

Morris Hills Regional Board of Education

July 2010



Final Energy Audit Report

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Executive Summary

As part of an initiative to reduce energy cost and consumption, the Morris Hills Regional Board of Education has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit at the two (2) high schools which are owned and operated by the Board of Education in an effort to develop comprehensive Energy Conservation and Retrofit Measures (ECRMs).

CDM's energy audit team visited the schools on March 16 and 17, 2010. As a result of the site visits and evaluation of the historical energy usage of the facilities, CDM was successful in identifying opportunities for energy savings measures.

CDM has also evaluated the potential for renewable energy technologies to be implemented at the buildings to offset the electrical energy usage. Specifically, the use of solar electric photovoltaic panels, ground source heat pumps and wind turbines were investigated.

CDM solicited a proposal from a third party electric energy supplier to investigate any additional energy cost savings that may be available for the Board. Additionally, there is potential for the Board to make money by participation in a Demand Response Program, as discussed in Section 5.2.

Not all ECRMs identified as a result of the energy audit are recommended. ECRMs must be economically feasible to be recommended for implementation. The feasibility of each ECRM was measured through a simple payback analysis. The simple payback period was determined after establishing Engineer's Opinion of Probable Construction Cost estimates, O&M estimates, projected annual energy savings estimates, and the potential value of New Jersey Clean Energy rebates, or Renewable Energy Credits, if applicable. ECRMs with a payback period of 20 years or less are recommended.

The payback periods presented herein do not account for additional cost savings associated with participation in the Clean Energy Programs, Pay for Performance Program or the Direct Install Program. The eligibility requirements for participation in these programs and the associated cost savings from these Programs are discussed in Section 7.2.

Historical Energy Usage

The following table, Table ES-1, summarizes the historical energy usage at each of the high school buildings as presented in Section 3. These values can serve as a benchmarking tool, along with the building profiles that have been established through the EPA's Portfolio Manager Program, to quantify the reduction in electrical energy and natural gas usage following the implementation of the recommended ECRMs.

Table ES-1: Summary of Annual Energy Usage & Cost						
	Electrical Energy Use (kWh)	Peak Summer Demand (kW)	Peak Winter Demand (kW)	Fuel Use for Entire Building (therms)	Cost for Electric Service	Cost for Fuel
Morris Knolls High School	2,416,352	777	662	146,023	\$399,106	\$199,268
Morris Hills High School	1,851,300	611	532	110,275	\$305,422	\$140,564

Recommended ECRMs

The following Table ES-2 presents the ranking of recommended ECRMs identified for the building lighting and HVAC systems based on the simple payback analysis. The lighting system improvement includes the combined upgrade to both the interior and exterior lighting systems. Although exterior measures have a longer payback period than improvements to the interior lighting system alone, implementing retrofits to both the interior and exterior lighting systems results in greater energy savings.

Additional ECRMs associated with the building envelope and other miscellaneous appliances were identified and evaluated, as discussed in Sections 2 and 4; however, were not recommended due to longer payback periods. This table includes the Total Cost, projected annual energy cost savings, projected annual energy usage savings, and total simple payback period for each recommended ECRM. The ECRMs are ranked based on payback period.

Table ES-3 summarizes the Total Cost, annual energy savings, projected annual energy and O&M cost savings and the payback period based on the implementation of all recommended ECRMs.

Table ES-2: Ranking of Energy Savings Measures Summary					
Overall Ranking³	ECRM	Total Cost¹	Energy Savings	Annual Fiscal Savings²	Simple Payback (Years)
1	Morris Knolls High School - Unit Vent Controls	\$48,875	8,757 Therms 243,494 kWh	\$63,218	0.77
2	Morris Hills High School - Unit Vent Controls	\$26,450	4,739 Therms 131,773 kWh	\$29,510	0.89
3	Morris Hills High School - Insulate Piping	\$740	490 Therms	\$525	1.41
4	Morris Knolls High School – Interior & Exterior Lighting Upgrades	\$113,800	244,915 kWh	\$55,019	2.1
5	Morris Hills High School – Interior & Exterior Lighting Upgrades	\$150,841	215,454 kWh	\$40,730	3.7

1. Total Cost takes into account Engineer's Opinion of Probable Construction Costs minus any applicable rebates.
2. Annual Fiscal Savings takes into account additional O&M cost or savings associated with the measure.
3. Overall Ranking is based on the simple payback period.

Table ES-3: Recommended ECRM's			
Total Engineer's Opinion of Probable Construction Cost	Projected Annual Energy Savings (kWh or therms)	Annual Fiscal Savings	Simple Payback Period (years)
\$340,707	7,530 therms 835,636 kWh	\$179,822	1.9

Renewable Energy Technologies

Solar Energy

Section 4 of the report provides for an economic evaluation of a solar energy system recommended to be installed at the two (2) high school buildings. The evaluation covered the economic feasibility of the Board installing a solar energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

Based on a simple payback model, summarized in Table ES-4, it would benefit the Board to further investigate the installation of a solar energy system at the two (2) school buildings. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the 14 to 15 year payback periods. This payback period may justify installing the solar energy system. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. Solar technology is constantly changing and will most likely continue to lower in price.

Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing. For the payback model, conservative estimates of the SREC's market value over a 25 year period were assumed, as discussed in Section 4.

Table ES-4 includes a simple payback analysis for the installation of a solar energy system at the two (2) school buildings.

Table ES-4: Simple Payback Analysis for Solar Energy Systems	
Estimated Budgetary Project Cost	\$15,560,351
1 st Year Production	1,701,478 kWh
Annual Electric Savings	\$322,614.7
Annual Estimated SREC Revenue	\$719,725
Project Simple Payback	15.1

Wind Power Generation

Section 4.3.3 of the report provides for an economic evaluation of a wind turbine energy system recommended to be installed at the Morris Knolls High School. The evaluation covered the economic feasibility of furnishing and installing a wind turbine energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

CDM completed a preliminary desktop wind power production analysis and has concluded that an additional on-site feasibility study is warranted and recommended. Such a feasibility study would include the installation of a wind test rig to measure actual wind conditions as observed on-site.

Wind power as a renewable energy source also qualifies for Renewable Energy Certificates (REC's). The prevailing energy market, REIP and REC's comprise the major factors influencing a wind turbine energy system installation. Other options, such as government bonds or a Power Purchase Agreement are potentially available and can assist with the financing of this project.

Table ES-5 includes a typical simple payback analysis for the installation of a wind turbine energy system located at the Morris Knolls High School. Refer to Appendix L for a more detailed wind energy financing spreadsheet.

Table ES-5: Ranking of Energy Savings Measures Summary – Wind Turbine Energy System			
Parameter	Wind Turbine (Minimum Site Wind Speed – 8.4 mph)	Wind Turbine (Maximum Site Wind Speed – 12.1 mph)	Wind Turbine (Average Site Wind Speed – 10.5 mph)
Engineer's Opinion of Probable Cost	\$68,489.69	\$68,489.69	\$68,489.69
Renewable Energy Incentive Program*	-\$17,395.00	-\$49,216.00	-\$33,082
Total Cost	\$51,094.69	\$19,273.69	\$35,407.69

Table ES-5: Ranking of Energy Savings Measures Summary – Wind Turbine Energy System			
Parameter	Wind Turbine (Minimum Site Wind Speed – 8.4 mph)	Wind Turbine (Maximum Site Wind Speed – 12.1 mph)	Wind Turbine (Average Site Wind Speed – 10.5 mph)
1 st Year Production	5,436 kWh	15,380 kWh	10,338 kWh
Annual Estimated Electric Savings	\$906.7	\$2,565.4	\$1,724.4
Annual Estimated REC Revenue	\$136.00	\$385.00	\$258.00
Project Simple Payback	49.0 Years	6.5 Years	17.9 Years

* REIP incentive is calculated for only the first year and is applied as a deduction

Computer Power Management Software

Section 4.4 of the report provides for an economic evaluation of computer power management software recommended to be installed at the two (2) high schools.

Table ES-6 includes a typical simple payback analysis for the installation of the computer power management software at the two (2) high schools. Refer to Appendix J for a more detailed computer power management software financing spreadsheet.

Table ES-6 Ranking of Energy Savings Measures Summary – Computer Power Management Software				
Site	Engineers Opinion of Probable Cost	Annual Energy Savings (kWh)	Annual Fiscal Savings	Simple Payback (Years)
Morris Knolls High School	\$10,304	121,330	\$24,266	0.42
Morris Hills High School	\$9,200	105,453	\$17,927	0.51

Section 1

Introduction

1.1 General

As part of an initiative to reduce energy cost and consumption, the Morris Hills Regional Board of Education has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit the Board's two (2) high school buildings in an effort to develop comprehensive energy conservation initiatives.

The performance of an Energy Audit requires a coordinated phased approach to identify, evaluate and recommend energy conservation and retrofit measures (ECRM). The various phases conducted under this Energy Audit included the following:

- Gather preliminary data on all facilities;
- Facility inspection;
- Identify and evaluate potential ECRMs and evaluate renewable/distributed energy measures;
- Develop the energy audit report.

Figure 1-1 is a schematic representation of the phases utilized by CDM to prepare the Energy Audit Report.

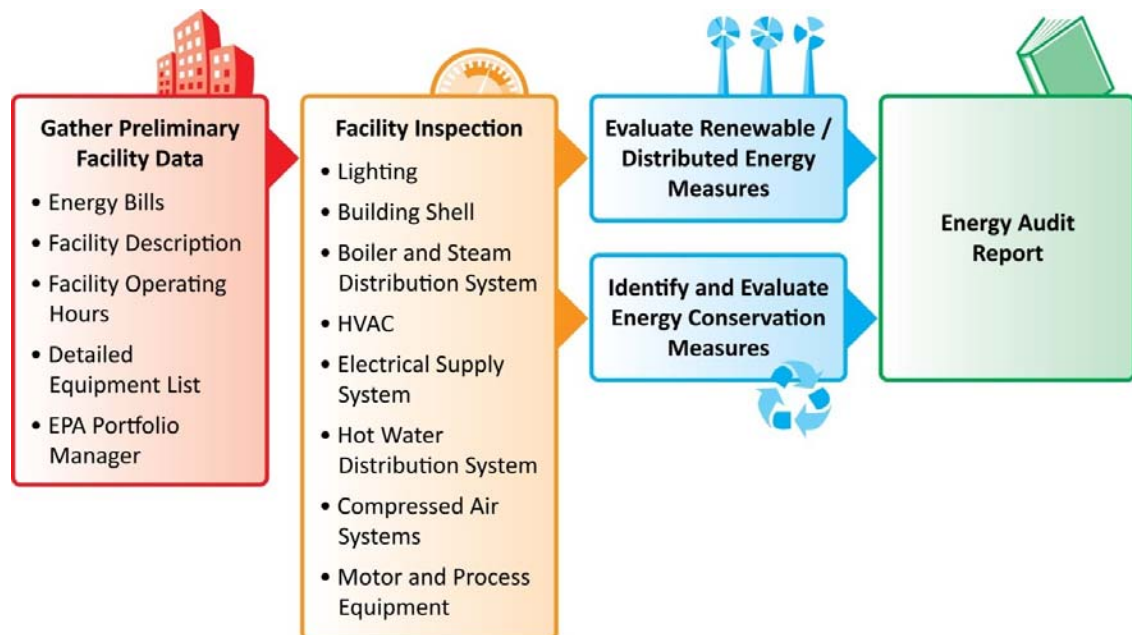


Figure 1-1: Energy Audit Phases

1.2 Background

The buildings that were included in the energy audit for the Morris Hills Regional Board of Education were the Morris Knolls High School and the Morris Hills High School.

The Morris Knolls High School is a 263,065 ft² building that was built in 1964. The science wing was completed in 2007. The high school consists of office space, class rooms, gym and locker rooms, auditorium space and a nurse's office. The school is occupied by 1,400 students and 250 faculty and staff members. The school is occupied from 7 am to 8 pm during the week and is partially occupied over the weekends.

The Morris Hills High School is a 229,760 ft² building that was originally built in 1953. The science wing was completed in 2007. The high school consists of office space, class rooms, gym and locker rooms, auditorium space and a nurse's office. The school is occupied by 800 students and 230 faculty and staff members. The school is occupied from 7 am to 8 pm during the week and is partially occupied over the weekends.

1.3 Purpose and Scope

The objective of the energy audit is to identify energy conservation and retrofit measures to reduce energy usage and to develop an economic basis to financially validate the planning and implementation of identified energy conservation and retrofit measures.

Significant energy savings may be available with retrofits to the buildings' envelopes, heating and cooling systems and lighting systems. It should be noted that the magnitude of energy savings available is not only dependent on the type of heating, lighting or insulation systems in use, but also on the age and condition of the equipment and the capital available to implement major changes. Due to the rising cost of power and the desire to minimize dependence on foreign oil supplies, energy consumption is taking a higher priority across the nation and feasible alternatives for reducing energy consumption and operating costs must be evaluated on a case-by-case basis.

The purpose of this energy audit is to identify the various critical building comfort systems that are major consumers of electrical and thermal energy and are clear candidates for energy savings measures. In addition, potential energy generation systems such as solar electric, ground source heat pumps, and wind energy systems were also evaluated. A discussion on these technologies is included in Section 4 Energy Conservation and Retrofit Measures (ECRM).

In addition to identifying ECRMs and the potential for on-site energy generation, an alternative third party supplier was contacted in an effort to identify further energy cost savings available for the Board, by switching service providers. This is discussed further in Section 5.

Section 2

Facility Description

2.1 Morris Knolls High School

2.1.1 Description of Building Envelope

The energy audit included an evaluation of the building's envelope (exterior shell) to determine the components' effective R-values to be utilized in the building model and to identify any thermal weaknesses that may be present. The components of a building envelope include the exterior walls, foundation, roof and insulation systems. The construction and material, age and general condition of these components, including exterior windows and doors, impact the building's energy use.

The walls of the Morris Knolls High School are concrete block cavity walls consisting of brick façade, cavity and CMU backup blocks. The roofing system of the original building is a built-up roofing (BUR) system consisting of insulation, multiple layers of roof felts with hot applied bitumen between the roofing layers and a gravel top. Significant pooling and interior leakage was observed.



Morris Knolls H.S. Roof

The roof on the remainder of the building, the new science wing, is a pitched standing metal seam roofing system and is in good condition.

Due to the roof leaks and consequently damaged insulation system, it is recommended that the roof be completely torn-off, including membranes, flashings, insulation, etc., down to the base substrate. Poly-isocyanurate rigid insulation system is recommended to promote positive drainage to existing roof drains (min. 4-inches). Installation of 1/2-in thick, high-density wood fiber recovery board is also recommended. It is recommended to install a new asphalt 3-ply built-up roof system with polyester felts and white or cool colored granulated cap sheet or a modified bitumen hot or cold applied system; including a 20 year warranty. The Built-up or Modified Bitumen systems permit maximum movement of the membrane and flashing, without failure, due to its elasticity.



Water Damaged Drop Ceiling

It is recommended that a qualified roofing contractor evaluate the system, including the structural capacity of the building frame. Due to the significant capital investment associated with a roof replacement, it is anticipated that the payback from an energy standpoint will be in excess of 20 years; as such, this recommendation has not been evaluated further. However, from a holistic viewpoint and taking into account maintenance savings associated with a new roof and improved occupant comfort, the benefits of planning for and implementing this recommended capital improvement will become apparent almost immediately.

The windows throughout the original building are single pane with aluminum frames and the exterior doors are light weight steel. The windows in the Science Wing are double pane insulating windows.

Replacement of the single pane windows throughout the original building with insulating double pane, low e-glass is highly recommended. Thermal transmittance and solar heat gain are the most important energy considerations for windows. Air leakage as well as the window's optical characteristics, frame material and type of glass assembly also enter into window selection.

In the northeast, the U-factor of the window is the most important criterion. The U-factor is the measure of the heat transfer through the window assembly. The lower the U-factor, the lower the resulting heat flow across the window. A U-factor of 0.4 is typically suggested for cold climates, but the lower the better to minimize heat transmission and window condensation. Single glass windows typically have a U-factor around 1.1.

Energy efficient windows use three strategies to improve the R-value (reciprocal of the U-value); multiple panes, gas fillings between the panes and special coatings. The best strategy from an energy standpoint is to include two or more of these parameters. The low-e, or low emissivity coatings are metallic glass coatings to resist the flow of radiant heat. Low-e coatings in colder climates are applied on the interior surface of the inside pane. Gases like carbon dioxide and argon have a higher R-value than air and are sometimes utilized to fill the space between the two glass panes. These are fairly high tech windows and the gases weigh more than air.



Through the use of the eQuest model developed and discussed in Section 4, the anticipated annual energy savings associated with the replacement of the existing single pane windows with double pane, low-e windows is 4,200 therms and 12,900 kWh. While replacement of the windows with new high-performance, double pane, low-E, air tight window models will be better energy efficiency performers, the cost of

window replacement is rarely justified by energy savings alone, as such this recommendation has not been evaluated further.

The Morris Knolls High School also has a number of window air conditioning units installed year round. It is recommended that the air conditioning sleeves be checked for a tight seal and as the units are left in place through winter that AC covers be purchased and installed. An outdoor AC cover covers the top and sides of the unit to stop drafts. Window and through-wall AC covers are UV resistant, water repellent PVC vinyl with elasticized corners and straps for a tight fit. Outdoor or indoor AC covers can also be customized. A standard outdoor AC cover can cost around \$15. The impact of the overall building heating load will be minimal; however, there will be a direct impact on the occupants' comfort.



Example of an Outdoor AC Cover

At the time of the audit, facility staff indicated the difficulty in adequately heating the Media Center. The exterior wall of the Media Center primarily consists of single pane glass windows and the floor extends out over the footprint of the base floor of the building. As shown in the adjacent picture, water staining on the exterior soffit board by one of the unit ventilators was noted. It is recommended that further investigation be completed to determine the cause of the water staining (leaking water pipe or condensation build up, etc.) and that consideration be given to replacing the exterior soffit board with the application of new insulation. Additionally, the replacement of the single pane glass windows with double pane windows or with the addition of storm windows as discussed previously will aid in the ability to adequately heat the Media Center.



Water Damaged Exterior Soffit

2.1.2 Description of Building HVAC

A central boiler plant, with two (2) 300 horsepower fire-tube water boilers located in the basement produces hot water which is circulated to all of the buildings unit ventilators, baseboard radiators cabinet unit heaters, and fan coil units. This hot water is also circulated through the air handlers that serve the Gyms, the Auditorium,

Chorus room, and Band Room. These boilers have natural gas pilots but run on #2 fuel oil. The pumps associated with the boilers run on Variable Frequency Drives. The Cafeterias, Locker rooms, and Team rooms are served by rooftop units that are equipped with gas fired heating sections and energy recovery wheels. The Trainers, Fitness and weight rooms are all served by gas fired rooftop units. The new science wing is equipped with gas fired makeup air units that run only when labs are in session. There are also sterling gas fired makeup air units that serve the hallways of the new science wing.

The new science wing is cooled via a chiller plant with two (2) 90-ton water cooled scroll compressor type chillers located in the basement of the original building with a cooling tower located on the roof of the new science wing. Chilled water is pumped over to the new wing and is used in the unit ventilators. There are also a number of classrooms in the old wings that use window mounted air conditioners as shown above. These are generally in classrooms that have a large number of computers in them. The administration areas have split system type air conditioners. For these units, the condensers are mounted on the roof or on the ground outside the area they serve.

2.1.3 Description of Building Lighting

The Morris Knolls High School Building's existing lighting system consists of 1X2 (1 lamp), 1X4 (1, 2, and 3 lamp), 1X8 (2 lamp), 2X4 (2, 3, and 4 lamp), and 2X2 (2, 3, and 4 lamp) T8 standard efficiency linear fluorescent fixtures with electronic ballasts, 1X4 (1 and 2 lamp), 1X8 (2 lamp), and 2X4 (2 and 4 lamp) T12 linear fluorescent fixtures with magnetic ballasts, recessed compact fluorescent (1 and 2 lamp) fixtures, incandescent and halogen incandescent fixtures, interior metal halide fixtures, and high bay compact fluorescent (8 lamp) fixtures. Existing exterior lighting consists of high pressure sodium area light fixtures and wallpacks, incandescent canopy fixtures, and metal halide area lights. Refer to Section 4 for a more detailed description.

2.2 Morris Hills High School

2.2.1 Description of Building Envelope

The walls of the Morris Hills High School are concrete block cavity walls consisting of brick façade, cavity, and CMU backup blocks. The roofing system of the original building is a BUR system consisting of insulation, multiple layers of roof felts with hot applied bitumen between the roofing layers and a gravel top. The roof of the science wing is an asphalt roll applied roof. There was some pooling noted and evidence of interior water damage on the drop ceiling tile of the original section of the building. This roof should also be repaired or replaced in the near future; however, the energy savings associated with this recommendation is not anticipated to off-set the cost of the recommendation as significantly as at Morris Knolls HS, as such this recommendation has not been evaluated further.

