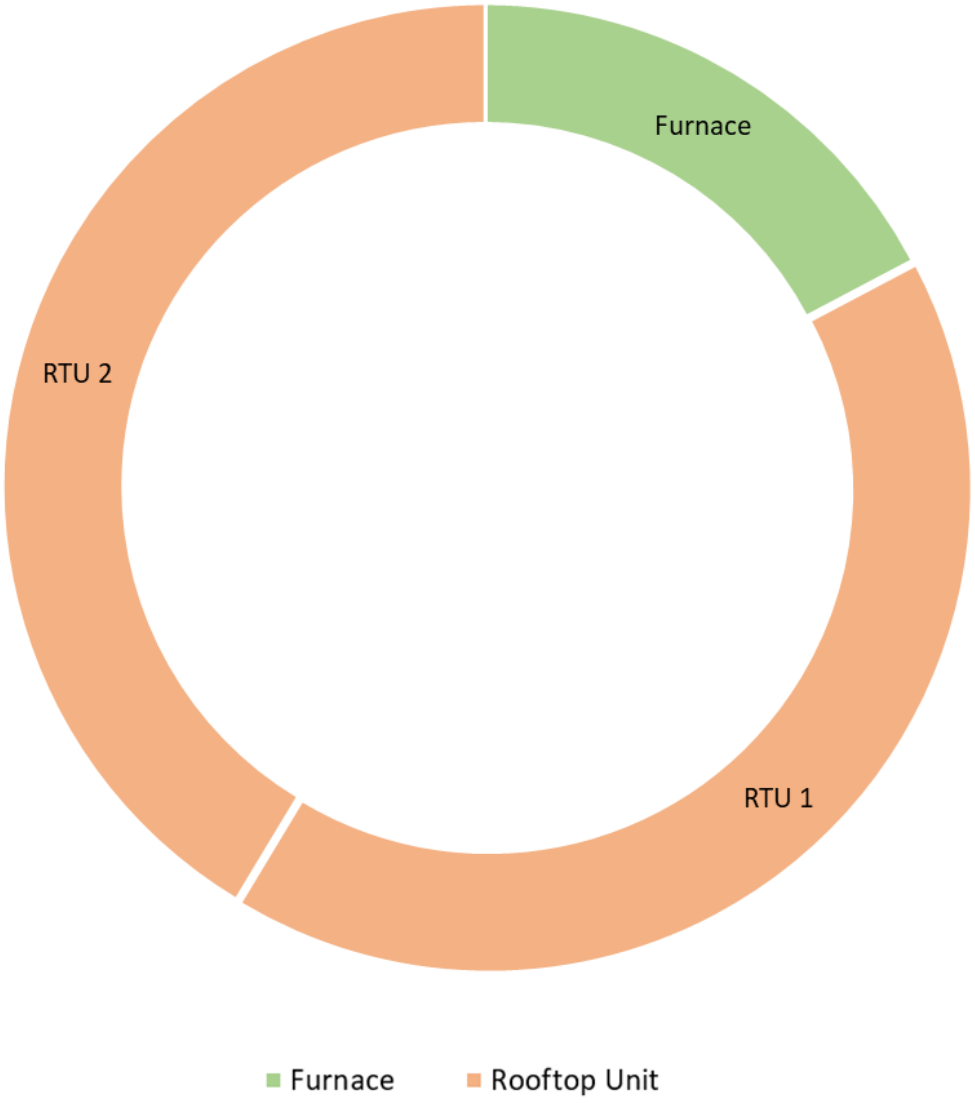

Figure 18: Cultural Centre - Estimated Propane End-Use Breakdown

Propane usage is estimated to service exclusively space heat at the Cultural Centre.

While the furnace is estimated to be comparable in output capacity and heat demand as each individual RTU, the unit is supplemented by a heat pump, and features a condensing burner achieving a higher combustion efficiency. As a result, it is anticipated that propane usage on the furnace will be significantly lower than the RTUs.

8.4.2 Electricity

Electricity consumption at the Cultural Centre was roughly 71,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

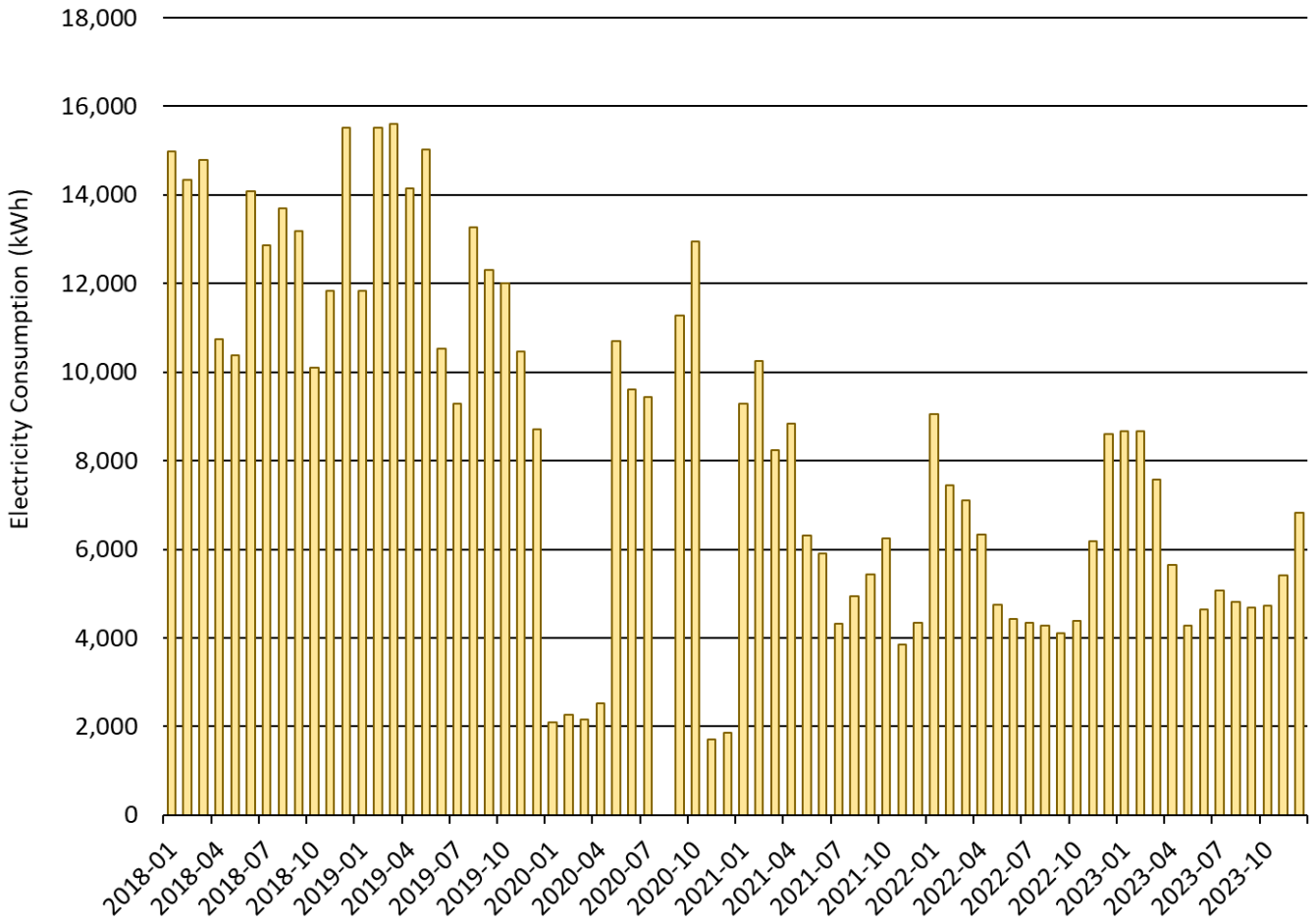

Figure 19: Cultural Centre - Electricity Consumption, January 2018 to December 2023

The above trend appears to be relatively steady, with seasonal electricity end-use going towards space cooling in the summertime months as well as heating via the gallery's heat pump and Nature Place's electric hot water boiler in the winter season.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity consuming assets:

Asset ID	Description	Location	Size (kW)
Humidifier 1	Humidifier	Gallery Storage Room	1.2 (Est.)
Humidifier 2	Humidifier	Gallery Storage Room	1.19 (Est.)
Humidifier 3	Humidifier	Gallery Storage Room (Top Section)	1.19
Furnace Blower	HVAC	Gallery Storage Room (Top Section)	0.37
Heat Pump	HVAC	Outside Gallery	5.52
Hot Water Boiler	Heating Boiler	Nature's Place	11.00 (Est.)
RTU 1 Compressor	HVAC	Roof (Library)	5.52 (Est.)
RTU 2 Compressor	HVAC	Roof (Library)	5.52 (Est.)
RTU 1 Supply Fan	HVAC	Roof (Library)	0.56 (Est.)
RTU 2 Supply Fan	HVAC	Roof (Library)	0.56 (Est.)
Domestic Hot Water	Domestic Hot Water	Gallery Storage Room (Top Section)	3.00

Table 37: Cultural Centre - Electricity Asset List

RTUs 1 and 2 were not available for direct observation during the site survey, as such details on their motors and compressor size has been estimated. In addition, nameplate information was not available on Humidifiers 1 & 2, or on the hot water boiler in Nature's Place. These units were directly observed and their size has been estimated using comparable units and/or breaker sizing.

Nameplate data and estimates gathered for all electric consuming assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

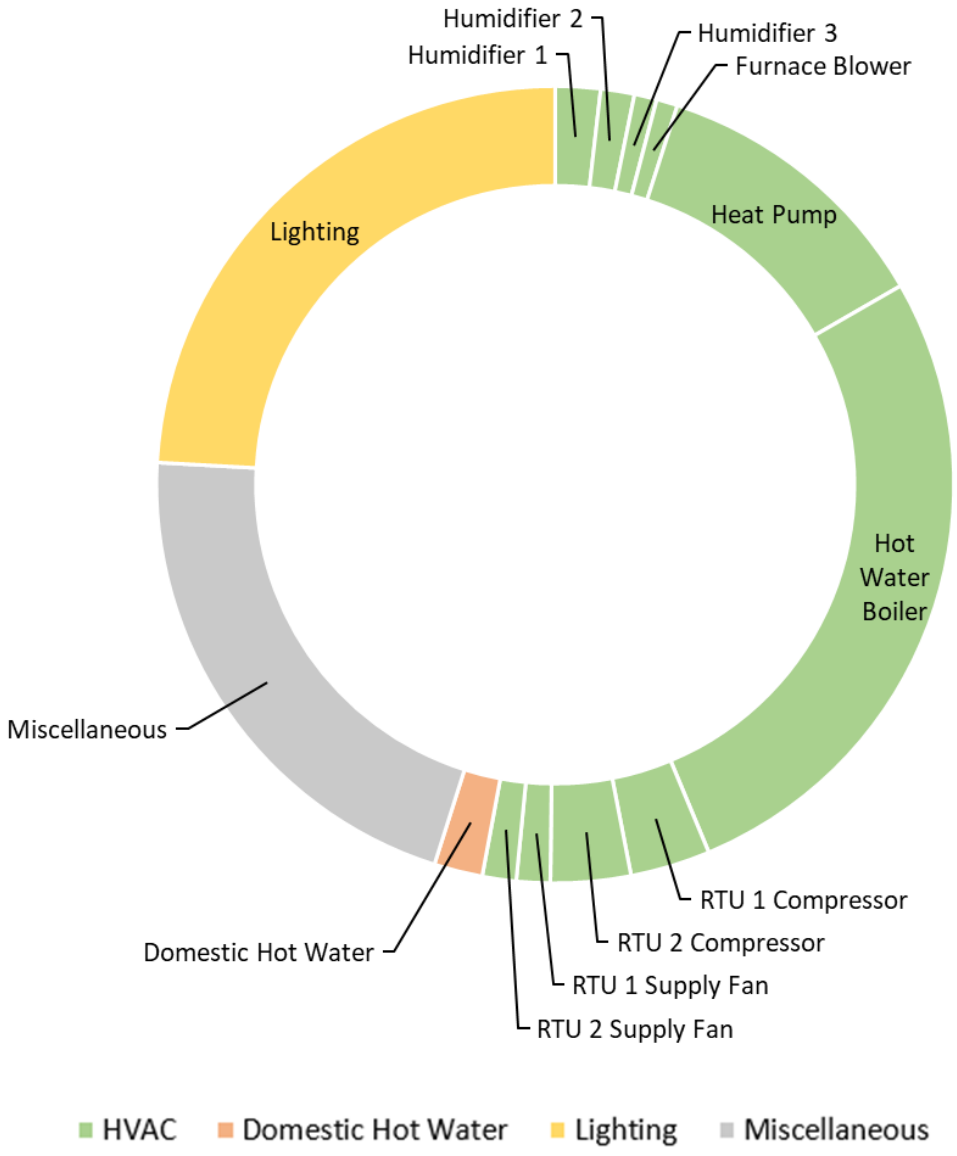

Figure 20: Cultural Center - Electricity End-Use Breakdown

Electricity required for space heating is estimated to account for roughly 39% of total site electricity consumption, with lighting and distributed plug loads accounting for an additional 45% combined.

8.5 Energy Conservation Measures

8.5.1 Building Envelope

The envelope of the Cultural Centre buildings appear to be in good shape with limited room for cost-effective improvement anticipated, as such no building envelope measures are recommended for the site.

8.5.2 Heating Hot Water

Heating hot water use at the Cultural Centre is limited to use at Nature's Place. The boiler is relatively new and appears to operate efficiently using electricity to heat water via resistive heating. It was noted that some of the piping was not insulated in the utility closet, however since the primary function of the boiler is to provide space heating, heat loss inside the building is likely not a significant concern.

While this unit appears to be generally efficient, energy usage could be reduced by supplementing with an air source heat pump to act as the primary heat source with the boiler operating as emergency backup, and to top up the hot water loop if required. A high-level business case for this project is as follows:

ID#	Measure Description	Electricity Savings (kWh/yr)	Total Cost Savings ($/yr)	Total Capital Cost ($)	Payback (yrs)
1	Natures Place - Hot Water Boiler Heat Pump Upgrade	10,428	$ 1,960	$ 26,000	13.3

Table 38:Nature's Place - Heating Hot Water Project Economics

The payback is fairly long on this project, and depends heavily on the heating capacity required which was estimated based on the nameplate information. It is recommended that this project be revisited when nameplate information on the heating boiler is available.

8.5.3 Domestic Hot Water

A high-level assessment of potential savings and associated costs was performed to identify if there was a valid business case to replace the domestic hot water heaters with heat pump models either in the near term, or at end-of-life. Estimates of DHW demand indicate that either project will likely not pay back on either the incremental or up-front project costs over the expected life of the hot water heaters. No projects are recommended at this time.

8.5.4 Lighting

Somewhat in contrast to other systems at the Cultural Centre, lighting was noted to be fairly inefficient with a large number of fluorescent, halogen, and even incandescent bulbs identified during a site walkthrough. In addition, there are several areas that are likely to experience periods of low/ no occupancy with all lights on due to typical building occupancy patterns, and the isolation of some areas.

Costing and potential savings have been scoped for LED bulb replacement, and installation of occupancy sensors to control lighting in select areas:

ID#	Measure Description	Electricity Savings (kWh/yr)	Total Cost Savings ($/yr)	Total Capital Cost ($)	Payback (yrs)
2	LED Lighting Replacement	7,773	$ 1,461	$ 1,353	0.9
3	Install Occupancy Sensors	406	$ 76	$ 792	10.4

Table 39: Cultural Centre - Lighting Project Economics

Costing assumes all bulbs will be replaced with swap-in LED equivalents. Note that some of the fixtures may need to be non-LEDs for historical purposes or related to the art gallery, and assessment of this is outside the scope of this study. Costing on the occupancy sensors assumes install in three areas and provides a budgetary cost of ~$400 for installation. These measures are recommended for consideration by the Township.

8.5.5 Rooftop Air Handling Units

While the RTUs were not directly observed during the site audit, discussion with the HVAC provider that services these units noted that their economizers needed repair, and that the units were nearing end-of-life and replacement may be considered in the near future. At time of replacement, it is recommended that options be considered with condensing burners, or condensing burners with a heat pump providing the primary heating on the unit. Preliminary economics for these measures are included in the following table based on estimated unit sizing:

ID#	Measure Description	Electricity Savings (kWh/yr)	Propane Savings (kWh/yr)	Total Cost Savings ($/yr)	Total Capital Cost ($)	Payback (yrs)	Incremental Cost ($)	Incremental Payback (yrs)
4a	RTU Replacement- Condensing Burner	-	8,940	$ 871	$ 195,000	224.0	$ 16,000	18.4
4b	RTU Replacement- Condensing Burner + Heat Pump	- 19,364	67,384	$ 2,922	$ 230,000	78.7	$ 44,000	15.1

Table 40: Cultural Centre - RTU Project Economics

Since costing and savings are both based on approximated unit size, it is recommended that this measure be revisited when nameplate information is available on the units.

