Town of Shrewsbury

Energy Reduction Plan

Adopted September 2018

This Energy Reduction Plan (ERP), in accordance with Criterion 3 of the Massachusetts Green Communities Program, outlines proposed energy efficiency measures to reduce costs and environmental impacts of municipal energy use in the Town of Shrewsbury, Massachusetts. The intent of this plan is to assist Shrewsbury in its energy reduction goals and help the Town achieve Green Communities designation through the Massachusetts Department of Energy Resources (DOER) Green Communities Program.

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I. PURPOSE AND ACKNOWLEDGEMENTS

This Energy Reduction Plan (ERP) outlines proposed energy efficiency measures to the reduce costs and environmental impact of municipal energy use in the Town of Shrewsbury. The intent of the Plan is to assist the Town of Shrewsbury in its ongoing Green Energy efforts, particularly the Town's current goal to become a designated Green Community through the Massachusetts Department of Energy Resources (DOER) Green Communities Program. In accordance with Criterion 3 of the Massachusetts Green Communities Program, the ERP allows municipal officials to identify energy-efficiency opportunities and establish a timeline with specific targets to reduce energy use in municipal facilities and vehicles by twenty (20) percent over a five-year period. Shrewsbury's energy baseline is computed from Fiscal Year 2017 (FY2017) energy usage and will be discussed in Section III of this plan. The energy conservation recommendations draw upon information from energy audits performed by Energy Source and the Central Massachusetts Regional Planning Commission (CMRPC). These strategies provide a realistic path for implementation that will evolve with the Town's priorities and changes in technology. The decreased energy use realized as a result of this plan will reduce greenhouse gas emissions and Town operating costs.

A. LETTERS VERIFYING THE ADOPTION OF THE ENERGY REDUCTION PLAN

- **General Government-** A letter of approval of this Energy Reduction Plan by the Board of Selectmen is attached in Appendix A, Adoption Verification Letters.
- **Schools**- A letter of approval of this Energy Reduction Plan by the School Superintendent is attached in Appendix A, Adoption Verification Letters.

B. CONTRIBUTORS TO THE ENERGY REDUCTION PLAN

- Board of Selectmen
- Town Manager's Office
- Shrewsbury Public Schools
- Shrewsbury Electric and Cable Operations
- Public Buildings Department
- Accounting Office
- Assessor's Office
- Water and Sewer Departments
- Highway Department
- Fire Department
- Police Department
- Horizon Solutions LLC
- Central Massachusetts Regional Planning Commission (CMRPC)

II. EXECUTIVE SUMMARY

A. NARRATIVE SUMMARY OF THE TOWN

The Town of Shrewsbury is located in Central Massachusetts, approximately 34 miles west of Boston. With a population of 35,608, it is the second largest municipality in Worcester County, following its neighbor the City of Worcester. Shrewsbury is a suburban, residential community about 22 square miles in size with Lake Quinsigamond making up most of the town's western border.

Approximately fourteen percent (14.6%) of Shrewsbury residents are sixty-five (65) years or older and thirty eight percent (37.9%) are between the ages of 15 to 44 years old (American Community Survey, 2016). The Town's median age is approximately forty (40.6) (American Community Survey, 2016). Recent estimates show that median income in Shrewsbury is equal to $98,790 (American Community Survey, 2016).

Shrewsbury has a board of selectmen comprised of five (5) members. While Shrewsbury remains an attractive place for recreation, working, and living, the Town must strive to balance environmental sustainability with its social and economic priorities. The Green Communities designation will be a significant step in achieving the status of a sustainable, environmentally friendly community.

B. SUMMARY OF MUNICIPAL ENERGY USES

The number of municipal buildings, vehicles, traffic lights and street lights are shown in Table 1 on page 5.

Municipal Buildings
The Town of Shrewsbury operates twenty-four (24) municipal buildings (excluding water and sewer treatment and pumping facilities) that will be assessed in this Energy Reduction Plan. These buildings include:

- Sherwood Middle School
- Shrewsbury Public Library
- Floral Street Elementary School
- Centech Fire Station
- Walter J. Paton Elementary School
- Calvin Coolidge Elementary School
- Beal School
- Senior Center
- Shrewsbury Town Hall
- Police Station
- Oak Middle School
- Lake Fire Station
- Donahue Rowing Center
- Parker Road PreK
- Fire Headquarters
- Shrewsbury Senior High School
- Highway Garage
- Spring Street Elementary School
- Legion
- Police Boat House
- Parker Road East
- Water and Sewer Garage
- Cemetery Garage

Most of these facilities are heated with natural gas, exceptions being the Donahue Rowing Center, which is heated with oil, and unheated buildings such as the Police Boat House, Allen Farm, and Parker Road East.

Building Additions and New Construction
In FY 2018, a new water treatment plant was constructed at 45 West Main Street, replacing the existing plant at 45 West Main Street. The Shrewsbury Public Library received an addition along with a complete renovation in August of 2016.

The Town is also in the process of replacing the Beal School. A new school facility is in the design phase. The Town intends to divest of the Beal School following construction and occupancy of the new facility. The Beal school is 32,100 sf. The replacement facility will be approximately 145,000 sf and meet LEED 4 standards. The lighting at the new school will consist of LEDs with digital lighting controls. The HVAC will have DDC controls. The Building insulation will meet or exceed building code.

Vehicles
Shrewsbury has a total of ___ (TBD) municipal vehicles. Of these vehicles, ___ (TBD) are exempt from the energy reduction policies. The Town owns no electric vehicle charging stations.

Street Lights and Traffic Lights

The Town of Shrewsbury has 3,084 streetlights. These lights are owned and maintained by Shrewsbury Electric and Cable Operations (SELCO), a municipal light plant that provides the Town with electricity. The majority of the lights (2,563) are LED while the remaining lights are sodium vapor or mercury (521). Converting the lights to LED occurred in four phases, the most recent (and most significant) of which took place in FY2018. Shrewsbury also has two (2) town-owned traffic control lights, which are located on Old Mill/Main Street and South Quinsigamond Avenue. The Town also owns and four (4) flashing school zone lights. The flashing school zone lights are LEDs.

