Local Government Energy Audit:
Energy Audit Report

Memorial Elementary School

201 Squaw Brook Rd.

North Haledon, NJ 07508

North Haledon Board of Education

August 28, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Memorial School.

The goal of an LGEA report is to provide you with information on how your building uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey public schools in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Building Summary

The Memorial School is a 60,480 square foot, two-story building comprised of various space types including classrooms, offices, cafeteria, media center, gymnasium, and various mechanical and storage spaces.

Lighting at the Memorial School consists of inefficient linear and compact fluorescent lighting. Heating is supplied by a hot water boiler and two gas-fired furnaces. Cooling is provided by various split system and package unit air conditioning units. A thorough description of the building and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated five measures which together represent an opportunity for the Memorial School to reduce annual energy costs by $22,716 and annual greenhouse gas emissions by 130,477 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.5 years. The breakdown of existing and potential utility costs after project implementation are illustrated in ***Figure 1*** and ***Figure 2***, respectively. Together these measures represent an opportunity to reduce the Memorial School's annual energy use by 11%.

Figure 1 – Previous 12 Month Utility Costs

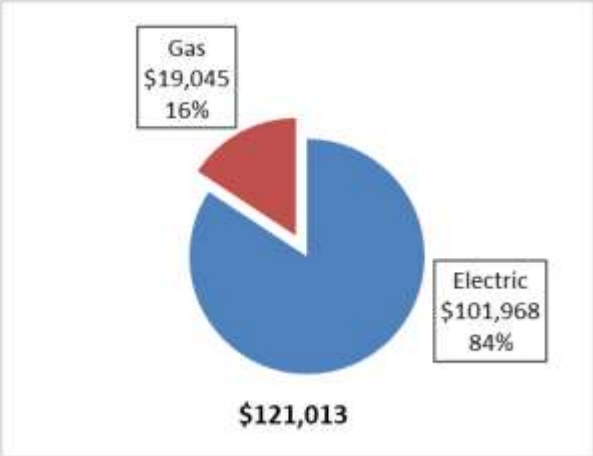
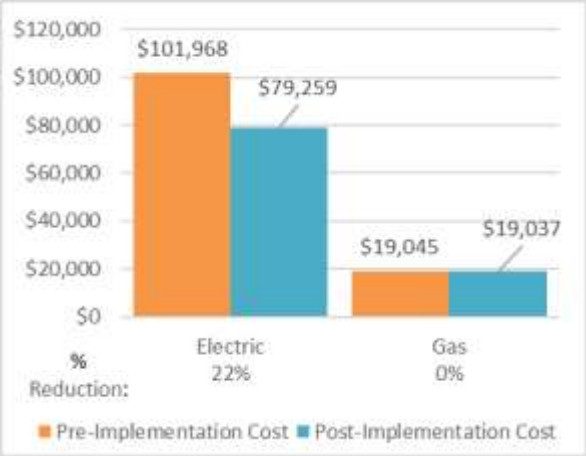


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Memorial School's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**125,432**	**28.4**	**0.0**	**$21,999.15**	**$137,255.86**	**$17,440.00**	**$119,815.86**	**5.4**	**126,309**
ECM 1	Install LED Fixtures	Yes	32,854	5.5	0.0	$5,762.12	$68,352.26	$5,900.00	$62,452.26	10.8	33,083
ECM 2	Retrofit Fixtures with LED Lamps	Yes	92,578	22.9	0.0	$16,237.03	$68,903.61	$11,540.00	$57,363.61	3.5	93,225
Lighting Control Measures			**2,434**	**0.4**	**0.0**	**$426.82**	**$4,400.00**	**$700.00**	**$3,700.00**	**8.7**	**2,451**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	2,434	0.4	0.0	$426.82	$4,400.00	$700.00	$3,700.00	8.7	2,451
Domestic Water Heating Upgrade			**0**	**0.0**	**0.8**	**$7.73**	**$89.30**	**$0.00**	**$89.30**	**11.6**	**95**
ECM 4	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	0.8	$7.73	$89.30	$0.00	$89.30	11.6	95
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$282.70**	**$230.00**	**$0.00**	**$230.00**	**0.8**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$282.70	$230.00	$0.00	$230.00	0.8	1,623
TOTALS			**129,477**	**28.8**	**0.8**	**$22,716.39**	**$141,975.16**	**$18,140.00**	**$123,835.16**	**5.5**	**130,477**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC also identified ten low cost (or no cost) energy efficient practices. A building's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at the Memorial School include:

- Reduce Air Leakage
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Clean Evaporator/Condenser Coils on AC Systems
- Perform Proper Boiler Maintenance
- Install Plug Load Controls
- Replace Computer Monitors
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for the Memorial School. Based on the configuration of the site and its loads there is a moderate potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	Medium	
System Potential	107	kW DC STC
Electric Generation	80,512	kWh/yr
Displaced Cost	$7,000	/yr
Installed Cost	$417,300	

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other building upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- SREC (Solar Renewable Energy Certificate) Registration Program
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 BUILDING INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Maquire	Supervisor of Buildings & Grounds	jmaguire@nhschools.net	973-427-1220
TRC Energy Services			
Alexander Klieverik	Auditor	aklieverik@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On January 23, 2018 and January 24, 2018, TRC performed an energy audit at the Memorial School located in North Haledon, New Jersey. TRC's team met with John Maguire, Supervisor of Buildings & Grounds to review the building operations and help focus our investigation on specific energy-using systems.

The Memorial School is a 60,480 square foot two-story building comprised of various space types including classrooms, offices, cafeteria, media center, gymnasium, and various mechanical and storage spaces. There is a large attic space above the second floor which contains the air handler units that condition the building. For the purposes of this report, this space will be referred to as the third floor.