9. Fire Hall Energy Audit

9.1 Facility Overview

Minden Fire Hall (Fire Hall) is the common fire hall for Minden Hills, providing emergency response calls for firefighting, medical assistance, rescues, vehicle extrication, ice rescue, open water rescues, and backcountry rescues. The Fire Hall has a combined indoor floor area of roughly 7,600 ft^2 and is typically open from 8:30 AM to 4:30 PM, 7 days per week, with occupied hours extending beyond this as needed to support operations.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 7,632 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	35,448	1	4.6
Propane	68,830	15	9.0
Totals	**104,278**	**15.9**	**13.7**

Table 41: Fire Hall - Analysis Period Utility Consumption & Intensity Data

In total this energy use equates to about 3.2 % of the Township's total annual energy consumption.

9.2 Historical Energy Performance

The following table demonstrates the Cultural Centre's utility consumption (electricity and propane usage), carbon emissions (Scope 1 & Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	20,839	35,448	-70.1%
Propane (kWh)	94,657	68,830	27.3%
Fuel Oil (kWh)	65,376	-	100.0%
Total Energy (kWh)	180,872	104,278	42.3%
Building Area (ft^2)	7,632	7,632	0.0%
Carbon Emissions (tCO2e)	21	16	24.7%
Intensity (kWh/ft^2)	**23.7**	**13.7**	**42.3%**

Table 42: Fire Hall - Facility Utility Performance vs. Baseline

The data provided above appears to include utility consumption from both the old and new fire hall buildings; given the significant changes between the periods, no conclusions have been drawn from the comparison.

9.3 Energy Benchmark Comparison

The Fire Hall has been classified as a “Fire Station” with respect to Energy Star’s Canadian National Median Energy Use Intensity (EUI)[5] reference table. The following table provides a comparison of the building’s actual EUI against the August 2023 Energy Star “Site” EUI reference value for this facility classification:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Public Services *(Broad Category)* Fire Hall *(Primary Function – Further Breakdown)*	0.66	0.53	-19.8%

Table 43: Fire Hall - Facility Performance Comparison vs. Energy Star Site Reference EUI

The above benchmark comparison can be used as a rough analysis tool to assess building performance and the potential for improvement, however it should be noted that unique building constraints and intricacies may exist which make this comparative analysis less valid. It appears that the Fire Hall consumes nearly 20% less energy per unit area compared to the chosen Energy Star reference value. This potentially indicates a high degree of efficiency, and likely little potential improvement in energy performance without significant capital investment.

[5] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

9.4 Utility Consumption Review

9.4.1 Propane

Propane consumption at the Fire Hall was roughly 69,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed propane consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

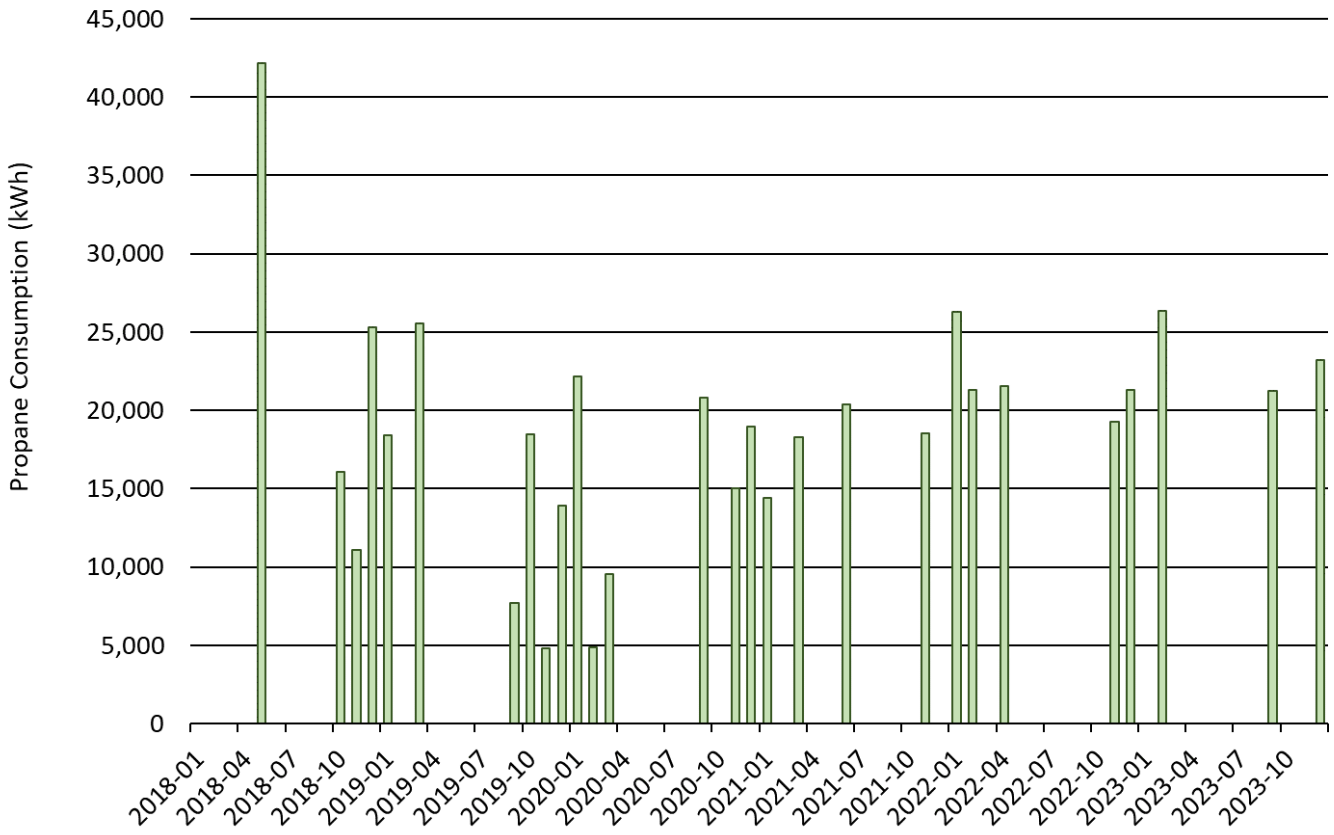

Figure 21: Fire Hall - Propane Consumption, January 2018 to December 2023

The above trend appears to be strongly weather-driven variance, which is generally expected given that the facility's primary propane end-users are space heating related with minor usage for domestic hot water.

A site visit was undertaken in May 2024 to identify all propane consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's propane consuming assets:

Asset ID	Description	Location	Maximum Prop. Input (BTUH)	Maximum Prop. Output (BTUH)	Nameplate Efficiency
DHW	Domestic Hot Water Heater	Utility Room	100,000	96,000	96.0%
Boiler	Boiler	Utility Room	200,000	185,000	92.5%
Furnace	Furnace	Utility Room	100,000	97,000	97.0%
Rad 1	Radiant Tube	Main Hall	62,500 (Est.)	50,000 (Est.)	80.0% (Est.)
Rad 2	Radiant Tube	Main Hall	62,500 (Est.)	50,000 (Est.)	80.0% (Est.)

Table 44: Fire Hall - Propane Asset List

One domestic hot water heater located in the utility room services the entire building. The asset is a new condensing unit with a high combustion efficiency.

Space heating throughout the building is primarily served via the following units:

- One propane-fired furnace in the Utility Room
- One heating boiler located in the Utility Room
- Two radiant tube heaters located in the Main Hall

A variety of smaller electric heaters also satisfy a small amount of heat demand at the main entrance.

Nameplate data gathered from all propane-consuming assets was combined with estimates of annual hours and asset loading to develop an estimated propane end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

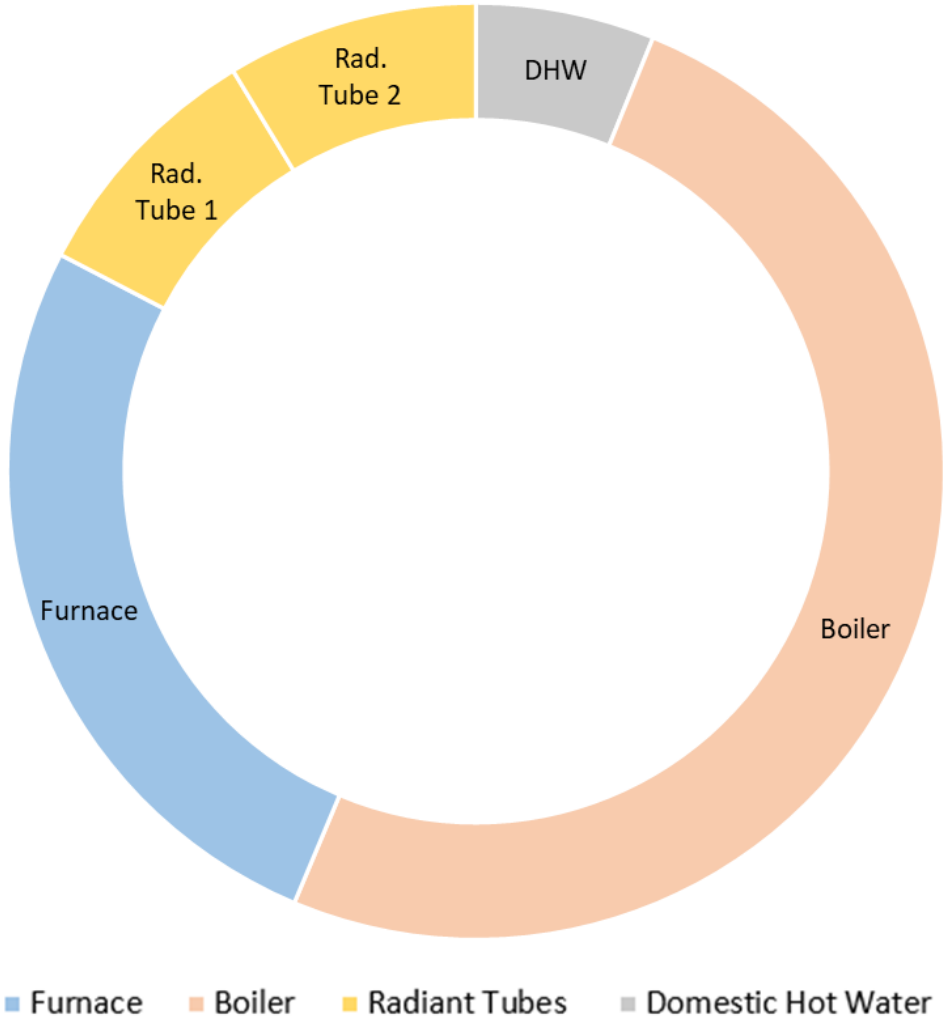

Figure 22: Fire Hall - Estimated Propane End-Use Breakdown

Propane used to service slab heat demand is estimated to account for roughly 50% of total site consumption, with usage on the radiant tube heaters and furnace expected to account for an additional 44% and domestic hot water accounting for the remainder.

9.4.2 Electricity

Electricity consumption at the Fire Hall was roughly 35,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

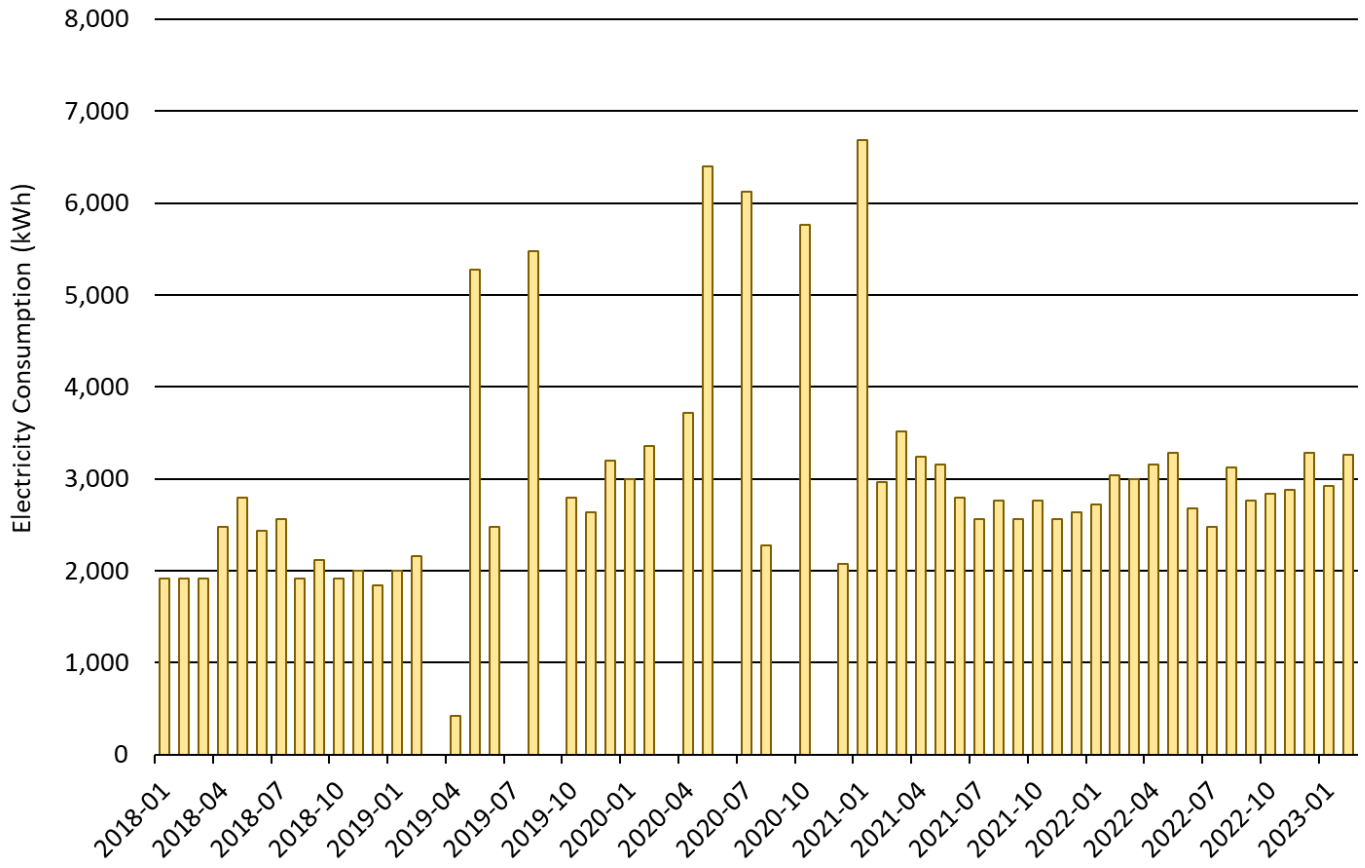

Figure 23: Fire Hall - Electricity Consumption, January 2018 to December 2023

Notably, the new fire hall was constructed in 2018 replacing an older fire hall building. There may be some duplication of counted consumption when both were open and operating.