The majority of the windows throughout the original portion of the Morris Hills HS are single pane or single pane with storm windows. The windows in the science wing are double pane. Storm windows provide an improved thermal transmittance factor as opposed to single pane windows alone. As such, the replacement of the single pane glass with high performance, air-tight glass panels will improve energy efficiency. However, the cost for window replacement is not expected to be justified through the energy savings alone. More cost effective options include the application of new caulking, 'shrink-to-fit' plastic films for making temporary interior windows, or the installation of interior or exterior storm windows throughout the original portion of the school building. These measures are recommended as temporary solutions to minimize infiltration and improve building occupant comfort.

It was determined that the building envelope is in good condition and is currently providing a high level of insulation. As such, any of the modifications discussed would not prove to be cost effective from an energy savings stand-point alone. However, from a holistic viewpoint, the benefits of the implementation of the recommended modifications to the building envelope when coupled with other ECRMs described herein may become apparent.

2.2.2 Description of Building HVAC

The Morris Hills High School classrooms are heated via a central steam boiler plant with two (2) 300 horsepower fire-tube steam boilers. The older classroom portions of the building are heated directly with steam. Unit ventilators in each classroom have steam heating coils. Steam is supplied to heat exchangers that generate hot water to heat the new science wing. This hot water is pumped to the new unit ventilators or Airedale units. The new science wing also has gas fired makeup air units that provide heating and ventilation during labs only. These units are each paired with an exhaust fan to balance the ventilation. The Administration and Guidance areas are served by a roof mounted packaged heating and cooling unit. The Auditorium is heated with steam coils and steam cabinet unit heaters and ventilated with supply and exhaust fans on the upper level. The Band and Chorus rooms are heated with gas-fired air handlers that also have direct expansion air conditioning for cooling. Each of the Gymnasiums were served by air handlers with steam heat, but are now out of commission. These areas are in need of new or repaired systems. The girls and boys locker rooms each have a gas fired makeup air unit that provides heating and ventilation. The Activity, Men's and Women's Team Areas, Trainers Room, Wrestling Room, Weight/Fitness Room, Metal Shop and Wood Shop, are each served by their own packaged gas fired heating and DX cooling rooftop units. The Metal and Wood shops each have an additional gas fired makeup air unit that runs when the process exhaust systems are turned on. The Cafeteria and Kitchen are each served by two (2) gas fired makeup air units, the two (2) serving the Kitchen are very old and appear to be in need of replacement. On the second floor, the TV Studios are served by split system ac units, and the Graphic Arts and Art Rooms are served by packaged rooftop units. Science Labs 200 and 202 are served by split systems, Lab 202 has a new rooftop unit that now serves the area. The split system in Lab 202 is unnecessary, and the

outside air intake is blocked by the addition. The faculty lounge also has a split system air conditioner.

Central cooling is provided to the new Science wing via a chiller plant with two (2) water-cooled 130 Ton scroll compressor type chillers located in the basement. This plant produces chilled water that is pumped to the new unit ventilators or Airedale Units. The cooling tower is located on the roof of the addition. The pumps are equipped with VFD's, and the cooling tower has two speed fans.

Approximately 14 classrooms in the original areas have window mounted air conditioners. These range in condition from unserviceable to good and some should be considered for replacement.

2.2.3 Description of Building Lighting

The Morris Hills High School Building's existing lighting system consists of 1X4 (2 lamp) T5 high efficiency linear fluorescent fixtures with electronic ballasts in the new science wing, 1X2 (2 lamp), 1X4 (1, 2, and 3 lamp), 2X4 (2, 3, and 4 lamp), and 2X2 (2 lamp) T8 standard efficiency linear fluorescent fixtures with electronic ballasts, 1X2 (1 and 2 lamp), 1X4 (1, 2, and 3 lamp), 1X8 (2 lamp), 2X4 (2, 3, and 4 lamp), and 2X2 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts, recessed compact fluorescent (2 lamp) fixtures, incandescent fixtures, interior metal halide fixtures, and compact fluorescent (6 lamp) fixtures. Existing exterior lighting consists of metal halide area light fixtures and wallpacks, and high pressure sodium area light fixtures and wallpacks. Refer to Section 4 for a more detailed description.

2.3 Miscellaneous Equipment

In general, the classrooms typically contain a TV and overhead projector. There are also a number of computer classrooms that contain 20 – 30 computers and several printers each. The office spaces throughout the two (2) buildings also contain computers, printers, copiers, phones, fax machines and small kitchen appliances, such as coffee machines and small refrigerators.

It is recommended that consideration be given to implementing the standardized use of Smart Strips. Computer peripherals, such as monitors, printers or scanners, continue to use energy even after they are shut off, which adds up over time. The Smart Strip power strips offer surge protection and the ability to monitor the current on a single 'control' outlet. When the computer that is plugged into that



single outlet is shut down the Smart Strip shuts off all of the other peripherals on the power strip. This is discussed further in Section 4.4.

The school's Kitchens contain a number of appliances including convection ovens, conventional ovens, refrigerators, electric warming tables and cabinets, and walk-in refrigerators and freezers. Convection ovens are recommended for energy savings, as convection ovens create a uniform temperature with internal fans to circulate the hot air. In general, because the heated air transfers more efficiently to the cooking container or food surface, it takes less time and energy to cook.

It is recommended that the Board consider the standardized use of Energy Star appliances. In addition to the use of Energy Star copiers and printers, Energy Star refrigerators and freezers, for example, use up to 40% less energy than models built in 2001. Energy Star appliances will not only reduce the Board's utility bills, but will also outperform standard appliances due to the improved design and advanced technologies.

In addition to replacing old appliances with Energy Star appliances, the following two maintenance procedures can work to save the energy consumed by the Board's refrigerators. One is cleaning dirty condenser coils twice a year. A refrigerator's condenser coils and cooling fins are located either under the unit behind a grille in the front or on the back of the appliance. The coils can be cleaned with a brush or vacuum cleaner hose. The second source of wasted energy associated with a refrigerator is the door seal. Realigning the door or replacing a no longer airtight door seal will work to improve energy efficiency.

It may also be considered that 'Vending Misers' be purchased and utilized for vending machines throughout the two (2) high schools. A 'Vending Miser' powers down a vending machine when the surrounding area is unoccupied and automatically repowers when the area is occupied, utilizing an infrared sensor. Similarly to occupancy sensors on lighting fixtures; however, the vending miser also monitors the ambient temperature while the vending machine is powered down and uses this as sort of an internal thermostat to power up the machine and ensure that the drinks remain cold. The implementation of a 'Vending Miser' also reduces maintenance costs and extends the life of the machine, by reducing the number of compressor cycles. A 'Vending Miser' is a \$180 investment, but has been found to reduce power consumption of a cold drink vending machine by an average of 46%. This is discussed further in Section 4.4.



Section 3

Baseline Energy Use

3.1 Utility Data Analysis

The first step in the energy audit process is the compilation and quantification of the facility's current and historical energy usage and associated utility costs. It is important to establish the existing patterns of electric and gas usage in order to be able to identify areas in which energy consumption can be reduced.

For this study, the monthly gas and electric bills per facility were analyzed and unit costs of energy were obtained. The unit cost of energy, as determined from the information provided by the Board, was utilized in determining the feasibility of switching from one energy source to another or reducing the demand on that particular source of energy to create annual cost savings.

3.1.1 Electric Charges

It is important to understand how the utility companies charge for the service. The majority of the energy consumed is electric, as a result of both indoor and outdoor lighting and heating, ventilating and air-conditioning equipment. Electricity is charged by three basic components: electrical consumption (kWh), electrical demand (kW) and power factor (kVAR) (reactive power). The cost for electrical consumption is similar to the cost for natural gas, the monthly consumption appears on the utility bill as kWh consumed per month with a cost figure associated with it. The service connections are either billed on a flat rate or time of day rates per kWh.

Electrical demand can be as much as 50 percent or more of the electric bill. The maximum demand (kW value) during the billing period is multiplied by the demand cost factor and the result is added to the electric bill. It is often possible to decrease the electric bill by 15 – 25 percent by reducing the demand, while still using the same amount of energy.

The power factor (reactive power) is the power required to energize electric and magnetic fields that result in the production of real power. Power factor is important because transmission and distribution systems must be designed and built to manage the need for real power as well as the reactive power component (the total power). If the power factor is low, then the total power required can be greater than 50 percent or more than the real power alone. The power factor charge is a penalty for having a low power factor. This penalty does not affect the Board.

The other parts of the electric bill are the supply charges, delivery charges, system benefits, transmission revenue adjustments, state and municipality tariff surcharges and sales taxes, which cannot be avoided.

JCP&L is the current distributor and supplier of electric energy for the Morris Hills Regional Board of Education facilities.

3.1.2 Natural Gas Charges

New Jersey Natural Gas is the current distributor and supplier of natural gas for the school facilities. The Board is charged for the cost of the natural gas, a delivery charge, and a customer charge, which covers gas administration charges.

3.1.3 Fuel Oil Charges

Final Oil Co., Inc. is the current supplier of fuel oil for the school facilities. The Board is charged a unit cost per gallon of #2 fuel oil delivered to the schools which covers any administration charges in addition to the current fuel oil cost.

3.2 Facility Results

3.2.1 Morris Hills High School

Electric power for the Morris Hills High School building is provided by one (1) General Secondary Service 3-phase line from JCP&L. There are separate accounts for the Morris Hills Vocational Building, field lighting and parking lot lighting. Figure 3.2-1 illustrates the monthly total energy consumption from July 2008 through July 2009 for the High School building.

From this graph, it can be determined that the average electrical consumption for the Morris Hills High School is approximately 150,000 kWh/month.

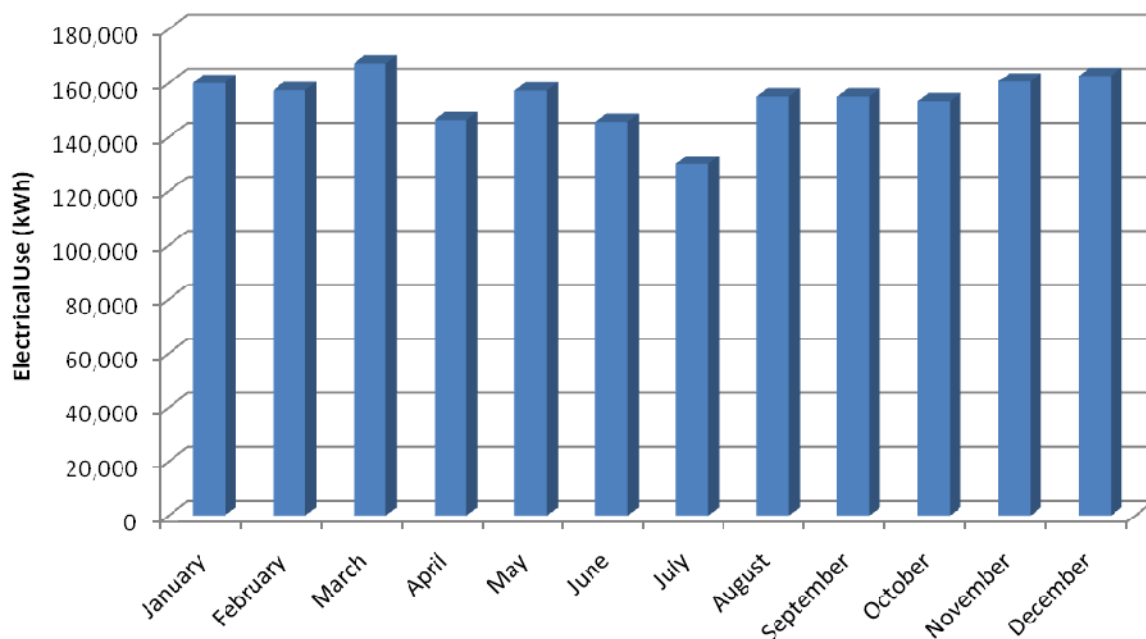


Figure 3.2-1: Morris Hills High School Electrical Usage: 10 00 01 2682 57

Figure 3.2-2 illustrates the monthly demand load for the Morris Hills High School from July 2008 through July 2009.

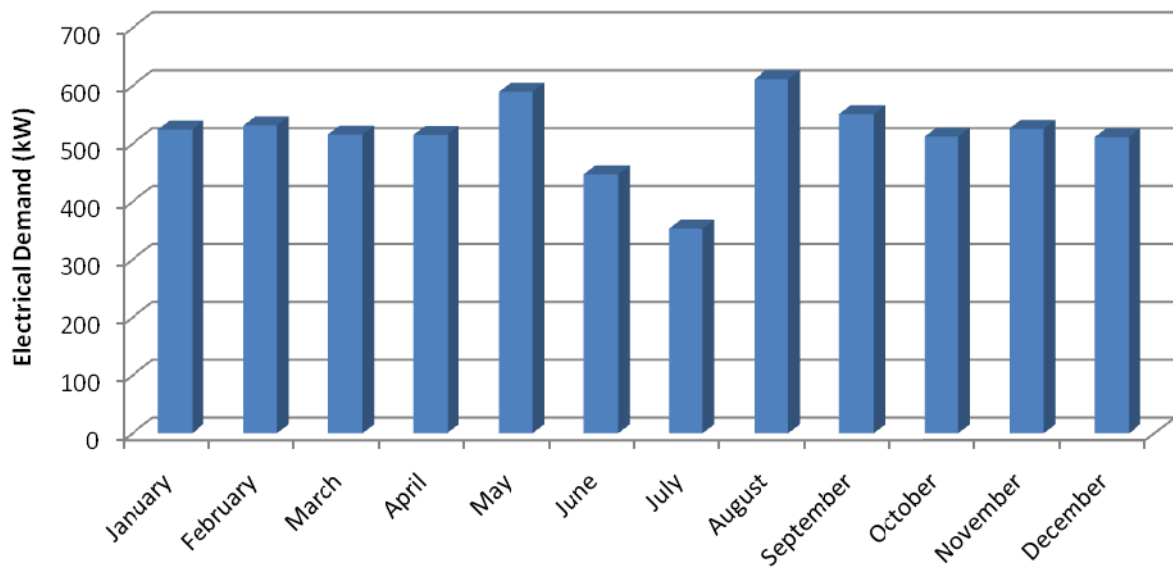


Figure 3.2-2: Morris Hills High School Average Monthly Demand: 10 00 01 2682 57

The most recent tariff rates available at the time of this audit, are as follows:

Acct #: 10 00 01 2682 57	
Customer Charge:	\$11.65/month
Non-Utility Generation Charge:	\$0.01696/kWh
Societal Benefits Charge:	\$0.003222/kWh
Delivery Service Charges:	\$0.008232/kWh
	\$6.82233/kW
System Control Charge:	\$0.000079/kWh
RGGI Recovery Charge:	\$0.000064/kWh

These tariff rates can be found on the bills from JCP&L. These tariffs are subject to change, typically on a six month basis.

Please refer to Table 3.3-1, in Section 3.3 for the average electrical aggregate cost used in the economic analyses presented in Section 4. Please refer to Appendix A for the complete Historical Data.

The gas usage for the Morris Hills High School complex is metered at two locations, metering the use at the High School Building and the Vocational Building separately. The monthly gas consumption from July 2008 through July 2009 at the High School building is illustrated in Figure 3.2-3.

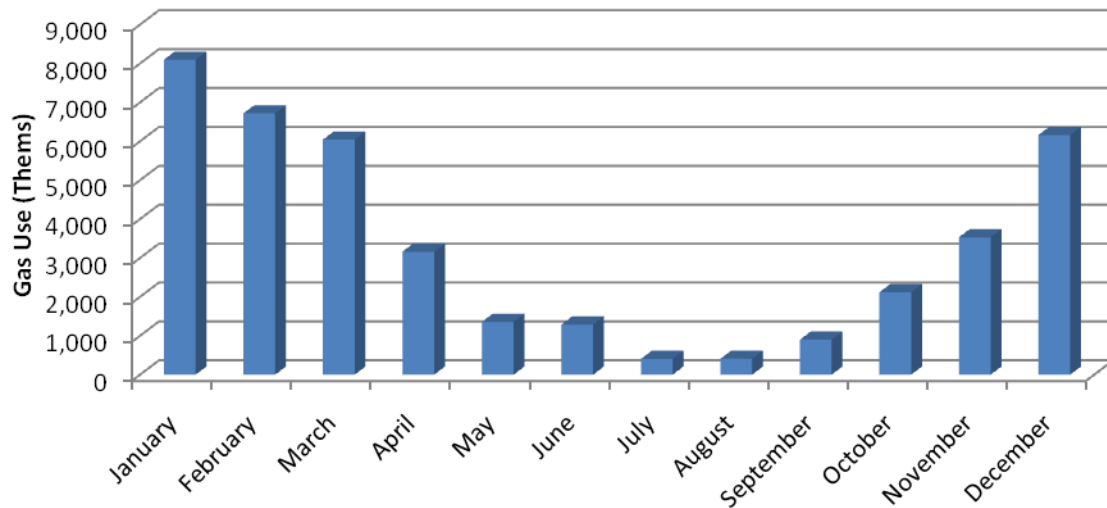


Figure 3.2-3: Morris Hills High School Natural Gas Usage: 20-1191-3550-19

For more information on the Morris Hills High School's gas usage, refer to Section 4.3.

The Morris Hills High School's fuel oil deliveries from July 2008 through July 2009 are illustrated in Figure 3.2-4.

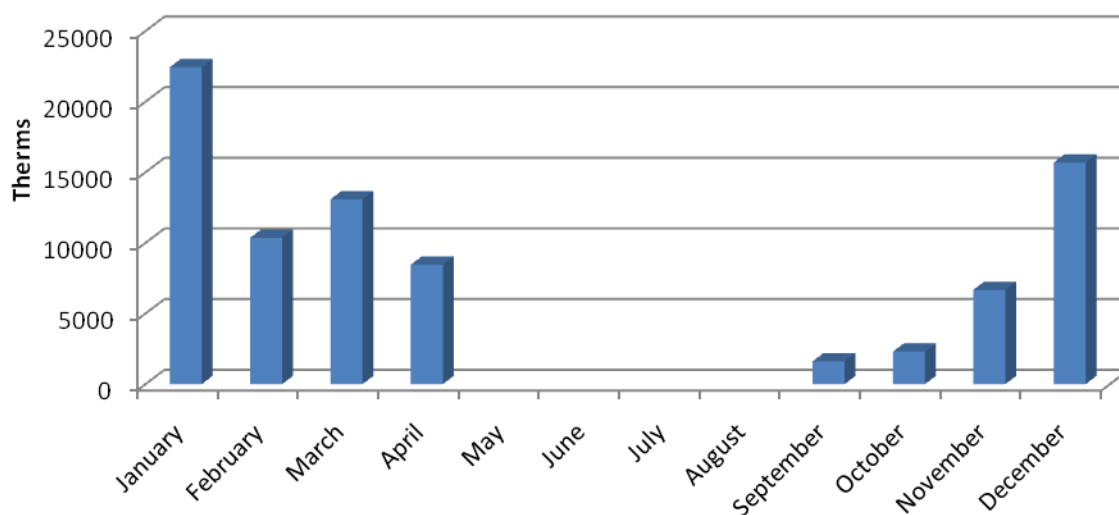


Figure 3.2-4: Morris Hills High School Fuel Oil Usage

3.2.2 Morris Knolls High School

Electric power for the Morris Knolls High School is fed from one (1) General Secondary Service 3-phase line and one (1) General Service single phase line from JCP&L. A third electric account at the Morris Knolls address provides power to the Maintenance Building. Figure 3.2-5 illustrates the monthly total energy consumption from July 2008 through July 2009 for these two accounts. From this graph, it can be determined that the annual average electrical consumption for the Morris Knolls High School is approximately 200,000 kWh/month.

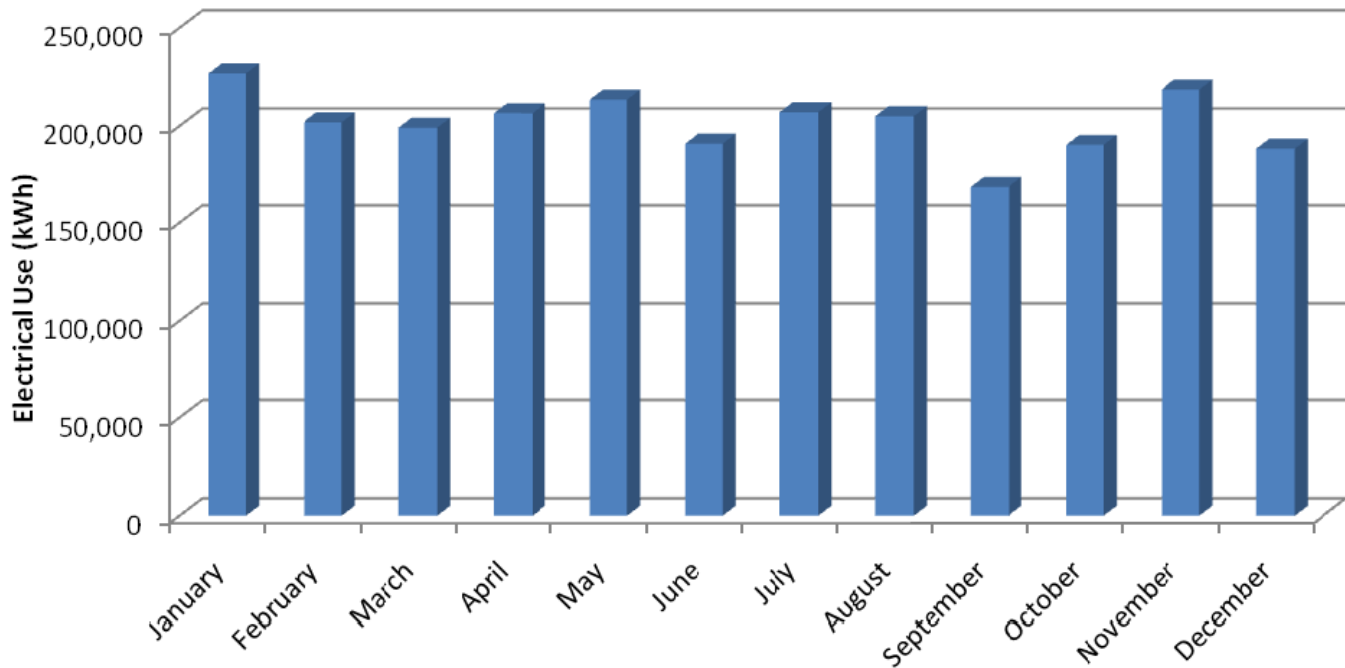


Figure 3.2-5: Morris Knolls High School Electrical Usage
Account #s: 10 00 00 9408 23 & 10 00 00 94 51

Figure 3.2-6 illustrates the monthly demand load for the Morris Knolls High School from July 2008 through July 2009.