The building was constructed in 2008. Over the last five years the building has installed new occupancy sensors in all classrooms throughout the building. The site is interested in new LED lighting, but has been unable to fund the project.

2.3 Building Occupancy

The building is open Monday through Friday and open as needed on weekends. The building is used year-round by the community, and camps are run throughout the summer. During a typical day, the building is occupied by 55 staff and 350 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Memorial School	Weekday	6:00 AM to 4:00 PM
Memorial School	Weekend	As Needed

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The building has a pitched roof covered with asphalt shingles that are in good condition. There is a small section of flat roof which has some heating and cooling equipment. The building has double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and in good condition except that the door seals have worn out which increases the level of outside air infiltration.



2.5 On-Site Generation

The Memorial School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the building's equipment.

Lighting System

Lighting at the building is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers, or indirect hanging fixtures. The boiler room, and the entire third floor has 2-lamp, 4-foot long shop fixtures.




Lighting control in most spaces is provided by occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout. The entire third floor, stairwells, and hallway areas do not contain any occupancy sensors, and fixtures are operated via wall switches. The lighting on the third floor is only used when servicing the air handler units, while the hallways and stairwell lights are on continuously from when the building opens to when it closes.



The building's exterior lighting consists of metal halide and compact fluorescent fixtures that are controlled by schedule timers.

Hot Water and Forced Air Heating System

The hot water system for this building consists of two Laars gas-fired, 1,360 kBtu/hr output, and forced draft boilers serving most of the building. The boilers have a nominal combustion efficiency of 85%. The hot water heating loop is configured as variable flow primary distribution with two 7.5 HP hot water pumps; each with a Yaskawa Varispeed E7 drive. Hot water is supplied at 170°F when the outside air temperature is below 55°F and the setpoint is reset to 140°F when the outside air is above 55°F. The boilers provide hot water to coils within the air handlers on the third floor, as well as to perimeter convection heaters.

The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather. The lead boiler is manually rotated every 24 hours.


The boilers are in good condition and well maintained.

The kitchen is heated by a gas-fired furnace located on the roof. The unit is manufactured by CaptiveAire and has an output capacity of 150 MBH and a combustion efficiency of 80%. The cafeteria is heated by a York packaged heating and cooling unit, also located on the roof of the building. The furnace component has an output capacity of 240 MBH and a combustion efficiency of 80%. The units are controlled via a thermostat located in the space.

Kitchen Furnace

Cafeteria Packaged Unit

The units are in good condition and well maintained.

Air Conditioning System

The building is primarily cooled by eight Trane air handler units (AHUs) with direct expansion coils (DX) and variable frequency drives, located on the third floor of the building. The corresponding compressor and condensing units are located on the flat section of the roof. The first and second floor classrooms are split into two zones; north (AHU1) and south (AHU2). The north side classrooms are served by a 30-ton capacity unit with a 15 HP supply air fan, and a 10 HP exhaust fan. The south side classrooms are served by a 40-ton capacity unit with a 15 HP supply air fan, and a 10 HP exhaust fan. The computer lab is served by a 6-ton capacity unit with a 5 HP supply air fan, and a 3 HP exhaust fan (AHU3). The center section of the building which includes the faculty room, restrooms, custodial room, SGI room, and elevator area are served by a 10-ton capacity unit with a 5 HP supply air fan, and a 3 HP exhaust fan (AHU4). The center hallways on the first and second floors are served by a 20-ton unit with a 5 HP supply air fan, and a 3 HP exhaust fan (AHU5). The gymnasium is served by a 40-ton capacity unit with a 15 HP supply air fan, and a 10 HP exhaust fan (AHU6). The media center and music room on the second floor are served by a 12 ½-ton capacity unit with a 5 HP supply air fan, and a 5 HP exhaust fan (AHU7). The main office area including the nurse's suite, conference rooms, and electrical room are served by a 10-ton capacity unit with a 5 HP supply air fan, and a 5 HP exhaust fan (AHU8).

The York packaged unit serving the cafeteria has a capacity of 20 tons, and has a 7.5 HP supply fan, and two 1.5 HP exhaust fans. Package unit supply and exhaust fans are equipped with variable frequency drives (VFD).

The server room on the second floor is conditioned via a cooling-only ductless mini-split AC unit. The unit is manufactured by EMI and has a cooling capacity of 24,000 Btus.

All cooling equipment at the building is in good condition and well maintained.

Building Automation System (BAS)

The building heating and air conditioning is controlled by a web-based building automation system (BAS) manufactured by Automated Logic. The system is set to maintain a heating setpoint of 72°F and a cooling setpoint of 74°F from 4:00 AM to 7:00 PM every day throughout most of the year. During the heating season, that time is extended from 2:00 AM to 9:00 PM. At night, the heating setpoint is set back to 60°F and cooling is shut off.

Domestic Hot Water Heating System

The domestic hot water heating system for the building consists of one A.O. Smith gas-fired hot water heater with an input rating of 199 kBtu/hr and a nominal efficiency of 87%. The water heater has a 100 gallon storage tank and a fractional horsepower recirculation pump to distribute 115°F water to the entire building. The recirculation pumps operate based on an aquastat.

Building Plug Load

There are 80 computer work stations throughout the building. Ninety percent of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

There are 150 Chromebook laptops housed in charging cabinets throughout the building.

Other equipment contributing to the building plug load includes 30 projectors and smartboards, 17 desk-top printers, two photocopiers, five televisions, and eight refrigerators/freezers of various sizes.