The above trend from 2021 onwards appears to be quite steady, with some minor seasonal variation.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity consuming assets:

Asset	Description	Location	Size (kW)
Boiler Pump	Pump	Utility Room	0.2
Office Area Pump	Pump	Utility Room	0.2
East Garage Pump	Pump	Utility Room	0.2
West Garage Pump	Pump	Utility Room	0.2
Entry Heat	Heat	Main Building Entrance	2.2
AC	Air Conditioner	Outside	5.0
Fan	Fan	Fill Room	0.2
Exhaust Fan	Exhaust Fan	Main Hall	0.5
Fill 1	Cylinder Filler	Fill Room	5.6
Fill 2	Cylinder Filler	Fill Room	5.6
Compressor	Compressor	Fill Room	0.4
Garage Door Opener 1	Garage Door Opener	Main Hall	0.6
Garage Door Opener 2	Garage Door Opener	Main Hall	0.6
Garage Door Opener 3	Garage Door Opener	Main Hall	0.6
Garage Door Opener 4	Garage Door Opener	Main Hall	0.6
HWY Sign	Illuminated Sign	Outside	0.8

Table 45: Fire - Hall Electricity Asset List

Nameplate data gathered from all electricity consuming assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

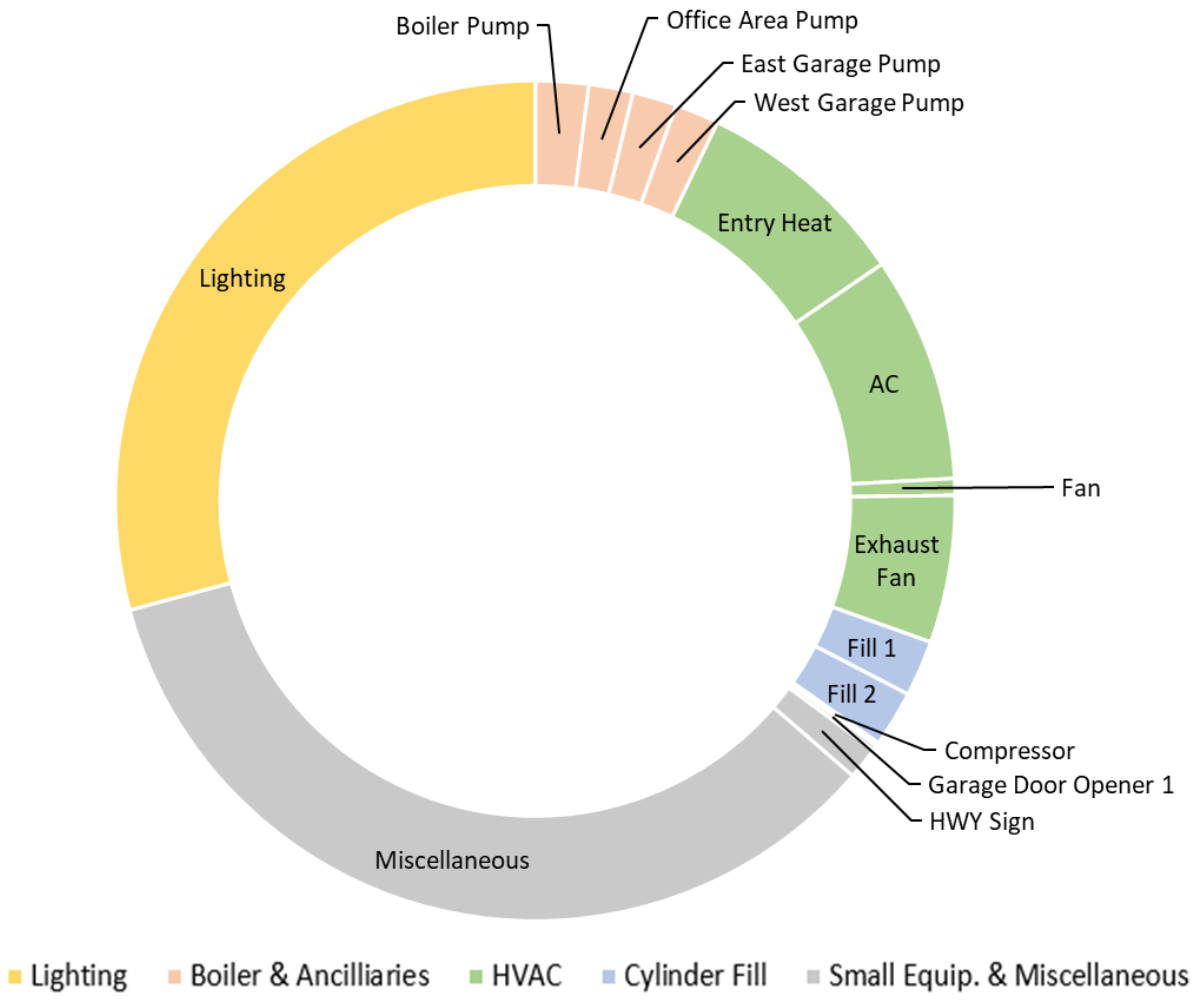

Figure 24: Fire Hall - Electricity End-Use Breakdown

Electricity used for lighting and miscellaneous loads (plug loads, equipment etc.) accounts for a large majority of building electricity use. Lighting throughout the Fire Hall is done with LEDs, and the high proportion of lighting and miscellaneous electricity use is a reflection of how efficient the building is as a whole rather than poor performance of those systems.

9.5 Energy Conservation Measures

9.5.1 Building Envelope

The building envelope of the Fire Hall is quite new with little room for cost-effective improvement expected, as such no building envelope measures are recommended for the Fire Hall.

9.5.2 Domestic Hot Water

Domestic hot water at the Fire Hall is provided by one Propane heater located in the Utility Room. Pertinent technical details gathered from the domestic hot water heater's nameplates is provided below:

Manufacturer	AO Smith
Model No.	BTX-100 141
Max. Input	100,000 BTUH
Tank Capacity	50 gallons
Location	Utility Room
Energy Source	Propane
Nameplate Efficiency	96%

Table 46: Fire Hall - Domestic Hot Water Heater Nameplate Information

The unit is a condensing model, has a high combustion efficiency, and is very new. While it is efficient, energy consumption could be reduced by switching to a heat pump hot water heater. Economics for this measure is as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)	Incremental Cost ($)	Incremental Payback (yrs)
1	DHW Heat Pump Upgrade	- 1,605	5,852	$ 251	$ 6,495	25.8	$ 1,750	7.0

Table 47: Fire Hall - DHW Heat Pump Upgrade Project Economics

Upgrading the existing hot water heater to a heat pump model has a long payback, however the incremental cost and payback is more reasonable. This project could either be considered prior to end-of-life or actioned as a replacement when the heater reaches end of life.

9.5.3 Lighting

Lighting at the Fire Hall is accomplished through the use of LED lights, and as a result, lighting systems are already highly efficient.

It was noted that lights were generally switched off in areas that were unoccupied, however there are areas of the building where lighting could be accidentally left on when unoccupied. It is expected that targeted occupancy sensor installation could provide some energy savings. Economics for this measure are as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
2	Lighting Occupancy Sensors	104	$ 19	$ 1,188	61.0

Table 48: Fire Hall - Lighting Project Economics

The economics above considers sensors for nine rooms, and based on the quantity and simplicity assumes that consumer-grade sensors will be viable and can be installed by Township staff.

9.5.4 HVAC

The Fire Hall's major HVAC units are all located in the Utility Room and in the Main Hall. The large majority of heating demand is serviced through the propane fired boiler and furnace with some resistive heating and radiant heaters. The following table provides details on these assets, including the stated "area served" for each:

Asset ID	Area Served	Description	Heat Source	Heating Input Capacity (BTUH)	Cooling Output	Unit Efficiency
Furnace	Office	Major HVAC Unit	Propane	100,000	Incl. w AC	96%
Boiler	Full Building	Major HVAC Unit	Propane	200,000	N/A	92.5%
Rad. Tube 1	Main Hall	Radiant Tube	Propane	62,500 (Est.)	N/A	80% (Est.)
Rad. Tube 2	Main Hall	Radiant Tube	Propane	62,500 (Est.)	N/A	80% (Est.)
Entry Heat	Entrance	Resistance Heater	Electric	Not Observed	N/A	N/A
AC	Office	Air Conditioning	N/A	None	3.5 Ton	13 SEER2

Table 49: Fire Hall – HVAC Unit Summary & Areas Served

Since the Fire Hall is so new, the HVAC equipment is fit for purpose, in good working shape, and units are high efficiency. It was noted during the site visit that most of the thermostats were modern, programmable units and feedback from site staff indicated that they are programmed with setback during unoccupied hours. It was however noted that there were five thermostats controlling the radiant heater and heat supply to some areas that were non-programmable. Additionally, the air conditioning unit tied into the furnace located in the utility room is efficient but could be replaced at its end of life with a heat pump which can offset some of the propane required by the furnace. A summary of these measures is as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
3	Replace Remaining Non-Programmable Thermostats	482	7,597	$ 809	$ 2,500	3.1
4	AC Heat Pump Upgrade	- 4,034	12,476	$ 421	$ 20,000	47.5

Table 50: Fire Hall - Air Handling Project Economics

Replacement of non-programmable thermostats budget allows for five modern smart thermostats with a budget allocated for installation. The AC heat pump upgrade cost is budgetary and should be re-evaluated when the unit is approaching its end-of-life.

10. Kinmount Road Shed Energy Audit

10.1 Facility Overview

The Kinmount Road Shed is a steel shed used for vehicle and equipment storage for municipal operations. Kinmount Road Shed has an indoor floor area of roughly 3,500 ft^2 and is typically open from 8:30 AM to 4:30 PM, 5 days per week.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 3,520 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	40,981	12	11.6
Propane	121,885	27	34.6
Totals	**162,866**	**28**	**46.3**

Table 51: Kinmount Road Shed - Analysis Period Utility Consumption & Intensity Data

In total, the building equates to about 5.3% of the Township's total annual energy consumption.

10.2 Historical Energy Performance

The following table demonstrates the Kinmount Road Shed's utility consumption (electricity and propane usage), carbon emissions (Scope 1 & Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	21,300	40,981	-92%
Propane (kWh)	164,469	121,884	26%
Total Energy (kWh)	185,769	162,865	12%
Building Area (ft^2)	3,520	3,520	0%
Carbon Emissions (tCO2e)	36	28	24%
Intensity (kWh/ft^2)	**53**	**46**	**12%**

Table 52: Kinmount Road Shed - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have decreased roughly 12% from the baseline period while facility area remained the same, while electricity consumption almost double compared to 2018, the propane consumption decreased 25%, yielding a net intensity decrease of approximately 12% between these periods.

10.3 Energy Benchmark Comparison

Kinmount Road Shed has been classified as “Repair Services (Vehicle, Shoe, Locksmith, etc.)” with respect to Energy Star’s Canadian National Median Energy Use Intensity (EUI)[6] reference table. The following table provides a comparison of the building’s actual EUI against the August 2023 Energy Star “Site” EUI reference value for this facility classification:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Services / Repair Services *(Broad Category)* Vehicle, Shoe, Locksmith, etc. *(Primary Function – Further Breakdown)*	0.92	1.8	95%

Table 53: Kinmount Road Shed - Facility Performance Comparison vs. Energy Star Site Reference EUI

The above benchmark comparison can be used as a rough analysis tool to assess building performance and the potential for improvement, however it should be noted that unique building constraints and intricacies may exist which make this comparative analysis less valid. It appears that the Kinmount Road Shed consumes almost 2 times as much energy per unit area compared to the chosen Energy Star reference value (or a variance of 95%). This potentially indicates that there are significant opportunities for energy performance improvement.

[6] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

10.4 Utility Consumption Review

10.4.1 Propane

Propane consumption at Kinmount Road Shed was roughly, 122,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed propane consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

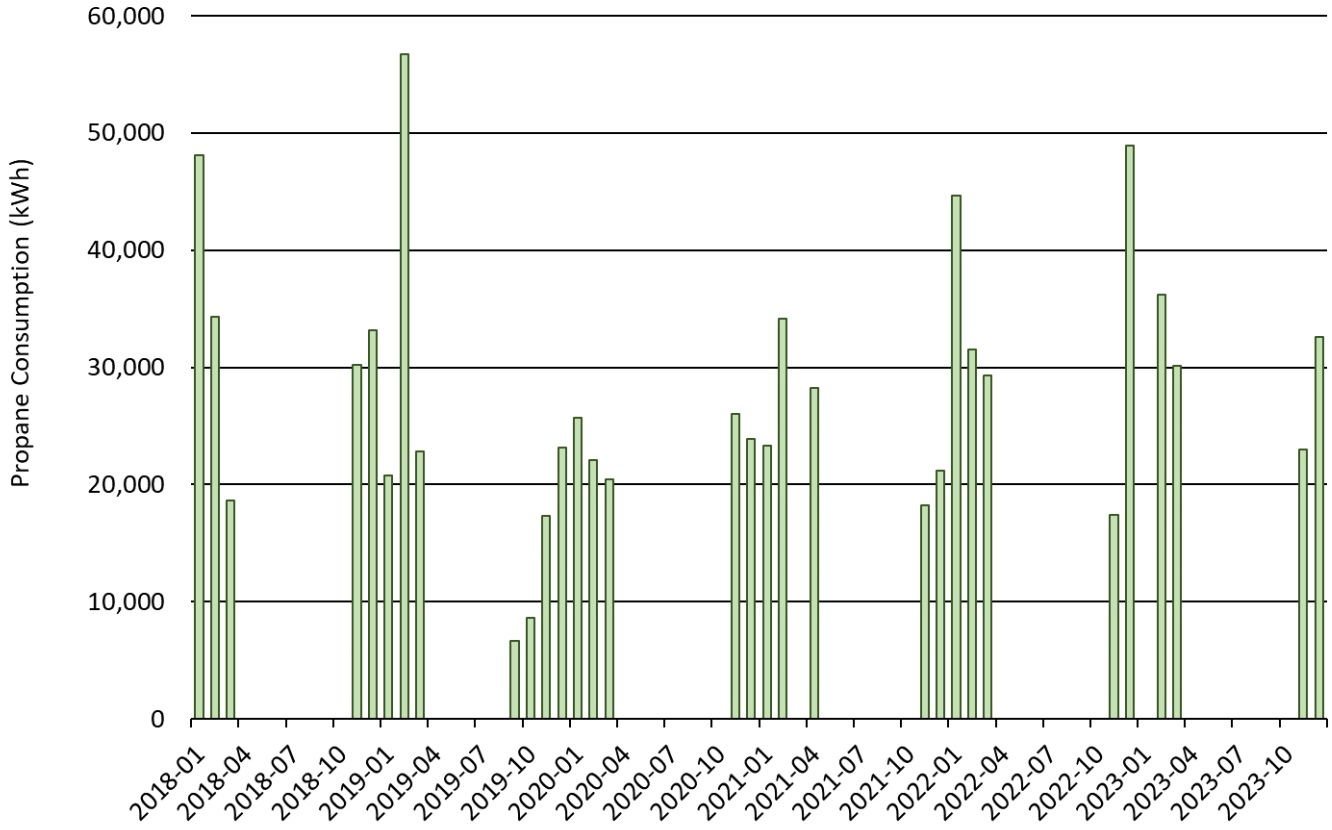

Figure 25: Kinmount Road Shed - Propane Consumption, January 2018 to December 2023

The above trend appears to show some weather-driven variance, which is generally expected given that the location's primary propane end-users are space heating related.

A site visit was undertaken in May 2024 to identify all propane consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's propane consuming assets:

Asset ID	Description	Location	Maximum Prop. Input (BTUH)	Maximum Prop. Output (BTUH)	Nameplate Efficiency
F1	Furnace	Storage	120,000	114,000	95.0%
R1	Radiant Tube 1	Main Area	100,000	80,000	80.0%
R2	Radiant Tube 2	Main Area	100,000	80,000	80.0%
R3	Radiant Tube 3	Main Area	100,000	80,000	80.0%

Table 54: Kinmount Road Shed - Propane Asset List

One condensing propane-fired Furnace is located in the storage room, and three radiant tubes were identified in the main area of the shed.

Nameplate data gathered from all propane consuming assets was combined with estimates of annual hours and asset loading to develop an estimated propane end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

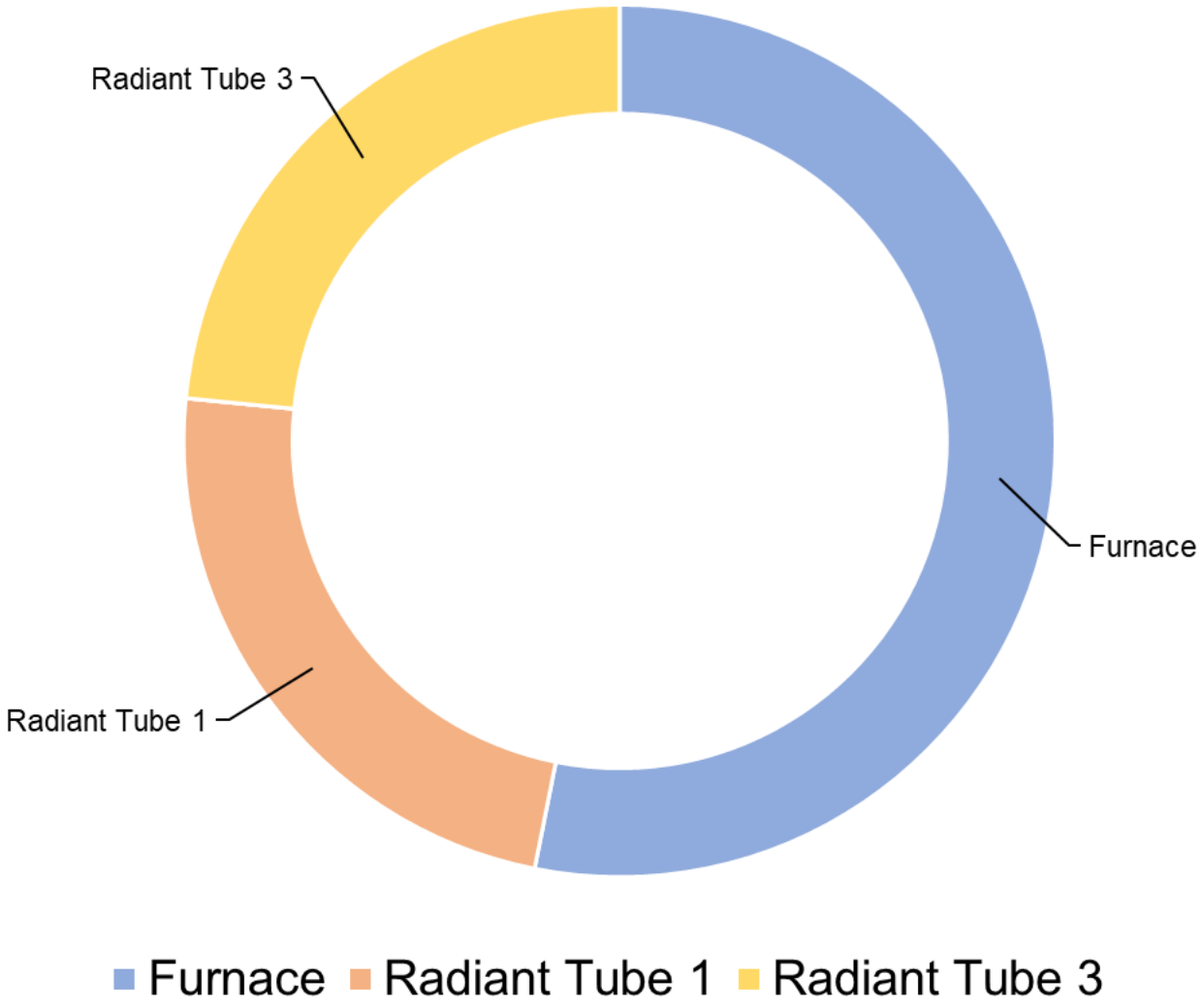

Figure 26: Kinmount Road Shed - Estimated Propane End-Use Breakdown

Propane used by the location's furnace is estimated to account for roughly 53% of total site propane consumption, while the remaining 47% is equally distributed between two of the 3 radiant tube heaters. Radiant Heater 2 is not currently operational. No other propane-consuming assets were identified.