Water and Sewer

The Town of Shrewsbury operates one (1) drinking water treatment plant, thirty-eight (38) sewer pump stations, eight (8) water pump stations, three (3) water regulator pits, four (4) water tanks, and an operations yard. Shrewsbury contributes to the regional wastewater treatment plant with Westborough. Because this plant is located in Westborough, it is excluded from this plan.

Renewable Energy

SELCO receives forty-five (45) to fifty (50) percent of its energy from non-carbon producing assets. There are small solar arrays on the roof at the Oak Middle School and at Floral Street Elementary School. SELCO commissioned a 3MW solar array in July 2018. The array was built by SELCO and will provide energy for 400-500 homes. The array is constructed on a 12 acre portion of a capped landfill. SELCO is in the process of creating a community solar program. They are also reserving 1,000,000 kWh hours of energy produced by the solar array for the projected new elementary school. In addition, SELCO has a Power Purchase Agreement (PPA) with Con Edison for a 2.5MW solar array located in Town on Cherry Street. There are plans for a 60kW solar facility being built in conjunction with the new water treatment plant located at 45 West Main Street.

Outside of Town borders, SELCO has a thirteen (13) percent ownership stake in a 15MW wind farm built by municipal electric utilities. It resides in Hancock MA and was the largest wind farm in the State at the time of commissioning in 2011. SELCO also has a PPA with Ashelot to purchase hydro-generated energy from a dam in New Hampshire.

Table 1: Summary of Municipal Energy Users

Municipal Energy User	Number	Ownership
Buildings Heat Source		
Oil Heat	1	Town of Shrewsbury
Natural Gas Heat	20	Town of Shrewsbury
Propane Heat	0	N/A
Propane for Kitchen Use	0	N/A
Biomass Heat	0	N/A
Other Heat Type	0	N/A
Vehicles		
Non-Exempt	TBD	Town of Shrewsbury
Exempt	TBD	Town of Shrewsbury
Street Lights and Traffic Lights		
Street Lights	3,084	SELCO
Traffic Lights	2	Town of Shrewsbury

Water and Sewer		
Drinking Water Treatment Plant	1	Town of Shrewsbury
Pumping Stations	46	Town of Shrewsbury
Open Space		
Parks and Fields	2	Town of Shrewsbury

C. SUMMARY OF ENERGY USE BASELINE AND PLANS FOR REDUCTIONS

During baseline year FY2017, the total energy use in municipal vehicles and facilities in the Town of Shrewsbury was 91,976 MMBtus. Table 2 depicts an overall summary of the Town's municipal energy usage during the baseline year. This table includes projected savings. Figure 1, on the following page, shows overall energy usage by facility category for FY2017 as determined by MassEnergyInsight.

The majority of energy consumed in Shrewsbury is used by municipal buildings (56%). The remaining usage is divided between vehicles (19%), water and sewer (19%), street and traffic lights (5%) and open space (<1%).

At the request of the Town of Shrewsbury, Horizon Solutions LLC (Horizon) assessed and documented the energy conservation opportunities at Shrewsbury facilities. These opportunities were identified through several site visits, inspections, staff interviews, and data collected through the course of ASHRAE Level 2[1] audits. In conjunction with vehicular and training measures, the identified projects will reduce Shrewsbury's municipal energy use by twenty (20) percent from the baseline year. Specific actions are detailed in Section IV of this plan. The complete energy audits from Horizon are included as Appendix C.

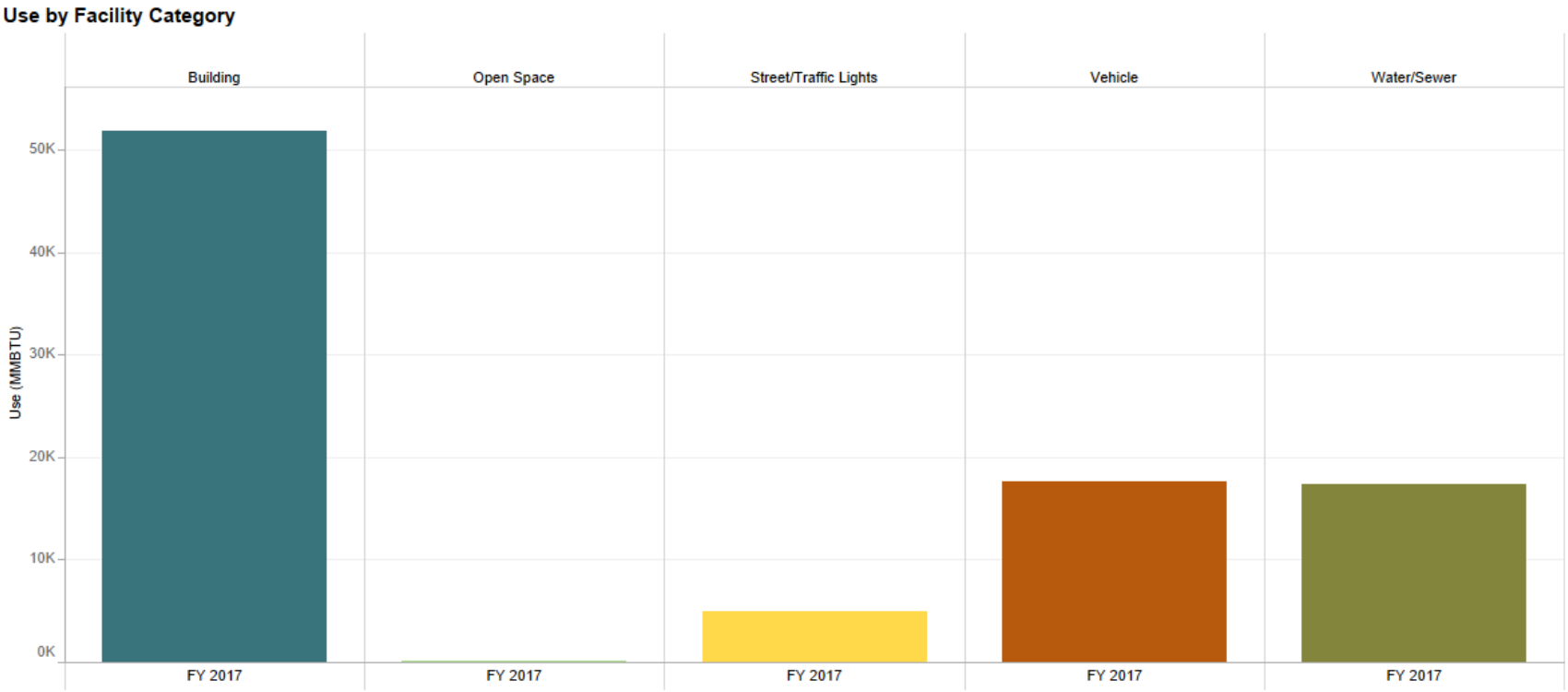
Table 2: Summary of Municipal Energy Use Baseline (FY2017)