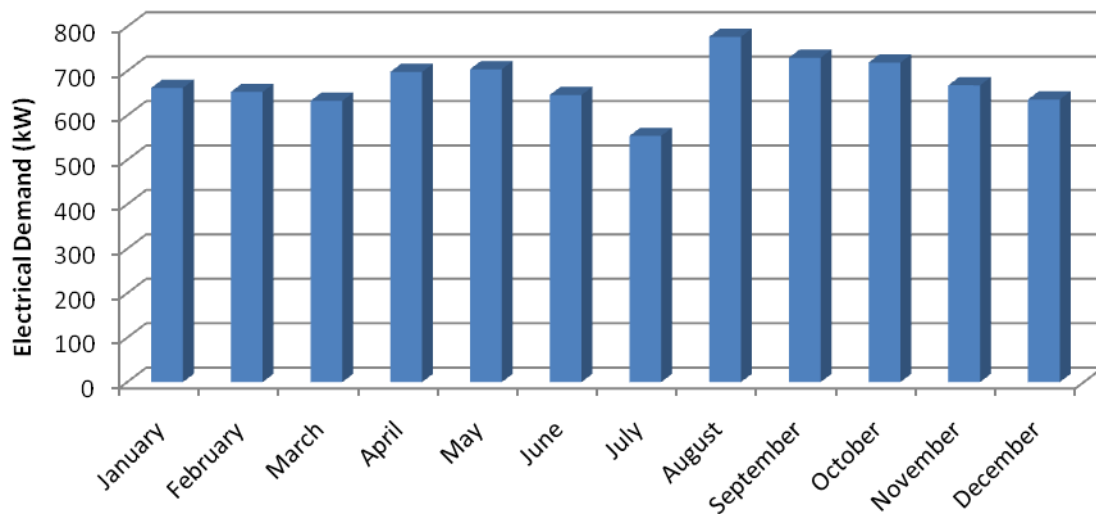


Figure 3.2-6: Morris Knolls High School Monthly Demand

The charges listed below can be found on the electrical bills provided by JCP&L.

	Acct #: 10 00 00 9408 23	Acct #: 10 00 00 9411 51
Customer Charge:	\$3.25/month	\$11.65/month
Non-Utility Generation Charge:	\$0.017015/kWh	\$0.01696/kWh
Societal Benefits Charge:	\$0.003209/kWh	\$0.003222/kWh
Delivery Service Charges:	\$0.064925/kWh	\$0.008187/kWh
	\$0/kW	\$6.832699/kW
System Control Charge:	\$0.000149/kWh	\$0.000079/kWh
RGGI Recovery Charge:	\$0.000064/kWh	\$0.000064/kWh

Refer to Table 3.3-1, in Section 3.3 for the average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The Morris Knolls High School's monthly average natural gas consumption from July 2008 through July 2009 is illustrated in Figure 3.2-7.

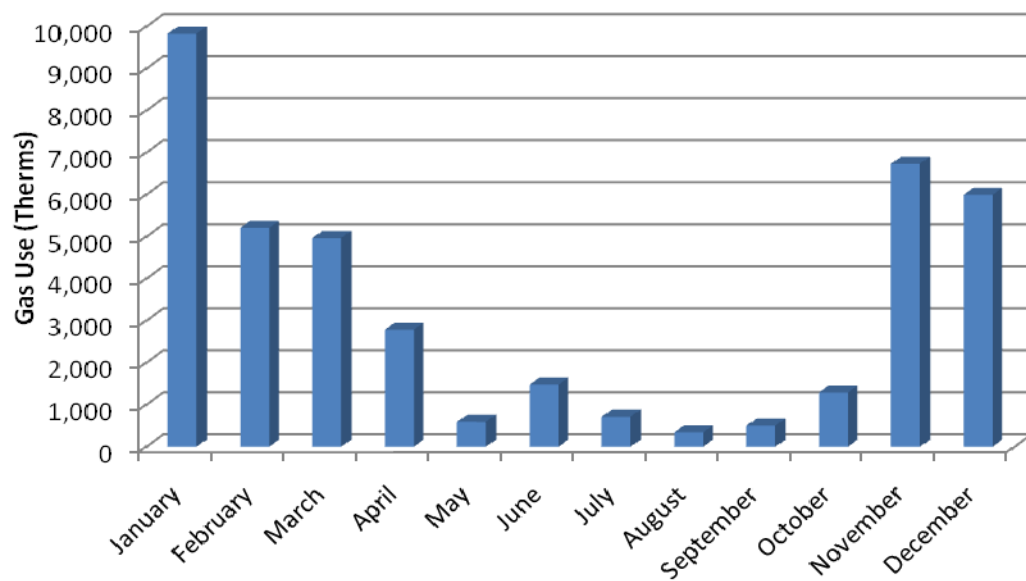


Figure 3.2-7: Morris Knolls High School Natural Gas Usage

The Morris Knolls High School's fuel oil deliveries from July 2008 through July 2009 are illustrated in Figure 3.2-8.

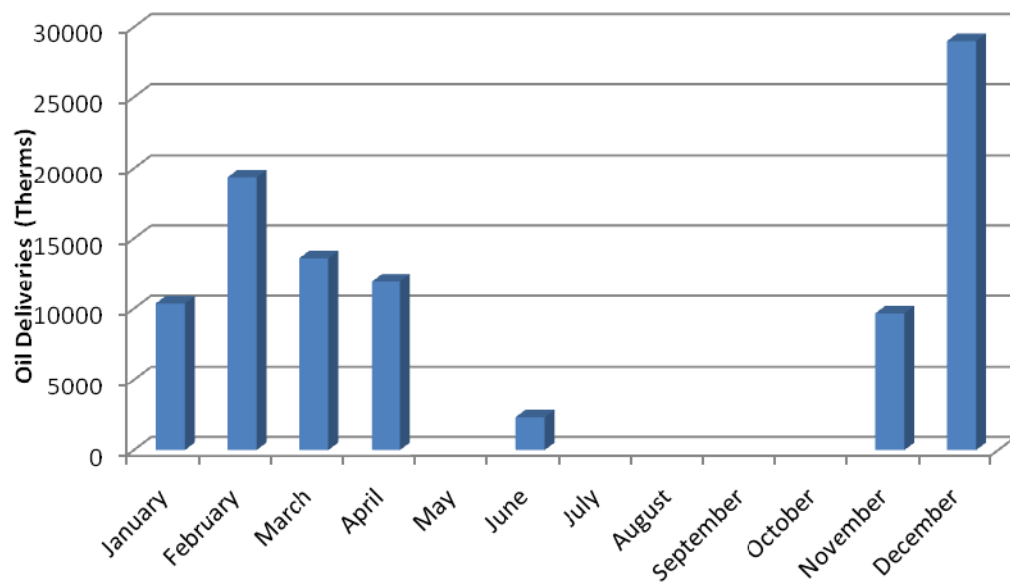


Figure 3.2-8: Morris Knolls High School Fuel Oil Deliveries

3.3 Aggregate Costs

For the purposes of computing energy savings for all identified energy conservation and retrofit measures, aggregate unit costs for electrical energy and fuel, in terms of cost/kWh and cost/therm, were determined for each service location and utilized in the simple payback analyses discussed in subsequent sections. The aggregate unit cost accounts for all distribution and supply charges for each location. Table 3.3-1 and Table 3.3-2 summarize the aggregate costs for electrical energy and heat energy, respectively.

Table 3.3-1: Electrical Aggregate Unit Costs

Service Location	Aggregate \$ / kWh
Morris Hills High School	\$0.17
Morris Knolls High School	\$0.21

Table 3.3-2: Natural Gas & Fuel Oil Aggregate Unit Costs

Service Location	Aggregate \$ / Therm (natural gas service)	Aggregate \$ / Therm (fuel oil)
Morris Hills High School	\$1.04	\$1.50
Morris Knolls High School	\$0.93	\$1.38

3.4 Portfolio Manager

3.4.1 Portfolio Manager Overview

Portfolio Manager is an interactive energy management tool that allows Morris Hills Board of Education to track and assess energy consumption at the school facilities in a secure online environment. Portfolio Manager can help Morris Hills BOE set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

3.4.2 Energy Performance Rating

For many facilities, you can rate their energy performance on a scale of 1–100 relative to similar facilities nationwide. Your facility is ***not*** compared to the other facilities entered into Portfolio Manager to determine your ENERGY STAR rating. Instead, statistically representative models are used to compare your facility against similar facilities from a national survey conducted by the Department of Energy’s Energy Information Administration. This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of facilities across the United States. Your facility’s peer group of comparison is those facilities in the CBECS survey that have similar facility and operating characteristics. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of

all similar facilities nationwide, while a rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

3.4.3 Portfolio Manager Account Information

A Portfolio Manager account has been established for the Morris Hills Regional Board of Education, which includes a profile for the two (2) buildings. Information entered into this Portfolio Manager Facility profile, including electrical energy, natural gas and fuel oil consumption has been used to establish a performance baseline.

It is recommended that the information be updated each month to track the buildings energy usage. The buildings received the following ratings:

Morris Hills High School – 59

Morris Knolls High School - 47

It should be noted that a placeholder electrical use value was entered for the month of July 2009 for both schools, as the program requires that the same 12 month period be entered for all accounts in order to apply a rating. This should be updated.

Appendix B contains the Statement of Energy Performance for each building and a Portfolio Manager Reference sheet.

The following website link, username and password shall be used to access the Portfolio Manager account and building profiles that has been established for the District:

<https://www.energystar.gov/istar/pmpam/>

USERNAME: MorrisHillsBOE

PASSWORD: EnergyStar

Section 4

Energy Conservation and Retrofit Measures (ECRM)

The following is a summary of how Annual Return on Investment (AROI), Internal Rate of Return (IRR), and Net Present Value (NPV) will be broken down in the cost analysis for all ECRMs recommended in this report.

Included in the simplified payback analysis summary table is the 'Annual Return on Investment' (AROI) values. This value is a performance measure used to evaluate the efficiency of an investment and is calculated using the following equation:

$$AROI = \frac{AECS + OCS}{NET\ ECM\ Cost} - \frac{1}{Lifetime}$$

Where OCS = Operating Cost Savings, and AECS = Annual Energy Cost Savings.

Also included in the table are net present values for each option. The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (DR) (assume bond rate of 3%). NPV is calculated using the following equation:

$$NPV = \sum_{n=0}^N \frac{C_n}{(1 + DR)^n}$$

Where C_n =Annual cash flow, and N = number of years.

The Internal Rate of Return (IRR) expresses an annual rate that results in a break-even point for the investment. If the Morris Hills Regional Board of Education is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the Board to compare ECRM's against each other to determine the most appealing choices.

$$IRR \rightarrow 0 = \sum_{n=0}^N \frac{C_n}{(1 + IRR)^n}$$

Where C_n =Annual cash flow, and N = number of years.

The lifetime energy savings represents the cumulative energy savings over the assumed life of the ECRM.

4.1 Building Lighting Systems

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building's heating and cooling loads. The building's cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

Two options are offered for most buildings. The first option will be for upgrading existing interior lighting, if applicable. The second option will be for upgrading existing exterior lighting, if applicable. A total cost for upgrading both options at the same time will be presented. For specific lighting fixture recommendations, refer to Appendix D.

For both of the schools, it was noted that there were existing interior occupancy sensors installed in some parts of the buildings. Installing occupancy sensors will typically increase energy savings; however, if the space is not occupied often in the first place, there will be little savings by installing occupancy sensors. However, certain areas of the Morris Knolls High School and Morris Hills High School could benefit from installation of occupancy sensors. Therefore, occupancy sensor installation has been recommended in this report. Refer to Appendix D for occupancy sensor locations and quantities.

De-lamping existing fixtures is a common practice for creating energy savings with minimal cost impact. During the site visit, photometric readings were taken in various types of rooms at all of the audited buildings. These readings indicate that the Board should not consider de-lamping existing fixtures. In general, the foot candle readings that were taken at desk height were between 40 to 50 foot candles, while the readings taken at the floor were between 20 to 30 foot candles. The Illuminating Engineering Society (IES) recommends 55 foot candles at working level for schools. Since the schools that were audited fell below this 55 foot candle measurement, de-lamping is not recommended at this time.

Please note that the Engineer's Estimate of Probable Construction Costs presented herein are estimates based on historic data compiled from similar installations and engineering opinions. Additional engineering will be required for each measure identified in this report and final scope of work and budget cost estimates will need to be confirmed prior to the coordination of project financing or the issuance of a Request for Proposal.

4.1.1 Morris Knolls High School

It is recommended that certain areas of the existing lighting system at the Morris Knolls High School Building be upgraded to high efficiency standards to reduce energy consumption throughout the building. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems.

Options for improving the interior and exterior lighting for the Morris Knolls High School Building are listed in Table 4.1-1.

Table 4.1-1 Morris Knolls High School Building Lighting System Improvements	
Interior Lighting	Incandescent to CFL, Metal Halide to Fluorescent, High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Lighting Replacement of Exterior Fixtures

The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The annual energy savings for these options are as follows:

Interior Lighting: 20.7kW, 213,467.7 kWh and \$43,291.24
Exterior Lighting: 6.2kW, 31,446.9 kWh and \$6,377.44

The following table, Table 4.1-2, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Morris Knolls High School Building.

Table 4.1-2 Morris Knolls High School Building Lighting System Improvements***			
	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	\$90,599.16	\$32,948.94	\$123,548.10
New Jersey SmartStart Rebate	-\$8,208*	-\$1,540*	-\$9,748*
Total Cost	\$82,391.16	\$31,408.94	\$113,800.09
Annual Energy Savings	\$43,291.24	\$6,377.44	\$49,668.68
Annual Maintenance Cost Savings (AMCS)	\$4,900.26	\$450.12	\$5,350.38
Simple Payback	1.7 years	4.6 years	2.1 years
Annual Return on Investment (AROI)	51.82%	15.07%	41.68%
Lifetime Energy Savings (15 years)**	\$805,170.04	\$118,613.46	\$923,783.50
Internal Rate of Return (IRR)	61.42%	23.27%	51.19%
Net Present Value (NPV)	\$619,426.80	\$68,021.55	\$687,448.36

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.

**3% yearly inflation on electricity costs.

***See Appendix H & J for ECRM Financial Analyses.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled “Proposed Operational Hours without Sensors” in Appendix D.

4.1.2 Morris Hills High School

It is recommended that certain areas of the existing lighting system at the Morris Knolls High School Building be upgraded to high efficiency standards to reduce energy consumption throughout the building. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the interior and exterior lighting for the Morris Hills High School Building are listed in Table 4.1-3.

The existing T5 high-output (HO) lamps as found in the science wing of Morris Hills High School are not recommended to be expanded throughout the building. Replacing the existing T8 fixtures with T5HO's requires a complete fixture replacement because of the different bulb sizes. This means significantly higher initial cost due to demolition, the large number of fixtures present in the school, and the high-end design of T5HO fixtures exceeding short payback periods.

Table 4.1-3	
Morris Hills High School Building Lighting System Improvements	
Interior Lighting	Incandescent to CFL, Metal Halide to Fluorescent, High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Lighting Replacement of Exterior Fixtures

The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles. Please refer to Appendix D for a line-by-line proposed detailed lighting upgrades list.

The annual energy savings for these options are as follows:

Interior Lighting: 51.3kW, 181,938.0 kWh and \$30,529.20

Exterior Lighting: 8.2kW, 33,515.8 kWh and \$5,623.94

The following table, Table 4.1-4, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Morris Hills High School Building.

Table 4.1-4 Morris Hills High School Building Lighting System Improvements***			
	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	\$124,935.28	\$39,876.25	\$164,811.53
New Jersey SmartStart Rebate	-\$10,610*	-\$3,360*	-\$13,970*
Total Cost	\$114,325.28	\$36,516.25	\$150,841.53
Annual Energy Savings	\$30,529.20	\$5,623.94	\$36,153.14
Annual Maintenance Cost Savings (AMCS)	\$4,522.42	\$54.18	\$4,576.60
Simple Payback	3.3 years	6.4 years	3.7 years
Annual Return on Investment (AROI)	23.99%	8.88%	20.34%
Lifetime Energy Savings (15 years)**	\$567,809.96	\$104,599.18	\$672,409.14
Internal Rate of Return (IRR)	33.00%	15.90%	29.09%
Net Present Value (NPV)	\$396,135.21	\$46,174.82	\$442,310.02

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.

**3% yearly inflation on electricity costs

***See Appendix H & J for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2 HVAC Systems

The goal of this section is to present any heating and cooling energy reduction and cost saving measures that may also be cost beneficial. Where possible, measures will be presented with a life-cycle cost analysis. This analysis displays a payback period based on weighing the capital cost of the measure against predicted annual fiscal savings. To do this, the buildings have been modeled as accurately as possible to predict energy usage for space heating and cooling, as well as domestic hot water use.

Each building is modeled using software called eQuest, a Department of Energy-sponsored energy modeling program, to establish a baseline space heating and cooling energy usage. Climate data from Belvidere, NJ was used for analyses. From this, the model is calibrated, using historical utility bills, to predict the impact of theoretical energy savings measures.

Once annual energy savings from a particular measure have been predicted and the initial capital cost has been estimated, payback periods may be approximated. Equipment cost estimate calculations are provided in Appendix H.

4.2.1 Morris Knolls High School

A model of the Morris Knolls High School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from July, 2008 through July, 2009, natural gas bills from August, 2008 through August, 2009, and fuel oil bills from September 2008 through June 2009. Figure 4.2-1 below compares actual monthly electricity usages with those predicted by the eQuest model. The annual predicted electricity usage was calibrated within 8% of the actual usage.

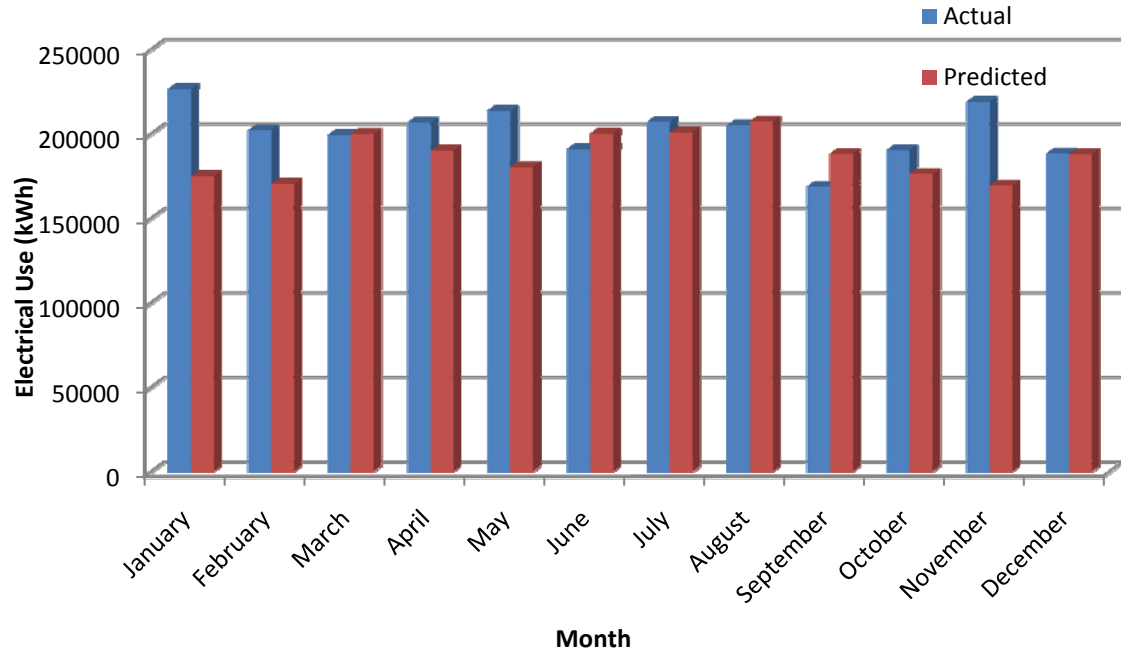


Figure 4.2-1: Morris Knolls High School Electricity Usage

Once the eQuest model was calibrated, it could be used to predict approximate major usage categories, such as lighting, plug loads (miscellaneous), ventilation, heating and cooling. It should be noted that these are only estimated usages based on information gathered during CDM's field audit. Figure 4.2-2 presents this information to help the Board visualize where CDM anticipates the electricity is ultimately being used.