2.7 Water-Using Systems

There are 14 restrooms at this building. A sampling of restrooms found that the faucets are rated for 2.2 gallons per minute (gpm) or lower, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. There is one restroom with a shower that is occasionally used by staff. The showerhead is rated at 2.5 gpm.

3 Site Energy Use and Costs

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

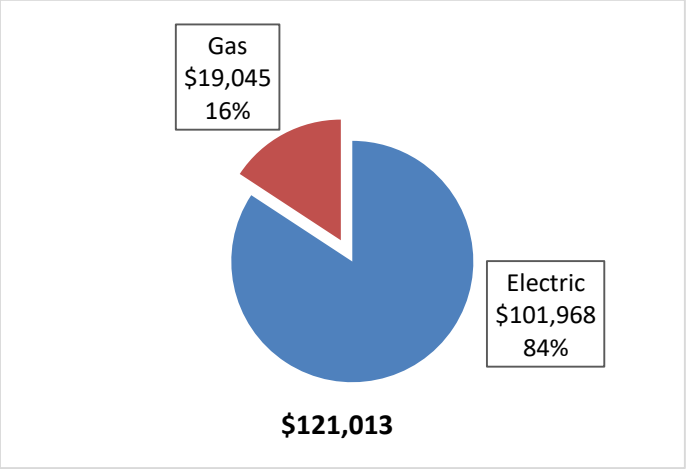
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the building was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Memorial School		
Fuel	**Usage**	**Cost**
Electricity	581,387 kWh	$101,968
Natural Gas	20,018 Therms	$19,045
Total		**$121,013**

The current annual energy cost for this building is $121,013 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.175/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The electric energy profile (pattern of consumption) indicates spikes in consumption during the summer months due to increased cooling load. The increase in consumption in September is most likely due increased activity at the beginning of the school year. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 9 - Electric Usage & Demand

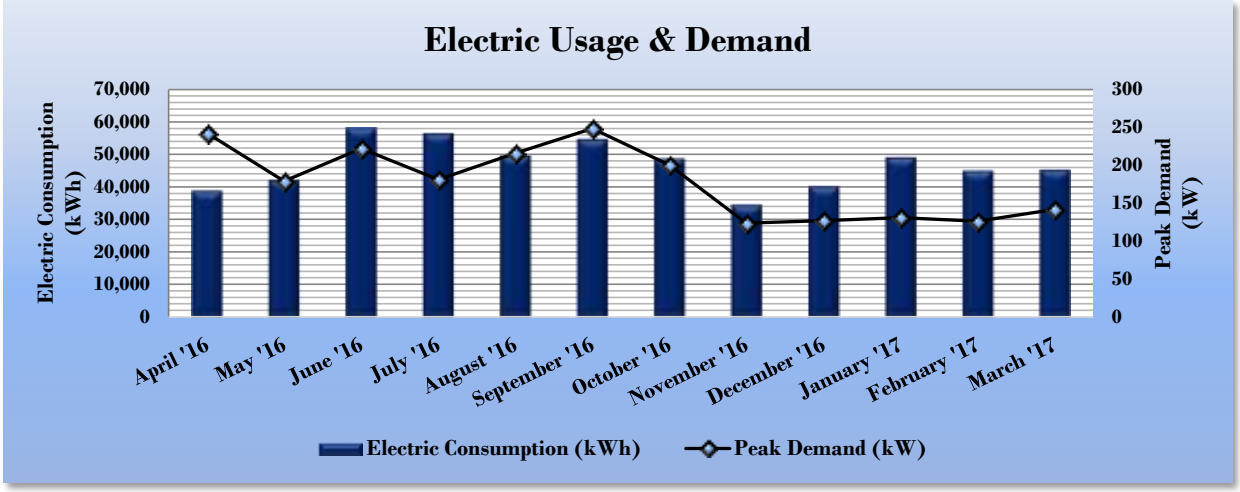


Figure 10 - Electric Usage & Demand

Electric Billing Data for Memorial School						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
4/26/16	28	38,760	242	$888	$6,644	No
5/25/16	28	42,000	179	$655	$6,862	No
6/24/16	29	57,960	222	$813	$11,173	No
7/27/16	32	56,280	181	$664	$10,435	No
8/24/16	27	49,440	216	$791	$9,915	No
9/23/16	29	54,480	248	$922	$11,055	No
10/27/16	33	48,480	200	$746	$7,758	No
11/22/16	25	34,440	124	$460	$5,612	No
12/23/16	30	40,000	127	$472	$6,800	Yes
1/25/17	32	48,960	131	$487	$7,728	No
2/24/17	29	44,760	126	$469	$7,120	No
3/27/17	30	45,120	142	$533	$7,235	No
Totals	**352**	**560,680**	**248.4**	**$7,900**	**$98,336**	
Annual	**365**	**581,387**	**248.4**	**$8,192**	**$101,968**	

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.951/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The usage profile is typical of a school with little in the way of DWH demand in a temperate climate zone.