Categories	MMBtu Used in Baseline Year	% of Total MMBtu Baseline Energy Consumption	Projected Planned Documented MMBtu Savings[2]	Savings as % of Total MMBtu Baseline Energy Consumption
Buildings	51,892	56.42%	13,853	15.06%
Vehicles	17,655	19.20%	1,882	2.05%
Street/Traffic Lights	4,941	5.37%	1,457	1.58%
Water/Sewer	17,350	18.86%	0	0.00%
Open Space	139	0.15%	0	0.00%
Total	**91,976**	**100%**	**17,192**	**18.69%**

[1] An ASHRAE Level 1 assessment determines how much energy a building uses and how that compares to other similar buildings, includes a short walk-through of the facility and identifies potential efficiency measures. The costs and savings of the measures are usually identified with low precision. An ASHRAE Level 1 assessment is often referred to as a scoping audit. An ASHRAE Level 2 assessment expands on a Level 1 by identifying much more accurate costs and savings for the recommended efficiency measures. Note that these costs are still not bid-level construction costs but generally are within 15-20 percent of accuracy. Cost and energy savings from operational and behavioral measures are also quantified in an ASHRAE Level 2 assessment. For more complex facilities, an end-use breakdown of how a facility uses its energy (i.e., 30 percent of electricity use is for lighting, 60 percent for HVAC, and 10 percent for plug load) is typically included.

[2] Projected planned energy savings are discussed in more detail later in this plan and are presented in Table 3.

Figure 1. Baseline Dashboard from MEI



III. ENERGY USE BASELINE INVENTORY

A. IDENTIFICATION OF THE INVENTORY TOOL USED

The Town of Shrewsbury will use the MassEnergyInsight (MEI) database as the inventory tool for this Energy Reduction Plan.

B. IDENTIFICATION OF THE BASELINE YEAR

The Town of Shrewsbury intends to complete its twenty (20) percent reduction as outlined in this Energy Reduction Plan in a 5-year period starting in fiscal year 2017 and ending in fiscal year 2022. FY2017 will serve as the baseline year, starting on July 1, 2016 and ending on June 30, 2017. The total consumption of energy in FY2017 was 91,976 MMBtus as shown Tables 3a and Table 3b on the following pages.

C. MUNICIPAL ENERGY CONSUMPTION FOR THE BASELINE YEAR

During baseline year FY2017, the energy used by municipal vehicles and facilities in the Town of Shrewsbury totaled 91,976 MMBtus. Tables 3a and 3b present energy use for each municipal facility in Native Units and MMBtus, respectively. The information shown in Figure 2 below is provided by the DOER to explain how MMBtus are calculated.

Figure 2. MMBtu Conversion Chart

1 kilowatt hour of electricity	= 0.003412 MMBtu
1 therm	= 0.1 MMBtu
1 ccf (100 cubic foot) of natural gas	= 0.1028 MMBtu[3]
1 gallon of heating oil	= 0.139 MMBtu
1 gallon of propane	= 0.091 MMBtu
1 cord of wood	= 20 MMBtu
1 gallon of gasoline	= 0.124 MMBtu[3]
1 gallon of E100 ethanol	= 0.084 MMBtu
1 gallon of E85 ethanol	= 0.095 MMBtu
1 gallon of diesel fuel	= 0.139 MMBtu
1 gallon of B100 biodiesel	= 0.129 MMBtu
1 gallon of B20 biodiesel	= 0.136 MMBtu2[4]
1 gallon of B10 biodiesel	= 0.137 MMBtu9
1 gallon of B5 biodiesel	= 0.138 MMBtu9[4]
1 barrel of residual fuel oil	= 6.287 MMBtu

Fuel Energy Content of Common Fossil Fuels per DOE/EIA[5]
BTU Content of Common Energy Units – (1 million Btu equals 1 MMBtu)

[3] Based on U.S. consumption, 2007
[4] Calculated Values from those of diesel and B100 biodiesel
[5] US Department of Energy/Energy Information Administration

Table 3a. Energy Reduction Plan Guidance (Native Fuel Units)

ERP Guidance Table 3a - Municipal Energy Consumption for 2017 (Native Fuel Units)

		2017				
		Electric (kWh)	Gas (therms)	Oil (gallons)	Gasoline (gallons)	Diesel (gallons)
Building	Sherwood MS	699,000	17,442			
	Shrewsbury Public Library	377,560	6,912			
	Floral Street ES	573,600	17,274			
	Centech Fire Station	39,183	1,570			
	Walter J Paton ES	186,577	10,861			
	Calvin Coolidge ES	397,640	8,823			
	Beal School	205,803	20,086			
	Senior Center	82,400	3,286			
	Shrewsbury Town Hall	532,630	527			
	Police Station	189,041	10,978			
	Oak MS	1,075,500	56,406			
	Lake Fire Station	38,180	2,141			
	Parker Road PreK	102,463	3,112			
	Donahue Rowing Center	33,824		2,398		
	Fire Headquarters	126,160	5,892			
	Shrewsbury Sr HS	2,064,000	65,222			
	Highway Garage	109,900	13,700			
	Spring Street ES	286,160	13,426			
	Legion	1,558	2,012			
	Police Boat House	331				
	Parker Road East	15,692				
	Water and Sewer Garage	41,077	8,868			
	Cemetery Garage	1,811	2,063			
	Allen Farm	71				
	Total	**7,180,161**	**270,601**	**2,398**		
Open Space	Dean Park	36,794				
	Maple Ave Soccer Fields	3,901				
	Total	**40,695**				
Street/Traffic Lights	Streetlights	1,444,282				
	Traffic Lights	3,685				
	Blinking School Lights	38				
	Total	**1,448,005**				
Vehicle	Police				39,672	0
	All except police				61,989	36,323
	Total				**101,661**	**36,323**

Table 3a. Energy Reduction Plan Guidance (Native Fuel Units) (cont.)