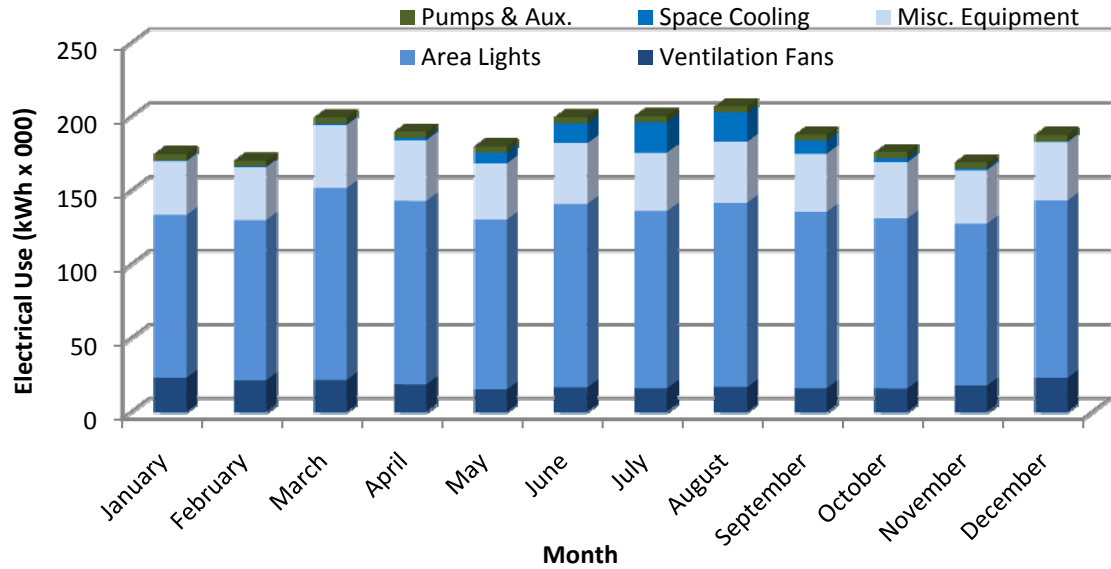


Figure 4.2-2: Morris Knolls High School Electricity Usage Breakdown

Figure 4.2-3 below compares actual electrical demand to model-predicted electrical demand.

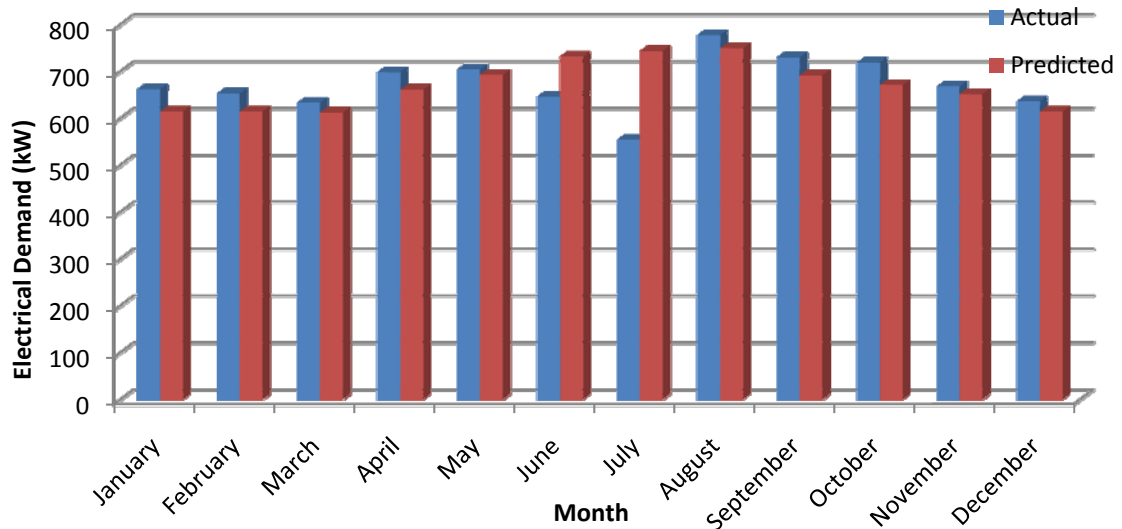


Figure 4.2-3: Morris Knolls High School Electric Demand

Figure 4.2-4 below compares actual natural gas usage to model-predicted fuel oil and natural gas use. For this plot, the fuel oil used at the school was converted into therms so one plot could represent the current usage. The annual predicted gas usage was modeled within 7% of the actual usage.

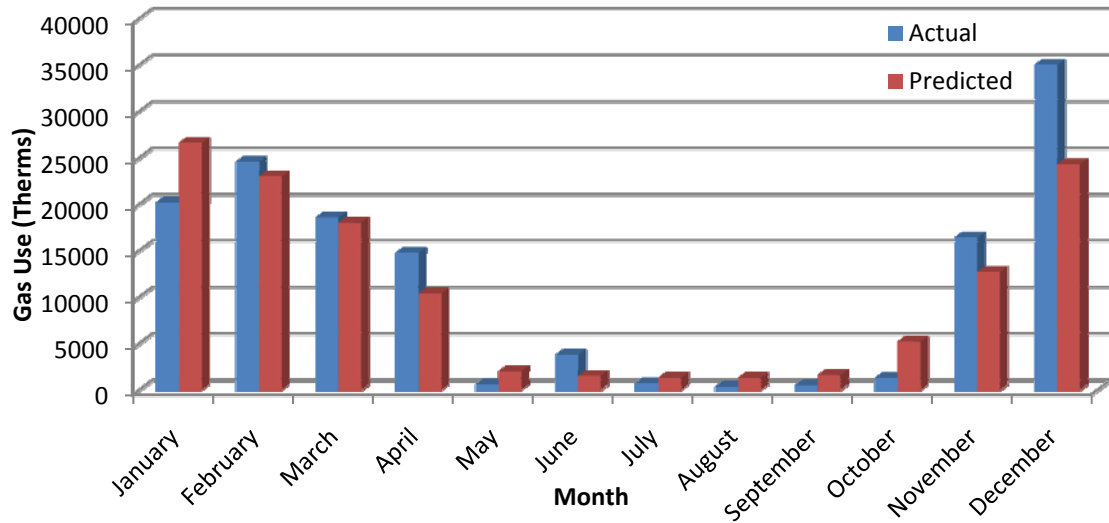


Figure 4.2-4: Morris Knolls High School Natural Gas Usage

Generally, the HVAC systems used at this High School building were found to be relatively new and in good working order. The original classroom areas did have some relatively old unit ventilators, fan coil units, and rooftop air handlers. Some were equipped with window mounted air conditioners. To replace all of these units would be very capital intensive. Therefore, the replacement is not warranted from an energy efficiency standpoint.

However, the fans associated with the unit ventilators reportedly run continuously. This is unnecessary during unoccupied periods and their shutdown has been evaluated to determine the energy savings. It was reported that the Morris Knolls classroom unit ventilators manufactured by Nesbit are original to the construction of the building.

Based on good engineering practice, CDM has assumed that the unit ventilators are heating when the outside air temperature is below 65 degrees. CDM estimated that eighty five unit ventilators run continuously supplying 100 CFM of outside air each. This is due to the assumption that the dampers are not fully closed. The months of May through September are assumed to have no heating. The annual savings from closing the damper fully to outside air when classrooms are unoccupied is \$12,084.63. Savings will also result from turning off the fans in each unit when the classrooms are unoccupied. It is assumed that the classrooms are generally unoccupied between 4pm and 8am during the weekdays, and completely unoccupied on the weekends, during breaks, and in the summer. The savings that result from turning off the fans after school hours and on weekends when school is in session is \$51,133.82. The calculations can be found in Appendix C.

The above ECRM has a capital equipment cost associated with it. This is in the form of electronic controllers at \$400 per unit plus a contractor's markup and contingency. For the Engineer's opinion of probable construction costs, see Appendix H. This control

will simply turn off the fan when the space is unoccupied. This can be done with individual manually switched controllers or a central control panel. The table below shows the financial highlights of this ECRM.

Table 4.2-1 Morris Knolls High School Unit Ventilator Controls Upgrade	
Engineer's Opinion of Probable Cost	\$48,875
New Jersey SmartStart Rebate	\$0
Total Cost	\$48,875
Annual Energy Savings	\$63,218.45
Annual Maintenance Cost Savings (AMCS)	\$0
Simple Payback	0.77 years
Annual Return on Investment (AROI)	125.35%
Lifetime Energy Savings (10 years)*	\$724,728.68
Internal Rate of Return (IRR)	132.31%
Net Present Value (NPV)	\$564,896.36

* The lifetime Energy Savings is assumed to be 10 years not because the controls expected life is 10 years, but because the ventilators themselves are only expected to last another 10 years.

During the walkthrough, CDM noted that the lavatory fixtures in the original section of the building were standard higher flow type fixtures. These fixtures could be replaced with low flow fixtures in order to realize both water savings as well as natural gas savings from hot water usage. Water use standards for commercial plumbing products were established as a result of the National Energy Policy Act. The standards required that toilets use no more than 1.6 gallons per flush, urinals were limited to 1 gallon per flush and faucets and shower heads were allowed a maximum flow of 1.5 gallons per minute (gpm) at 80 psi. Now, according to the NYS Plumbing Code and industry standards, faucets are limited to 0.5 GPM for a lavatory. Prior to the National Energy Policy Act originally passed in 1992, standard toilets used 3.5 – 5.5 gallons per flush, urinals required 2 to 3 gallons per flush and standard lavatory faucets had flow rates of 2.5 to 5 gpm.

In general, replacement of the water fixtures results in a 40% – 50% reduction in water consumption. Water is currently available to customers at low rates; a typical water rate for New Jersey is \$5.00 per 1,000 gallons of water used. Although these water savings retrofits are a sustainable solution, benefiting society as a whole, the cost savings associated with toilet and urinal retrofits are insignificant when compared to the investment and it is anticipated that the resulting payback period will be well in excess of 20 years.

However, faucet retrofits are cost effective as a result of the natural gas savings associated with the hot water use. For this analysis, it has been assumed that each student uses the lavatory twice a day for a duration of 10 seconds each time, using hot water. Based on the number of students in the building, significant savings can be obtained by replacing old fixtures. This ECRM has a capital cost associated with it. For the Engineer's opinion of probable construction costs see Appendix H. The table below shows the financial highlights of this ECRM.

Table 4.2-2 Morris Knolls High School Fixture Replacement	
Engineer's Opinion of Probable Cost	\$7,669
New Jersey SmartStart Rebate	\$0
Total Cost	\$7,669
Annual Energy Savings	\$958.20
Annual Maintenance Cost Savings (AMCS)	\$0
Simple Payback	8 years
Annual Return on Investment (AROI)	8.49%
Lifetime Energy Savings (20 years)	\$25,746.92
Internal Rate of Return (IRR)	13.79%
Net Present Value (NPV)	\$10,936.57

Over several decades, ASHRAE has compiled data pertaining to service lives of most HVAC related equipment. From this, ASHRAE indicates a median service life (life until replacement) for HVAC related equipment that may be used as an estimate for the useful life of HVAC equipment currently in service. For example, ASHRAE indicates a make-up air unit has a median service life of 20 years. Therefore, if a make-up air unit has been in service for more than 20 years, the owner may want to consider replacement. Not only will a replacement ensure minimal downtime between units (the unit is replaced before it ceases to function), but it will also maintain rated system efficiency, as efficiency tends to decrease with age.

All major equipment noted during CDM's on site audit is listed in Table 4.2-3 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included. Where equipment ages were not found on the equipment tags, they have been estimated based on the unit appearance or approximate renovation dates. In some cases, service locations may have been estimated based on unit proximity. Additionally, in cases where a unit's manufacturer and/or model could not be determined due to an unreadable, faded, destroyed, or lost tag, manufacturer and model number information has been represented as "unknown".

Table 4.2-3 Morris Knolls High School Major HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Chiller 1	Basement	Science Wing	Mc Quay	WCZ090AW27-ER10	Unknown	~5	20
Chiller 2	Basement	Science Wing	Mc Quay	WCZ090AW27-ER10	Unknown	~5	20
CWP-1	Basement	Science Wing	Taco	F13013E2LAJL00	Unknown	~5	20
CWP-2	Basement	Science Wing	Taco	F13013E2LAJL00	Unknown	~5	20
CHWP-1	Basement	Science Wing	Taco	Unknown	Unknown	~5	20
CHWP-2	Basement	Science Wing	Taco	Unknown	Unknown	~5	20
CHWP-3	Basement	Science Wing	Taco	Unknown	Unknown	~5	20
Cooling Tower	Science Wing Roof	Science Wing	Marley	Primus	Unknown	~5	20
Boiler-1	Boiler Room	Morris Knolls	Rockmills	MP 300	82%	~5	25
Boiler-2	Boiler Room	Morris Knolls	Rockmills	MP 300	82%	~5	25
HWP-1	Boiler Room	Morris Knolls	Taco	Unknown	Unknown	~10	20
HWP-2	Boiler Room	Morris Knolls	Taco	Unknown	Unknown	~10	20
(2) Gas Fired Make-up Air Unit	Science Wing Roof	Science Halls	Sterling	E1M-PV30A2	80%	~5	15
(13) Make-up Air Units	Science Wing Roof	Labs	Greenheck	IGX-108-H12-DBC	80%	~5	15
(13) Exhaust Fans	Science Wing Roof	Labs	Greenheck	CUBE-141HP-10-X	Unknown	~5	25
(4) Air Handlers	Cafeteria Roofs	Cafeteria & Kitchens	AAON	66859 RM-016-3-0-A402-379	81%	~5	15
(8) Air Handlers	Gym	Gym	Unknown	Unknown	Unknown	~10	15

Table 4.2-3 Morris Knolls High School Major HVAC Equipment Service Lives

(8) Exhaust Fans	Gym Roof	Gym	Greenheck	Unknown	Unknown	~5	25
(4) Energy Recovery Units	Roof Behind Gym	Locker Rooms & Team Rooms	Unknown	Unknown	Unknown	~5	15
(2) Gas Fired Rooftop Units	Roof	Trainers' Room and Fitness/Weight Room	Unknown	Unknown	Unknown	~5	15
Air Handler	Mechanical Room above Auditorium	Auditorium	Unknown	Unknown	Unknown	~20	15
(4) Exhaust Fans	Auditorium Roof	Auditorium	Jenn-Air	Unknown	Unknown	~20	25
Air Handler	Mezzanine	Band Room	York	Unknown	Unknown	~20	15
Air Handler	Mezzanine	Chorus Room	York	Unknown	Unknown	~20	15
ACCU	Roof	Band Room	York	H2CE120A25B	Unknown	~20	15
ACCU	Roof	Chorus Room	York	H2CE120A25B	Unknown	~20	15
Air Handler	Original Roof	Guidance Suite	McQuay	RPS015CS4	Unknown	~10	15
Air Handler	Roof	Administration	Carrier	38AB012510	Unknown	~20	15
Air Handler	Roof	Nurse/Child Study	Carrier	38AB012510	Unknown	~20	15
Split System	Roof	Athletics Office	Unknown	Unknown	Unknown	~15	15
Split System	Roof	Faculty Room	Unknown	Unknown	Unknown	~15	15
Split System	Roof	Server Room	Unknown	Unknown	Unknown	~15	15
(85) Unit Ventilators	Old Classrooms	Old Classrooms	Nesbitt	Unknown	Unknown	>20	20
New Unit Ventilators	New Classrooms	New Classrooms	Airedale	UV6CHW4	Unknown	~5	20

CDM also creates an inventory of observed domestic water heaters. This domestic water heater inventory may be seen as Table 4.2-4 below.

Table 4.2-4 Morris Knolls High School Domestic Hot Water Boilers					
Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Observed Condition
DHW Boiler Room	A.O. Smith	Unknown	Gas Fired Storage	Unknown	Excellent
DHW Boiler Room	A.O. Smith	Unknown	Gas Fired Storage	Unknown	Excellent

4.2.2 Morris Hills High School

A model of the Morris Hills High School was created in eQuest to predict heating and cooling loads for the building. To calibrate this model, CDM used electricity bills from July, 2008 through July 2009, natural gas bills from August, 2008 through August, 2009, and fuel oil bills from September, 2008 through June, 2009. Figure 4.2-5 below compares actual monthly electricity usages, with those predicted by the eQuest model. The annual predicted electricity usage was calibrated within 4% of the actual usage.

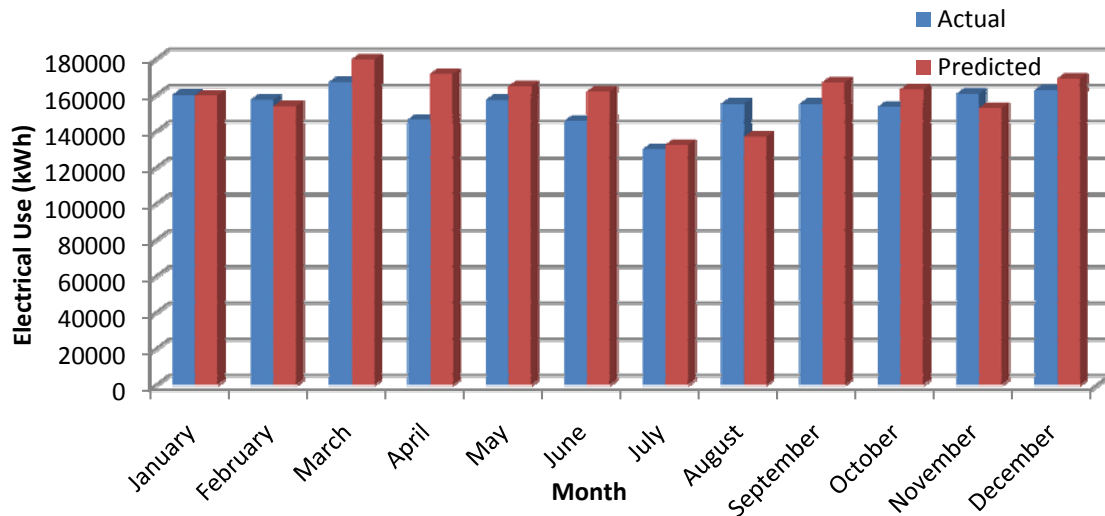


Figure 4.2-5: Morris Hills High School Electricity Usage

Once the eQuest model was calibrated, it could be used to predict approximate major usage categories such as lighting, plug loads (miscellaneous), ventilation, heating and cooling. It should be noted that these are only estimated usages based on information gathered during CDM's field audit. Figure 4.2-6 presents this information to help the Board visualize where CDM anticipates the electricity is ultimately being used.

Figure 4.2-6: Morris Knolls High School Electricity Usage Breakdown

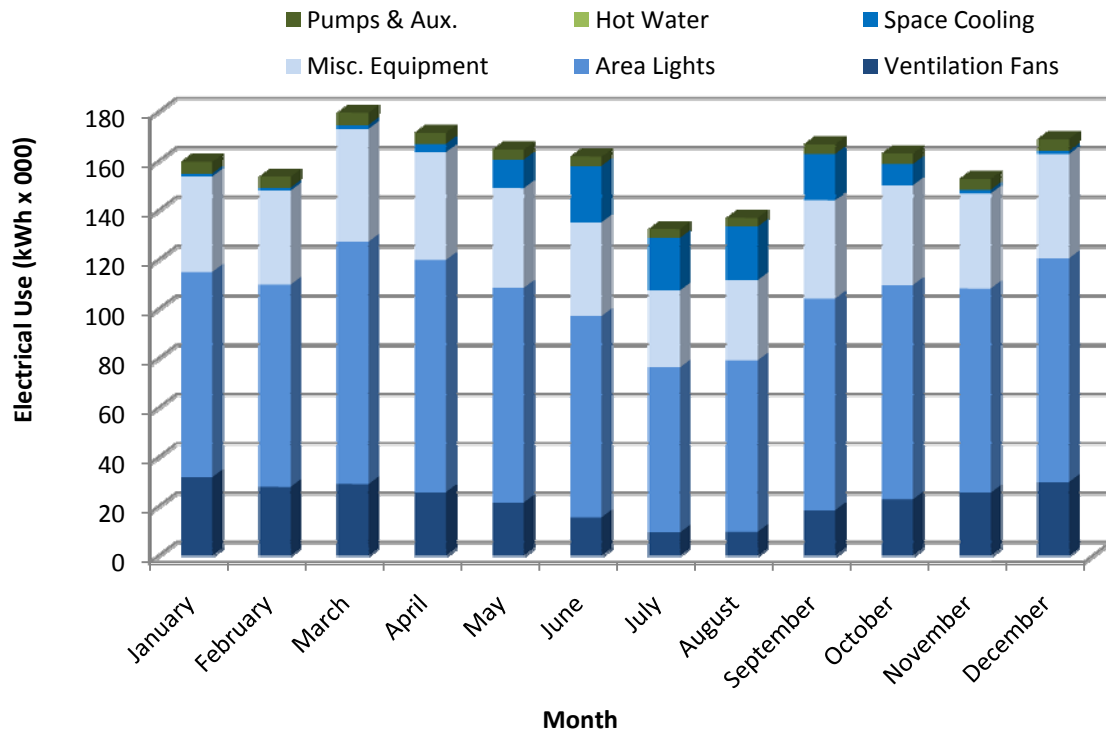


Figure 4.2-7 below compares actual natural gas and fuel oil usage to model-predicted natural gas and fuel oil use. Natural gas at the high school is primarily used for domestic water heating and makeup air units. The central boilers use #2 fuel oil as their main source of heat. The table below shows the combined usage by converting the gallons of oil into therms and simply adding the two together. The modeled building usage is within 5% of the actual building usage.