Figure 11 - Natural Gas Usage

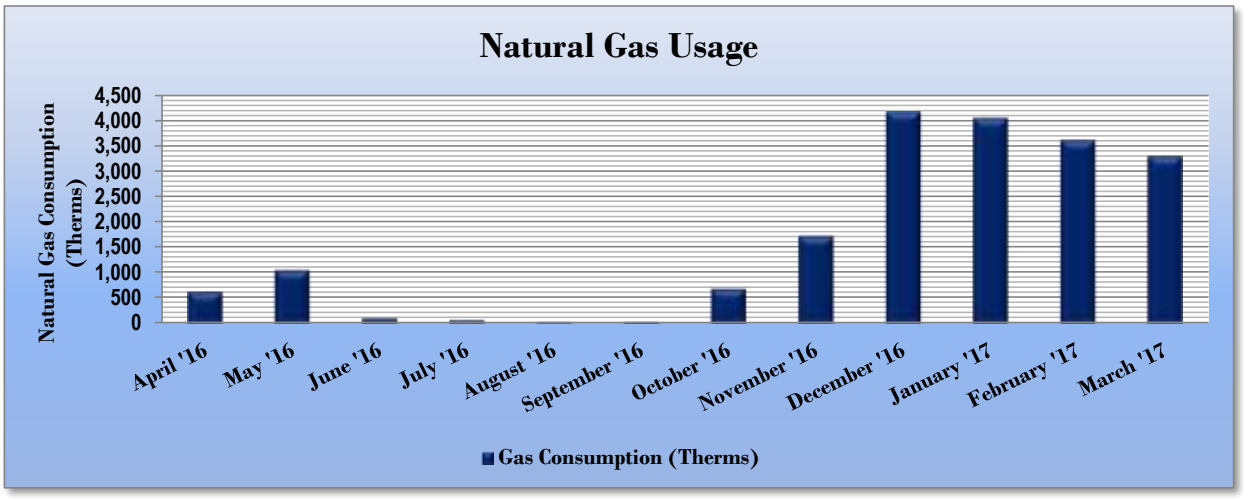


Figure 12 - Natural Gas Usage

Gas Billing Data for Memorial School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
4/26/16	28	615	$440	No
5/25/16	28	1,039	$670	No
6/24/16	29	94	$158	No
7/27/16	32	56	$138	No
8/24/16	27	20	$118	No
9/23/16	29	22	$119	No
10/27/16	33	679	$479	No
11/22/16	25	1,713	$1,732	No
12/23/16	30	4,155	$4,023	Yes
1/25/17	32	4,032	$3,974	No
2/24/17	29	3,598	$3,520	No
3/27/17	30	3,283	$2,997	No
Totals	**352**	**19,305**	**$18,367**	
Annual	**365**	**20,018**	**$19,045**	

3.4 Benchmarking

This building was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a building's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Memorial School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	137.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	65.9	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Memorial School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	114.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	58.5	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This building has a current score of 34.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this building, see Appendix B: ENERGY STAR® Statement of **Energy Performance**.

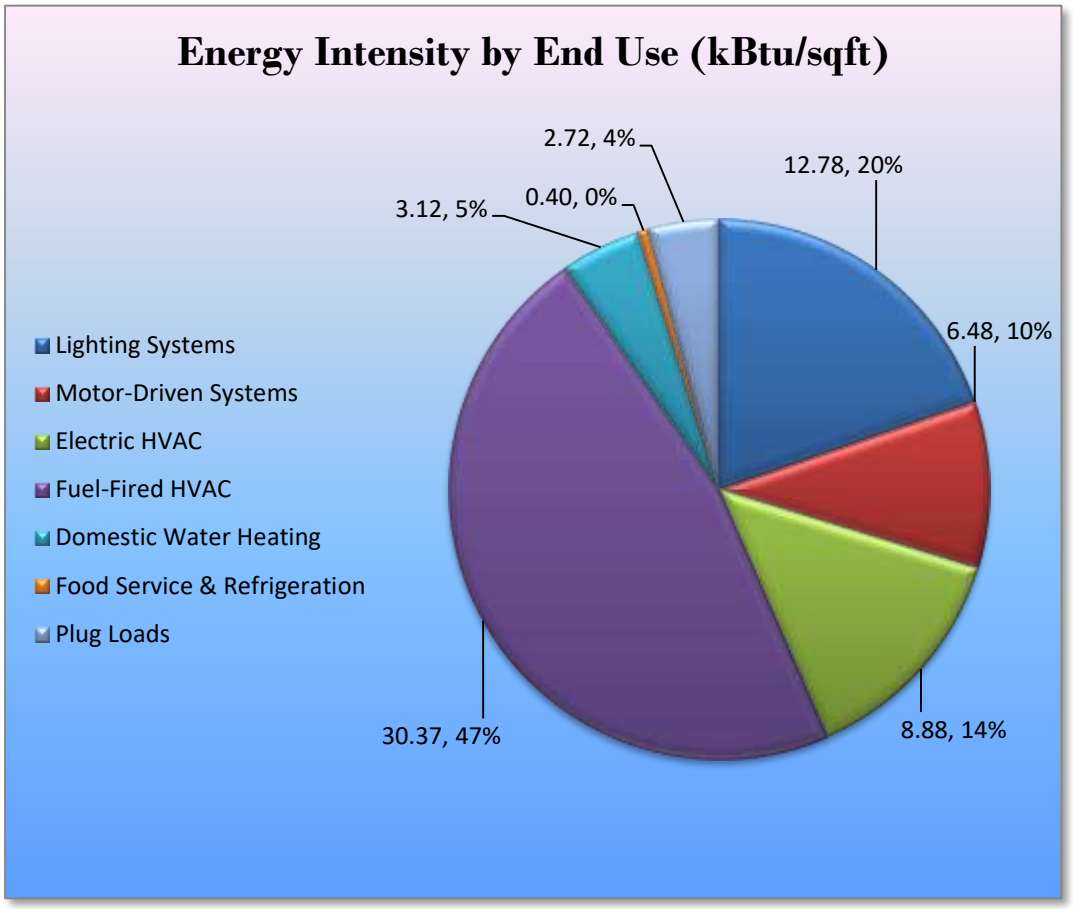
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/building-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your building and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this building. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - Energy Balance (kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Memorial School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the building.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**125,432**	**28.4**	**0.0**	**$21,999.15**	**$137,255.86**	**$17,440.00**	**$119,815.86**	**5.4**	**126,309**
ECM 1	Install LED Fixtures	Yes	32,854	5.5	0.0	$5,762.12	$68,352.26	$5,900.00	$62,452.26	10.8	33,083
ECM 2	Retrofit Fixtures with LED Lamps	Yes	92,578	22.9	0.0	$16,237.03	$68,903.61	$11,540.00	$57,363.61	3.5	93,225
Lighting Control Measures			**2,434**	**0.4**	**0.0**	**$426.82**	**$4,400.00**	**$700.00**	**$3,700.00**	**8.7**	**2,451**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	2,434	0.4	0.0	$426.82	$4,400.00	$700.00	$3,700.00	8.7	2,451
Domestic Water Heating Upgrade			**0**	**0.0**	**0.8**	**$7.73**	**$89.30**	**$0.00**	**$89.30**	**11.6**	**95**
ECM 4	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	0.8	$7.73	$89.30	$0.00	$89.30	11.6	95
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$282.70**	**$230.00**	**$0.00**	**$230.00**	**0.8**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$282.70	$230.00	$0.00	$230.00	0.8	1,623
TOTALS			**129,477**	**28.8**	**0.8**	**$22,716.39**	**$141,975.16**	**$18,140.00**	**$123,835.16**	**5.5**	**130,477**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**125,432**	**28.4**	**0.0**	**$21,999.15**	**$137,255.86**	**$17,440.00**	**$119,815.86**	**5.4**	**126,309**
ECM 1	Install LED Fixtures	32,854	5.5	0.0	$5,762.12	$68,352.26	$5,900.00	$62,452.26	10.8	33,083
ECM 2	Retrofit Fixtures with LED Lamps	92,578	22.9	0.0	$16,237.03	$68,903.61	$11,540.00	$57,363.61	3.5	93,225