Water/Sewer	108 Reservoir Street Sewer P..	67,694	17			
	17 Hillandro Drive	9,527	0			
	Camelot Drive Sewer Pump S..	14,641	17			
	Quail Hollow Sewer Pump Sta..	39,072	112			
	Stoney Hill Sewer Pump Stati..	47,712	84			
	Stone Meadow Farm Sewer P..	13,565	32			
	371 Main Street Line	273,600	5,002			
	231 West Main Street		10			
	Arrowwood Drive Sewer Pum..	17,952	491			
	79 Main Street		553			
	171 Oak Street	5,867	272			
	1 Appaloosa Drive Sewer Pu..	5,563	212			
	Bowditch Drive/ James Barre ..	7,578				
	7 Cedar Rd. Sewer Pump Stat..	7,199				
	Colonial Drive Sewer Pump St..	13,393				
	Eaglehead Terrace Sewer Pu..	7,255				
	Gold Street/ Farmington Sewe..	31,600				
	629 Grafton St. Sewer Pump ..	10,718				
	478 Grafton St. Sewer Pump ..	24,727				
	Gulf Street Sewer Pump Stati..	25,034				
	51 Hartford Turnpike Sewer P..	20,544				
	Harvey Place Sewer Pump St..	100,363				
	Hill Street Sewer Pump Station	69,221				
	Holden Street Sewer Pump St..	10,000				
	128 Howe Ave Sewer Pump S..	1,709				
	Jordan Pond Sewer Pump Sta..	59,202				
	490 Lake St. Sewer Pump Sta..	5,600				
	65 Lakeside Drive Sewer Pum..	2,284				
	Maple Ave Sewer Pump Stati..	224,700				
	Oak Street Sewer Pump Stati..	9,124				
	Old Laxfield Road Sewer Pum..	37,583				
	ORCHARD MEADOW DR SE..	3,167				
	1 PINELAND AVE SEWER P..	2,485				
	ROLFE AVE SEWER	290,840				
	232 SO QUINSIG. AVE SEW..	2,305				
	6 SO. BROOK ST SEWER P..	3,610				
	TANAGER HILL DR SEWER ..	5,121				
	TOBLIN HILL DR SEWER PU..	27,386				
	344 WALNUT STREET SEW..	45,555				
	35 BROWNING RD TANK	1,914				
	171 GULF ST WATER BOOS..	342,250				
	38 HILLSIDE DR WATER TA..	1,170				
	LAMBERTS PIT Well	181,843				
	45 MAIN ST.	2,427,600				
	125 PROSPECT STREET	6,923				
	SEWALL ST PUMP 4	361,760				
	206 SOUTH ST PUMP	3,409				
	8 THORNING DRIVE	304				
	Colton Lane Pump	14,975				
	Total	**4,885,644**	**6,802**			
Grand Total		**13,554,505**	**277,403**	**2,398**	**101,661**	**36,323**

Table 3b. Energy Reduction Plan Guidance (MMBtu)

ERP Guidance Table 3b - Municipal Energy Consumption for 2017 (MMBTU)

Please make sure that any data submitted to DOER contains complete Data!

		2017					
		Diesel	Electric	Gas	Gasoline	Oil	Total
Building	Sherwood MS		2,385	1,744			4,129
	Shrewsbury Public Library		1,288	691			1,979
	Floral Street ES		1,957	1,727			3,685
	Centech Fire Station		134	157			291
	Walter J Paton ES		637	1,086			1,723
	Calvin Coolidge ES		1,357	882			2,239
	Beal School		702	2,009			2,711
	Senior Center		281	329			610
	Shrewsbury Town Hall		1,817	53			1,870
	Police Station		645	1,098			1,743
	Oak MS		3,670	5,641			9,310
	Lake Fire Station		130	214			344
	Parker Road PreK		350	311			661
	Donahue Rowing Center		115			333	449
	Fire Headquarters		430	589			1,020
	Shrewsbury Sr HS		7,042	6,522			13,565
	Highway Garage		375	1,370			1,745
	Spring Street ES		976	1,343			2,319
	Legion		5	201			207
	Police Boat House		1				1
	Parker Road East		54				54
	Water and Sewer Garage		140	887			1,027
	Cemetery Garage		6	206			212
	Allen Farm		0				0
	Total		24,499	27,060		333	51,892
Open Space	Dean Park		126				126
	Maple Ave Soccer Fields		13				13
	Total		139				139
Street/Traffic Lights	Streetlights		4,928				4,928
	Traffic Lights		13				13
	Blinking School Lights		0				0
	Total		4,941				4,941
Vehicle	Police	0			4,919		4,919
	All except police	5,049			7,687		12,736
	Total	5,049			12,606		17,655
Water/Sewer	108 Reservoir Street Sewer P..		231	2			233
	17 Hillandro Drive		33	0			33
	Camelot Drive Sewer Pump S..		50	2			52
	Quail Hollow Sewer Pump Sta..		133	11			145
	Stoney Hill Sewer Pump Stati..		163	8			171

Table 3b. Energy Reduction Plan Guidance (MMBtu) (cont.)