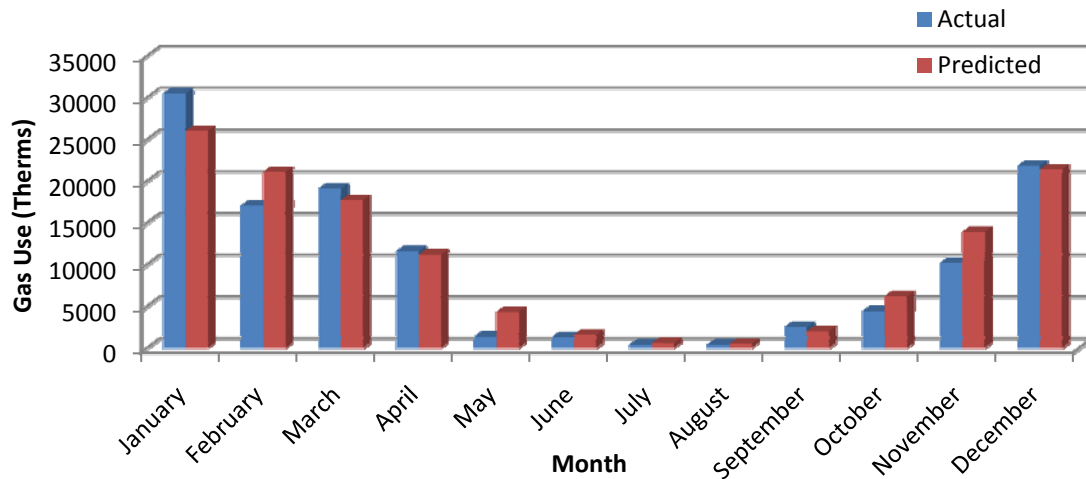


Figure 4.2-7: Morris Hills High School Natural Gas & Fuel Oil Usage

Generally, the HVAC systems used at this High School building were found to be relatively new and in good working order. The original classroom areas did have some relatively old unit ventilators and steam convectors. Some were equipped with window mounted air conditioners. Both of the Gymnasiums have H&V systems that are no longer working, and the Kitchen makeup air units are beyond their service lives. To replace all of these units would be very capital intensive, and necessary in the case of the Gymnasiums. Therefore, the replacement is not warranted from an energy efficiency standpoint, although they should be replaced to meet codes, comfort and prevent downtime and maintenance costs.

The fans associated with the unit ventilators are reported to be running continuously. This is unnecessary and the shutdown of these fans has been evaluated to determine the energy savings. It was reported that the Morris Hills classroom unit ventilators manufactured by Nesbitt are original to the construction of the building.

Based on good engineering practice, CDM has assumed that the unit ventilators are heating when the outside air temperature is below 65 degrees. CDM estimated that forty-six (46) unit ventilators run continuously supplying 100 CFM of outside air each. This is due to the assumption that the dampers are partially open. The months of May through September are assumed to have no heating. The annual savings from closing the damper fully to outside air when classrooms are unoccupied is \$7,108.60. Savings will also result from turning off the fans in each unit when the classrooms are unoccupied. It is assumed that the classrooms are generally unoccupied between 4pm and 8am during the weekdays, and completely unoccupied on the weekends, during breaks, and in the summer. The savings that result from turning off the fans after school hours and on weekends when school is in session is \$22,401.48. The calculations can be found in Appendix C.

The above ECRM has a capital equipment cost associated with it. This is in the form of electronic controllers at \$400 per unit plus a contractor's markup and contingency. Engineer's opinion of probable cost estimates can be found in Appendix H. This control will simply turn off the fan when the space is unoccupied. This can be done with individual manual controllers or a central control panel. The table below shows the financial highlights of this ECRM.

Table 4.2-5 Morris Hills High School Unit Ventilator Controls Upgrade	
Engineer's Opinion of Probable Cost	\$26,450
New Jersey SmartStart Rebate	\$0
Total Cost	\$26,450
Annual Energy Savings	\$29,510.08
Annual Maintenance Cost Savings (AMCS)	\$0
Simple Payback	0.89 years
Annual Return on Investment (AROI)	107.57%
Lifetime Energy Savings (10 years)*	\$338,300.00
Internal Rate of Return (IRR)	114.50%
Net Present Value (NPV)	\$260,055.63

* The lifetime Energy Savings is assumed to be 10 years not because the controls expected life is 10 years, but because the ventilators themselves are only expected to last another 10 years.

During the walkthrough, un-insulated steam pipes were noticed in the basement just outside of the boiler room. It was also noted that the Nurses Office, which is located directly above these pipes, seems to be overheated quite a bit. A nurse stated that they use the air conditioner year-round to combat the excess heat from below. An analysis has been done on the insulation of these steam pipes. Please note that throughout the analysis, the savings associated with not running the air conditioner are not accounted for. This will increase the actual savings and reduce the payback period from what is presented in table 4.2-6 below.

Table 4.2-6	
Morris Hills High School Insulate Piping ECRM	
Engineer's Opinion of Probable Cost	\$740.31
New Jersey SmartStart Rebate	\$0
Total Cost	\$740.31
Annual Energy Savings	\$525
Annual Maintenance Cost Savings (AMCS)	\$0
Simple Payback	1.41 years
Annual Return on Investment (AROI)	66.92%
Lifetime Energy Savings (10 years)*	\$14,106.95
Internal Rate of Return (IRR)	73.91%
Net Present Value (NPV)	\$9,453.86

The calculation for the above ECRM can be found in Appendix C.

During the walkthrough, CDM noted that the lavatory fixtures in the original section of the building were standard higher flow type fixtures. These fixtures could be replaced with low flow fixtures in order to realize both water savings as well as natural gas savings from hot water usage. Water use standards for commercial plumbing products were established as a result of the National Energy Policy Act. The standards required that toilets use no more than 1.6 gallons per flush, urinals were limited to 1 gallon per flush and faucets and shower heads were allowed a maximum flow of 1.5 gallons per minute (gpm) at 80 psi. Now, according to the NYS Plumbing Code and industry standards, faucets are limited to 0.5 GPM for a lavatory. Prior to the National Energy Policy Act, originally passed in 1992, standard toilets used 3.5 – 5.5 gallons per flush, urinals required 2 to 3 gallons per flush and standard lavatory faucets had flow rates of 2.5 to 5 gpm.

In general, replacement of the water fixtures results in a 40% – 50% reduction in water consumption. Water is currently available to customers at low rates; a typical water rate for New Jersey is \$5.00 per 1,000 gallons of water used. Although these water savings retrofits are a sustainable solution benefiting society as a whole, the associated cost savings associated with toilet and urinal retrofits are insignificant when compared to the investment, and it is anticipated that the resulting payback period will be well in excess of 20 years.

However, faucet retrofits are cost effective as a result of the natural gas savings associated with the hot water use. For this analysis, it has been assumed that each student uses the lavatory twice a day for a duration of 10 seconds each time, using hot

water. Based on the number of students in the building, significant savings can be obtained by replacing old fixtures. This ECRM has a capital cost associated with it. For the Engineer's opinion of probable construction costs see Appendix H. The table below shows the financial highlights of this ECRM.

Table 4.2-7 Morris Hills High School Fixture Replacement	
Engineer's Opinion of Probable Cost	\$7,948
New Jersey SmartStart Rebate	\$0
Total Cost	\$7,948
Annual Energy Savings	\$877.50
Annual Maintenance Cost Savings (AMCS)	\$0
Simple Payback	9 years
Annual Return on Investment (AROI)	7.04%
Lifetime Energy Savings (20 years)	\$23,579.29
Internal Rate of Return (IRR)	11.96%
Net Present Value (NPV)	\$9,091.28

Over several decades, ASHRAE has compiled data pertaining to service lives of most HVAC related equipment. From this, ASHRAE indicates a median service life (life until replacement) for HVAC related equipment that may be used as an estimate for the useful life of HVAC equipment currently in service. For example, ASHRAE indicates a make-up air unit has a median service life of 20 years. Therefore, if a make-up air unit has been in service for more than 20 years, the owner may want to consider replacement. Not only will a replacement ensure minimal downtime between units (the unit is replaced before it ceases to function), but it will also maintain rated system efficiency, as efficiency tends to decrease with age.

All major equipment noted during CDM's on site audit is listed in Table 4.2-8 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included. Where equipment ages were not found on the equipment tags, they have been estimated based on the unit appearance or approximate renovation dates. In some cases, service locations may have been estimated based on unit proximity. Additionally, in cases where a unit's manufacturer and/or model could not be determined due to an unreadable, faded, destroyed, or lost tag, manufacturer and model number information has been represented as "unknown".

Table 4.2-8 Morris Hills High School HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Boiler-1	Boiler Room	Morris Hills	Rockmills	MP300	82%	~5	25
Boiler-2	Boiler Room	Morris Hills	Rockmills	MP300	82%	~5	25
Condensate Receiver	Boiler Room	Morris Hills	Shipco	Unknown	Unknown	~5	N/A
DHW Return Pump	Boiler Room	Morris Hills	Bell & Gossett	FVN48T	Unknown	~5	10
Chiller-1	Chiller Room	Science Wing	McQuay	WGS130AW27-ER10	Unknown	~5	20
Chiller-2	Chiller Room	Science Wing	McQuay	WGS130AW27-ER10	Unknown	~5	20
CHWP-1	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
CHWP-2	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
CWP-1	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
CWP-2	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
HWP-1	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
HWP-2	Chiller Room	Science Wing	Weinman/Crane	Unknown	93%	~5	20
CT	Roof	Science Wing	Marley	Primus	Unknown	~5	20
(2) Rooftop Units	Band Room Roof	Band Room	Lennox	82K69	80%	~10	15
(2) Rooftop Units	Chorus Room Roof	Chorus Room	Lennox	82K69	80%	~10	15
Makeup Air Unit	Roof	Girls Locker Room	Greenheck	IGX-115-H22-DB	80%	~5	15
Cassette Split Sys.	Roof/Ceiling	Coach's Office	Airedale	MC2D9900AA00A0K	Unknown	~5	15
Rooftop Unit	Roof	Activity Room	Carrier Weathermaster	48HJR006---641HY	81%	~5	15

Table 4.2-8 Morris Hills High School HVAC Equipment Service Lives

Broken Heat Vent Unit	Penthouse	Boys Gym	Unknown	Unknown	Unknown	>20	15
Broken Heat Vent Unit	Penthouse	Girls Gym	Unknown	Unknown	Unknown	>20	15
Broken Air Handler	Gymnasium	Gymnasium	Unknown	Unknown	Unknown	>20	15
Broken Air Handler	Gymnasium	Gymnasium	Unknown	Unknown	Unknown	>20	15
Makeup Air Unit	Roof	Boys Locker Room	Greenheck	IGX-115-H22-DB	80%	~5	15
Rooftop Unit	Roof	Trainers' Room	Carrier Weathermaster	48HJR004---641HY	82.8%	~5	15
RTU-A1	Roof	Boys Team Room	AAON	65560 RM-008	81%	~5	15
RTU-A2	Roof	Girls Team Room	AAON	65560 RM-008	81%	~5	15
(2) Split Systems	Roof/Ceiling	Locker Rooms Offices	Mitsubishi	Mr. Slim	Unknown	~5	15
MAU A-1	Roof	Metal Shop	Greenheck	IGX-HV-115-H22-DB	80%	~5	15
Rooftop Unit	Roof	Metal Shop	Carrier Weathermaster	48HJR012-H-671HY	82%	~5	15
Exhaust Fan	Roof	Metal/Wood Shop	PlymoVent	F56HC	Unknown	~5	25
Rooftop Unit	Roof	Wood Shop	Carrier Weathermaster	48HJR012---671HY	82%	~5	15
MAU A-7	Roof	Wood Shop	Greenheck	IGX-115-H22-DB	80%	~5	15
RTU A-5	Roof	Weight Room	Carrier Weathermaster	48HJR012---671HY	82%	~5	15
RTU A-4	Roof	Wrestling Room	Carrier Weathermaster	48HJR012---671HY	82%	~5	15
HV D-1	Roof	Cafeteria	Reznor	Unknown	80%	~5	15
HV D-2	Roof	Cafeteria	Reznor	Unknown	80%	~5	15
(2) Makeup Air Units	Roof	Kitchen	Unknown	Unknown	Unknown	>20	15
Kitchen Exhaust Fan	Roof	Kitchen Hoods	Greenheck	3C367	Unknown	~5	20
RTU E-2	Roof	Room 203	Carrier Weathermaster	48HJR007---651HY	81%	~5	15

Table 4.2-8 Morris Hills High School HVAC Equipment Service Lives

AC F-1	Roof	Room 101	Lennox	Unknown	Unknown	~5	15
CU F-1	Roof	Hasel Office	Mitsubishi	PUY-A12NHA	Unknown	~5	15
CU H-1 & 2	Roof	Room 224	Airedale	SCC360DFA0A0AA0B	Unknown	~5	15
CU H-3 & 4	Roof	TV Studio	Mitsubishi	Mr. Slim	Unknown	~5	15
RTU H-1	Roof	TV Studio	AAON	65661 RM-008	81%	~5	15
RTU H-3	Roof	Child Care	Carrier Weathermaster	48HJR007---651HY	81%	~5	15
Rooftop Unit	Roof	Elevator/Hallway	Trane	TCC030F10BD	Unknown	~10	15
Rooftop Unit	Roof	Graphic Arts Room	Carrier Weathermaster	48HJR006---641HY	81%	~5	15
CU H-1 & 2	Roof	Art Room	Mitsubishi	Mr. Slim	Unknown	~10	15
HV H-1	Roof	Hallways	Reznor	Unknown	Unknown	~10	15
(9) MAU's	Roof	Science Classrooms	Greenheck	IGX-108-H12-DB	80%	~5	15
(9) Exhaust Fans	Roof	Science Labs	Greenheck	CUBE 141-7	Unknown	~5	25
(2) Supply Fan & Coils	Above Auditorium	Auditorium	Champion Blower	6S	87.5%	>25	25
DC A-1 Exhaust Fan	Ground	Wood Shop	Vibraclean	DKPD48010-2	Unknown	~10	N/A
RTU E-1	Lower Roof	Admin Area	Carrier Weathermaster	48HJR012---671HY	82%	~5	15
Split System	Lab	Lab	Nesbitt	MSI	Unknown	>20	15
(2) Exhaust Fans	Media Center Wall	Media Center	Unknown	Unknown Wall Fan	Unknown	~10	25
(~15) Window AC's	Classrooms	Classrooms	Friedrich	Quietmaster	Unknown	~5-10	10
Steam Unit Ventilators	Old Classrooms	Old Classrooms	Nesbitt	Unknown	Unknown	>20	20
New Unit Ventilators	New Classrooms	New Classrooms	Airedale	UV6CHW4	Unknown	~5	20

CDM also creates an inventory of observed domestic water heaters. This domestic water heater inventory may be seen as Table 4.2-9 below.

Table 4.2-9 Morris Hills High School Domestic Hot Water Boilers					
Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Observed Condition
Boiler Room	Turbopower	600	Gas	1000 MBH	Excellent

4.3 Alternative Energy Sources

4.3.1 Photovoltaic Solar Energy System Overview

Photovoltaic (PV) cells convert energy in sunlight directly into electrical energy through the use of silicon semi conductors, diodes and collection grids. Several PV cells are then linked together in a single frame of module to become a solar panel. PV cells are able to convert the energy from the sun into electricity. The angle of inclination of the PV cells, the amount of sunlight available, the orientation of the panels, the amount of physical space available and the efficiency of the individual panels are all factors that affect the amount of electricity that is generated.

Based on the estimated cumulative total available roof area, calculations determine that the installation of two systems with a total rating of approximately 1,361 kW (dc) will be appropriate for the two Morris Hills Regional Board of Education High School Buildings listed below.

As part of this energy audit, a preliminary engineering feasibility study of the sites outlined above to support solar generation facilities was completed consisting of the following tasks:

- a. Site visit by CDM engineers.
- b. Satellite image analysis and conceptual design and layout of the photovoltaic system.
- c. Design and construction cost estimates.
- d. Determine a preliminary design for the size and energy production of the solar system.

The total unobstructed available area of each section of the roof with southern exposure was evaluated. It is important to note the following:

1. The structural integrity of the roofs was not confirmed during the site visit. The municipal buildings may require some degree of roofing work prior to the implementation of a solar system.

2. In the case of the flat areas, the PV system sizing and kWh production was calculated assuming the installation of a crystalline module facing south direction (220 Degree Azimuth) and tilted approximately 20 degrees to allow better rain water shedding and snow melting. Please note that the kWh production, as well as system size, may differ significantly based on final panel tilt selected during the RFP and design phase.
3. Electric rates were used based on actual utility bills and were applied for the facility.

The following is a preliminary study on the feasibility of installing PV solar systems at the two high school buildings to generate a portion of each facility's electricity requirements. Each system is designed to offset the electric purchased from the local utility and not as a backup or emergency source of power.

In order to determine the best location for the installation of the PV solar system, a satellite image analysis and site walkthrough of the buildings was performed on March 16th and 17th. As per the Scope of Work, only the building roofs were considered for PV installation.

Also, part of the assessment included investigating possible locations for electrical equipment that need to be installed such as combiner boxes, disconnect switches and DC to AC inverters. Consideration was also given to locations of interconnection between the solar system and building's electrical grid.

4.3.1.1 Morris Knolls High School

The roof of the Morris Knolls High School is a flat roof with several obstructions. The obstructions include things such as exhaust fans, rooftop HVAC units, and electrical and gas piping. There is no amount of shading on the roof from adjacent foliage that would need to be addressed during the design phase of the project. The structural integrity of the roof was not confirmed but a visual inspection revealed significant pooling and interior leakage. Due to the roof leaks and water damage, it is recommended that the roof be completely replaced before a roof mounted solar system is installed. Consequently, the structural integrity of the roof will need to be confirmed prior to the implementation of a PV system.

The Project Team conducted both a facility walkthrough and a satellite image analysis and based on the estimated total available area, the calculated rating for a solar system installation is determined to be approximately 848 kW (dc).

Electrical Service

The electrical service size of the Morris Knolls High School is 2500 A, at 277/480V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker. Protective relaying will also have to be implemented. Any connection points would have to meet NEC

and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.3.1.2 Morris Hills High School

The roof of the Morris Hills High School is a flat roof with a many obstructions such as exhaust fans, rooftop HVAC units, and electrical and gas piping. There is no amount of shading on the roof from adjacent foliage that would need to be addressed during the design phase of the project. The structural integrity of the roof was not confirmed although a visual inspection revealed some pooling and interior water damage at the original section of the building. This roof should also be repaired or replaced before a roof mounted solar system is installed. Consequently, the structural integrity of the roof will need to be confirmed prior to the implementation of a PV system.

The Project Team conducted both a facility walkthrough and a satellite image analysis and based on the estimated total available area, the calculated rating for a solar system installation is determined to be approximately 513 kW (dc).

Electrical Service

The electrical service size of the Morris Hills High School is 2500 A, at 277/480V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker. Protective relaying will also have to be implemented. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.3.1.3 Basis for Design and Calculations

The proposed Photovoltaic (PV) Power systems outlined above for each school are comprised of the PV arrays, inverter(s), combiner boxes, disconnect switches, and all of the necessary wiring and interconnection equipment. The solar panels will be mounted onto the roof. The array outputs will feed power into the DC to AC inverters. AC outputs will then be connected at each building's electrical service as outlined above. Pending further engineering analysis of the roofs, it is yet to be determined if the solar arrays will be installed using a self-ballasting system, or roof penetration system, or a combination of both.