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	22,849	3.9	0.0	$4,007.40	$53,704.00	$3,000.00	$50,704.00	12.7	23,009
Exterior	10,005	1.7	0.0	$1,754.72	$14,648.26	$2,900.00	$11,748.26	6.7	10,075

Measure Description

We recommend replacing existing HID fixtures containing metal halide lamps with new high performance LED light fixtures. Interior fixtures are located in the gym and exterior fixtures in the parking lot and along the building perimeter. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a HID lamp.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	92,091	22.8	0.0	$16,151.67	$68,375.00	$11,540.00	$56,835.00	3.5	92,735
Exterior	487	0.1	0.0	$85.36	$528.61	$0.00	$528.61	6.2	490

Measure Description

We recommend retrofitting existing linear and compact fluorescent fixtures with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**2,434**	**0.4**	**0.0**	**$426.82**	**$4,400.00**	**$700.00**	**$3,700.00**	**8.7**	**2,451**
ECM 3	Install Occupancy Sensor Lighting Controls	2,434	0.4	0.0	$426.82	$4,400.00	$700.00	$3,700.00	8.7	2,451

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,434	0.4	0.0	$426.82	$4,400.00	$700.00	$3,700.00	8.7	2,451

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in many restrooms, storage rooms, and office areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**0.8**	**$7.73**	**$89.30**	**$0.00**	**$89.30**	**11.6**	**95**
ECM 4	Install Low-Flow Domestic Hot Water Devices	0	0.0	0.8	$7.73	$89.30	$0.00	$89.30	11.6	95

ECM 4: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	0.8	$7.73	$89.30	$0.00	$89.30	11.6	95

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.4 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 20 below.

Figure 20 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$282.70**	**$230.00**	**$0.00**	**$230.00**	**0.8**	**1,623**
ECM 5	Vending Machine Control	1,612	0.0	0.0	$282.70	$230.00	$0.00	$230.00	0.8	1,623

ECM 5: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$282.70	$230.00	$0.00	$230.00	0.8	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. We recommend installing occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a building's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your building. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20%-60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6–12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.3for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a building, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your building. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

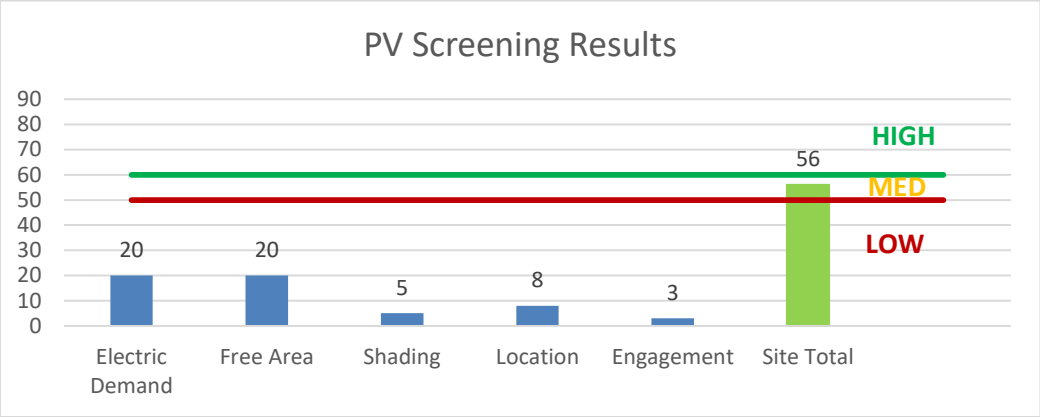
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the building's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the building's electric demand, size and location of free area, and shading elements shows that the building has a Medium potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the medium potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If the Memorial School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 21 - Photovoltaic Screening



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.2 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