	Stone Meadow Farm Sewer P..		46	3			49
	371 Main Street Line		934	500			1,434
	231 West Main Street			1			1
	Arrowwood Drive Sewer Pum..		61	49			110
	79 Main Street			55			55
	171 Oak Street		20	27			47
	1 Appaloosa Drive Sewer Pu..		19	21			40
	Bowditch Drive/ James Barre ..		26				26
	7 Cedar Rd. Sewer Pump Stat..		25				25
	Colonial Drive Sewer Pump St..		46				46
	Eaglehead Terrace Sewer Pu..		25				25
	Gold Street/ Farmington Sewe..		108				108
	629 Grafton St. Sewer Pump ..		37				37
	478 Grafton St. Sewer Pump ..		84				84
	Gulf Street Sewer Pump Stati..		85				85
	51 Hartford Turnpike Sewer P..		70				70
	Harvey Place Sewer Pump St..		342				342
	Hill Street Sewer Pump Station		236				236
	Holden Street Sewer Pump St..		34				34
	128 Howe Ave Sewer Pump S..		6				6
	Jordan Pond Sewer Pump Sta..		202				202
	490 Lake St. Sewer Pump Sta..		19				19
	65 Lakeside Drive Sewer Pum..		8				8
	Maple Ave Sewer Pump Stati..		767				767
	Oak Street Sewer Pump Stati..		31				31
	Old Laxfield Road Sewer Pum..		128				128
	ORCHARD MEADOW DR SE..		11				11
	1 PINELAND AVE SEWER P..		8				8
	ROLFE AVE SEWER		992				992
	232 SO QUINSIG. AVE SEW..		8				8
	6 SO. BROOK ST SEWER P..		12				12
	TANAGER HILL DR SEWER ..		17				17
	TOBLIN HILL DR SEWER PU..		93				93
	344 WALNUT STREET SEW..		155				155
	35 BROWNING RD TANK		7				7
	171 GULF ST WATER BOOS..		1,168				1,168
	38 HILLSIDE DR WATER TA..		4				4
	LAMBERTS PIT Well		620				620
	45 MAIN ST.		8,283				8,283
	125 PROSPECT STREET		24				24
	SEWALL ST PUMP 4		1,234				1,234
	206 SOUTH ST PUMP		12				12
	8 THORNING DRIVE		1				1
	Colton Lane Pump		51				51
	Total		16,670	680			17,350
Grand Total		5,049	46,248	27,740	12,606	333	91,976

IV. ENERGY REDUCTION PLAN

A. NARRATIVE SUMMARY

The Town of Shrewsbury is committed to reducing baseline (FY2017) energy consumption by twenty (20) percent over the 5-year period from FY2018 to the end of FY2022. A list of specific and documented strategies is presented in Table 4 (see Appendix B), which accounts for 17,192 MMBtus or 18.69 percent of total municipal energy consumption. The energy audit conducted by Horizon identifies the majority of these projects and is included as Appendix C.

Overview of Goals for Years 1 – 3

This time period runs from FY2018 to the end of FY2020. Several energy efficiency measures were completed in the first year of this period. These projects include:

- Streetlights: Shrewsbury converted 1,933 of its streetlights to energy efficient LEDs.
- Town Hall: LED lighting on 2nd floor and HVAC upgrade.
- High School: LED exterior lighting.
- Paton School: HVAC upgrade and air conditioning.
- Spring Street School: HVAC upgrade and air conditioning.

In years FY2019 and FY2020, Shrewsbury's strategy will be to implement….

- TBD
- TBD
- TBD
- TBD

During this period the Town will also work on behavioral and vehicular fuel conservation measures such as:

- Implementing an anti-idling policy in all non-police vehicles
- Installing IdleRight devices in a portion of its police vehicles
- Implement the general vehicle fuel economy measures recommended and outlined in this plan
- Implement the general behavioral conservation measures recommended and outlined in this plan

Overview of Goals for Years 4 – 5

The goals for FY2021 and FY2022 are to complete any unfinished projects planned for years 1-3 and the following projects:

- TBD
- TBD
- TBD
- TBD

Identify Areas of Least Efficiency/Greatest Waste

Shrewsbury will work to identify areas of least efficiency/greatest waste using MEI's Buildings to Target assessment. This assessment, which is presented in Table 3a, compares municipal buildings to one another using a standardized energy use per area metric. This metric is measured as kBTU/square foot. Buildings that have the highest energy use and the worst efficiency are located in the top right quadrant of the figure labeled Efficiency and Use in Figure 3b.

Shrewsbury's municipal buildings average 51.6 kBTU/sf. The High School is the largest energy user but slightly below the median efficiency at 43.4 kBTU/sf. Oak Middle School is the second largest energy user and has an efficiency comparable to the median and High School (48.3 kBTU/sf). In comparison, the Police Station and Legion are closer to the Town's median usage (981 MMBtu) but are less efficient at 150.4 and 145 kBTU/sf, respectively. Stronger conservation measures at high-usage but relatively efficient buildings combined with the first-wave of conservation measures at small-usage but inefficient buildings will provide the greatest savings. Thus, Figures 3a and 3b provides a clear path forward in regard to what energy conservation measures can be expected to result in the greatest savings at each municipal building in the Town of Shrewsbury.