The most common roof mounted system is referred to as a "fixed tilt" system typically mounted to a metal rack that can be fixed at a specific angle. There are also "tracking systems" or movable along one or two axes to follow the position of the sun during the day. For a roof-mounted PV system, tracking systems are very rarely installed and are usually used for ground-mounted systems only, as they require more complex racks and higher maintenance costs. For the "fixed tilt" system, the tilt is determined based on the following factors: geographical location, total targeted kWh production, seasonal electricity requirements and weather conditions such as wind. Ideally, the module tilt for Central to Eastern New Jersey should be 25-35

degrees with an azimuth as close as possible to 180 (south); however, CDM's experience has shown that PV systems are typically installed at a tilt of 20 degrees or lower in order to avoid any issues with wind and to maximize total system size.

The type of PV panels and equipment used to mount the system shall be determined based on the wind conditions and structural integrity of the roof determined during the design phase of the project. In general, penetration/tie-down systems, non-penetrating ballasted type systems, or a combination of the two should be considered.



Calculation of PV System Yield

An industry accepted software package PV Watts was used to calculate projected annual electrical production of the crystalline silicon PV system in its first year, as summarized in Table 4.3-1. The system was designed to provide maximum kWh production based on available roof space.

Table 4.3-1 Summary of Solar (PV) Systems

Site	Est. Area (ft ²)	kWh	Annual Energy Savings	Est. Annual SREC	Lifetime Energy Savings (25 Years)*	Annual Return On Investment (AROI)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Morris Knolls High School	84,799	1,060,192	\$215,006.9	\$448,461	\$7,838,993	2.9%	\$568,650	3.6%
Morris Hills High School	51,293	641,286	\$107,607.8	\$271,264	\$3,923,301	2.4%	-\$218,743	2.6%

*3% yearly inflation on electricity costs

Total Costs

It should be noted that construction costs are only estimates based on historic data compiled from similar installations, and engineering opinion. Additional engineering and analysis is required to confirm the condition of the roofs, structural integrity of the roofs, the system type, sizing, costs and savings. Budget costs assume existing roofs are structurally sound, do not need to be replaced, and can accommodate a solar system. For illustration purposes, a draft financial analysis pro forma is attached outlining all project costs and revenues.

Table 4.3-2 Engineers Opinion of Probable Cost

Engineers Opinion of Probable Cost	\$15,560,351
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As stated above, the estimated installation costs are based on significant experience with the pricing of solar installations in New Jersey, and are intended to provide the Board with a realistic budget cost. A typical solar installation can vary in cost from \$7.00 - \$10.00 per watt depending on size, complexity of the system, labor rates, etc. Approximately 60%-70% of that number is material costs while the balance is labor, engineering, etc. Like any installation, certain conditions can affect a price upward or downward. For purposes of this analysis, the estimated installation cost does not include any roofing or structural work which may be required to maintain warranties or for additional structural support. The budget includes \$9 per watt for the solar system installation with an additional estimated budget of \$100,000 for potential electric service work.

Refer to Section 7 for discussion on Solar Renewable Energy Certificates and other financing options for solar projects. The financial model in Appendix E provides an annual forecast illustration of project revenues and costs for 25 years.

4.3.2 Geothermal Energy

Geothermal systems utilize the constant temperature of the earth throughout the year (at depths from 5 ft. to 1,000 ft., the earth temperature remains at 53 deg. F) as the primary source of energy for the heating/cooling and domestic hot water production. Additionally, since the earth is maintained at a constant temperature from heat absorbed from the sun, this energy is considered a “renewable resource,” and therefore is not as reliant on existing supplies of fossil fuels.

Even though this application requires significantly higher up-front costs, it has several advantages over conventional HVAC systems such as substantially lower operating and maintenance costs. The life span of the system is longer than conventional heating and cooling systems. Most loop fields are warranted for 25 to 50 years and are expected to last at least 50 to 100 years. However, it is important to note that geothermal systems are more difficult to install in existing facilities and require higher capital cost due to having to complete significant infrastructure changes. Therefore, installation of a geothermal system is not recommended at any of Morris Hills older schools at this point.

4.3.3 On-Site Wind Power Generation

On-site wind power generation typically utilizes a form of turbine, which is rotated with the flow of wind across it. This rotational force powers a generator, producing DC electricity. The DC electricity is then converted into AC electricity, which can be used for commercial power, or can be fed back into the power grid, reducing the overall electric demand. The size of the turbine is proportional to the amount of wind and concurrently the amount of energy it can produce. An ideal location for a wind turbine is 20 feet above any surrounding object within a 250 foot radius. In general, this relates to a property size of one acre or more.

CDM has determined that it is feasible for the Morris Hills Regional Board of Education to install a wind turbine energy system on the Morris Knolls High School

grounds. A wind turbine energy system would not be viable for Morris Hills High School as the available ground space required for a wind turbine is either paved, or limited. For the purpose of this feasibility analysis, CDM is recommending payback on a one-10KW wind turbine. Depending on area available, and funding, the Board may choose to install more than one wind turbine on the premises.

Utilizing NASA's online wind data tool, it was determined that the local average wind speeds ranged from 8.4mph to 12.1mph, or 3.8m/s to 5.4m/s. In general, around 9mph of average wind speed, as determined over the course of a year, is necessary to "fuel" the turbine. These values fall within the range of feasibility for installation of a new wind turbine system.

For the purposes of this feasibility analysis, CDM chose a 10KW Bergey wind turbine. This turbine size is used most often for small commercial applications. Power Curve data was determined through the use of the product specification sheets on vendor websites, and vendor provided tools. Actual turbine size, height, location, and manufacturer should be determined upon design of a wind turbine system.

The estimated wind speed data, associated wind probability distribution function (weibull value), turbulence losses, and other relevant data were then incorporated into Bergey's Wind Cad program to estimate the annual output for the wind turbine.

Refer to Appendix K for Wind Cad Modeling.

In order to determine simple payback analysis of the proposed wind turbine, CDM used the vendor pricing information located on the Bergey Wind Turbine website (www.bergey.com). For more information on wind turbine cost estimation, refer to Appendix H. By installing the proposed wind turbine, Morris Knolls High School will offset between \$906.7 and \$2,565.4 per year in utility costs based on the minimum and maximum average local wind speeds. In addition, Renewable Energy Credits (REC's) are obtainable for renewable power and incentives are available through the Renewable Energy Incentive Program (REIP). Refer to Section 7 for a more in depth explanation.

This simple payback calculation takes into account the incentive provided for wind turbines through the REIP program. For the first 16,000 kWh of production, the incentive is \$3.20/kWh. For production between 16,000 kWh – 750,000 kWh, the REIP program incentive is \$0.50/kWh. CDM used this incentive as an upfront deduction from the Engineer's Opinion of Probable Cost. In addition, in order to benefit from the REIP incentive, the District must purchase a wind turbine on the approved NJ Clean Energy list. CDM chose the Bergey wind turbine for this analysis as it is approved by the NJ Clean Energy program and is the appropriate size for pump stations or smaller commercial installations.

Refer to the NJ Clean Energy website for more information.

Table 4.3-3 includes a simple payback analysis for the installation of a wind turbine energy system on the Morris Knolls High School grounds. Refer to Appendix L for a more detailed wind turbine financing spreadsheet, including utility cost avoidance and REC's.

Table 4.3-3: Simple Payback Analysis for Wind Turbine Energy System			
Parameter	Wind Turbine (Minimum Site Wind Speed – 8.4 mph)	Wind Turbine (Maximum Site Wind Speed – 12.1 mph)	Wind Turbine (Average Site Wind Speed – 10.5 mph)
Engineer's Opinion of Probable Cost	\$68,489.69	\$68,489.69	\$68,489.69
Renewable Energy Incentive Program**	-\$17,395.00	-\$49,216.00	-\$33,082
Total Cost	\$51,094.69	\$19,273.69	\$35,407.69
1 st Year Production	5,436 kWh	15,380 kWh	10,338 kWh
Annual Estimated Electric Savings	\$906.7	\$2,565.4	\$1,724.4
Annual Estimated REC Revenue	\$136.00	\$385.00	\$258.00
Project Simple Payback	49.0 Years	6.5 Years	17.9 Years
Annual Return On Investment (ARO I)	-2.0%	11.3%	1.6%
Lifetime Energy Savings (25 years)**	\$33,057.61	\$93,532.60	\$62,870.36
Internal Rate of Return (IRR)	-2.7%	16.9%	4.8%
Net Present Value (NPV)	-\$28,111	\$45,753	\$8,301

*Refer to Appendix K for Wind Cad Modeling

**REIP incentive is calculated for only the first year and is applied as a deduction.

Based on the simple payback model, summarized in Table 4.3-3, it would benefit the Board to further investigate the installation of a wind energy system for Morris Knolls High School. This is primarily based on the initial upfront capital investment required for a wind turbine energy system installation and the 17.9 year average wind speed payback period. This payback period justifies installing the wind turbine energy system. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. This technology is constantly changing and will most likely continue to lower in price.

It should be noted that CDM used only REC values, utility cost avoidance factors, and the REIP incentive in determining simple payback periods. As stated above, other incentives and financial programs such as Power Purchase Agreements are available to help finance this installation. For example, if a Power Purchase Agreement is completed, the private company financing the project would benefit from the 30% tax credit. Other incentives such as CREB's and first year usage incentives could be

available to the District in lowering the payback period. Refer to www.dsireusa.org for an extensive listing of possible incentives for the New Jersey area.

It should also be noted that the wind turbine represented above is for feasibility purposes only. If the Board decides to install a wind turbine, different mounting heights, turbine sizes, and manufacturers should be considered. In addition, permits may be required for installation according to local zoning laws. The FAA must also be notified in order to give clearance for the tower, and for installation of aviation safety lights if necessary.

4.4 Additional Measures

As discussed in Section 2, it may be possible to reduce the plug load of the schools even further with the implementation of smart strips, energy star appliances, 'Vending Misers' and computer power management software. The use of energy star appliances is recommended on an as-needed basis.

4.4.1 Smart Strips

Smart Strips save energy by electronically unplugging all of the devices that are plugged into the "Automatically Switched Outlets" when the device plugged into the control outlet is turned off. It is important to note that CDM is not suggesting that computers be plugged into the automatically switched off outlets, as there would be potential for the computers to be shut off mid-operation. There are a vast amount of computer peripherals that are typically left on after a computer is shut off, including monitors, scanners, printers and DSL/cable modems. These peripherals can be plugged into the automatic outlets.

As an example, a computer room contains 30 computers and 4 printers. A standard Smart Strip has one 'control' outlet, six (6) outlets that are automatically switched off when the control device is and three (3) outlets that are always hot. An example of how the Board can implement the use of Smart Strips within this classroom is to plug a computer into the control outlet, five (5) monitors and a personal printer (8 W in standby mode) into the automatic outlets and three (3) computers into the always hot outlets. An LCD monitor can use up to 34W; in standby mode the monitor utilizes 1-2W. A CRT monitor typically utilizes around 75W. The following table 4.4-1 summarizes the payback of a Smart Strip, assuming 5 LCD monitors and 1 printer are automatically powered down that would otherwise been left on 8 hours/day and in standby mode 16 hours/day, 5 days/week for 9 months.

Table 4.4-1: Simple Payback Smart Strip Classroom Application Example	
Predicted Annual Savings – 5 LCD monitors, 1 printer (kWH)	611
*Total Annual Savings	\$97
Initial Capital Cost	\$40

Table 4.4-1: Simple Payback	
Smart Strip Classroom Application Example	
Simple Payback (months)	4.9
Lifetime Energy Savings (15 years)	\$1,804
Net Present Value (NPV)	\$1,373

*Aggregate Cost of \$.1590/kWh taken from the High School

The following Table 4.4-2 summarizes other applications for the Smart Strip that may be applicable throughout the buildings:

Table 4.4-2: Applications for Smart Strips	
Control Outlet	Switched Outlets
Computer	Monitors, printers, scanners, lamps
TV	VCR, DVD player, cable box
Lamp	Stereo, space heater

4.4.2 'Vending Misers'

As discussed in Section 2.3, a 'Vending Miser' powers down a vending machine when the surrounding area is unoccupied and automatically repowers when the area is occupied, utilizing an infrared sensor. Similarly to occupancy sensors on lighting fixtures; however, the vending miser also monitors the ambient temperature while the vending machine is powered down and uses this as sort of an internal thermostat to power up the machine and ensure that the drinks remain cold. Additionally, the 'Vending Miser' monitors electrical current to ensure that the vending machine isn't powered down while the compressor is running and that the cooling cycle is run to completion before powering down the vending machine.

At the time of the audit, seven (7) vending machines were noted outside of the gym and in the cafeteria of the Morris Knolls High School, four (4) of which were for cold drinks. Vending machines with lights typically require 400 W, which relates to an annual consumption per vending machine of 3,504 kWh. This annual consumption assumes operation year round. The following Table 4.4-3 summarizes the payback associated with utilizing 'Vending Misers' at these locations at the Morris Knolls H.S. Due to the 'high traffic' locations of the noted vending machines, an annual savings estimate of 35% was carried.

Table 4.4-3: Simple Payback	
'Vending Misers' at Morris Knolls H.S.	
Predicted Annual Savings – 4 Vending Misers (kWH) (35% annual savings)	4,906

Table 4.4-3: Simple Payback 'Vending Misers' at Morris Knolls H.S.	
Total Annual Savings	\$1,030
Initial Capital Cost	\$864
Simple Payback (months)	10 months
Lifetime Energy Savings (5 years – based on warranty period)	\$5,468
Net Present Value (NPV)	\$4,136

4.4.3 Computer Power Management Software

Computer power management software controls the amount of time a group of desktop or laptop computers are powered up. The installation of power management software is simple, and only requires a small software package to be installed on each computer connected to a specific network. Software packages such as Night Watchman from 1e Software provide remote control of computers connected to a network, allowing for power down schedules to be setup, which can be used to optimize energy savings by turning off computers at a designated time. The power management software can also store energy/computer usage statistics in a database that can be used for energy usage analysis. CDM recommends the installation of PC power management software both at the Morris Knolls and Morris Hills High School facilities.

An energy savings analysis was performed based on the number of desktop computers provided by the school district. Laptops were omitted from the analysis based on the assumption that a laptop is powered down after use for transportation or storage, and is therefore not always connected to the School District's network. It was also assumed that the School District does not currently have a computer shut down/standby policy, and that the implementation of the power management software would reduce the daily operating time from 24 to 9.5 hours, eight months out of the year.

Table 4.4-4 includes a simple payback analysis for the installation of PC power management software at the two (2) High Schools. Refer to Appendix J for a more detailed PC power management software financing spreadsheet.

Table 4.4-4 Summary of PC Power Management Systems							
Site	Engineers Opinion of Probable Cost	Annual Energy Savings	Lifetime Energy Savings (5 Years)*	Simple Payback (Years)	Annual Return On Investment (ARO I)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Morris Knolls High School	\$10,304	\$24,266.3	\$128,833.1	0.42	231.5%	\$107,493.6	237.9%

Table 4.4-4 Summary of PC Power Management Systems							
Site	Engineers Opinion of Probable Cost	Annual Energy Savings	Lifetime Energy Savings (5 Years)*	Simple Payback (Years)	Annual Return On Investment (ARO I)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Morris Hills High School	\$9,200	\$17,927.1	\$95,177.3	0.51	190.9%	\$77,824.7	196.9%

*3% yearly inflation on electricity costs

**Refer to Appendix J for Computer Power Management Calculations

It should be noted that 1e Software also provides software to reduce the energy consumption of network devices and servers. Based on the daytime occupancy schedule and of a school building, the School District could also implement this additional power management software and reduce the energy usage of the servers and network devices during the unoccupied afterschool and nighttime time periods. CDM recommends that the School District has further analysis performed, to access the feasibility of implementation of the additional PC power management software.

Section 5

Evaluation of Energy Purchasing and Procurement Strategies

5.1 Energy Deregulation

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, and the deregulation of the market, allowed all consumers to shop for their electric supplier. The intent was to create a competitive market for electrical energy supply. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party supplier. Energy deregulation in New Jersey increased the energy buyers' options by separating the function of electricity distribution from that of electricity supply.

To sell electric generation service in New Jersey, electric power suppliers must be licensed by the New Jersey Board of Public Utilities (NJ BPU). They must also be registered with the local public utility (PSE&G or JCP&L) to sell electric service in that utility's service areas. The following third party electric suppliers are licensed with the NJ BPU:

- Amerada Hess Corp
- BOC Energy Services
- Con Edison Solutions, Inc.
- Constellation New Energy, Inc.
- Direct Energy, LLC.
- First Energy Solutions Corp.
- Glacial Energy
- Integrys Energy Service
- Liberty Power
- Pepco Energy Services, Inc.
- PP&L Energy Plus, LLC.
- Reliant Energy Solutions East, LLC.
- Sempra Energy Solutions
- South Jersey Energy
- Strategic Energy LLC
- Suez Energy Resources NA, Inc
- UGI Energy Services

Natural gas service is also deregulated in New Jersey. Similarly with electric power suppliers, natural gas suppliers must be licensed by the NJ BPU. The following natural gas suppliers are licensed with the NJ BPU:

- Core Energy
- Dominion Retail, Inc.
- GASMARK
- Gateway Energy Services Corp.
- Glacial Energy
- Great Eastern Energy
- Hess Corporation
- Hudson Energy Services LLC
- Infinite Energy
- Metro Media Energy
- MXenergy
- NATGASCO
- Pepco Energy Services
- PPL EnergyPlus, LLC
- South Jersey Energy Company
- Sprague Energy
- Systrum Energy
- U.S. Gas & Electric Inc.
- Woodruff Energy

5.1.1 Alternate Third Party Electric Supplier

CDM obtained a proposal for third party electrical service from Glacial Energy. The objective was to get an overall idea of whether or not switching electric energy suppliers is an avenue that should be pursued further to obtain energy cost savings.

Glacial Energy has proposed a flat rate retail cost per kWH over the next 6 or 12 month period for four (4) electric accounts. The proposal is included in Appendix F.

The following table, Table 5.1-1, summarizes the annual cost savings available based on historical energy consumption and the proposed energy rate for a 12 month term. The retail rates used in this analysis represent the baseline generation rates from the two suppliers and do not include any applicable demand charges, societal benefits charges, transmission charges, energy charges, reconciliation charges, transitional assessment charges or system control charges that were included in the aggregate rates presented in Section 3. These baseline generation rates are used for comparison purposes to identify any potential energy cost savings, as all other applicable charges cannot be avoided by switching suppliers. This summary table, which utilizes the historical electrical energy usage presented in Appendix A, confirms the information and available cost savings presented by Glacial Energy.

**Table 5.1-1: Potential Electrical Energy Cost Savings with an Alternate Third Party Supplier
– Glacial Energy**

Service Location	Average Annual Use (kWh)	Projected Annual Cost with JCP&L(@ \$0.12275/kWh)	Proposed Annual Cost with Glacial Energy (@ \$0.10864/kWh)	Potential Annual Savings (\$)
Morris Knolls HS (Acct #: 100000940823 & 100000941151)	2,416,352	\$296,607	\$262,512	\$34,095
Morris Hills HS (Acct #: 100001268257)	1,851,300	\$227,247	\$201,125	\$26,122
Morris Hills HS (Outdoor Lighting Acct# 100001268380)	38,143	\$4,682	\$4,144	\$539
Total Potential Annual Savings:				\$60,756

As energy cost savings are available by switching to a third party supplier, such as Glacial Energy, this is a recommended energy cost savings measure. The estimated annual cost savings available by switching to Glacial Energy is an 11% savings. CDM recommends that the Board investigate this cost savings opportunity further and compare proposals from alternate third party suppliers to obtain the lowest electrical energy rates available.

5.2 Demand Response Program

Demand Response is a program through which a business can make money on reducing their electricity use when wholesale electricity prices are high or when heavy demand causes instability on the electric grid, which can result in voltage fluctuations or grid failure. Demand Response is an energy management program that compensates the participant for reducing their energy consumption at critical times. Demand Response is a highly efficient and cost effective means of reducing the potential for electrical grid failure and price volatility and is one of the best solutions to the Mid-Atlantic region's current energy challenges.

The program provides at least two hours advance notice before curtailment is required. There is typically one event a year that lasts about three hours in the summer months, when demand for electricity is at its highest.

Participation in Demand Response is generally done through companies known as Curtailment Service Providers, or CSPs, who are members of PJM Interconnection. There is no cost to enroll in the program and participation is voluntary, for instance, you can choose when you want to participate. In most cases, there is no penalty for declining to reduce your electricity use when you are asked to do so. The event is managed remotely by notifying your staff of the curtailment request and then

enacting curtailment through your Building Management System. CSPs will share in a percentage of your savings, which may differ among various CSPs, since there may be costs associated with the hardware and /or software required for participation. It is recommended that a number of CSPs be contacted to review their offers.

Section 6

Ranking of Energy Conservation and Retrofit Measures (ECRM)

6.1 ECRMs

The main objective of this energy audit is to identify potential Energy Conservation and Retrofit Measures and to determine whether or not the identified ECRM's are economically feasible to warrant the cost for planning and implementation of each measure. Economic feasibility of each identified measure was evaluated through a simple payback analysis. The simple payback analysis consists of establishing the Engineer's Opinion of Probable Construction Cost estimates; O&M cost savings estimates, projected annual energy savings estimates and the potential value of New Jersey Clean Energy Rebates or Renewable Energy Credits, if applicable. The simple payback period is then determined as the amount of time (years) until the energy savings associated with each measure amounts to the capital investment cost.