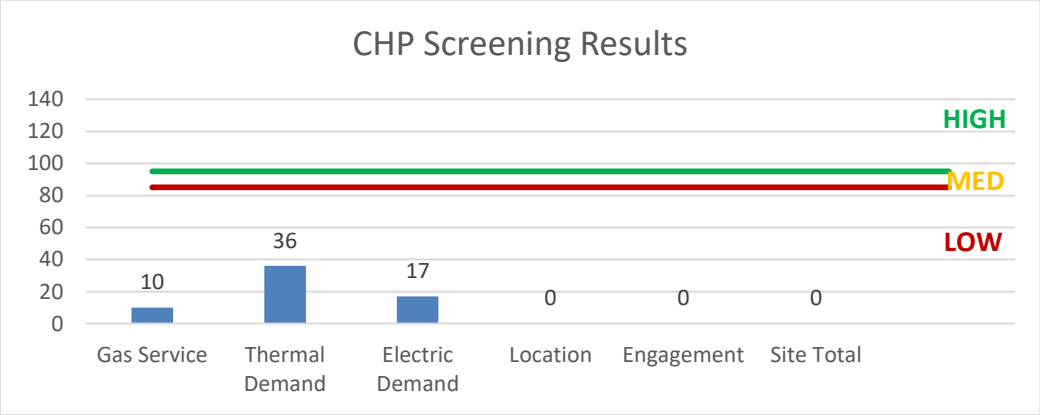
CHP systems are typically used to produce a portion of the electric power used onsite by a building, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the building's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the building has a Low potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the building does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 22 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund, your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X					
ECM 2	Retrofit Fixtures with LED Lamps	X					
ECM 3	Install Occupancy Sensor Lighting Controls	X					
ECM 4	Install Low-Flow Domestic Hot Water Devices						
ECM 5	Refrigeration Controls	X					
ECM 6	Vending Machine Control						

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single building or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your building. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your building is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SRECs are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SRECs to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program description and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e., non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your building's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your building is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your building is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your building is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your building is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gym	20	Metal Halide: (1) 400W Lamp	Wall Switch	458	3,380	Fixture Replacement	Yes	20	LED - Fixtures: High-Bay	Occupancy Sensor	120	2,366	4.26	25,282	0.0	$4,434.22	$58,104.00	$3,700.00	12.27
Gym	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 231 (Data)	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.06	269	0.0	$47.24	$150.40	$30.00	2.55
Stage Area	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,380	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,380	0.26	1,539	0.0	$269.97	$702.00	$120.00	2.16
Stage Area	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot	22	Metal Halide: (1) 70W Lamp	Wall Switch	95	3,380	Fixture Replacement	No	22	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Wall Switch	21	3,380	1.07	6,328	0.0	$1,109.86	$7,616.07	$1,100.00	5.87
Building Lights	12	Compact Fluorescent: Pin-Style: (42W)	Wall Switch	42	3,380	Relamp	No	12	LED Screw-In Lamps: Pin-Style: (30W) 1L	Wall Switch	30	3,380	0.09	560	0.0	$98.17	$528.61	$0.00	5.38
Building Lights	18	Metal Halide: (1) 70W Lamp	Wall Switch	95	3,380	Fixture Replacement	No	18	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	21	3,380	0.87	5,177	0.0	$908.07	$7,032.19	$1,800.00	5.76
2nd Floor Hallways	50	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,380	Relamp	No	50	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,380	1.08	6,414	0.0	$1,124.86	$2,925.00	$500.00	2.16
2nd Floor Hallways	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor Display Cabinet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,380	0.02	128	0.0	$22.50	$58.50	$10.00	2.16
Stairwell 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,380	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,380	0.13	770	0.0	$134.98	$300.80	$60.00	1.78
Stairwell 1	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stairs to 3rd Floor	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,380	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,380	0.13	770	0.0	$134.98	$300.80	$60.00	1.78
1st Floor Hallways	47	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,380	Relamp	No	47	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,380	1.02	6,029	0.0	$1,057.37	$2,749.50	$470.00	2.16
1st Floor Hallways	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Entry Area	2	Compact Fluorescent: Pin-Style Long Lamp: (56W) 2L	Wall Switch	112	3,380	Relamp	No	2	LED Screw-In Lamps: Pin-Style: (39W) 2L	Wall Switch	78	3,380	0.04	264	0.0	$46.36	$176.20	$0.00	3.80
218 CR	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.06	237	0.0	$41.53	$175.50	$30.00	3.50
Men's RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Women's RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Media Center (220)	8	Compact Fluorescent: Pin-Style: (42W) 8L	Occupancy Sensor	336	2,366	Relamp	No	8	LED Screw-In Lamps: Pin-Style: (30W) 8L	Occupancy Sensor	240	2,366	0.50	2,090	0.0	$366.50	$2,819.26	$0.00	7.69
Media Center (220)	5	Compact Fluorescent: Pin-Style: (42W) 2L	Occupancy Sensor	84	2,366	Relamp	No	5	LED Screw-In Lamps: Pin-Style: (30W) 2L	Occupancy Sensor	60	2,366	0.08	327	0.0	$57.27	$440.51	$0.00	7.69
Media Center Front Desk (220)	2	Compact Fluorescent: Pin-Style Long Lamp: (56W) 2L	Occupancy Sensor	112	2,366	Relamp	No	2	LED Screw-In Lamps: Pin-Style: (39W) 2L	Occupancy Sensor	78	2,366	0.04	185	0.0	$32.45	$176.20	$0.00	5.43
Media Center (220)	36	Compact Fluorescent: Pin-Style: (42W)	Occupancy Sensor	42	2,366	Relamp	No	36	LED Screw-In Lamps: Pin-Style: (30W) 1L	Occupancy Sensor	30	2,366	0.28	1,175	0.0	$206.16	$1,585.84	$0.00	7.69
Media Center (220)	27	Compact Fluorescent: Pin-Style: (42W)	Occupancy Sensor	42	2,366	Relamp	No	27	LED Screw-In Lamps: Pin-Style: (30W) 1L	Occupancy Sensor	30	2,366	0.21	882	0.0	$154.62	$1,189.38	$0.00	7.69