Figure 3a. Buildings to Target from MEI

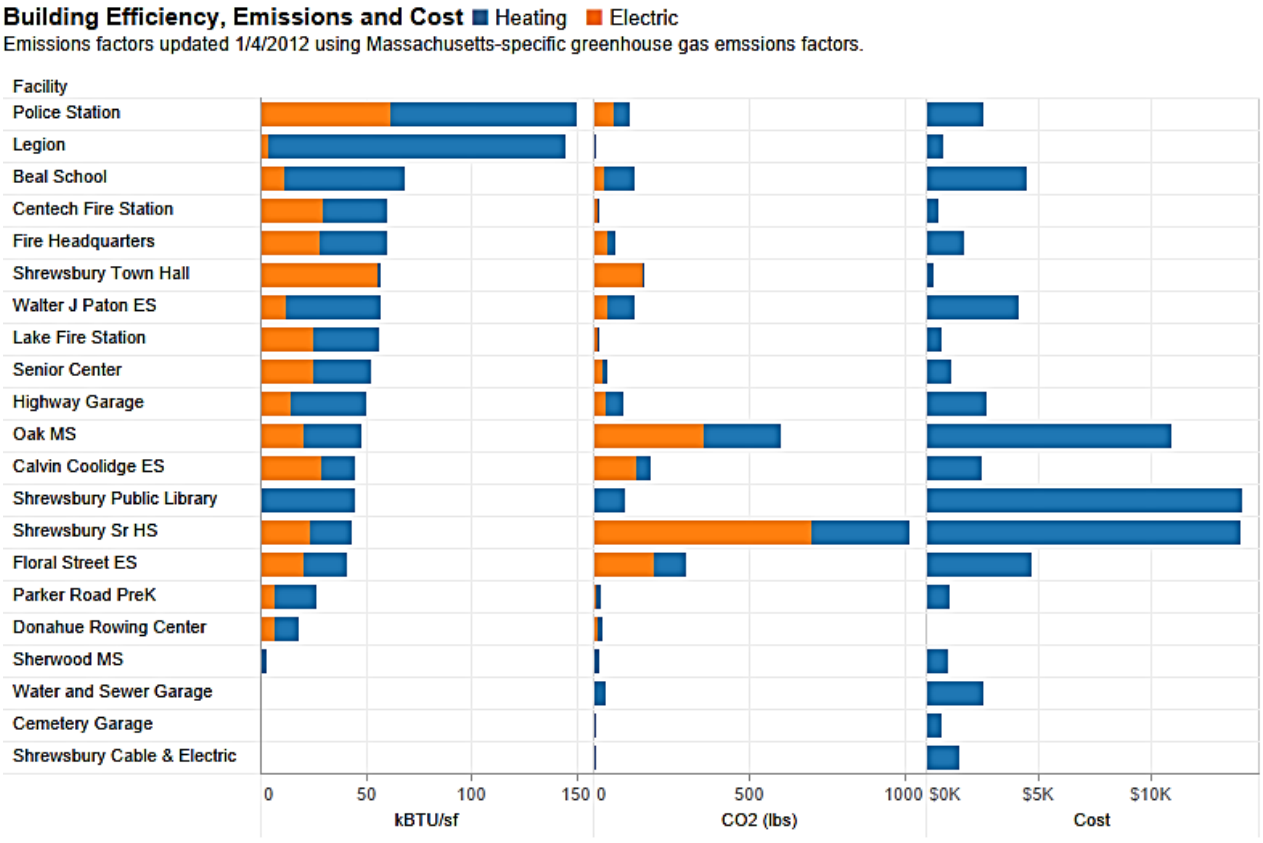
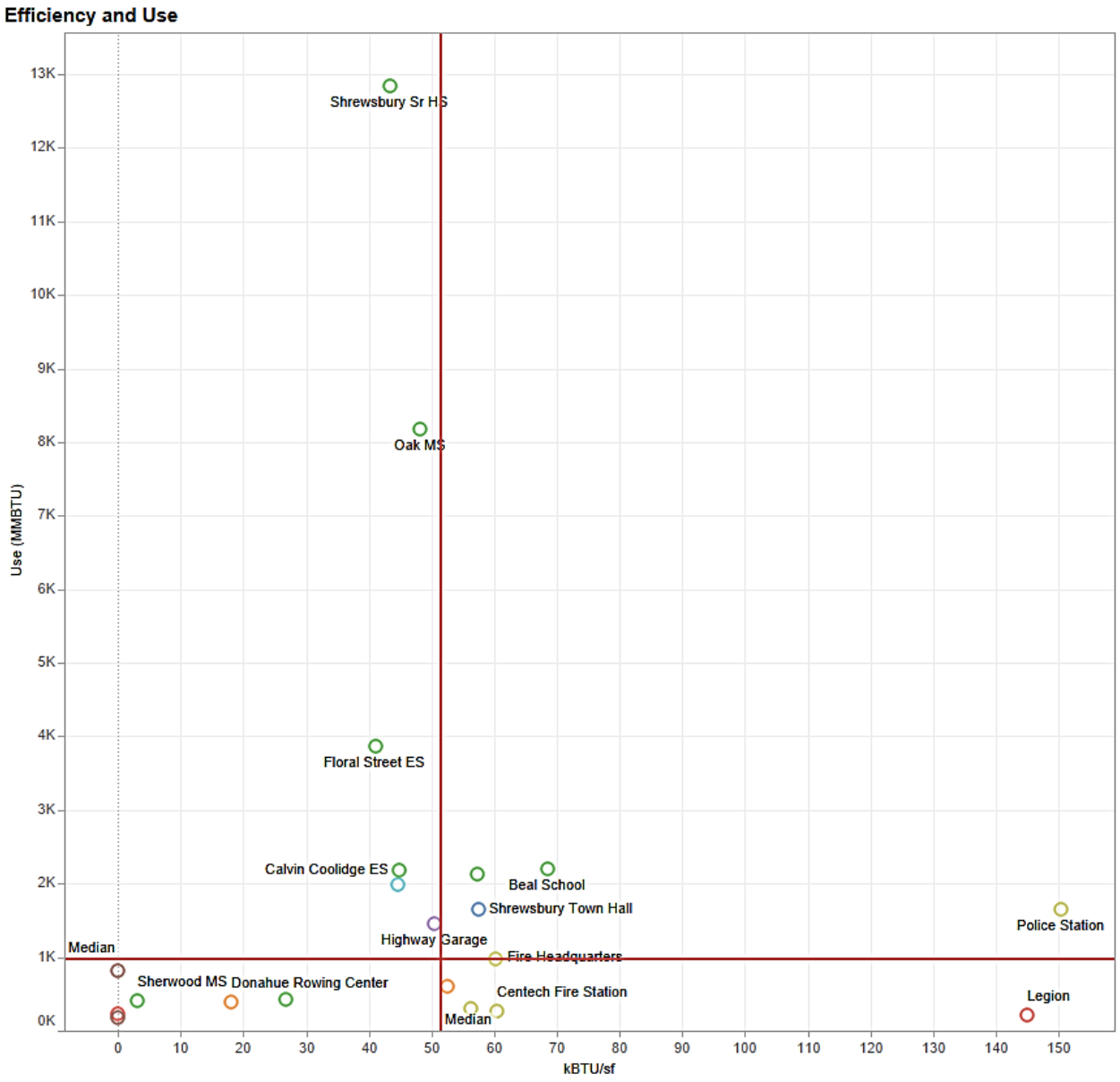


Figure 3b. Building Energy Efficiency per Square Foot from MEI



B. REACHING 20% ENERGY USE REDUCTION WITHIN 5-YEARS FOLLOWING BASELINE

The Town of Shrewsbury is committed to reducing baseline (FY2017) energy consumption by twenty (20) percent over the 5-year period from FY2017 to the end of FY2022. A list of specific and documented strategies is presented in Table 4a (see Appendix B) and accounts for a reduction of 18.69 percent of baseline energy use. The strategy for implementing this plan is presented below.