10.4.2 Electricity

Electricity consumption at Kinmount Road Shed was roughly 41,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

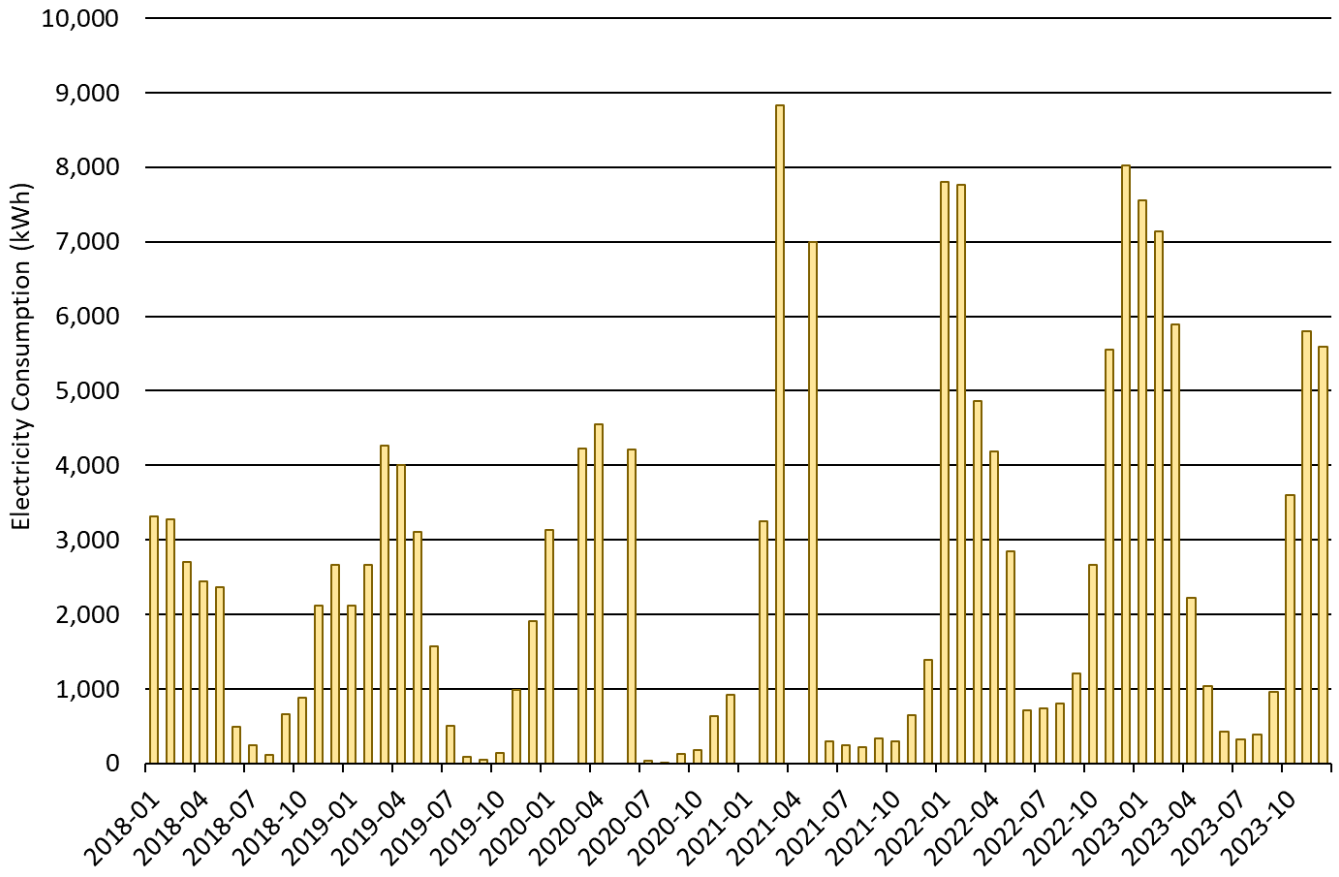

Figure 27: Kinmount Road Shed - Electricity Consumption, January 2018 to December 2023

The electricity usage trend shows a close relationship with heat demand; this is likely due to the hot water heater and baseboard heaters in the upstairs break room being electrically-fed.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity consuming assets:

Asset ID	Description	Location	Size (kW)
Furnace 1	Furnace	Storage	1
DHW	Domestic water heater	Utility Room	6
Baseboard Heaters	Resistive Heaters	Upstairs Breakroom	N/A

Table 55: Kinmount Road Shed - Electricity Asset List

Nameplate data gathered from all electricity consuming assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

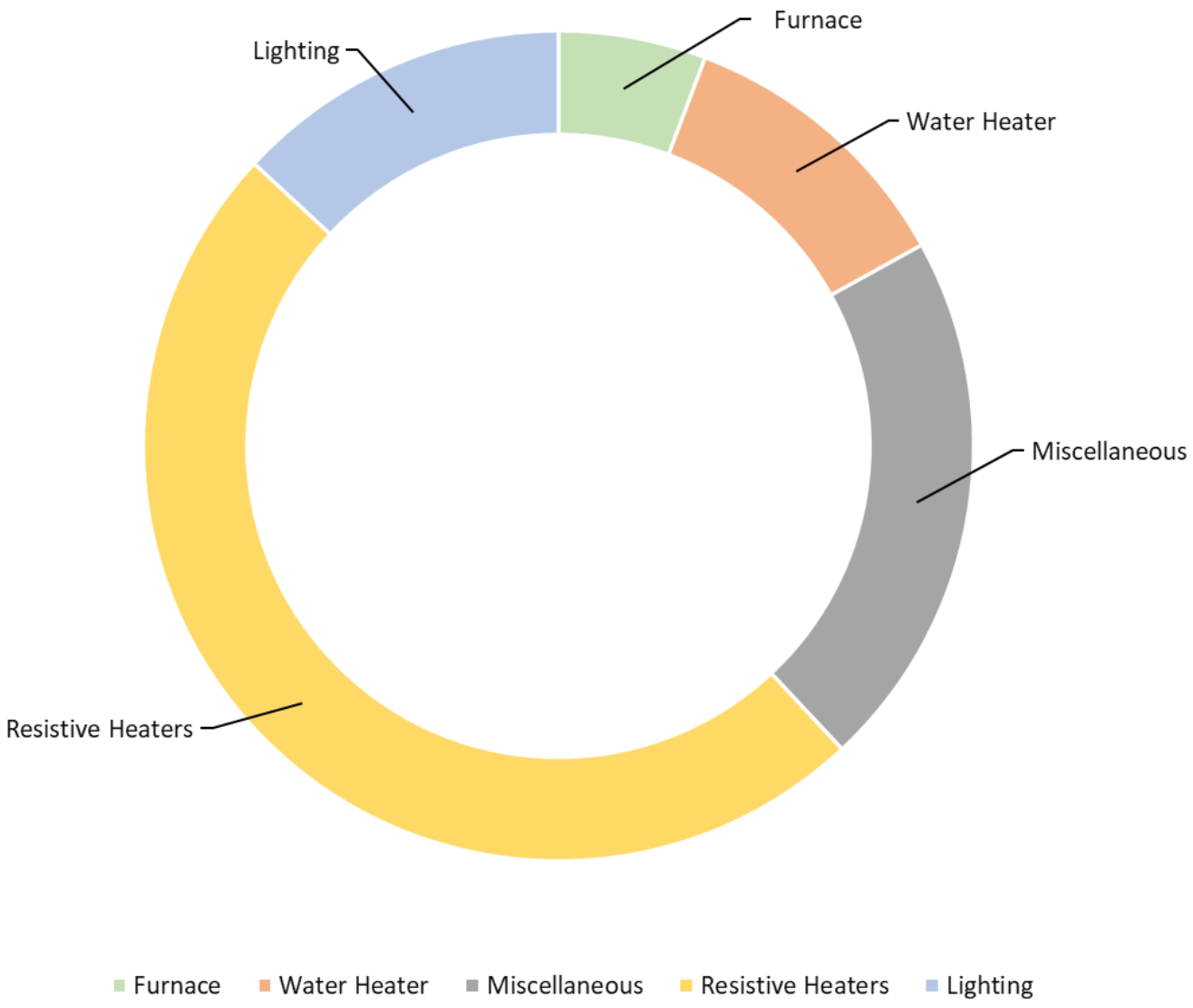

Figure 28: Kinmount Road Shed - Electricity End-Use Breakdown

Electricity required for space heating is modelled to account for roughly 50% of total site electricity consumption, with another 13% allocated to lighting.

10.5 Energy Conservation Measures

10.5.1 Building Envelope

During a site survey performed in May 2024, it was noted that the building envelope was in need of improvement in a few key areas. The doors of the Road Shed were damaged and had significant gaps with the door frame allowing for significant loss of heat to the outdoors in winter time. Additionally, the walls appeared to have some insulation in certain areas, and be lacking in significant insulation in others. A building R-Value of around 7 was estimated based on building size, heat demand, weather, and building construction and era. Details for projects to address these two aspects of the building envelope are included in the following table:

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Replace Doors	1,044	3,622	$ 557	$ 12,000	21.5
2	Insulate Building Envelope	9,145	31,739	$ 4,881	$ 26,717	5.5

Table 56: Kinmount Road Shed - Building Envelope Measure Project Economics

Door replacement shows a poor payback from an energy standpoint, however based on the condition of the doors should be pursued for non-energy related reasons. Building insulation demonstrates a more attractive payback despite a larger capital investment. Both projects are recommended for consideration.

10.5.2 Domestic Hot Water

Domestic hot water at the Kinmount Road Shed is provided by one electric heater located on the ground floor. Pertinent technical details gathered from the domestic hot water heater's nameplates is provided below:

Manufacturer	John Wood
Model No.	JW651665DE
Max. Input	Not Observed
Tank Capacity	65 gallons
Location	Main Floor
Energy Source	Electric
Nameplate Efficiency	N/A

Table 57: Kinmount Road Shed - Domestic Hot Water Heater Nameplate Information

The unit appears to be quite old, although it was noted that it is turned off for parts of the year. It is expected that energy leaks in the building envelop may be contributing towards energy use on the unit. The unit is likely approaching its end of life and may be due for replacement in the near future. It was additionally noted during a site visit that portions of the hot water piping were uninsulated.

Economics to insulate the hot water lines and to replace the heat pump at end-of-life with a heat pump model are as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
3	Insulate Hot Water Piping	141	$ 27	$ 37	1.4
4	DHW Heat Pump Upgrade	1,596	$ 300	$ 6,495	21.6

Table 58: Kinmount Road Shed - DHW Project Economics

Note that the long payback on the heat pump model replacement is caused by the low expected annual operating hours.

10.5.3 Lighting

Outdoor lighting at the Kinmount Road Shed has been replaced with LEDs, however it appeared that the lighting indoors is still fluorescent. Replacement is recommended with the following economics:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
5	Lighting Replacement	1,223	$ 230	$ 335	1.5

Table 59: Kinmount Road Shed - Lighting Replacement Project Economics

Costing allows for replacement of ~42 bulbs with LED swap-in bulbs.

10.5.4 HVAC

HVAC at the Kinmount Road Shed is serviced by a furnace and two radiant tube heaters, along with resistive heaters in the upstairs break room. There is a third radiant tube heater that is currently not operating. A list of major HVAC assets is included in the following table:

Asset ID	Area Served	Heat Source	Heating Input Capacity	Unit Efficiency
Furnace	Main Area	Propane	120,000 BTUH	95%
Radiant Tube 1	Main Area	Propane	100,000 BTUH (Est.)	80% (Est.)
Radiant Tube 2	Main Area	Propane	(not in service)	80% (Est.)
Radiant Tube 3	Main Area	Propane	100,000 BTUH (Est.)	80% (Est.)
Resistive Heaters	Breakroom	Electricity	N/A	N/A

Table 60: Kinmount Road Shed - HVAC Assets

Based on the potential savings from building insulation, it is recommended to re-evaluate the buildings energy performance after insulation has been implemented and then determine if HVAC projects are warranted.

10.5.5 Other Measures

Due to structural concerns with the upstairs breakroom, it is currently not in use. A portable has been provided for use by Township staff which requires additional heating to maintain comfort. It is recommended that the break room be assessed for feasibility to be re-opened. Energy savings can be achieved by closing the temporary break room if it is no longer needed, but these have not been quantified at this time.

11. Lutterworth Water Shed Energy Audit

11.1 Facility Overview

The Lutterworth Water Shed (Lutterworth Water) is a small fibreglass shed used for water treatment processes for the Township. Lutterworth Water has an indoor floor area of 323 ft^2 and is typically running 24 hours a day, 7 days per week.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 323 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	28,219	1	87
Totals	**28,219**	**1**	**87**

Table 61: Lutterworth Water - Analysis Period Utility Consumption & Intensity Data

In total equates to about 0.9% of the Township's total annual energy use.

11.2 Historical Energy Performance

The following table demonstrates Lutterworth Water's utility consumption (electricity usage only), carbon emissions (Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	29,208	28,219	3.4%
Propane (kWh)	-	-	N/A
Total Energy (kWh)	29,208	28,219	3.4%
Building Area (m^2)	323	323	0.0%
Carbon Emissions (tCO2e)	1	1	3.4%
Intensity (kWh/m^2)	**90.5**	**87.4**	**3.4%**

Table 62: Lutterworth Water - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have decreased roughly 3.4% from the baseline period while facility area remained the same, yielding a net intensity decrease of approximately 3.4% between these periods.

11.3 Energy Benchmark Comparison

Lutterworth Water was not able to be classified in respect to Energy Star's Canadian National Median Energy Use Intensity (EUI)[7] reference table. The following table provides the building's actual EUI for reference:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Not Identified	N/A	3.39	N/A

Table 63: Lutterworth Water - Facility Performance Comparison vs. Energy Star Site Reference EUI

[7] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

11.4 Utility Consumption Review

11.4.1 Electricity

Electricity consumption at Lutterworth Water was roughly 29,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

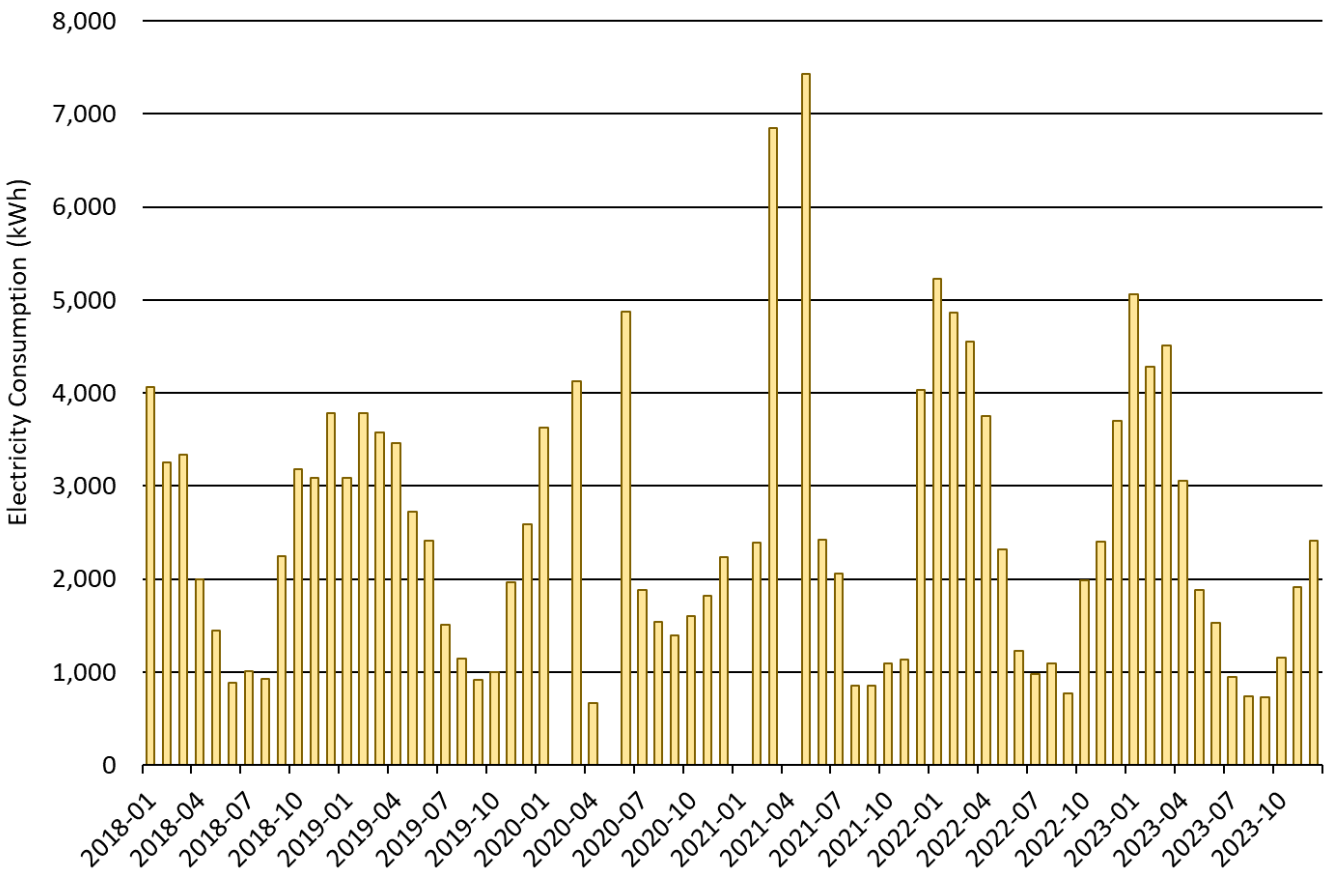

Figure 29: Lutterworth Water - Electricity Consumption, January 2018 to December 2023

The above trend appears to vary strongly with the seasons, which can be explained by the building's relative lack of insulation and the use of electric resistive heating to maintain temperature.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity consuming assets:

Asset ID	Description	Location
Well 1	Transmitter	Main
Well 2	Transmitter	Main
MP1	Pre Filter Chlorine	Main
MP2	Pre Filter Chlorine	Main
UH-1	Unit Heater	Main
UH-2	Unit Heater	Main
PW1	Pump Well	Main
PW2	Pump Well	Main
EF-1	Exhaust Fan	Main

Table 64: Lutterworth Water - Electricity Asset List

The site contains a number of small pumps, transmitters, and filters with the main assets being two unit heaters, and two well pumps.