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Media Center (220)	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media Center Office (220A)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.06	269	0.0	$47.24	$175.50	$30.00	3.08
Media Center (220B)	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.10	404	0.0	$70.87	$225.60	$45.00	2.55
222 CR	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.23	829	0.0	$145.37	$526.40	$105.00	2.90
224 Music Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
224 Music Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
224 Music Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.01	42	0.0	$7.34	$35.90	$5.00	4.21
224 Music Room back Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Room 221E	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Room 221F	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Boys RR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,380	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,380	0.13	770	0.0	$134.98	$300.80	$60.00	1.78
Girls RR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,380	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,380	0.13	770	0.0	$134.98	$300.80	$60.00	1.78
Caferia	30	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	30	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.97	4,041	0.0	$708.66	$2,256.00	$450.00	2.55
Caferia	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
208 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
208 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
Room 206	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.13	539	0.0	$94.49	$351.00	$60.00	3.08
210 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
210 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
211 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
211 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
212 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.13	474	0.0	$83.07	$300.80	$60.00	2.90
212 CR	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.15	553	0.0	$96.91	$409.50	$70.00	3.50
212 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
213 CR	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.26	947	0.0	$166.13	$601.60	$120.00	2.90

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
213 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.26	947	0.0	$166.13	$702.00	$120.00	3.50
213 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
214 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.13	474	0.0	$83.07	$300.80	$60.00	2.90
214 CR	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.15	553	0.0	$96.91	$409.50	$70.00	3.50
215 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.13	474	0.0	$83.07	$300.80	$60.00	2.90
215 CR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.04	158	0.0	$27.69	$117.00	$20.00	3.50
215 CR	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.02	84	0.0	$14.68	$71.80	$10.00	4.21
216 Computer Lab	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
216 Computer Lab	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
102 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
102 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
101 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
101 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
101 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.02	79	0.0	$13.84	$58.50	$10.00	3.50
Stairwell #2	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	3,380	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	None	44	3,380	0.13	770	0.0	$134.98	$300.80	$60.00	1.78
Stairwell #2	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
201 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
201 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
201A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.04	158	0.0	$27.69	$117.00	$20.00	3.50
202 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
202 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
203 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
203 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
204 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
204 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
203A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.04	158	0.0	$27.69	$117.00	$20.00	3.50
205A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.04	158	0.0	$27.69	$117.00	$20.00	3.50
205 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
205 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
206 CR	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
206 CR	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
206 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
207 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
207 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
109 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
109 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
109 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.02	79	0.0	$13.84	$58.50	$10.00	3.50
108 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
108 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
107 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
107 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
107 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.02	79	0.0	$13.84	$58.50	$10.00	3.50
106 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
106 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
105 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
105 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
105 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.02	79	0.0	$13.84	$58.50	$10.00	3.50
104 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
104 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
103 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
103 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
103 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.02	79	0.0	$13.84	$58.50	$10.00	3.50
Room 116 Teacher's Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.36	1,482	0.0	$259.84	$827.20	$165.00	2.55
121B Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
127 Supply Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.10	404	0.0	$70.87	$225.60	$45.00	2.55
125 Supply Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.06	269	0.0	$47.24	$150.40	$30.00	2.55
Room 121	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.06	269	0.0	$47.24	$150.40	$30.00	2.55
Room 121 RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.04	180	0.0	$31.50	$117.00	$20.00	3.08
123 Elevator Machine Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Mens RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Womnes RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Boys RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08
Boys RR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.13	539	0.0	$94.49	$300.80	$60.00	2.55
Girls RR	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.16	673	0.0	$118.11	$376.00	$75.00	2.55
New Beginnings RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.03	135	0.0	$23.62	$75.20	$15.00	2.55
114 CR	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.55	2,013	0.0	$353.03	$1,278.40	$255.00	2.90
115 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.39	1,421	0.0	$249.20	$902.40	$180.00	2.90
115 CR	1	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Wall Switch	30	2,552	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,552	0.01	45	0.0	$7.98	$35.90	$5.00	3.87
113 CR	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.13	474	0.0	$83.07	$351.00	$60.00	3.50
112 CR	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
112 CR	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
112 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
111 CR	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
111 CR	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
111 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
110 CR	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,080	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,080	0.19	710	0.0	$124.60	$451.20	$90.00	2.90
110 CR	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,080	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,080	0.24	868	0.0	$152.29	$643.50	$110.00	3.50
110 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,080	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,080	0.05	167	0.0	$29.37	$143.60	$20.00	4.21
129 Mech Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.26	1,077	0.0	$188.98	$702.00	$120.00	3.08
129 Mech Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
124d Generator Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.22	898	0.0	$157.48	$585.00	$100.00	3.08
124d Generator Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical/Storage	64	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	64	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	1.38	5,747	0.0	$1,007.87	$3,744.00	$640.00	3.08
3rd Floor Mechanical/Storage	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.26	1,077	0.0	$188.98	$601.60	$120.00	2.55
Main Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.13	539	0.0	$94.49	$351.00	$60.00	3.08
Main Office 124G Conf. Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.09	359	0.0	$62.99	$234.00	$40.00	3.08
124H Principal's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.04	180	0.0	$31.50	$117.00	$20.00	3.08
124E Child Study	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.04	180	0.0	$31.50	$117.00	$20.00	3.08
124I BOE Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.11	449	0.0	$78.74	$292.50	$50.00	3.08
124J BOE Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.09	359	0.0	$62.99	$234.00	$40.00	3.08
Superintendant Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.11	449	0.0	$78.74	$292.50	$50.00	3.08
Nurse's Suite	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,366	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,366	0.16	673	0.0	$118.11	$376.00	$75.00	2.55
Nurse's Suite	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.04	180	0.0	$31.50	$117.00	$20.00	3.08
Nurse's Suite	2	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Occupancy Sensor	30	2,366	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,366	0.02	84	0.0	$14.79	$71.80	$10.00	4.18
Nurse's Suite RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,366	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,366	0.02	90	0.0	$15.75	$58.50	$10.00	3.08