Program Management Plan for Implementation, Monitoring, and Oversight
The Town Manager's Office will be responsible for securing the funds and general oversight of the energy efficiency projects, annual reporting, grant administration, and maintaining energy use data in MEI.

Methodology
The Town of Shrewsbury will follow the recommendations outlined by Horizon and the vehicle and programmatic measures identified by CMRPC. Together, these strategies will reduce the Town's energy use by twenty (20) percent.

Summary of Energy Audits and Other Sources for Projected Energy Savings
In 2018, Horizon Solutions audited eleven (11) of Shrewsbury's buildings as part of the Town's Green Communities effort. Audited facilities included:

- Oak Middle School
- Sherwood Middle School
- High School
- Senior Center
- Town Hall
- Beal School
- Paton Elementary School
- Parker Road Pre-K
- Coolidge Elementary School
- Floral Street Elementary School
- Spring Street Elementary School

Buildings
In 2018, detailed audits were conducted at eleven (11) municipal buildings. These audits included data during site visit walkthroughs, review of utility bills, and discussions with administration officials, staff, and building occupants. The data presented in these audits includes specific energy conservation measures (ECMs) with detailed information about baseline energy use, projected usage savings and annual cost data. This information is contained in individual reports for each facility as well as in an Energy Audit Summary Report. Annual usage, cost estimates and annual cost savings were taken directly from these reports to estimate energy savings. These reports are contained in Appendix C.

In addition to building upgrades and energy-saving modifications, the Town intends to send a representative to Building Operator Certification (BOC®) training. Energy-savings evaluations show that an individual Certified Building Operator (CBO) can reduce energy use by more than 2% of a building's building electricity demand.[6] By certifying operators in building systems efficiency, the town will realize savings in energy use and related costs, improvements in comfort and safety, and may continue to experience these benefits for up to five (5) years following certification (based on program estimates). [7]

[6]Energy Savings for the Building Operator Certification (BOC®) Program. http://www.theboc.info/wp-content/uploads/2017/02/BOC-Energy-Savings-FAQ-2.0-web.pdf
[7] Building Operator Certification Program. https://www.theboc.info/certifications/

Vehicles

The Central Massachusetts Regional Planning Commission (CMRPC) audited Shrewsbury's vehicular energy usage, projected usage savings, and annual cost information. CMRPC projects energy savings in the following vehicle-specific areas: (1) general fuel economy measures, (2) anti-idling policy, and (3) IdleRight technology. Savings projections were derived as follows:

General Vehicle-Fuel Conservation Measures (All Departments)

Implementing fuel economy measures can help reduce fuel consumption without any additional cost or investment. The town will implement the goals listed below to achieve approximately a three (3) percent reduction in fuel use. According to the US Department of Energy (DOE) website at fueleconomy.gov, these include the following:

- **Drive sensibly**: Avoid aggressive driving (e.g., rapid acceleration/ braking) to reduce vehicle fuel use by five (5) to thirty-three (33) percent.
- **Remove excess weight**: Avoid storing unnecessary items in your vehicle. An extra 100 pounds could reduce mpg by up to two (2) percent, especially in smaller vehicles
- **Keep engine tuned**: Fixing a vehicle that is out of tune or has failed an emissions test can improve gas mileage by an average of four (4) percent.
- **Keep tires inflated**: Improve gas mileage by up to 3.3 percent by inflating to proper pressure.
- **Use recommended grade of oil.** Improve gas mileage by one (1) to two (2) percent by using manufacturer's recommended grade of motor oil.

Calculations for estimating the MMBtus saved as a result of these measures are shown in Table 5a and 5b.

Table 5a. General Vehicle Fuel Economy Measures

Action	Description	DOE Est Savings	Used in this ERP
Drive Sensibly	Avoid aggressive driving (e.g., rapid acceleration and braking).	5-33%	1%
Remove Excess Weight	Avoid storing unnecessary items in your vehicle. An extra 100 pounds could reduce mpg by up to 2% especially in smaller vehicles.	1-2%	0.5%
Keep Engine Tuned	Fixing a vehicle that is out of tune or has failed an emissions test can improve gas mileage by an average of 4%.	4%	0.5%
Keep Tires Inflated	Improve gas mileage by up to 3.3% by inflating to proper pressure.	Up to 3%	0.5%
Use Recommended Grade of Oil	Improve gas mileage by 1%-2% by using manufacturer's recommended grade of motor oil.	1-2%	0.5%
		Total	**3.0%**

Table 5b. Fuel Economy as MMBtus	
Summary	**Amount**
Total Gasoline Gallons	101,661
Total Diesel Gallons	36,323
Gasoline Gallons Saved (3%)	3,050
Diesel Gallons Saved (3%)	1,090
Conversion Rate MMBtu, Gasoline	0.124
Conversion Rate MMBtu, Diesel	0.139
Total MMBtus Saved Annually	**530**

Anti-Idling Policy (Non-Police Vehicles)

The Town of Shrewsbury will adopt an Anti-Idling Policy for Town-owned vehicles (excluding police vehicles). Department Heads will be asked to monitor compliance and report to the Town Manager after six (6) months of this policy taking effect in order to make suggestions for improvements or changes. Table 6 demonstrates potential anti-idling policy fuel savings based on Shrewsbury's non-police vehicles.

Table 6. Anti-Idling Policy Fuel Savings	
Category	**Amount**
Non-Police Vehicle Gasoline	61,989
Non-Police Vehicle Diesel	36,323
Estimated Fuel Savings	3.0%
Gasoline Saved (gallons)	3,050
Diesel Saved (gallons)	1,090
Conversion Rate MMBtu, Gasoline	0.124
Conversion Rate MMBtu, Diesel	0.139
MMBtus Saved, Gasoline	378
MMBtus Saved, Diesel	152
Total MMBtus Saved Annually	**530**

IdleRight Devices

Shrewsbury will install IdleRight systems in fifteen (15) of its police patrol cruisers (IdleRight technology is available from Havis, Inc. and is described more completely at www.havis.com/idleright.htm). This technology is cost-effective, generates a fast return on investment, and is ideal for fleets in which anti-idling policies are not preferred. Table 7 presents the fuel savings projected as a result of this measure.