As discussed in Section 3, aggregate unit costs for electrical energy delivery and usage and natural gas delivery and usage, which accounts for all demand and tariff charges at each complex, was determined and utilized in the simple payback analyses.

In general, ECRMs having a payback period of 20 years or less have been recommended and only those recommended ECRMs within Section 4 of the report have been ranked for possible implementation. The most attractive rankings are those with the lowest simple payback period. The payback periods presented do not account for additional cost savings associated with participation in the Clean Energy Programs; Pay for Performance Program, or the Direct Install Program.

Ranking of ECRMs has been broken down into the following categories:

- Lighting Systems
- HVAC & Plumbing Systems
- Solar
- Wind
- Power Management Software
- Additional Measures for Plug Load Reduction

6.1.1 Lighting Systems

Table 6.1-1 includes the recommended ECRMs to provide energy savings for all building lighting systems, which include the installation of energy-efficient

luminaires and occupancy sensors. A detailed discussion on building lighting systems is presented in Section 4.1.

Table 6.1-1 Ranking of Energy Savings Measures Summary – Lighting System Retrofits					
Location/Measure	Engineer's Opinion of Probable Cost	Incentives	Total Cost*	Annual Fiscal Savings**	Simple Payback (Years)
Morris Knolls High School – Lighting System	\$123,548.10	\$9,748	\$113,800.09	\$55,019.06	2.1
Morris Hills High School – Lighting System	\$164,811.53	\$13,970	\$150,841.53	\$40,729.74	3.7

*'Total Cost' takes into account any applicable rebates.

**'Annual Fiscal Savings' takes into account maintenance costs savings.

6.1.2 HVAC & Plumbing Systems

Table 6.1-2 includes the recommended ECRM to provide energy savings for building HVAC systems and plumbing fixtures, which provide a simple payback of less than 20 years. A detailed discussion on these systems is presented in Section 4.2.

Table 6.1-2 Ranking of Energy Savings Measures Summary – HVAC System & Plumbing Upgrades					
Building & Measure	Retrofit Cost	Incentives	Total Cost	Annual Fiscal Savings	Simple Payback (Years)
Morris Knolls Unit Vent Controls	\$48,875	\$0	\$48,875	\$63,218	0.77
Morris Hills Unit Vent Controls	\$26,450	\$0	\$26,450	\$29,510	0.89
Morris Hills Insulate Piping	\$740.31	\$0	\$740.31	\$525.00	1.41
Morris Knolls Low Flow Faucets	\$7,669	\$0	\$7,669	\$958.20	8.0
Morris Hills Low Flow Faucets	\$7,948	\$0	\$7,948	\$877.50	9.0

6.1.3 Solar Energy

Implementation of new solar energy systems have been evaluated to determine the economic feasibility for furnishing and installing such systems for two high schools for the Morris Hills Regional Board of Education. Based on the simple payback modeling performed, it would benefit the Board to further investigate installing the solar energy systems. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the average 10.6 year payback period.

Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing. For the payback model, conservative estimates of the SREC's market value over a 25 year period were assumed, as discussed in Section 4.3.

Table 6.1-3 includes a simple payback analysis for the installation of two solar energy systems for the Morris Hills Regional Board of Education. Refer to Appendix E for a more detailed solar financing spreadsheet.

Table 6.1-3 Ranking of Energy Savings Measures Summary – Solar Energy Systems				
Building & Measure	Engineer's Opinion of Probable Cost	Annual SREC Credit	Annual Fiscal Savings	Simple Payback (Years)
Morris Knolls High School – PV Solar System	\$9,664,888	\$448,461	\$215,006.9	14.6
Morris Hills High School – PV Solar System	\$5,895,463	\$271,264	\$107,607.8	15.6

6.1.4 Wind Power Generation

Implementation of a new on-site wind energy system has been evaluated to determine the economic feasibility for furnishing and installing such systems for the Morris Hills Regional Board of Education. Based on the simple payback modeling performed, it would benefit the Board to further investigate installing the on-site wind energy system at the Morris Knolls High School. This is primarily based on the initial upfront capital investment required for a wind energy system installation and an acceptable payback period.

Three major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions, Renewable Energy Certificate (REC) rates and the Renewable Energy Incentive Program, with the largest impact to the simple payback model being the REIP incentive.

Table 6.1-4, includes a summary of the wind energy ECRM for the Morris Knolls High School. Refer to Appendix L for a more detailed wind financing spreadsheet.

Table 6.1-4: Ranking of Energy Savings Measures Summary – Wind Turbine Energy System			
Parameter	Wind Turbine (Minimum Site Wind Speed – 8.4 mph)	Wind Turbine (Maximum Site Wind Speed – 12.1 mph)	Wind Turbine (Average Site Wind Speed – 10.5 mph)
Engineer's Opinion of Probable Cost	\$68,489.69	\$68,489.69	\$68,489.69

Table 6.1-4: Ranking of Energy Savings Measures Summary – Wind Turbine Energy System			
Parameter	Wind Turbine (Minimum Site Wind Speed – 8.4 mph)	Wind Turbine (Maximum Site Wind Speed – 12.1 mph)	Wind Turbine (Average Site Wind Speed – 10.5 mph)
Renewable Energy Incentive Program**	-\$17,395.00	-\$49,216.00	-\$33,082
Total Cost	\$51,094.69	\$19,273.69	\$35,407.69
1 st Year Production	5,436 kWh	15,380 kWh	10,338 kWh
Annual Estimated Electric Savings	\$906.7	\$2,565.4	\$1,724.4
Annual Estimated REC Revenue	\$136.00	\$385.00	\$258.00
Project Simple Payback	49.0 Years	6.5 Years	17.9 Years

6.1.5 Computer Power Management Software

Implementation of computer power management software has been evaluated to determine the economic feasibility for furnishing and installing such systems for the Morris Hills Regional Board of Education. Based on the simple payback modeling performed, it would benefit the Board to further investigate installing the software at the two high schools.

Table 6.1-5 includes a typical simple payback analysis for the installation of the computer power management software at the two high schools. Refer to Appendix J for a more detailed computer power management software financing spreadsheet.

Table 6.1-5: Simple Payback Analysis for Computer Power Management Software				
Site	Engineers Opinion of Probable Cost	Annual Energy Savings	Lifetime Energy Savings (5 Years)*	Simple Payback (Years)
Morris Knolls High School	\$10,304	\$24,266.3	\$128,833.1	0.42
Morris Hills High School	\$9,200	\$17,927.1	\$95,177.3	0.51

*3% yearly inflation on electricity costs

6.1.6 Additional Measures

The implementation of Smart Strips and Vending Misers will work to reduce plug loads associated with computer peripherals and cold drink vending machines. Table 6.1-6 summarizes the simple payback examples associated with the use of smart strips and vending misers, as described in Section 4.4.

Table 6.1-6: Simple Payback Analysis for Additional Measures				
Site	Engineers Opinion of Probable Cost	Annual Energy Savings	Lifetime Energy Savings	Simple Payback (Months)
Smart Strip – Classroom Application Example	\$40	\$97	\$1,804	4.9
Morris Knolls High School – 4 vending misers	\$864	\$1,030	\$5,468	10

Section 7

Grants, Incentives and Funding Sources

7.1 Renewable Energy

7.1.1 Renewable Energy Certificates (NJ BPU)

As part of New Jersey's Renewable Portfolio Standards (RPS), electric suppliers are required to have an annually-increasing percentage of their retail sales generated by renewable energy. Electric suppliers fulfill this obligation by purchasing renewable energy certificates (RECs) from the owners of solar generating systems. One REC is created for every 1,000 kWh (1 MWh) of renewable electricity generated. Although solar systems generate electricity and SRECs in tandem, the two are independent commodities and sold separately. The RPS, and creation of RECs, is intended to provide additional revenue flow and financial support for renewable energy projects in New Jersey. Class I RECs, which include electricity generation from wind, wave, tidal, geothermal and sustainable biomass typically trade at around \$25/MWh. RECs generated from solar electricity, or SRECs, trade at \$550/MWh due to supplemental funding from NJ PBU. The supplemental funding will decrease over time to \$350/MWh.

7.1.2 Clean Energy Solutions Capital Investment Loan/Grant (NJ EDA)

NJ EDA, in cooperation with NJ DEP, is offering interest-free loans and grants for energy efficiency, combined heat and power (CHP) and renewable energy projects with total project capital equipment costs of at least \$1 million. The interest-free loans are available for up to \$5 million, a portion of which may be issued as a grant. The most recent round was closed as of October 2009, but new CESCO program updates will be posted at www.njeda.com. For additional information, contact CESCI@njeda.com or call 866-534-7789.

7.1.3 Renewable Energy Incentive Program (NJ BPU)

The Renewable Energy Incentive Program (REIP) provides rebates for installing solar, wind, and sustainable biomass systems in [Smart Growth](#) regions. Rebates of \$1.00 per watt are available for solar electricity projects up to 50 kW in capacity. Wind systems can receive rebates up to \$3.20 per expected kWh produced. Sustainable biomass rebates start at \$4.00 per watt installed with a maximum incentive amount of 30 percent of project costs. REIP will give out \$53.25 million in rebates from 2009 - 2012. Project owners must complete the Pay for Performance Program, Direct Install, or Local Municipal audit, or the rebate will be reduced by \$0.10 per watt.

The REIP Funding Cycle 2, opened May 3, 2010, for solar installation incentives was recently closed. The budget is currently being reviewed and there is still expectation for Funding Cycle 3 to open in September. For further information on the status of this program, please visit: <http://www.njcleanenergy.com/renewable-energy/home/home>

7.1.4 Grid Connected Renewables Program (NJ BPU)

The New Jersey Grid Connected Renewables Program offers competitive incentives for wind and sustainable biomass electricity generation projects larger than 1 Megawatt (MW). Applications for the most recent round of funding, which totaled \$6 million, were due January 8, 2010. Requests for Proposals (RFPs) for the next round will be posted at www.njcleanenergy.com and www.state.nj.us/bpu. A total of roughly \$16 million is available for incentives under this program during 2010. Most of the incentives offered under this program will take the form of a payment for energy production (\$/MWh) once the project is operating. Incentives range up to \$58.49/MWh for publicly-owned wastewater biogas projects. Up to 10% of the incentive may be requested in the form of a lump grant to cover up-front costs such as financing fees, interconnection fees, project design, permitting, and construction costs.

7.1.5 Utility Financing Programs

All four Electric Distribution Companies (EDCs) in New Jersey have developed long term contracting or financing programs for the development of solar energy systems. In all of the programs, Solar Renewable Energy Credits (SRECs) generated by the solar energy systems will be sold at auction to energy suppliers who are required to purchase a certain quantity of SRECs to meet their Renewable Portfolio Standard requirements.

7.1.6 Renewable Energy Manufacturing Incentive (NJ BPU)

New Jersey's Renewable Energy Manufacturing Incentive (REMI) program provides rebates to purchase and install solar panels, inverters, and racking systems manufactured in New Jersey. Rebates for panels start at \$0.25 per watt and rebates for racking systems and inverters start at \$0.15 per watt for solar projects up to 500 kW in capacity. To be eligible for REMI, applicants must apply to either the Renewable Energy Incentive Program (REIP) or the SREC Registration Program (SRP).

7.1.7 Clean Renewable Energy Bonds (IRS)

CREBs are 0% interest bonds typically issued for up to approximately \$3.0 million administered by the Internal Revenue Service (IRS). Last year, \$2.2 billion in CREBs was allocated to municipal entities to fund 610 renewable energy projects, including anaerobic digestion. IRS has been allocating funding for CREBs annually since 2005. Last year, IRS solicited applications starting in April, which were due in August. The IRS is expected to receive additional funding for CREBs and release another round of solicitations in 2010.

7.1.8 Qualified Energy Conservation Bonds (IRS)

These IRS 0% interest bonds are very similar to CREBs except they are allocated based on state and county population. New Jersey was allocated \$90 million as part of the ARRA stimulus fund. QECBs are typically distributed through municipal bond banks or state economic development agencies.

7.1.9 Global Climate Change Mitigation Incentive Fund (US EDA)

The Economic Development Agency (part of the U.S. Department of Commerce) administers the GCCMIF to public works projects that reduce greenhouse gas emissions and creates new jobs. In FY 2009, \$15 million was allocated to the fund, and additional funding is expected to be allocated in FY 2010. Applications are due on a rolling basis. The program does not have a maximum grant amount but does limit the grant to 50 percent of the project cost.

7.1.10 Private Tax-Exempt Financing

Similar to traditional municipal bond financing, there are many private financial service companies that offer a myriad of options for tax-exempt financing of municipal projects. The providers of these services suggest that this capital can be offered at competitive rates in an expedited timeframe and with fewer complications when compared to traditional municipal financing methods. Though these factors would need to be compared on a case-by-case basis, the one distinct advantage to private financing on the current project would likely be the flexibility to structure payments to meet budget needs with consideration given to the terms and conditions of existing loan and/or bond agreements. For example, this mechanism could be used to limit the initial debt payments when the current bond debt is the greatest and the operations savings of the project has yet to be fully realized. It should also be noted that, in many cases, the construction and long term financing can be rolled into a single private financing agreement. Also, in some instances, equipment manufacturers have the ability to offer competitive financing terms (e.g. Siemens Financial Services Corporation), though financing from these sources is generally contingent upon a substantial portion of the project cost (~20% to 30%) being for their respective equipment.

7.1.11 Performance Based Contracts (ESCOs)

A second financing alternative for a project of this nature would be to enter into a Performance Based Contract with an Energy Services Company (ESCO). The premise of this type of contract is that it requires no initial municipal capital contributions in order to implement the project - instead relying on future operations cost savings and/or energy production, to fund the annual payments. Prior to entering into an agreement for the funding of the project, an ESCO would perform an energy audit and/or conceptual studies to confirm future energy cost savings or energy production inherent with the projects implementation and operation. The contract would then be formulated based on some measurable parameter(s) (energy production, etc.) which would be verified by measurement throughout the contract duration. The savings in energy costs or energy production would then be used to pay back the capital investment of the project over the contract time period (typically on the order of 10-years or less). The ESCO would guarantee the agreed upon energy savings or energy production. If the project does not meet energy savings or production commitments, the ESCO pays the owner the equivalent difference.

With this funding alternative, the ownership and operation of the facility would be maintained by the original owner. A performance contract may also include ESCO operation and maintenance of the energy-related facilities if that were deemed appropriate. Significant ESCO's with experience in this area include Siemens Building Technologies, Chevron and Johnson Controls. CDM has functioned in several roles on performance based contracts including being the owner's representative and, on different contracts, providing design-build services (as a subcontractor to the ESCO). We can provide additional experience-based information upon request.

7.1.12 Power Purchase Agreements (SPCs)

A Power Purchase Agreement (PPA) also delivers a project with no initial capital contribution by the original owner. In this model, a Special Purpose Company (SPC) created by a developer, would own the energy production facilities. Within the framework of a PPA, a SPC will typically lease property from the owners for construction and operation of the new facilities. The funding and construction of the new facilities would be performed by the SPC who would then own and operate the facilities for the duration of the contract (typically 20 to 30 years). Throughout that period of time, the original owner would purchase power from the SPC at a pre-negotiated rate which would take into account the initial capital cost, operation and maintenance of the constructed facility, ancillary benefits of the project and investor returns on investment. For renewable energy, financial incentives may enable this financing approach to compete favorably with utility power tariffs. Incentives include state and local tax credits, renewable energy credits, and Federal energy production tax credits or energy investment tax credits. It is expected that a number of experienced companies and developers may be interested in a PPA for New Jersey municipal renewable energy projects.

7.2 Energy Efficiency

7.2.1 Introduction

New Jersey's Clean Energy Program (NJ CEP) promotes increased energy efficiency and the use of clean, renewable sources of energy including solar, wind, geothermal, and sustainable biomass. The results for New Jersey are a stronger economy, less pollution, lower costs, and reduced demand for electricity. NJCEP offers financial incentives, programs, and services for residential, commercial, and municipal customers.

NJCEP reduces the need to generate electricity and burn natural gas which eliminates the pollution that would have been caused by such electric generation or natural gas usage. The benefits of these programs continue for the life of the measures installed, which on average is about 15 years. Thus, the public receives substantial environmental and public health benefits from programs that also lower energy bills and benefit the economy.

7.2.2 New Jersey Smart Start Buildings Program (NJ BPU)

The New Jersey Smart Start Buildings Program offers rebate incentives for several qualifying equipment such as high efficient premium motors and lighting, and lighting controls.

Incentive information and incentive calculation worksheets are provided for the various new equipment installation identified in this report and are included in Appendix G.

7.2.3 Pay for Performance Program (NJ BPU)

Another program offered through the New Jersey Smart Start Program, is the Pay for Performance (PFP) Program. Commercial, industrial and institutional buildings are eligible for participation if not already receiving Energy Efficiency and Conservation Block Grants.

Incentives are available for buildings that are able to present an Energy Reduction Plans (ERPs) that reduce the building's current energy consumption by 15% or more, in addition to incentives for installing the recommended measures and incentives for presenting the energy savings in a post-construction benchmarking report. No more than 50% of the total energy savings may be derived from lighting retrofits. In addition, the total energy savings of 15% may not come from the implementation of one energy savings measure. The incentive structure for the Pay for Performance Program is provided in Appendix G.

The following table summarizes the current annual energy use at the high schools and the energy savings presented herein from the implementation of the Indoor & Outdoor lighting retrofits and the HVAC ECRMs, in addition to the installation of 'Vending Misers'.

Table 7.2-1: Pay for Performance ERP			
	Current Annual Electrical Energy Use (kWh)	Current Annual Fuel Use (therms)	Annual Energy Savings from Vending Misers, HVAC & Lighting ECRMs
Morris Knolls High School	2,416,352	146,023	494,541 kWh 9,332 therms
Morris Hills High School ¹	1,851,300	110,275	313,711 kWh 5,723 therms

1. Electrical Energy Savings associated with the indoor lighting retrofits only.

The ERP's presented herein for both high school buildings result in electrical energy savings of 15% of more. Unfortunately, for the Morris Hill's High School, implementation of both the recommended indoor and exterior lighting retrofits accounts for more than 50% of the total savings presented herein. Implementation of

just the indoor lighting retrofits would potentially warrant participation in the Pay for Performance program.

The Morris Knolls High School is eligible for the Pay for Performance program based on the requirements for a 15% annual energy savings (electrical savings) and less than 50% of the total savings being derived from lighting upgrades.

The following table summarizes the potential incentives available through participation in the Pay for Performance Program.

Table 7.2-2: Pay for Performance Incentive Summary		
	Morris Knolls High School	Morris Hills High School
Incentive #1: Energy Reduction Plan	\$26,307	\$22,976
Incentive #2: Installation of Recommended ECRMs	\$49,127 (30% of total project cost)	\$37,645 (\$0.12/kWh saved)
Incentive #3: Post-Construction Benchmarking Report	\$32,751 (20% of total project cost)	\$25,097 (\$0.08/kWh saved)
Total Incentives	\$108,185	\$85,718

7.2.4 Direct Install (NJ BPU)

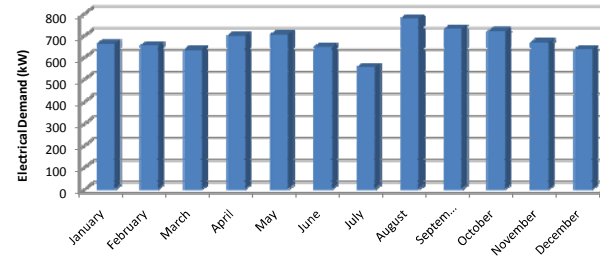
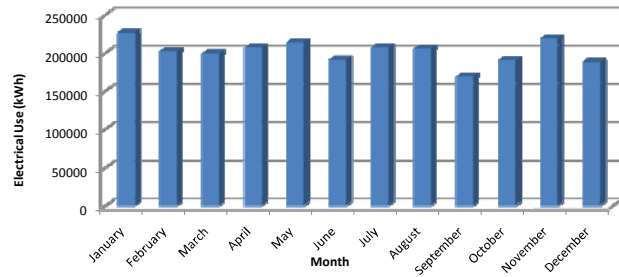
Owners of existing small to mid-size commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. This is not applicable for either High School building.