Nameplate data gathered from all electrical assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

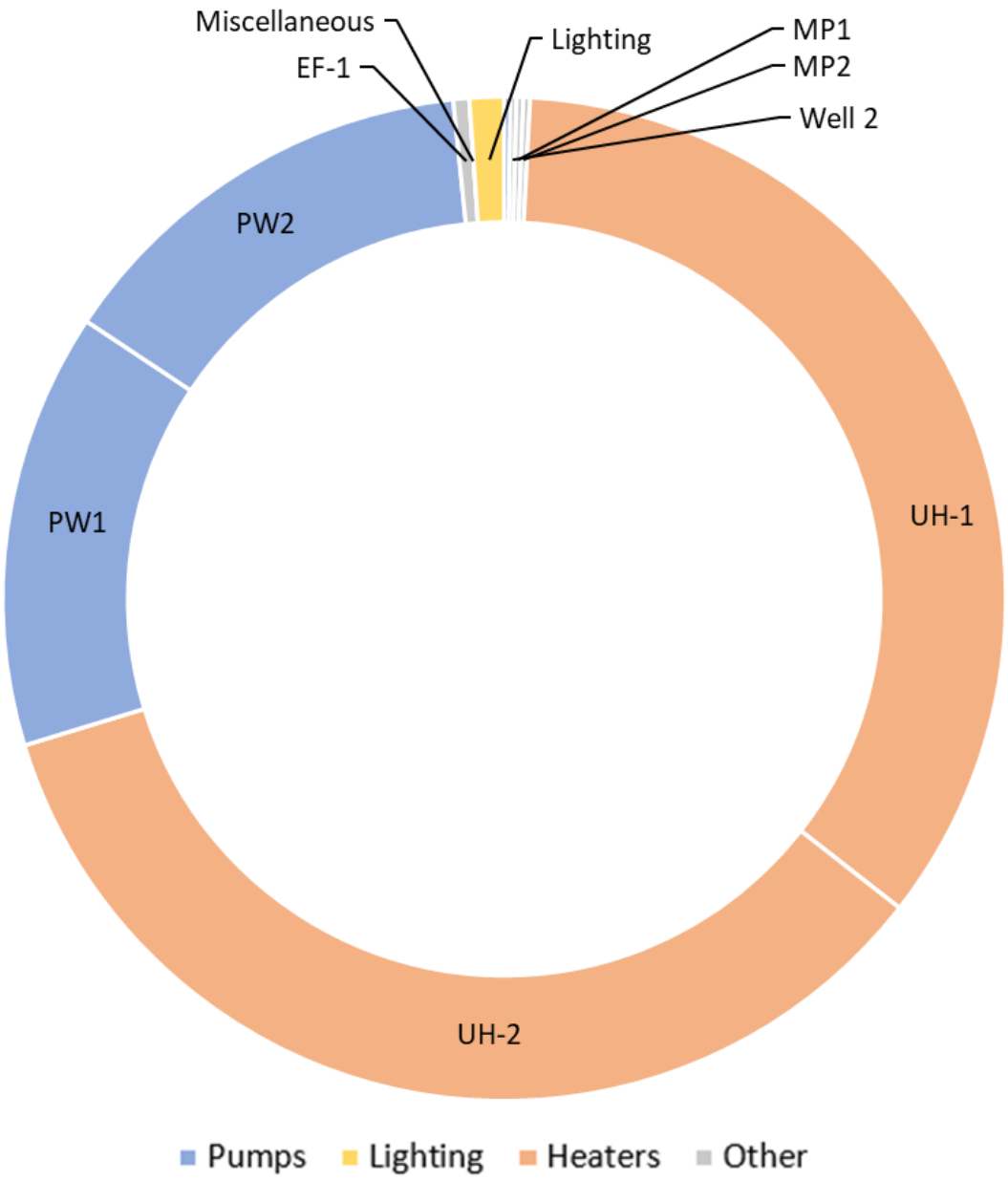

Figure 30: Lutterworth Water - Electricity End-Use Breakdown

Electricity required for space heating is estimated to account for ~70% of electricity use, with the well pumps accounting for the remaining 28%.

11.5 Energy Conservation Measures

11.5.1 Building Envelope

A survey of the Lutterworth Water facility was performed indicating that there was minimal to no insulation present, however the exterior was generally in good condition. An analysis of electricity and weather data was performed to estimate heat loss from the building and assess potential savings. An expected R-value of 4 was generated as prediction of the current effective thermal resistance of the building. It is suggested that the building be insulated to R20; quotes were requested and received yielding the following project business case:

ID#	Measure Description	Electricity Savings (kWh/yr)	Total Cost Savings ($/yr)	Total Capital Cost ($)	Payback (yrs)
1	Lutterworth Water Insulation - R20	8,336	$ 1,567	$ 2,428	1.5

Table 65: Lutterworth Water - Insulation Project Economics

The economics for this project indicate a reasonable payback and moderate electricity savings relative to the building's consumption. As such, it is recommended this measure be considered for implementation.

11.5.2 Lighting

Lutterworth Water already utilizes LEDs for its lighting both indoors and outdoors. In addition building occupancy is fairly low so the amount of light used is minor compared with other buildings. The details for installation of an occupancy sensor to control the lights is as follows:

ID#	Measure Description	Electricity Savings (kWh/yr)	Total Cost Savings ($/yr)	Total Capital Cost ($)	Payback (yrs)
2	Install Lighting Occupancy Sensor	28.8	$ 5	$ 132	24

Table 66: Lutterworth Water - Lighting Occupancy Sensor Project Economics

The economics reflect poorly on the project, however it is still suggested for consideration since the capital cost is quite low, and the infrequent and sporadic building occupancy means that the lights being left on a single time can drastically change the attractiveness of the project.

12. Sewer Plant Energy Audit

12.1 Facility Overview

The Wastewater Treatment Plant (Sewer Plant) is a facility for receiving, treating and processing sewage generated by the residential and commercial sources within the Township of Minden Hills .The Sewer Plant has a combined indoor floor area of roughly 2,400 ft^2 and is typically operating 24 hours per day, 7 days per week.

Total building utility consumption data has been gathered from utility data for the 12-month period covering January 1st, 2023 to December 31st, 2023. The following table provides utility consumption and related carbon emissions and calculated intensity data for this period, using an occupied building area of 2,422 ft^2.

Utility	Total Consumption (kWh)	Carbon Emissions (tCO2e)	Intensity (kWh/ft^2)
Electricity	285,522	8	118
Totals	**285,522**	**8**	**118**

Table 67: Sewer Plant - Analysis Period Utility Consumption & Intensity Data

Annual energy use at the location equates to about 8.8% of the Township's total annual energy use.

12.2 Historical Energy Performance

The following table demonstrates the Sewer Plant's utility consumption (electricity usage only), carbon emissions (Scope 2 only), and energy intensity from the Baseline Period (2018) to the Analysis Period (2023):

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	251,760	285,522	-13.4%
Propane (kWh)	-	-	-
Total Energy (kWh)	251,760	285,522	-13.4%
Building Area (ft^2)	2,422	2,422	0.0%
Carbon Emissions (tCO2e)	7	8	-13.4%
Intensity (kWh/ft^2)	**104.0**	**117.9**	**-13.4%**

Table 68: Sewer Plant - Facility Utility Performance vs. Baseline

In total, energy consumption appears to have increased roughly 13% from the baseline period.

12.3 Energy Benchmark Comparison

The Sewer Plant was not able to be classified in respect to Energy Star's Canadian National Median Energy Use Intensity (EUI)[8] reference table. The following table provides the building's actual EUI for reference:

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Not Identified	N/A	4.57	N/A

Table 69: Sewer Plant - Facility Performance Comparison vs. Energy Star Site Reference EUI

[8] https://portfoliomanager.energystar.gov/pdf/reference/Canadian%20National%20Median%20Table.pdf

12.4 Utility Consumption Review

12.4.1 Electricity

Electricity consumption at the Sewer Plant was roughly 285,000 kWh for the period covering January 1st, 2023 to December 31st, 2023. Billed electricity consumption data is available for the 5-year period covering January 1st, 2018 to December 31st, 2023; the following chart demonstrates this data in monthly resolution:

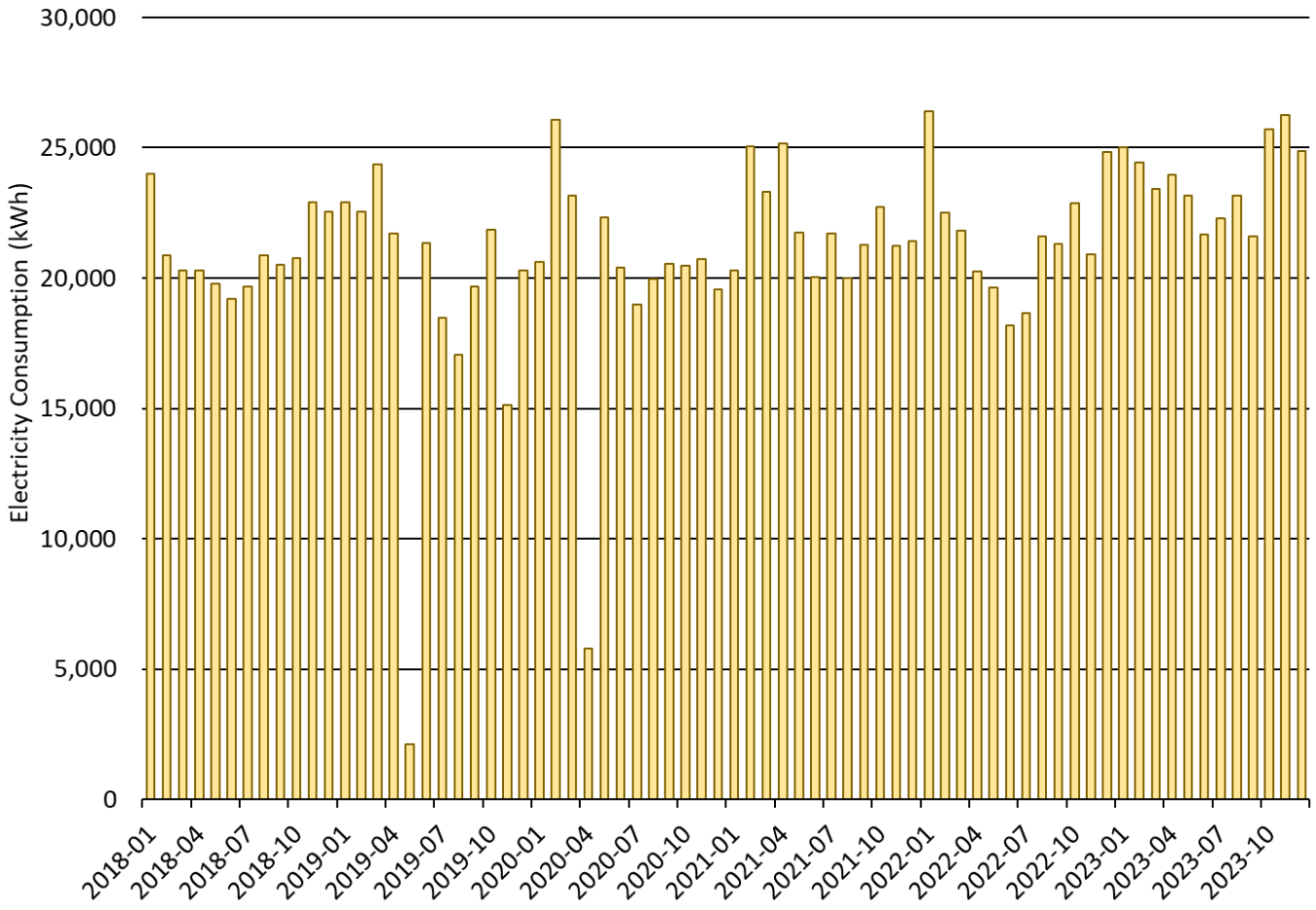

Figure 31: Sewer Plant - Building Electricity Consumption, January 2018 to December 2023

The above trend appears to be relatively steady with some seasonal variation observed, likely to service the facility's electricity supplied space heating.

A site visit was undertaken in May 2024 to identify all major electricity consuming assets on site and observe their operation. The following table summarizes high-level nameplate information gathered from the site's major electricity consuming assets:

Asset ID	Description	Location
Filter Blower 1	Filter Blower	Basement Motor Room
Filter Blower 2	Filter Blower	Basement Motor Room
DHW	DHW	Basement
Wall AC	Wall-Mounted AC Unit	Lunchroom
Outdoor AC	AC Unit	Outside
P1	Pump	Treatment Room
P2	Pump	Treatment Room
P3	Pump	Treatment Room
Fan	Fan	Treatment Room
UV	UV System	Treatment Room
Pump Sludge Arms	Pump Sludge Arms	Outdoor Sludge Treatment
Grinder	Sludge Grinder	Outdoor Sludge Treatment
Distributed Resistance Heaters	Filter Blower	Basement Motor Room
Exhaust Fan	Filter Blower	Basement Motor Room

Table 70: Sewer Plant - Electricity Asset List

The largest assets by size are the two filter blowers that serve to aerate the sludge during treatment. While large, both units are equipped with VFDs and spot data collected at the time of the visit indicated that they are lightly loaded, taking advantage of affinity laws and allowing the units to serve their end-use demands with reduced electricity draw.

Nameplate data gathered from all electrical assets was combined with estimates of annual hours and asset loading to develop an estimated electricity end-use balance for the building. A summary of this balance is provided below, broken out by asset grouping:

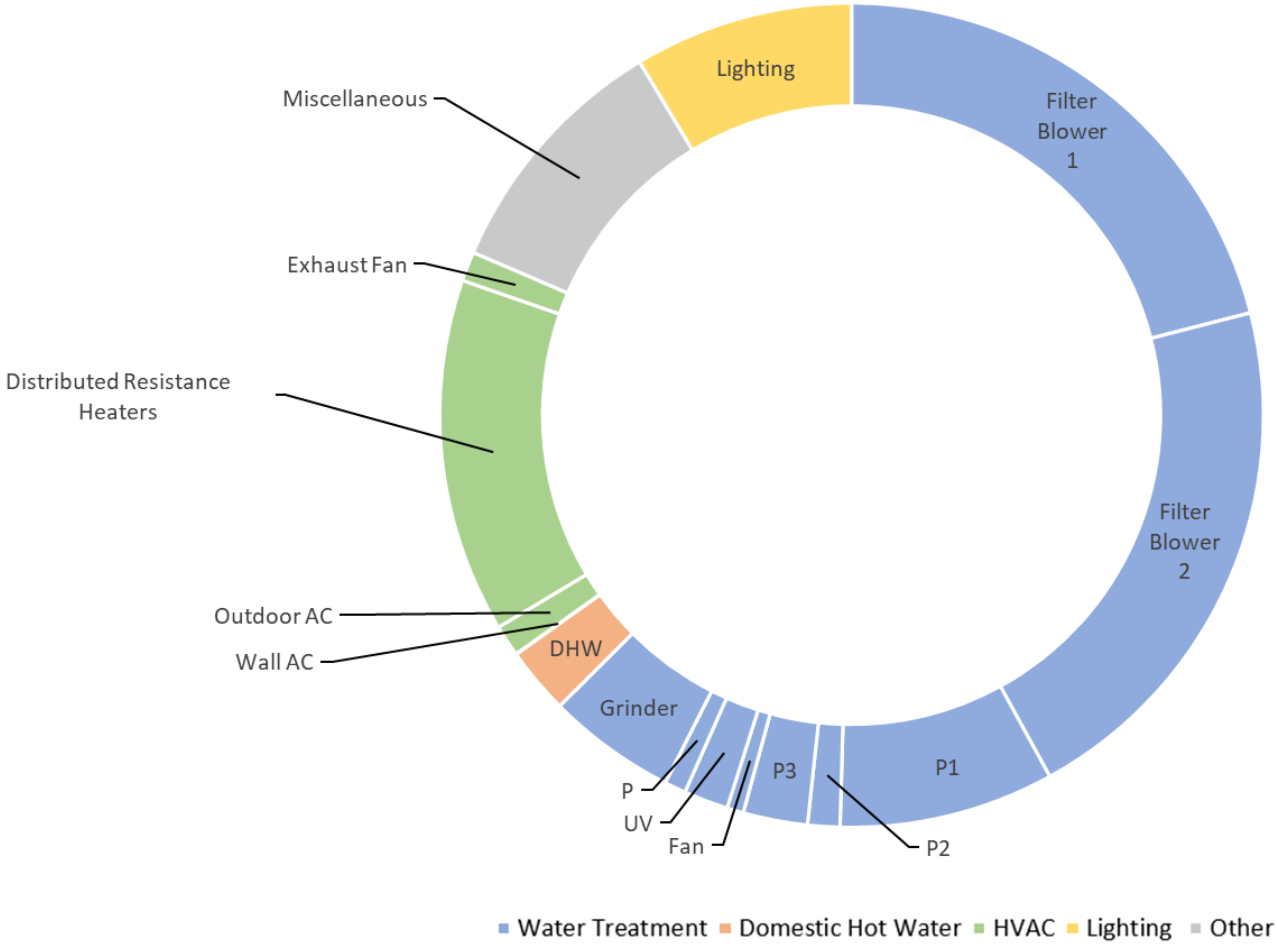

Figure 32: Sewer Plant - Electricity End-Use Breakdown

Electricity required for sewage treatment is estimated to account for ~63% of site electricity usage with HVAC accounting for the next largest share at 16%.