The IdleRight system monitors vehicle batteries' conditions and automatically turns vehicles on to idle only when necessary. While idling at an emergency or construction scene, a typical police

cruiser uses about 0.9 gallon of gasoline per hour. That same vehicle, equipped with the IdleRight system uses only about 1/10th of a gallon of gasoline per hour- and never jeopardizes the charge in the battery needed for startup. The cost of implementing the IdleRight equipment is approximately $750 per vehicle. This means that the system will pay for itself in about 3 to 4 months of operation. Table 7 (next page) shows the calculated savings for implementing the program on the fifteen (15) sample vehicles.

Table 7. IdleRight Police Savings	
IdleRight Savings Per Police Cruiser	
Hours per Day Idling	1.5
Days per Week on Duty	7
Hours per Year Idling	546
Gallons per Hour Saved	0.81
Gallons Saved per Vehicle per Year	442
Total Savings for Cruisers	
Number of Cruisers (sample of fleet)	15
Total Gallons Saved per Year	6630
Conversion Rate MMBtu, Gasoline	0.124
Total MMBtu Saved Annually	**882**

C. GENERAL CONSERVATION MEASURES

Specific strategies outlined in Table 4, in combination with the strategies identified above account for a projected energy savings of 18.69 percent. Beyond these measures, the Town of Shrewsbury will also implement "soft" measures, enabling the Town to meet the twenty (20) percent reduction target.

Municipal Buildings
Town buildings serve as the largest energy users. Consequently, the municipal buildings will continue to be an area of focus in the future. After the priority work identified in Table 4 Appendix B. is underway, smaller but still significant projects can be undertaken in all buildings. Such projects would include energy conserving window treatments for smaller area windows where appropriate and upgrading storm windows.

We also view training and education of building occupants as an ongoing energy reduction strategy. We will utilize a variety of behavioral strategies to conserve energy, including:

Equipment
Municipal employees will be instructed to turn off or set computers and other electronic equipment to hibernation mode when not in use. Additionally, school equipment will be turned off when not in use during summer months. Shrewsbury will ensure that building occupants are maintaining energy efficient practices by placing signage and/or reminder tags in each department office to encourage all occupants to power down and unplug during off hours.

Heating and Cooling
Regarding heating and cooling, building and zone thermostats shall be set to the highest comfortable temperature in summer and the lowest in winter. Employees shall be encouraged to keep warmer clothes on hand so that heating can be set at a lower level. Shrewsbury will also establish specific guidelines for open window air exchange as may be feasible and practicable. Automatic thermostats will be considered where feasible and employees will be encouraged to dial down thermostats when leaving room or building for non-automatic systems. The Town will also evaluate energy efficient strategies for keeping IT equipment cool.

Interior Lighting
Regarding lighting systems, The Town of Shrewsbury will ensure that public buildings are not lighted unnecessarily when in use, that buildings be upgraded to automatic light switches, and that employees be encouraged to turn off lights when exiting rooms and buildings.

Upon designation, the Town will track behavioral changes by conducting occasional, off-hours checks for monitors and lights left on and windows open in winter. We will also create an inventory of light switches that are not automatic and pursue appropriate upgrades.

Street and Traffic Lighting
The Town will continue to identify opportunities to utilize solar energy as substitute for hard wired street lighting systems. The Town Manager's Office will also coordinate with the Public Works and Police Department to identify additional energy savings by using passive, reflective signage rather than lighting for roadway safety where ever possible.

Operations, Maintenance, and Equipment
The Town will reduce energy consumption by working to make sure that certain operational and maintenance standards are in place. The Town will ensure that all equipment is functioning as designed, thermostats are calibrated correctly, dampers are correctly adjusted, and janitors are implementing best practices. Thermostats can also be relocated to be placed in more effective positions.

D. SUMMARY OF LONG-TERM ENERGY REDUCTION GOALS – BEYOND 5 YEARS

Beyond the 5-year plan outlined above, Shrewsbury will continue to pursue energy reduction goals. The following strategies will allow the Town to reduce its energy consumption below twenty (20) percent of the established FY2017 usage baseline.

Vehicles
The Town of Shrewsbury will continue to replace older vehicles with more fuel-efficient vehicles. The town will also investigate the possibility of acquiring electric vehicles and installing electric vehicle charging stations at public places throughout the town.

Perpetuating Energy Efficiency
The Town Manager's Office will investigate the possibility of an energy savings reinvestment plan, in which some of the energy savings are reinvested into a fund to finance future energy efficiency or renewable efficiency projects.

Alternative Modes of Transportation
The Town of Shrewsbury will continue to encourage walking, bicycling, and carpooling as energy efficient practices to reduce use of fossil fuels.

V. ONSITE RENEWABLE ENERGY PROJECTS AND RENEWABLE ENERGY

SELCO commissioned a 3MW solar array in July 2018. The array was built by SELCO and will provide energy for 400-500 homes. The array is constructed on a 12 acre portion of a capped landfill. SELCO is in the process of creating a community solar program. They are also reserving 1,000,000 kWh hours of energy produced by the solar array for the projected new elementary school. There are plans for a 60kW solar facility being built in conjunction with the new water treatment plant located at 45 West Main Street.

VI. LIST OF RESOURCES

In addition to the audits and reports referenced above in Section IV and attached to this report, the Town of Shrewsbury used the following people and resources to create this Energy Reduction Plan:

- **Kelly Brown**, Green Communities Regional Coordinator, Western Region, Massachusetts Department of Energy Resources (MA DOER). kelly.brown@state.ma.us
- **Green Communities Grant Program Information and Guidance**, Massachusetts Department of Energy Resources (MA DOER). www.mass.gov/energy/greencommunities
- **Dominique DuTremble**, Associate Planner, Central Massachusetts Regional Planning Commission. ddutremble@cmrpc.org
- **Trea Schumacher**, Planning Assistant, Central Massachusetts Regional Planning Commission. tschumacher@cmrpc.org
- **Chris Bennet**, Planning Technician, Central Massachusetts Regional Planning Commission. cbennett@cmrpc.org
- **2018 Energy Audit:** Prepared by Horizon Solutions LLC. 2018. Appendix C.

APPENDICES – INCLUDED AS SEPARATE ATTACHMENTS

Appendix A: Adoption Verification Letters

Appendix B: Table 4. Energy Conservation Measures

Appendix C: Horizon Solutions Audit Report