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hot Water Heating System	1	Heating Hot Water Pump	7.5	88.5%	Yes	0	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hot Water Heating System	1	Heating Hot Water Pump	7.5	91.7%	Yes	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	DHW recirculation pump	1	Water Supply Pump	0.1	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Classrooms (North Side)	1	Supply Fan	15.0	91.0%	Yes	848	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Classrooms (North Side)	1	Exhaust Fan	10.0	89.5%	Yes	848	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Classrooms (South Side)	1	Supply Fan	15.0	91.0%	Yes	848	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Classrooms (South Side)	1	Exhaust Fan	10.0	89.5%	Yes	848	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Computer Lab	1	Supply Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Computer Lab	1	Exhaust Fan	3.0	86.5%	Yes	848	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Center Area	1	Supply Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	1st & 2nd Floor Center Area	1	Exhaust Fan	3.0	84.0%	Yes	848	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Whole Building Hallways	1	Supply Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Whole Building Hallways	1	Exhaust Fan	3.0	86.5%	Yes	848	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Gym	1	Supply Fan	15.0	91.0%	Yes	848	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Gym	1	Exhaust Fan	10.0	89.5%	Yes	848	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Media Center & Music Room	1	Supply Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Media Center & Music Room	1	Exhaust Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Main Office Area	1	Supply Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Main Office Area	1	Return Fan	5.0	87.5%	Yes	848	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Whole Building	3rd Floor Mechanical Area Unit Heaters	8	Supply Fan	0.1	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
3rd Floor Mechanical	3rd Floor Mechanical Area Exhaust Fan	2	Exhaust Fan	1.5	84.0%	No	2,160	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Supply Fan	7.5	88.5%	No	3,391	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	2	Exhaust Fan	1.3	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Exhaust Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Exhaust Fan	2.0	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Exhaust Fan	0.3	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Mechanical	Bathrooms	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator Machine Room	Elevator	1	Process Pump	20.0	91.0%	No	48	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Gym (AHU6)	1	Split-System AC	40.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Whole Building Hallways (AHU5)	1	Split-System AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office Area (AHU8)	1	Split-System AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Computer Lab (AHU3)	1	Split-System AC	6.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1st & 2nd Floor Classrooms South Side (AHU 2)	1	Split-System AC	40.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1st & 2nd Floor Classrooms North Side (AHU 1)	1	Split-System AC	30.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Compuer/Server Room	1	Ductless Mini-Split AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1st & 2nd Floor Center Area (AHU4)	1	Split-System AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Media Center & Music Room(AHU7)	1	Split-System AC	12.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Whole Building AHUs	2	Non-Condensing Hot Water Boiler	1,360.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Furnace	240.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Furnace	150.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Whole Building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
121 Restroom	1	Showerhead	2.50	2.00	0.00	0	0.8	$7.73	$89.30	$0.00	11.56

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teacher's Room	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Nurse's Suite	1	Medical Supplies Chest Cooler	Yes	0.00	262	0.0	$45.88	$252.00	$75.00	3.86
Cafeteria	1	Ice Cream Chest	Yes	0.00	311	0.0	$54.46	$252.00	$75.00	3.25

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Whole Building	84	Desktop Computer	150.0	Yes
Whole Building	30	Projector	200.0	Yes
Whole Building	30	Smartboard	100.0	Yes
Whole Building	17	Desk Printer	60.0	Yes
Whole Building	2	Photocopier	600.0	Yes
Whole Building	2	Shredder	150.0	Yes
Whole Building	3	Minifridge	153.0	Yes
Whole Building	3	Microwave	1,000.0	Yes
Teachers Room	1	Coffee Maker	900.0	Yes
Whole Building	2	Laptops	45.0	Yes
Whole Building	2	TV LED	100.0	Yes
Whole Building	3	TV Tube	120.0	Yes
Whole Building	150	Chromebooks	45.0	Yes
Stage Area	1	Handicap Lift	400.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teachers Room	1	Refrigerated	Yes	0.00	1,612	0.0	$282.70	$230.00	$0.00	0.81

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Memorial School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 60,480
Built: 2008

For Year Ending: February 28, 2017
Date Generated: March 28, 2018

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Memorial School 201 Squaw Brook Rd. North Haledon, New Jersey 07508	North Haledon Board of Education 201 Squaw Brook Road North Haledon, NJ 07508 (____)____-_____	John Maguire 201 Squaw Brook Road North Haledon, NJ 07508 973-427-1220 jmaguire@nhschools.net

Property ID: 6258404

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
62.1 kBtu/ft²

Source EUI
131.5 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,921,287 (51%)
Natural Gas (kBtu)	1,831,620 (49%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	54.1
National Median Source EUI (kBtu/ft²)	114.7
% Diff from National Median Source EUI	15%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	310

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp
(if applicable)