12.5 Energy Conservation Measures

12.5.1 Building Envelope

The building envelope of the Sewer Plant is in good condition and wall thickness suggests the building is insulated. It is anticipated that there is limited room for cost-effective improvement, as such no building envelope measures have been recommended for the Sewer Plant.

12.5.2 Domestic Hot Water

Domestic hot water at the Sewer Plant is provided by one electric heater located in the basement. Pertinent technical details gathered from the domestic hot water heater's nameplates is provided below:

Manufacturer	Rheem
Model No.	PR0410T
Max. Input	3,000 W
Tank Capacity	46 gallons
Location	Utility Room
Energy Source	Electricity
Nameplate Efficiency	N/A

Table 71: Sewer Plant - Domestic Hot Water Heater Nameplate Information

The unit appears to be somewhat old but is in good working order. While the unit is working, energy consumption could be reduced by switching to a heat pump hot water heater. Economics for this measure is as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	DHW Heat Pump Upgrade	4,380	$ 823	$ 5,299	6.4

Table 72: Sewer Plant - DHW Heat Pump Upgrade Economics

Upgrading the existing hot water heater to a heat pump model has a moderate payback, and the unit cost will likely be reasonable compared with like-for-like replacement. This measure is appropriate for consideration at end of life but is also suitable to be actioned in advance. This had not been included in the recommended actions by the Township in the next ECDMP reporting window, it is assumed that it will be considered at end of equipment life.

12.5.3 Lighting

Lighting in the Sewer Plant is serviced primarily by fluorescent bulbs with some LEDs on the exterior of the building. During the site audit it was noted that the treatment area has a significant number of light fixtures, however lights are typically kept off when it is sufficiently bright outside as the room has large windows and several skylights that provide natural lighting to the area.

It was noted that lights were generally switched off in areas that were unoccupied, however there are significant areas of the building where lighting could be accidentally left on when unoccupied. It is expected that targeted occupancy sensor installation could provide some energy savings. Economics for LED replacement, and lighting occupancy sensor installation is as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
2	Lighting Occupancy Sensors	1,407	$ 265	$ 1,716	6.5
3	Lighting Replacement	9,427	$ 1,772	$ 874	0.5

Table 73: Sewer Plant - Lighting Project Economics

LED Lighting replacement accounts for replacement of ~96 bulbs with swap-in LED bulbs without replacement of the light fixture. It is assumed this is suitable based on LED swap-ins at other sites. This project can be actioned as existing bulbs burn out and need to be replaced. In the case that ballasts are failing on existing fixtures, full fixture replacement should be considered as an alternative.

Proposed occupancy controls are for the installation of ~13 sensors spread throughout the building and assumes installation by Township staff. These measures are recommended for consideration.

12.5.4 HVAC

The Sewer Plant's HVAC needs are met primarily through electric resistive heaters including electric baseboard / cabinet heaters and a duct heater. Outdoor air is introduced to the building by creating negative pressurization using exhaust fans, negatively pressurizing the building. There is some cooling demand in the building that is served by one Mitsubishi mini split unit located in the office. The following table provides details on these assets, including the stated "area served" for each:

Asset ID	Area Served	Description	Heat Source	Cooling Output	Unit Efficiency
AC	Office	Mini Split AC	N/A	1.5 Ton	19.2 SEER
Distributed Resistance Heaters	Full Building	N/A	Electric Resistive Heat	N/A	N/A

Table 74: Sewer Plant – HVAC Unit Summary & Areas Served

The Mitsubishi mini split is in good working condition and appears to be relatively efficient. The distributed resistive heaters are in working condition and are generally efficient, however they are controlled via a knob located on the heater. This makes unoccupied hour setback unachievable in the current operating state.

The Mitsubishi mini split can be replaced with a newer heat pump version to accommodate cooling demand while providing space heating to a significant portion of the main floor. This would allow the existing resistive heaters to be turned down and scheduling to be performed on the new mini split letting the baseboards service setback periods and act as emergency backup heat during extreme cold periods. Additional units, or a larger unit with multiple heads could be used to offset additional. A summary of these measures is as follows:

ID#	Measure Description	Electricity Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
4	AC Heat Pump Replacement	5,167	$ 971	$ 7,190	7.4
5	Supplement Baseboards w Additional Heat Pump	6,240	$ 1,173	$ 16,880	14.4

Table 75: Sewer Plant – HVAC Project Economics

Both measures have moderate to long paybacks, however the cost on the AC heat pump replacement may still make the measure feasible for implementation.

13. Remote Assessment Sites

Common measures identified at the Category 1 and Category 2 audit sites that are expected to be applicable to any remotely assessed facilities include:

- Building Insulation Updates to ~R20 (for poorly insulated buildings)
- LED Lighting Replacement for indoor lighting
- Lighting Occupancy Sensor installation
- Thermostat Replacement (where programmable thermostats are not currently installed)
- Domestic Hot Water – Heat pump model upgrades
- Propane fired HVAC replacement with condensing units
- Heating – Heat Pump Conversion (for electric and propane heating)

The suitability of these measures for implementation was assessed based on building age, energy intensity, utility usage patterns, and size. For each measure, project costs and savings have been estimated without direct observation of the site or existing assets to provide high level estimates of project economics.

One notable exception is the Minden Museum for which a walkthrough was performed due to its proximity to the Cultural Centre.

13.1 Communications Tower

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	6,818	4,858	-28.75%
Propane (kWh)	0	0	-
Total Energy (kWh)	6,818	4,858	-28.75%
Building Area (ft^2)	200	200	0.00%
Carbon Emissions (tCO2e)	0.18	0.13	-31.39%
Intensity (kWh/ft^2)	**34.09**	**24.29**	**-28.75%**

Table 76: Communications Tower - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
None Found	N/A	0.94	N/A

Table 77: Communications Tower - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	-	-	$ -	$ -	-
2	LED Lighting Replacement	243	-	$ 46	$ 49	1.1
3	Lighting Occupancy Sensor Installation	49	-	$ 9	$ 130	14.2
4	Thermostat Replacement & Setback	76	-	$ 14	$ 150	10.6
5	Domestic Hot Water - Heat Pump Upgrade	-	-	$ -	$ -	-
6	HVAC Condensing Unit Replacement	-	-	$ -	$ -	-
7	Heat Pump Conversion	719	-	$ 135	$ 2,000	14.8
	Subtotal	**1,086**	**-**	**$ 204**	**$ 2,329**	**11.4**

Table 78: Communications Tower - Measure Summary

13.2 Irondale Hall

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	4,270	4,072	-4.64%
Propane (kWh)	28,368	14,129	-50.19%
Total Energy (kWh)	32,638	18,201	-44.23%
Building Area (ft^2)	1,296	1,296	0.00%
Carbon Emissions (tCO2e)	6.29	3.18	-49.43%
Intensity (kWh/ft^2)	**25.2**	**14.0**	**-44.23%**

Table 79: Irondale Hall - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Social/Meeting Hall	0.86	0.54	-36.72%

Table 80: Irondale Hall - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	-	-	$ -	$ -	-
2	LED Lighting Replacement	204	-	$ 38	$ 319	8.3
3	Lighting Occupancy Sensor Installation	41	-	$ 8	$ 390	50.9
4	Thermostat Replacement & Setback	-	211	$ 19	$ 300	15.8
5	Domestic Hot Water - Heat Pump Upgrade	348	1,045	$ 160	$ 6,500	40.7
6	HVAC Condensing Unit Replacement	-	1,308	$ 118	$ 15,000	127.4
7	Heat Pump Conversion	- 3,489	11,775	$ 404	$ 25,000	61.9
	Subtotal	**- 2,896**	**14,340**	**$ 746**	**$ 47,509**	**63.7**

Table 81: Irondale Hall - Measure Summary

13.3 Lochlin Hall

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	9,763	5,427	-44.41%
Propane (kWh)	0	20,638	-
Total Energy (kWh)	26,622	26,065	-2.09%
Building Area (ft^2)	1,400	1,400	0.00%
Carbon Emissions (tCO2e)	4.81	4.64	-3.70%
Intensity (kWh/ft^2)	**19.0**	**18.6**	**-2.09%**

Table 82: Lochlin Hall - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Social/Meeting Hall	0.86	0.72	-16.11%

Table 83: Lochlin Hall - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	-	-	$ -	$ -	-
2	LED Lighting Replacement	380	-	$ 71	$ 345	4.8
3	Lighting Occupancy Sensor Installation	54	-	$ 10	$ 260	25.5
4	Thermostat Replacement & Setback	-	321	$ 29	$ 150	5.2
5	Domestic Hot Water - Heat Pump Upgrade	- 422	1,582	$ 63	$ 6,500	103.1
6	HVAC Condensing Unit Replacement	-	1,906	$ 172	$ 15,000	87.5
7	Heat Pump Conversion	- 5,082	17,150	$ 588	$ 25,000	42.5
	Subtotal	**- 5,069**	**20,959**	**$ 933**	**$ 47,255**	**50.6**

Table 84: Lochlin Hall - Measure Summary

13.4 Lutterworth Office & Road Shed

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	20,420	17,365	-14.96%
Propane (kWh)	66,155	69,039	4.36%
Total Energy (kWh)	86,575	86,404	-0.20%
Building Area (ft^2)	3,660	3,660	0.00%
Carbon Emissions (tCO2e)	17	15	-10.33%
Intensity (kWh/ft^2)	**23.7**	**23.6**	**-0.20%**

Table 85: Lutterworth Office & Road Shed - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Office* Repair Services (Vehicle, Shoe, Locksmith, etc.)	0.87 0.92	0.91	5.15%

Table 86: Lutterworth Office & Road Shed - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	87	2,762	$ 265	$ 12,500	47.2
2	LED Lighting Replacement	1,389	-	$ 261	$ 902	3.5
3	Lighting Occupancy Sensor Installation	260	-	$ 49	$ 390	8.0
4	Thermostat Replacement & Setback	-	1,074	$ 97	$ 300	3.1
5	Domestic Hot Water - Heat Pump Upgrade	- 1,411	5,292	$ 211	$ 13,000	61.6
6	HVAC Condensing Unit Replacement	-	4,462	$ 402	$ 15,000	37.4
7	Heat Pump Conversion	- 16,999	57,372	$ 1,968	$ 35,000	17.8
	Subtotal	**- 16,674**	**70,962**	**$ 3,252**	**$ 77,092**	**23.7**

Table 87: Lutterworth Office & Road Shed - Measure Summary

13.5 Minden Museum

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	23,257	17,870	-23.16%
Propane (kWh)	24,090	57,353	138.07%
Total Energy (kWh)	47,347	75,223	58.87%
Building Area (ft^2)	843	843	0.00%
Carbon Emissions (tCO2e)	5.87	12.95	120.53%
Intensity (kWh/ft^2)	**56.2**	**89.2**	**58.87%**

Table 88: Minden Museum - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Museum	0.41	3.46	743%

Table 89: Minden Museum - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Fix Outdoor Lighting Electrical	3,839	-	$ 722	$ 5,000	6.9
2	Bank Increased Setback	-	6,131	$ 597	$ 250	0.4
3	Bank Window Replacement	-	2,894	$ 282	$ 3,200	11.4
4	Bank Weatherstripping	-	482	$ 47	$ 25	0.5
5	Museum Lighting Replacement	13,500	-	$ 2,538	$ 741	0.3
6	Supplement Bank Furnace w Heat Pump	- 13,244	34,853	$ 905	$ 25,000	27.6
	Subtotal	**4,094**	**44,361**	**$ 5,090**	**$ 34,216**	**6.7**

Table 90: Minden Museum - Measure Summary

13.6 Minden Roads Shed

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	17,322	15,995	-7.66%
Propane (kWh)	14,614	88,344	504.52%
Total Energy (kWh)	119,502	104,339	-12.69%
Building Area (ft^2)	7,560	7,560	0.00%
Carbon Emissions (tCO2e)	27.28	19.65	-27.96%
Intensity (kWh/ft^2)	**15.8**	**13.8**	**-12.69%**

Table 91: Minden Roads Shed - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Repair Services (Vehicle, Shoe, Locksmith, etc.)	0.92	0.53	-41.87%

Table 92: Minden Roads Shed - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	-	-	$ -	$ -	-
2	LED Lighting Replacement	1,600	-	$ 301	$ 1,864	6.2
3	Lighting Occupancy Sensor Installation	400	-	$ 75	$ 910	12.1
4	Thermostat Replacement & Setback	-	1,375	$ 124	$ 600	4.8
5	Domestic Hot Water - Heat Pump Upgrade	- 2,936	8,807	$ 241	$ 25,000	103.9
6	HVAC Condensing Unit Replacement	-	7,158	$ 644	$100,000	155.2
7	Heat Pump Conversion	- 21,210	71,583	$ 2,455	$150,000	61.1
	Subtotal	**- 22,146**	**88,923**	**$ 3,840**	**$ 278,374**	**72.5**

Table 93: Minden Roads Shed - Measure Summary

13.7 Minden Water Plant

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	97,860	97,223	-0.65%
Propane (kWh)	0	0	-
Total Energy (kWh)	97,860	97,223	-0.65%
Building Area (ft^2)	378	378	0.00%
Carbon Emissions (tCO2e)	2.64	2.53	-4.33%
Intensity (kWh/ft^2)	**258.9**	**257.2**	**-0.65%**

Table 94: Minden Water Plant - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
None Found	N/A	9.97	N/A

Table 95: Minden Water Plant - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	10,208	-	$ 1,919	$ 5,500	2.9
2	LED Lighting Replacement	2,917	-	$ 548	$ 186	0.3
3	Lighting Occupancy Sensor Installation	486	-	$ 91	$ 130	1.4
4	Thermostat Replacement & Setback	486	-	$ 91	$ 150	1.6
5	Domestic Hot Water - Heat Pump Upgrade	-	-	$ -	$ -	-
6	HVAC Condensing Unit Replacement	-	-	$ -	$ -	-
7	Heat Pump Conversion	21,915	-	$ 4,120	$ 35,000	8.5
	Subtotal	**36,012**	**-**	**$ 6,770**	**$ 40,966**	**6.1**

Table 96: Minden Water Plant - Measure Summary

13.8 Minden Water Tower

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	24,245	24,118	-0.52%
Propane (kWh)	0	0	-
Total Energy (kWh)	24,245	24,118	-0.52%
Building Area (ft^2)	707	707	0.00%
Carbon Emissions (tCO2e)	0.65	0.63	-4.21%
Intensity (kWh/ft^2)	**34.3**	**34.1**	**-0.52%**

Table 97: Minden Water Tower - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
None Found	N/A	1.32	N/A

Table 98: Minden Water Tower - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	2,532	-	$ 476	$ 8,500	17.9
2	LED Lighting Replacement	1,206	-	$ 227	$ 349	1.5
3	Lighting Occupancy Sensor Installation	121	-	$ 23	$ 260	11.5
4	Thermostat Replacement & Setback	241	-	$ 45	$ 150	3.3
5	Domestic Hot Water - Heat Pump Upgrade	-	-	$ -	$ -	-
6	HVAC Condensing Unit Replacement	-	-	$ -	$ -	-
7	Heat Pump Conversion	4,757	-	$ 894	$ 15,000	16.8
	Subtotal	**8,857**	**-**	**$ 1,665**	**$ 24,259**	**14.6**

Table 99: Minden Water Tower - Measure Summary

13.9 Sewage Pumping Station

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	67,200	85,000	26.49%
Propane (kWh)	0	0	-
Total Energy (kWh)	67,200	85,000	26.49%
Building Area (ft^2)	278	278	0.00%
Carbon Emissions (tCO2e)	1.81	2.21	21.80%
Intensity (kWh/ft^2)	**241.7**	**305.8**	**26.49%**

Table 100: Sewage Pumping Station - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
None Found	N/A	11.85	N/A

Table 101: Sewage Pumping Station - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	4,675	-	$ 879	$ 5,500	6.3
2	LED Lighting Replacement	1,700	-	$ 320	$ 137	0.4
3	Lighting Occupancy Sensor Installation	425	-	$ 80	$ 130	1.6
4	Thermostat Replacement & Setback	425	-	$ 80	$ 150	1.9
5	Domestic Hot Water - Heat Pump Upgrade	-	-	$ -	$ -	-
6	HVAC Condensing Unit Replacement	-	-	$ -	$ -	-
7	Heat Pump Conversion	10,115	-	$ 1,902	$ 15,000	7.9
	Subtotal	**17,340**	**-**	**$ 3,260**	**$ 20,917**	**6.4**

Table 102: Sewage Pumping Station - Measure Summary

13.10 U-Links

Energy Performance

	Jan 2018 to Dec 2018 (Baseline)	Jan 2023 to Dec 2023 (Analysis)	Reduction vs. Baseline (%)
Electricity (kWh)	6,466	4,700	-27.31%
Propane (kWh)	0	0	-
Total Energy (kWh)	6,466	4,700	-27.31%
Building Area (ft^2)	370	370	0.00%
Carbon Emissions (tCO2e)	0.17	0.12	-30.00%
Intensity (kWh/ft^2)	**17.5**	**12.7**	**-27.31%**

Table 103: U-Links - Energy Performance

Energy Benchmark

Energy Star Reference Table Classification	Energy Star Site EUI (GJ/m^2)	Analysis Period Facility EUI (GJ/m^2)	EUI Variance (%)
Office*	0.87	0.49	-43.42%

Table 104: U-Links - Energy Benchmark

ECMs

ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
1	Building Envelope Insulation	-	-	$ -	$ -	-
2	LED Lighting Replacement	470	-	$ 88	$ 182	2.1
3	Lighting Occupancy Sensor Installation	71	-	$ 13	$ 130	9.8
4	Thermostat Replacement & Setback	141	-	$ 27	$ 150	5.7
5	Domestic Hot Water - Heat Pump Upgrade	-	-	$ -	$ -	-
6	HVAC Condensing Unit Replacement	-	-	$ -	$ -	-
7	Heat Pump Conversion	1,480	-	$ 278	$ 15,000	53.9
	Subtotal	**2,161**	**-**	**$ 406**	**$ 15,462**	**38.1**

Table 105: U-Links - Measure Summary

Appendix A – Facility Information

Facility Name	Operation Type	Address	Construction Year	Building Area (ft²)	Electricity (kWh)	Propane (L)	Total Energy (kWh)	Electricity Emissions (tCO2e)	Propane Emissions (tCO2e)	Total GHG Emissions (tCO2e)	EUI (GJ/m2)	E Star Ref EUI (GJ/m2)
Administration Office	Administrative offices and related facilities.	7 Milne St	2004 (major addition / rennovation)	8,680	101,469	16,376	217,601	2.8	25	28	0.97	0.87
Communications Tower	Fire stations and associated offices and facilities	2108 Scotchiine Rd		200	4,858	-	4,858	0.1	-	0	0.9	N/A
Cultural Centre/Library	Cultural facilities	176 Bobcaygeon Rd	2005	9,200	71,014	10,535	145,724	2.0	16	18	0.6	1.0
Irondale Hall	Community centres	1004 Line Drive Rd	1950	1,296	4,072	1,992	18,201	0.1	3	3	0.5	0.9
Kinmount Road Shed	Storage facilities where equip or vehicles are maintained, repaired or stored	4564 County Rd 21	1950	3,520	40,981	17,187	162,865	1.1	27	28	1.8	0.9
Lochlin Hall	Community centres	4713 Gelert Rd	1950	1,400	5,427	2,910	26,065	0.2	4	5	0.7	0.9
Lutterworth Office	Administrative offices and related facilities	11445 Hwy 35	1940	1,200	7,412	9,735	76,451	0.2	15	15	2.5	0.9
Lutterworth Road Shed	Storage facilities where equip or vehicles are maintained, repaired or stored	11445 Hwy 35	1940	2,460	9,953	-	9,953	0.3	-	0	0.2	0.9
Lutterworth Water Plant	Facilities related to the treatment of water	Conc 12 Lot 4 Lutterworth Twp		320	28,219	-	28,219	0.8	-	1	3.4	N/A
Minden Fire Hall	Fire stations and associated offices and facilities	12418 Highway 35, Minden Hills, ON, K0M 2K0	2018	7,632	35,666	9,979	106,434	1.0	15	16	0.5	0.7
Minden Museum	Cultural facilities	176 Bobcaygeon Rd	Various	843	17,870	8,087	75,223	0.5	12	13	3.5	0.4
Minden Roads Shed	Storage facilities where equipment or vehicles are maintained, repaired or stored	1987 Fleming Rd	1965	7,560	15,995	12,457	104,339	0.4	19	20	0.5	0.9
Minden Water Plant	Facilities related to the treatment of water	142 Bobcaygeon Rd		378	97,223	-	97,223	2.7	-	3	10.0	N/A
Minden Water Tower	Pumping & supply of water	2 St. Germaine St		707	24,118	-	24,118	0.7	-	1	1.3	N/A
Sewage Pumping Station	Facilities related to the treatment of sewage	27 Orde Street	1977	278	85,000	-	85,000	2.4	-	2	11.8	N/A
S.G. Nesbitt Memorial Arena	Indoor ice rinks	55 Parkside St	2020	56,400	998,752	69,300	1,490,203	28.0	107	135	1.02	1.1
U-Links	Administrative offices and related facilities.	93 Bobcaygeon Rd	1990	370	4,700	-	4,700	0.1	-	0	0.5	0.9
Waste Water Treatment Plant	Facilities related to the treatment of sewage	73 Orde St	1977	2,415	285,522	-	285,522	8.0	-	8	4.6	N/A
			Totals	**104,859**	**1,838,251**	**158,559**	**2,962,700**	**51**	**245**	**296**	**1.1**	**0.9**

Appendix B – 2019 ECDMP Measures Progress

Building	Item	No	Type	Description	Priority	Estimated Capital	Savings (Annual)	Simple ROI (years)	Completion Status
Administration Building	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	4	$3,750	$400	9	Complete
Administration Building	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	3	$200	$100	2	Incomplete
Administration Building	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	4	$1,250	$250	5	Incomplete
Administration Building	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	1	$1,000	$500	2	Complete
Administration Building	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Administration Building	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$4,000	$700	6	Incomplete
Administration Building	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$3,000	$300	10	Incomplete
Administration Building	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	3	$2,100	$175	12	Incomplete
Administration Building	Water Conservation	6.3	Automatic Equipment	Replace existing manual plumbing fixtures and washroom equipment withautomatic fixtures/equipment.	3	$2,000	$200	10	Incomplete
Administration Building	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	4	TBD	TBD		Incomplete
Administration Building	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	4	TBD	TBD		Incomplete
Administration Building	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Communications Tower	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$375	$40	9	Incomplete
Communications Tower	Building Envelope	2.1	Windows	Replace existing windows in the building to meet energy efficient fenestration requirements.	5	$1,000	$200	5	Incomplete
Communications Tower	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	5	$750	$100	8	Incomplete
Communications Tower	Building Envelope	2.4	Insulation	Provide insulation and protective exterior cladding to building envelope areas that do not have existing insulation.	5	$500	$250	2	Incomplete
Communications Tower	Building Envelope	2.6	Building Envelope Integrity	Repair damage to building envelope/structure that could have an adverse affect on energy consumption.	5	$500	$50	10	Incomplete
Communications Tower	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Cultural Centre / Library	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$1,500	$200	8	Incomplete
Cultural Centre / Library	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	3	$1,250	$250	5	Incomplete
Cultural Centre / Library	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	2	$1,250	$500	3	Complete
Cultural Centre / Library	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Cultural Centre / Library	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$2,000	$350	6	Incomplete
Cultural Centre / Library	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$1,500	$180	8	Incomplete
Cultural Centre / Library	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$2,500	$250	10	Incomplete
Cultural Centre / Library	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	4	$1,200	$100	12	Incomplete
Cultural Centre / Library	Water Conservation	6.3	Automatic Equipment	Replace existing manual plumbing fixtures and washroom equipment withautomatic fixtures/equipment.	4	$1,000	$50	20	Incomplete
Cultural Centre / Library	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	5	TBD	TBD		Incomplete
Cultural Centre / Library	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	5	TBD	TBD		Incomplete
Cultural Centre / Library	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Fire Hall	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	3	$250	$500	1	Complete
Fire Hall	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$1,600	$280	6	Incomplete
Fire Hall	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	3	$600	$50	12	Incomplete
Fire Hall	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	3	TBD	TBD		Incomplete
Fire Hall	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Irondale Hall	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$1,875	$200	9	Incomplete
Irondale Hall	Building Envelope	2.6	Building Envelope Integrity	Repair damage to building envelope/structure that could have an adverse affect on energy consumption.	2	$2,000	$200	10	Incomplete
Irondale Hall	Building Envelope	2.7	Exterior Cladding	Repair any areas of exterior cladding that are damaged and would create a potential location for energy loss.	1	$2,500	$125	20	Incomplete
Irondale Hall	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	3	$1,000	$50	20	Incomplete
Irondale Hall	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	4	$500	$100	5	Incomplete
Irondale Hall	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Irondale Hall	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$800	$140	6	Incomplete
Irondale Hall	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$1,000	$100	10	Incomplete
Irondale Hall	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	5	$600	$50	12	Incomplete
Irondale Hall	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete
Kinmount Road Shed	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$750	$80	9	Complete
Kinmount Road Shed	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	1	$1,500	$200	8	In Progress
Kinmount Road Shed	Building Envelope	2.3	Overhead Doors	Replace overhead doors and associated seals.	2	$10,000	$1,000	10	Incomplete
Kinmount Road Shed	Building Envelope	2.4	Insulation	Provide insulation and protective exterior cladding to building envelope areas that do not have existing insulation.	1	$50,000	$2,500	20	Incomplete
Kinmount Road Shed	Building Envelope	2.7	Exterior Cladding	Repair any areas of exterior cladding that are damaged and would create a potential location for energy loss.	1	$25,000	$1,500	17	Incomplete
Kinmount Road Shed	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	2	$5,000	$200	25	Incomplete
Kinmount Road Shed	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	2	$1,250	$500	3	Incomplete
Kinmount Road Shed	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Kinmount Road Shed	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$800	$140	6	Incomplete
Kinmount Road Shed	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$500	$60	8	Incomplete
Kinmount Road Shed	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$500	$50	10	Incomplete
Kinmount Road Shed	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	5	$300	$25	12	Incomplete
Kinmount Road Shed	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	4	TBD	TBD		Incomplete
Kinmount Road Shed	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	4	TBD	TBD		Incomplete
Kinmount Road Shed	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Lochlin Hall	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$3,000	$320	9	Incomplete
Lochlin Hall	Building Envelope	2.2	Doors	Replace/repair seals on exterior person doors.	3	$200	$100	2	Incomplete
Lochlin Hall	Building Envelope	2.6	Building Envelope Integrity	Repair damage to building envelope/structure that could have an adverse affect on energy consumption.	1	$2,500	$250	10	Incomplete
Lochlin Hall	Building Envelope	2.7	Exterior Cladding	Repair/repointing of any areas of masonry that are damaged and would create a source of energy loss through the building envelope.	3	$1,000	$100	10	Incomplete
Lochlin Hall	HVAC and DHW	3.1	Heating & Cooling System	Replace electric baseboard heater units with new units with controls.	4	$10,000	$500	20	Incomplete
Lochlin Hall	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	3	$1,000	$50	20	Incomplete
Lochlin Hall	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	4	$250	$50	5	Incomplete
Lochlin Hall	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Lochlin Hall	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$1,200	$210	6	Incomplete
Lochlin Hall	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$500	$60	8	Incomplete
Lochlin Hall	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$1,000	$100	10	Incomplete
Lochlin Hall	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	5	$600	$75	8	Incomplete
Lochlin Hall	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	4	TBD	TBD		Incomplete
Lochlin Hall	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	5	TBD	TBD		Incomplete
Lochlin Hall	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete
Lutterworth Office	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$750	$80	9	Incomplete
Lutterworth Office	Building Envelope	2.1	Windows	Replace existing windows in the building to meet energy efficient fenestration requirements.	2	$5,000	$1,000	5	Incomplete
Lutterworth Office	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$400	$200	2	Incomplete
Lutterworth Office	Building Envelope	2.6	Building Envelope Integrity	Repair damage to building envelope/structure that could have an adverse affect on energy consumption.	4	$500	$50	10	Incomplete
Lutterworth Office	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	3	$1,000	$50	20	Incomplete
Lutterworth Office	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	3	$500	$100	5	Incomplete
Lutterworth Office	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	2	$1,250	$500	3	complete
Lutterworth Office	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	4	$150	$150	1	Incomplete
Lutterworth Office	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$1,200	$210	6	Incomplete
Lutterworth Office	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$500	$50	10	Incomplete
Lutterworth Office	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	2	$300	$25	12	Incomplete
Lutterworth Office	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	TBD	TBD	TBD		Incomplete
Lutterworth Office	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	TBD	TBD	TBD		In Progress
Lutterworth Office	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete

Building	Item	No	Type	Description	Priority	Estimated Capital	Savings (Annual)	Simple ROI (years)	Completion Status
Lutterworth Roads Shed	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	1	$1,125	$120	9	Incomplete
Lutterworth Roads Shed	Building Envelope	2.1	Windows	Replace existing windows in the building to meet energy efficient fenestration requirements.	2	$3,000	$600	5	Incomplete
Lutterworth Roads Shed	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$400	$200	2	Incomplete
Lutterworth Roads Shed	Building Envelope	2.3	Overhead Doors	Replace overhead doors and associated seals.	3	$1,000	$100	10	Incomplete
Lutterworth Roads Shed	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	3	$5,000	$200	25	Incomplete
Lutterworth Roads Shed	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	2	$250	$500	1	Incomplete
Lutterworth Roads Shed	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	1	$150	$150	1	Incomplete
Lutterworth Roads Shed	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$400	$70	6	Incomplete
Lutterworth Roads Shed	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$500	$60	8	Incomplete
Lutterworth Roads Shed	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$500	$50	10	Incomplete
Lutterworth Roads Shed	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	5	$300	$25	12	Incomplete
Lutterworth Roads Shed	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	4	TBD	TBD		Incomplete
Lutterworth Roads Shed	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	complete
Lutterworth Water	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	4	$125	$25	5	Incomplete
Lutterworth Water	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and setback temperatures when the building is unoccupied.	2	$250	$500	1	complete
Lutterworth Water	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$600	$105	6	Incomplete
Lutterworth Water	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$500	$60	8	Incomplete
Lutterworth Water	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Minden Road Shed	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$800	$400	2	Incomplete
Minden Road Shed	Building Envelope	2.3	Overhead Doors	Replace overhead doors and associated seals.	2	$12,500	$1,250	10	Incomplete
Minden Road Shed	Building Envelope	2.4	Insulation	Provide insulation and protective exterior cladding to building envelope areas that do not have existing insulation.	1	$50,000	$5,000	10	Incomplete
Minden Road Shed	Building Envelope	2.7	Exterior Cladding	Repair any areas of exterior cladding that are damaged and would create a potential location for energy loss.	1	$25,000	$1,500	17	Incomplete
Minden Road Shed	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	2	$10,000	$400	25	Incomplete
Minden Road Shed	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	4	$500	$50	10	Incomplete
Minden Road Shed	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	2	$500	$500	1	Incomplete
Minden Road Shed	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	1	$150	$150	1	Incomplete
Minden Road Shed	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$1,000	$175	6	Incomplete
Minden Road Shed	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$750	$90	8	Incomplete
Minden Road Shed	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	2	$500	$50	10	Incomplete
Minden Road Shed	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	4	$300	$25	12	Incomplete
Minden Road Shed	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	3	TBD	TBD		Incomplete
Minden Road Shed	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	3	TBD	TBD		Incomplete
Minden Road Shed	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	complete
Minden Water Plant	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$200	$100	2	Incomplete
Minden Water Plant	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	3	$250	$500	1	Incomplete
Minden Water Plant	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	3	$150	$150	1	Incomplete
Minden Water Plant	Electrical	4.1	Energy Efficient Lighting System	Replace the existing lighting system with an energy-efficient LED lighting system.	4	$250	$100	3	Incomplete
Minden Water Plant	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$200	$35	6	Incomplete
Minden Water Plant	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$250	$30	8	Incomplete
Minden Water Plant	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Minden Water Tower	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	4	$400	$200	2	Incomplete
Minden Water Tower	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	2	$250	$500	1	complete
Minden Water Tower	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$15	10	Incomplete
Minden Water Tower	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$200	$35	6	Incomplete
Minden Water Tower	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete
Museum	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	3	$750	$80	9	Incomplete
Museum	HVAC and DHW	3.2	Ventilation System	Install demand control ventilation system to regulate ventilation.	3	$1,000	$50	20	Incomplete
Museum	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	2	$250	$50	5	Incomplete
Museum	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$600	$105	6	Incomplete
Museum	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete
Natures Place	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	2	$250	$500	1	Incomplete
Natures Place	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Natures Place	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$600	$105	6	Incomplete
Natures Place	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$500	$60	8	Incomplete
Natures Place	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	5	TBD	TBD		Incomplete
Natures Place	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	5	TBD	TBD		Incomplete
Natures Place	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete
Sewage Pumping Station	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	2	$375	$40	9	Incomplete
Sewage Pumping Station	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$1,500	$200	8	NA
Sewage Pumping Station	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	2	$250	$500	1	NA
Sewage Pumping Station	Electrical	4.1	Energy Efficient Lighting System	Replace the existing lighting system with an energy-efficient LED lighting system.	4	$250	$100	3	NA
Sewage Pumping Station	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	4	$200	$35	6	NA
Sewage Pumping Station	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$250	$30	8	NA
Sewage Pumping Station	Electrical	4.4	Pumps	Install Variable Frequency Drive (VFD) equipment to improve the efficiency of the system.	2	$10,000	$1,000	10	Incomplete
Sewage Pumping Station	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
Sewer Plant	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	3	$1,500	$160	9	Complete
Sewer Plant	Building Envelope	2.6	Building Envelope Integrity	Repair damage to building envelope/structure that could have an adverse affect on energy consumption.	3	$500	$50	10	Incomplete
Sewer Plant	HVAC and DHW	3.1	Heating & Cooling System	Replace electric baseboard heater units with new units with controls.	2	$2,500	$500	5	Incomplete
Sewer Plant	HVAC and DHW	3.3	Duct Network	Insulate and/or seal existing HVAC ductwork to mitigate heating/cooling losses.	2	$500	$100	5	Incomplete
Sewer Plant	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	2	$500	$500	1	Incomplete
Sewer Plant	HVAC and DHW	3.5	Domestic Hot Water System	Install a programmable timer on the domestic hot water system.	2	$150	$150	1	Incomplete
Sewer Plant	Electrical	4.1	Energy Efficient Lighting System	Replace the existing lighting system with an energy-efficient LED lighting system.	2	$500	$200	3	In Progress
Sewer Plant	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	2	$1,200	$210	6	Incomplete
Sewer Plant	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$750	$90	8	Incomplete
Sewer Plant	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	3	$500	$50	10	Incomplete
Sewer Plant	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	5	$300	$25	12	Incomplete
Sewer Plant	High Eff. Appliances/Equip.	7.1	Energy Star Rated Appliances	Replace the existing non-rated appliances with new Energy Star rated appliances at the end of service life.	4	TBD	TBD		In Progress
Sewer Plant	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	4	TBD	TBD		In Progress
Sewer Plant	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Complete
U Links	Exterior Grounds	1.1	Exterior Lighting	Replace existing outdoor lighting with energy efficient LED lighting with control sensors.	3	$375	$40	9	Incomplete
U Links	Building Envelope	2.1	Windows	Replace existing windows in the building to meet energy efficient fenestration requirements.	2	$2,500	$500	5	Incomplete
U Links	Building Envelope	2.2	Doors	Replace the existing person doors to meet the new energy efficiency requirements.	2	$750	$100	8	Incomplete
U Links	HVAC and DHW	3.4	HVAC Controls	Install programmable thermostats to control the indoor air temperature and night/weekend set back temperatures.	1	$250	$500	1	Incomplete
U Links	Electrical	4.2	Lighting Controls	Replace existing with occupancy-activated lighting controls.	3	$200	$35	6	Incomplete
U Links	Electrical	4.3	Emergency Exit Signs	Install energy efficient, photo luminescent emergency exit signs.	1	$250	$30	8	Incomplete
U Links	Water Conservation	6.1	Low-Flow Toilets	At the end of an existing toilet's service life, replace with low-flow type.	4	$500	$50	10	Incomplete
U Links	Water Conservation	6.2	Low-Flow Faucets	Install metered low-flow faucets for the hot & cold water services. Faucets are to have an adjustable timing sequence	4	$300	$25	12	Incomplete
U Links	High Eff. Appliances/Equip.	7.2	Energy Star Rated Office Equipment	Replace the existing non-rated office equipment with new Energy Star rated equipment at the end of service life.	5	TBD	TBD		Incomplete
U Links	Training & Awareness	8.1	Staff Training	Staff/Employees have been made aware of the goals, objectives, and benefits of the Municipality's energy conservation and demand management planning and associated measures.	1	$1,000	$200	5	Incomplete

Note: Some commonly identified measures from the 2019 ECDMP have been implemented at the Fire Hall and the Arena as part of building and construction; these are not reflected in the above table.

Appendix C – Complete Measures List

Site	ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Energy Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
Arena	1	Quonset Hut Insulation - R20	-	32,437	32,437	$ 3,075	$ 12,144	3.9
	2	Insulate Hot Water Lines	-	1,563	1,563	$ 148	$ 46	0.3
	3	DHW Heat Pump Upgrade	- 6,885	53,340	46,456	$ 3,762	$ 66,667	17.7
	4	Light Occupancy Sensors in Mechanical Rooms	1,844	-	1,844	$ 347	$ 1,056	3.0
	5	Quonset Hut Temperature Setback	-	7,849	7,849	$ 744	$ 200	0.3
	6	Furnace Night Time Setback	-	2,015	2,015	$ 191	$ 500	2.6
	7	Furnace Heat Pump Retrofit	- 17,717	48,855	31,138	$ 1,300	$ 40,000	30.8
	8a	RTU - 1, RTU - 2, & MAU - 1 Condensing Replacement	-	36,539	36,539	$ 3,464	$ 412,500	119.1
	8b	RTU - 1, RTU - 2, & MAU - 1 ASHP w Gas Backup	- 86,905	288,015	201,110	$ 10,964	$ 480,000	43.8
	9	Arena Exhaust Controls Update	3,062	-	3,062	$ 576	$ 5,000	8.7
	10	Resurfacer Electrification	17,497	105,631	123,128	$ 13,302	$ 150,250	11.3
Admin Building	1	Insulate Bare Hot Water Lines	211	-	211	$ 40	$ 14	0.4
	2	DHW Heat Pump Upgrade	5,907	-	5,907	$ 1,110	$ 6,500	5.9
	3	LED Lighting Replacement	8,627	-	8,627	$ 1,622	$ 2,782	1.7
	4	Lighting Occupancy Control	1,815	-	1,815	$ 341	$ 4,884	14.3
	5	Basement Baseboard Heater - Control Upgrades	876	-	876	$ 165	$ 260	1.6
	6a	RTU Unit Replacement - Condensing Burner	1,836	20,374	22,210	$ 2,357	$ 386,250	163.9
	6b	RTU Unit Replacement - ASHP w Condensing Gas Backup	- 23,063	102,461	79,397	$ 5,782	$ 457,500	79.1
Cultural Centre	1	Natures Place - Hot Water Boiler Heat Pump Upgrade	10,428	-	10,428	$ 1,960	$ 26,000	13.3
	2	LED Lighting Replacement	7,773	-	7,773	$ 1,461	$ 1,353	0.9
	3	Install Occupancy Sensors	406	-	406	$ 76	$ 792	10.4
	4a	RTU Replacement- Condensing Burner	-	8,940	8,940	$ 871	$ 195,000	224.0
	4b	RTU Replacement- Condensing Burner + Heat Pump	- 19,364	67,384	48,021	$ 2,922	$ 230,000	78.7
Fire Hall	1	DHW Heat Pump Upgrade	- 1,605	5,852	4,247	$ 251	$ 6,495	25.8
	2	Lighting Occupancy Sensors	104	-	104	$ 19	$ 1,188	61.0
	3	Replace Remaining Non-Programmable Thermostats	482	7,597	8,079	$ 809	$ 2,500	3.1
	4	AC Heat Pump Upgrade	- 4,034	12,476	8,442	$ 421	$ 20,000	47.5
Kinmount Road Shed	1	Replace Doors	1,044	3,622	4,666	$ 557	$ 12,000	21.5
	2	Insulate Building Envelope	9,145	31,739	40,884	$ 4,881	$ 26,717	5.5
	3	Insulate Hot Water Piping	141	-	141	$ 27	$ 37	1.4
	4	DHW Heat Pump Upgrade	1,596	-	1,596	$ 300	$ 6,495	21.6
	5	Lighting Replacement	1,223	-	1,223	$ 230	$ 335	1.5
Lutterworth Water Plant	1	Lutterworth Water Insulation - R20	8,336	-	8,336	$ 1,567	$ 2,428	1.5
	2	Install Lighting Occupancy Sensor	29	-	29	$ 5	$ 132	24.4
Wastewater Treatment Plant	1	DHW Heat Pump Upgrade	4,380	-	4,380	$ 823	$ 5,299	6.4
	2	Lighting Occupancy Sensors	1,407	-	1,407	$ 265	$ 1,716	6.5
	3	Lighting Replacement	9,427	-	9,427	$ 1,772	$ 874	0.5
	4	AC Heat Pump Replacement	5,167	-	5,167	$ 971	$ 7,190	7.4
	5	Supplement Baseboards w Additional Heat Pump	6,240	-	6,240	$ 1,173	$ 16,880	14.4
On-site Audit Total			**- 50,572**	**804,252**	**753,680**	**$ 67,577**	**$2,577,840**	**38.1**

Site	ID#	Measure Description	Electricity Savings (kWh/year)	Propane Savings (kWh/year)	Total Energy Savings (kWh/year)	Total Cost Savings ($/year)	Total Capital Cost ($)	Payback (yrs)
Minden Museum	1	Outdoor Lighting Switchoff	-	-	-	$ -	$ -	-
	2	Bank Increased Setback	3,839	-	3,839	$ 722	$ 5,000	6.9
	3	Bank Window Replacement	-	6,131	6,131	$ 597	$ 250	0.4
	4	Bank Weatherstripping	-	2,894	2,894	$ 282	$ 3,200	11.4
	5	Museum Lighting Replacement	-	482	482	$ 47	$ 25	0.5
	6	Supplement Bank Furnace w Heat Pump	-	-	-	$ -	$ -	-
Communications Tower	1	Building Envelope Insulation	-	-	-	$ -	$ -	-
	2	LED Lighting Replacement	243	-	243	$ 46	$ 55	1.2
	3	Lighting Occupancy Sensor Installation	49	-	49	$ 9	$ 130	14.2
	4	Thermostat Replacement & Setback	196	-	196	$ 37	$ 150	4.1
	5	Domestic Hot Water - Heat Pump Upgrade	-	-	-	$ -	$ -	-
	6	HVAC Condensing Unit Replacement	-	-	-	$ -	$ -	-
	7	Heat Pump Conversion	489	-	489	$ 92	$ 2,000	21.8
Irondale Hall	1	Building Envelope Insulation	-	-	-	$ -	$ -	-
	2	LED Lighting Replacement	204	-	204	$ 38	$ 319	8.3
	3	Lighting Occupancy Sensor Installation	41	-	41	$ 8	$ 390	50.9
	4	Thermostat Replacement & Setback	-	211	211	$ 19	$ 300	15.8
	5	Domestic Hot Water - Heat Pump Upgrade	348	1,045	1,393	$ 160	$ 6,500	40.7
	6	HVAC Condensing Unit Replacement	-	1,308	1,308	$ 118	$ 15,000	127.4
	7	Heat Pump Conversion	- 3,489	11,775	8,286	$ 404	$ 25,000	61.9
Lochlin Hall	1	Building Envelope Insulation	-	-	-	$ -	$ -	-
	2	LED Lighting Replacement	380	-	380	$ 71	$ 345	4.8
	3	Lighting Occupancy Sensor Installation	54	-	54	$ 10	$ 260	25.5
	4	Thermostat Replacement & Setback	-	321	321	$ 29	$ 150	5.2
	5	Domestic Hot Water - Heat Pump Upgrade	- 422	1,582	1,160	$ 63	$ 6,500	103.1
	6	HVAC Condensing Unit Replacement	-	1,906	1,906	$ 172	$ 15,000	87.5
	7	Heat Pump Conversion	- 5,082	17,150	12,069	$ 588	$ 25,000	42.5
Lutterworth Office & Road Shed	1	Building Envelope Insulation	87	2,762	2,848	$ 265	$ 12,500	47.2
	2	LED Lighting Replacement	1,389	-	1,389	$ 261	$ 902	3.5
	3	Lighting Occupancy Sensor Installation	260	-	260	$ 49	$ 390	8.0
	4	Thermostat Replacement & Setback	-	1,074	1,074	$ 97	$ 300	3.1
	5	Domestic Hot Water - Heat Pump Upgrade	- 1,411	5,292	3,881	$ 211	$ 13,000	61.6
	6	HVAC Condensing Unit Replacement	-	4,462	4,462	$ 402	$ 15,000	37.4
	7	Heat Pump Conversion	- 16,999	57,372	40,373	$ 1,968	$ 35,000	17.8
Minden Roads Shed	1	Building Envelope Insulation	-	-	-	$ -	$ -	-
	2	LED Lighting Replacement	1,600	-	1,600	$ 301	$ 1,864	6.2
	3	Lighting Occupancy Sensor Installation	400	-	400	$ 75	$ 910	12.1
	4	Thermostat Replacement & Setback	-	1,375	1,375	$ 124	$ 600	4.8
	5	Domestic Hot Water - Heat Pump Upgrade	- 2,936	8,807	5,871	$ 241	$ 25,000	103.9
	6	HVAC Condensing Unit Replacement	-	7,158	7,158	$ 644	$ 100,000	155.2
	7	Heat Pump Conversion	- 21,210	71,583	50,373	$ 2,455	$ 150,000	61.1
Minden Water Plant	1	Building Envelope Insulation	10,208	-	10,208	$ 1,919	$ 5,500	2.9
	2	LED Lighting Replacement	2,917	-	2,917	$ 548	$ 186	0.3
	3	Lighting Occupancy Sensor Installation	486	-	486	$ 91	$ 130	1.4
	4	Thermostat Replacement & Setback	486	-	486	$ 91	$ 150	1.6
	5	Domestic Hot Water - Heat Pump Upgrade	-	-	-	$ -	$ -	-
	6	HVAC Condensing Unit Replacement	-	-	-	$ -	$ -	-
	7	Heat Pump Conversion	21,915	-	21,915	$ 4,120	$ 35,000	8.5
Minden Water Tower	1	Building Envelope Insulation	2,532	-	2,532	$ 476	$ 8,500	17.9
	2	LED Lighting Replacement	1,206	-	1,206	$ 227	$ 349	1.5
	3	Lighting Occupancy Sensor Installation	121	-	121	$ 23	$ 260	11.5
	4	Thermostat Replacement & Setback	241	-	241	$ 45	$ 150	3.3
	5	Domestic Hot Water - Heat Pump Upgrade	-	-	-	$ -	$ -	-
	6	HVAC Condensing Unit Replacement	-	-	-	$ -	$ -	-
	7	Heat Pump Conversion	4,757	-	4,757	$ 894	$ 15,000	16.8
Sewage Pumping Station	1	Building Envelope Insulation	4,675	-	4,675	$ 879	$ 5,500	6.3
	2	LED Lighting Replacement	1,700	-	1,700	$ 320	$ 137	0.4
	3	Lighting Occupancy Sensor Installation	425	-	425	$ 80	$ 130	1.6
	4	Thermostat Replacement & Setback	425	-	425	$ 80	$ 150	1.9
	5	Domestic Hot Water - Heat Pump Upgrade	-	-	-	$ -	$ -	-
	6	HVAC Condensing Unit Replacement	-	-	-	$ -	$ -	-
	7	Heat Pump Conversion	10,115	-	10,115	$ 1,902	$ 15,000	7.9
U-Links	1	Building Envelope Insulation	-	-	-	$ -	$ -	-
	2	LED Lighting Replacement	470	-	470	$ 88	$ 182	2.1
	3	Lighting Occupancy Sensor Installation	71	-	71	$ 13	$ 130	9.8
	4	Thermostat Replacement & Setback	141	-	141	$ 27	$ 150	5.7
	5	Domestic Hot Water - Heat Pump Upgrade	-	-	-	$ -	$ -	-
	6	HVAC Condensing Unit Replacement	-	-	-	$ -	$ -	-
	7	Heat Pump Conversion	1,480	-	1,480	$ 278	$ 15,000	53.9
Remote Audit Total			**22,399**	**204,692**	**227,091**	**$ 22,704**	**$ 562,645**	**24.8**
Grand Total			**- 28,173**	**1,041,381**	**1,013,208**	**$ 93,356**	**$3,152,629**	**33.8**

Document Control

Document type:	Energy Conservation Demand Management Plan
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Title:	2024 Energy Conservation & Demand Management Plan
Reference:	Proposal PR-9724 / Project PE2027
Revision:	Final
Revision date:	29th June 2024

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