APPENDIX A

UTILITY BILL INFORMATION

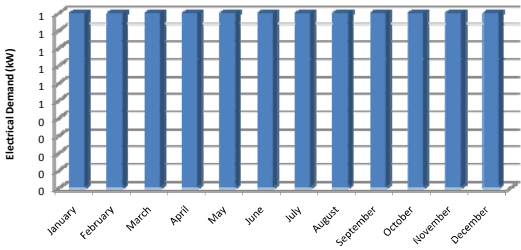
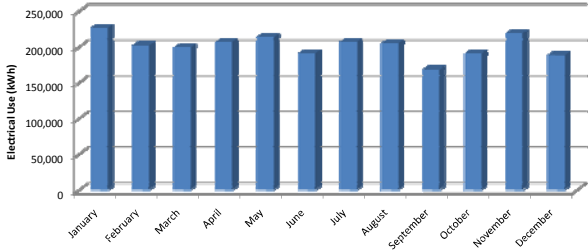
Electric Bills for Plots - Morris Knolls High School										
			Account #							
			10 00 00 9411 51							
Comments	Month	Year	Delivery Charges Meter # G28168640	Utility Supply Charges	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
Not Consecutive	July	2008	\$ 16,457.98	\$ -	\$ 16,457.98	-	-	92269	554.0	\$ 0.18
	August	2008	\$ 37,032.36	\$ -	\$ 37,032.36	-	-	204951	777.0	\$ 0.18
	September	2008	\$ 30,425.72	\$ -	\$ 30,425.72	-	-	168421	730.0	\$ 0.18
	October	2008	\$ 30,727.62	\$ -	\$ 30,727.62	-	-	190140	719.0	\$ 0.16
Not Consecutive	November	2008	\$ 34,857.88	\$ -	\$ 34,857.88	-	-	218719	668.0	\$ 0.16
	December	2008	\$ 31,119.04	\$ -	\$ 31,119.04	-	-	188100	636.0	\$ 0.17
	January	2009	\$ 36,860.99	\$ -	\$ 36,860.99	-	-	226228	662.0	\$ 0.16
	February	2009	\$ 33,021.79	\$ -	\$ 33,021.79	-	-	201810	653.0	\$ 0.16
	March	2009	\$ 32,692.43	\$ -	\$ 32,692.43	-	-	199042	633.0	\$ 0.16
	April	2009	\$ 23,468.02	\$ 9,427.90	\$ 32,895.93	-	-	206564	698.0	\$ 0.16
	May	2009	\$ 11,414.33	\$ 22,380.27	\$ 33,794.60	-	-	213511	704.0	\$ 0.16
	June	2009	\$ 10,631.48	\$ 20,001.89	\$ 30,633.38	-	-	190818	646.0	\$ 0.16
Not Consecutive	July	2009	\$ 6,326.58	\$ 12,026.32	\$ 18,352.90	-	-	114727		\$ 0.16

Month	KWh	Demand (KW)
January	226228	662
February	201810	653
March	199042	633
April	206564	698
May	213511	704
June	190818	646
July	206996	554
August	204951	777
September	168421	730
October	190140	719
November	218719	668
December	188100	636
Total	2415300	8080



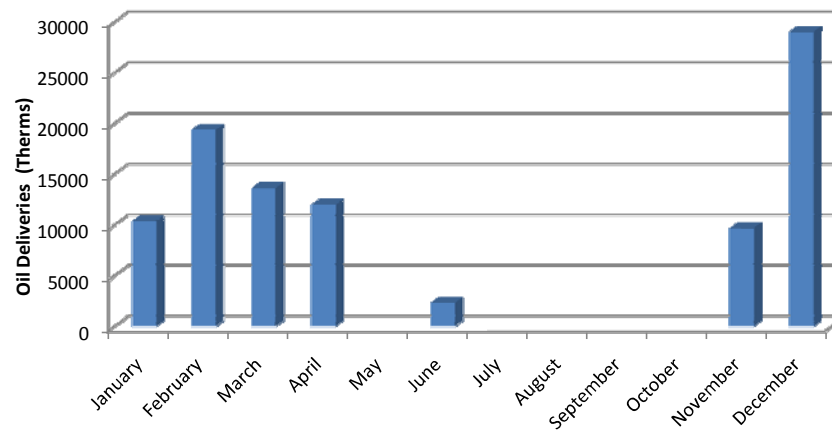
Electric Bills for Plots - Morris Knolls High School										
			Account #							
			10 00 00 9408 23							
Comments	Month	Year	Delivery Charges	Utility Supply	Total Electric	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
			Meter # A82665134	Charges						
Not Consecutive	July	2008	\$ 7.03	\$ -	\$ 7.03	-	-	26	1.0	\$ 0.27
	August	2008	\$ 14.24	\$ -	\$ 14.24	-	-	51	1.0	\$ 0.28
	September	2008	\$ 18.05	\$ -	\$ 18.05	-	-	75	1.0	\$ 0.24
	October	2008	\$ 22.37	\$ -	\$ 22.37	-	-	100	1.0	\$ 0.22
	November	2008	\$ 19.69	\$ -	\$ 19.69	-	-	86	1.0	\$ 0.23
	December	2008	\$ 32.03	\$ -	\$ 32.03	-	-	147	1.0	\$ 0.22
	January	2009	\$ 31.00	\$ -	\$ 31.00	-	-	141	1.0	\$ 0.22
	February	2009	\$ 17.62	\$ -	\$ 17.62	-	-	75	1.0	\$ 0.24
	March	2009	\$ 17.49	\$ -	\$ 17.49	-	-	72	1.0	\$ 0.24
	April	2009	\$ 12.88	\$ 2.81	\$ 15.69	-	-	65	1.0	\$ 0.24
	May	2009	\$ 8.28	\$ 6.15	\$ 14.43	-	-	59	1.0	\$ 0.25
	June	2009	\$ 7.95	\$ 5.66	\$ 13.61	-	-	54	1.0	\$ 0.25
Not Consecutive	July	2009	\$ 5.56	\$ 4.25	\$ 9.82	-	-	41		\$ 0.24

Month	Combined (KWH)	Demand (KW)
January	226429	1
February	201885	1
March	199114	1
April	206629	1
May	213570	1
June	190872	1
July	207062	1
August	205002	1
September	168496	1
October	190240	1
November	218805	1
December	188247	1
Total	201,363	12



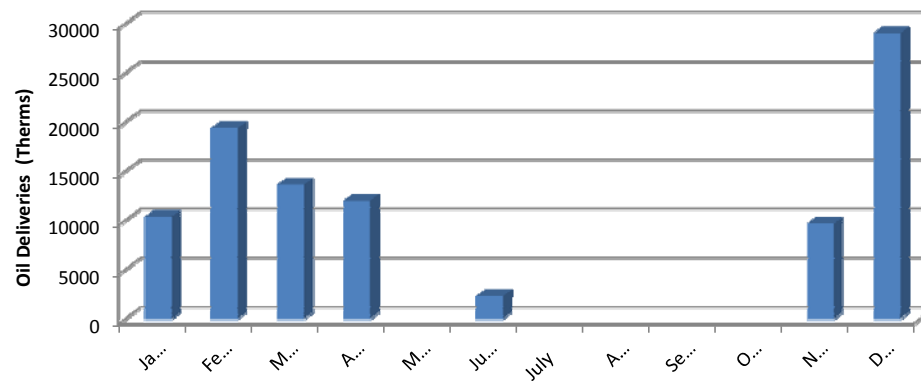
Morris Knolls High School						
			Finch Fuel Oil Co.			
			4509			
Month	Year	Delivery Charges Meter # -	Total Charges	Total Gallons	Total Therms ¹	Cost Per Gallon
Nov	2008	\$ 11,304.77	\$ 11,304.77	5,507	6,333	\$ 2.05
Nov	2008	\$ 5,346.08	\$ 5,346.08	2,905	3,341	\$ 1.84
Dec	2008	\$ 9,999.88	\$ 9,999.88	5,864	6,744	\$ 1.71
Dec	2008	\$ 9,532.15	\$ 9,532.15	6,301	7,246	\$ 1.51
Dec	2008	\$ 4,787.46	\$ 4,787.46	3,018	3,471	\$ 1.59
Dec	2008	\$ 4,494.90	\$ 4,494.90	3,000	3,450	\$ 1.50
Dec	2008	\$ 10,287.46	\$ 10,287.46	7,052	8,110	\$ 1.46
Jan	2009	\$ 7,770.55	\$ 7,770.55	5,001	5,751	\$ 1.55
Jan	2009	\$ 6,594.92	\$ 6,594.92	4,012	4,614	\$ 1.64
Feb	2009	\$ 7,669.00	\$ 7,669.00	5,000	5,750	\$ 1.53
Feb	2009	\$ 8,672.74	\$ 8,672.74	5,800	6,670	\$ 1.50
Feb	2009	\$ 8,426.44	\$ 8,426.44	6,050	6,958	\$ 1.39
Mar	2009	\$ 8,347.48	\$ 8,347.48	5,940	6,831	\$ 1.41
Mar	2009	\$ 8,365.02	\$ 8,365.02	5,900	6,785	\$ 1.42
Apr	2009	\$ 8,192.48	\$ 8,192.48	5,428	6,242	\$ 1.51
Apr	2009	\$ 7,821.50	\$ 7,821.50	5,000	5,750	\$ 1.56
June	2009	\$ 3,768.60	\$ 3,768.60	2,000	2,300	\$ 1.88

Month	Combined (therms)
January	10365
February	19378
March	13616
April	11992
May	
June	2300
July	
August	
September	
October	
November	9674
December	29020
Total	96345



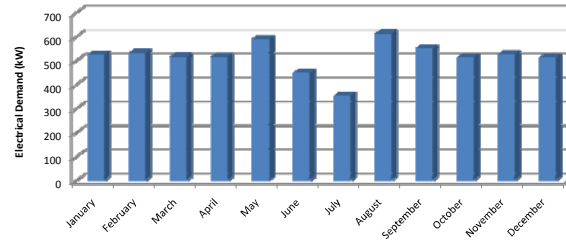
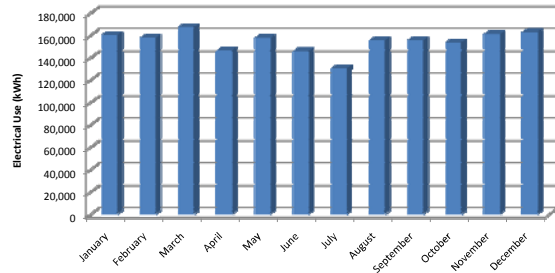
Morris Knolls High School						
			Finch Fuel Oil Co.			
			4509			
Month	Year	Delivery Charges Meter # -	Total Charges	Total Gallons	Total Therms ¹	Cost Per Gallon
Nov	2008	\$ 11,304.77	\$ 11,304.77	5,507	6,333	\$ 2.05
Nov	2008	\$ 5,346.08	\$ 5,346.08	2,905	3,341	\$ 1.84
Dec	2008	\$ 9,999.88	\$ 9,999.88	5,864	6,744	\$ 1.71
Dec	2008	\$ 9,532.15	\$ 9,532.15	6,301	7,246	\$ 1.51
Dec	2008	\$ 4,787.46	\$ 4,787.46	3,018	3,471	\$ 1.59
Dec	2008	\$ 4,494.90	\$ 4,494.90	3,000	3,450	\$ 1.50
Dec	2008	\$ 10,287.46	\$ 10,287.46	7,052	8,110	\$ 1.46
Jan	2009	\$ 7,770.55	\$ 7,770.55	5,001	5,751	\$ 1.55
Jan	2009	\$ 6,594.92	\$ 6,594.92	4,012	4,614	\$ 1.64
Feb	2009	\$ 7,669.00	\$ 7,669.00	5,000	5,750	\$ 1.53
Feb	2009	\$ 8,672.74	\$ 8,672.74	5,800	6,670	\$ 1.50
Feb	2009	\$ 8,426.44	\$ 8,426.44	6,050	6,958	\$ 1.39
Mar	2009	\$ 8,347.48	\$ 8,347.48	5,940	6,831	\$ 1.41
Mar	2009	\$ 8,365.02	\$ 8,365.02	5,900	6,785	\$ 1.42
Apr	2009	\$ 8,192.48	\$ 8,192.48	5,428	6,242	\$ 1.51
Apr	2009	\$ 7,821.50	\$ 7,821.50	5,000	5,750	\$ 1.56
June	2009	\$ 3,768.60	\$ 3,768.60	2,000	2,300	\$ 1.88

Month	Combined (therms)
January	10365
February	19378
March	13616
April	11992
May	
June	2300
July	
August	
September	
October	
November	9674
December	29020
Total	96345

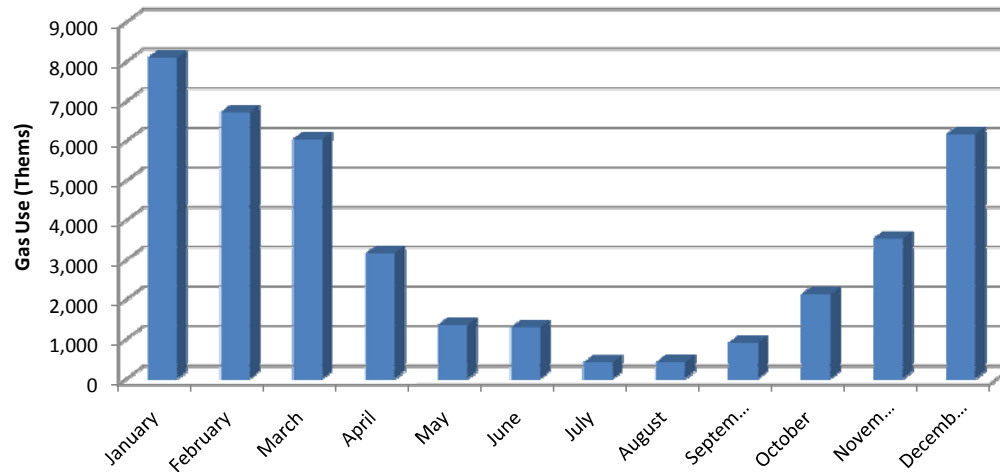


Electric Bills for Plots - Morris Hills High School										
			Account #							
			10 00 01 2682 57							
Comments	Month	Year	Delivery Charges	Utility Supply	Total Electric	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
			Meter # G17955684	Charges						
Not Consecutive	July	2008	\$ 8,455.50	\$ -	\$ 8,455.50	-	-	47700	353.4	\$ 0.18
	August	2008	\$ 27,869.55	\$ -	\$ 27,869.55	-	-	155141	611.4	\$ 0.18
	September	2008	\$ 27,072.63	\$ -	\$ 27,072.63	-	-	155134	551.4	\$ 0.17
	October	2008	\$ 24,362.64	\$ -	\$ 24,362.64	-	-	153485	512.4	\$ 0.16
	November	2008	\$ 25,679.11	\$ -	\$ 25,679.11	-	-	160636	525.9	\$ 0.16
	December	2008	\$ 26,660.25	\$ -	\$ 26,660.25	-	-	162733	511.5	\$ 0.16
	January	2009	\$ 26,393.43	\$ -	\$ 26,393.43	-	-	160071	524.4	\$ 0.16
	February	2009	\$ 25,941.72	\$ -	\$ 25,941.72	-	-	157421	531.6	\$ 0.16
	March	2009	\$ 27,291.88	\$ -	\$ 27,291.88	-	-	167211	516.0	\$ 0.16
	April	2009	\$ 23,688.54	\$ -	\$ 23,688.54	-	-	146341	515.4	\$ 0.16
	May	2009	\$ 25,234.49	\$ -	\$ 25,234.49	-	-	157328	589.8	\$ 0.16
	June	2009	\$ 23,477.81	\$ -	\$ 23,477.81	-	-	145700	447.0	\$ 0.16
Not Consecutive	July	2009	\$ 13,294.89	\$ -	\$ 13,294.89	-	-	82400	0.0	\$ 0.16

Month	Combined (KWH)	Demand (KW)
January	160071	524
February	157421	532
March	167211	516
April	146341	515
May	157328	590
June	145700	447
July	130100	353
August	155141	611
September	155134	551
October	153485	512
November	160636	526
December	162733	512
Total	1851300	6190

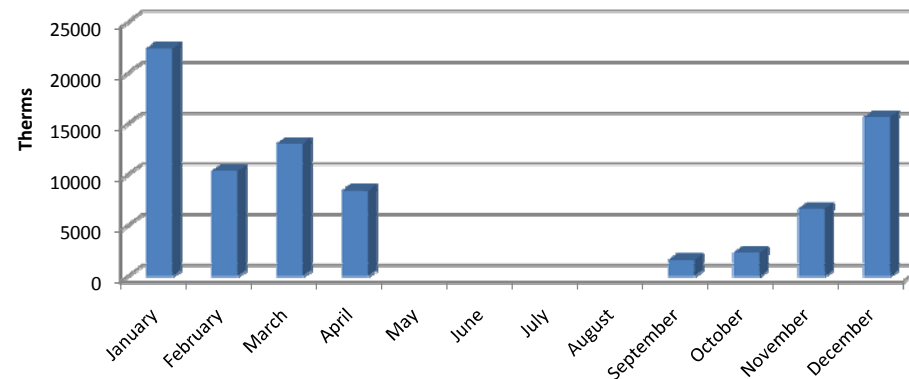


Gas Bills for Plots - Morris Hills High School							
			NJNG Account #				
			20-1191-3550-19				
Comments	Month	Year	Delivery Charges Meter # 0	Utility Supply Charges Pepco	Total Gas Charges	Total Therms	Cost Per Therm
Not Consecutive	August	2008	\$ 757.23	\$ -	\$ 757.23	353	\$ 2.15
	September	2008	\$ 1,363.69	\$ -	\$ 1,363.69	900	\$ 1.52
	October	2008	\$ 1,711.44	\$ -	\$ 1,711.44	2,120	\$ 0.81
	November	2008	\$ 2,194.11	\$ -	\$ 2,194.11	3,533	\$ 0.62
	December	2008	\$ 3,277.74	\$ -	\$ 3,277.74	6,164	\$ 0.53
Not Consecutive	January	2009	\$ 4,134.36	\$ -	\$ 4,134.36	8,096	\$ 0.51
	February	2009	\$ 3,521.78	\$ -	\$ 3,521.78	6,718	\$ 0.52
	March	2009	\$ 3,295.01	\$ -	\$ 3,295.01	6,042	\$ 0.55
	April	2009	\$ 2,125.24	\$ -	\$ 2,125.24	3,161	\$ 0.67
	May	2009	\$ 1,409.38	\$ -	\$ 1,409.38	1,357	\$ 1.04
	June	2009	\$ 1,301.75	\$ -	\$ 1,301.75	1,290	\$ 1.01
	July	2009	\$ 1,013.59	\$ -	\$ 1,013.59	405	\$ 2.50
	August	2009	\$ 411.52	\$ -	\$ 411.52	56	\$ 7.29



Morris Hills High School						
			Finch Fuel Oil Co.			
			4508			
Month	Year	Delivery Charges Meter # -	Total Charges	Total Gallons	Total Therms ¹	Cost Per Gallon
Sept	2008	\$ 4,638.23	\$ 4,638.23	1,402	1,612	\$ 3.31
Oct	2008	\$ 4,265.60	\$ 4,265.60	2,000	2,300	\$ 2.13
Nov	2008	\$ 5,510.87	\$ 5,510.87	2,900	3,335	\$ 1.90
Nov	2008	\$ 5,336.87	\$ 5,336.87	2,900	3,335	\$ 1.84
Dec	2008	\$ 9,786.72	\$ 9,786.72	5,739	6,600	\$ 1.71
Dec	2008	\$ 9,359.17	\$ 9,359.17	5,900	6,785	\$ 1.59
Dec	2008	\$ 2,996.60	\$ 2,996.60	2,000	2,300	\$ 1.50
Jan	2009	\$ 8,760.10	\$ 8,760.10	6,005	6,906	\$ 1.46
Jan	2009	\$ 11,893.30	\$ 11,893.30	7,001	8,051	\$ 1.70
Jan	2009	\$ 3,886.05	\$ 3,886.05	2,501	2,876	\$ 1.55
Jan	2009	\$ 6,575.20	\$ 6,575.20	4,000	4,600	\$ 1.64
Feb	2009	\$ 6,304.65	\$ 6,304.65	4,006	4,607	\$ 1.57
Feb	2009	\$ 7,476.50	\$ 7,476.50	5,000	5,750	\$ 1.50
March	2009	\$ 8,392.45	\$ 8,392.45	5,972	6,868	\$ 1.41
March	2009	\$ 7,656.12	\$ 7,656.12	5,400	6,210	\$ 1.42
April	2009	\$ 6,566.96	\$ 6,566.96	4,351	5,004	\$ 1.51
April	2009	\$ 4,641.95	\$ 4,641.95	3,001	3,451	\$ 1.55

Month	Combined (therms)
January	22433
February	10357
March	13078
April	8455
May	
June	
July	
August	
September	1612
October	2300
November	6670
December	15685
Total	80590



APPENDIX B

STATEMENT OF ENERGY PERFORMANCE

PORTFOLIO MANAGER REFERENCE SHEET



STATEMENT OF ENERGY PERFORMANCE

Morris Hills High School

Building ID: 2261933
For 12-month Period Ending: July 31, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: May 17, 2010

Facility
 Morris Hills High School
 520 West Main St.
 Rockaway, NJ 07866

Facility Owner
 Morris Hills Regional District
 48 Knoll Drive
 Rockaway, NJ 07866

Primary Contact for this Facility
 Steven Ternosky
 48 Knoll Drive
 Rockaway, NJ 07866

Year Built: 1953
Gross Floor Area (ft²): 229,760

Energy Performance Rating² (1-100) 59

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	6,316,636
Natural Gas (kBtu) ⁴	4,162,641
Total Energy (kBtu)	10,479,277

Energy Intensity⁵

Site (kBtu/ft ² /yr)	88
Source (kBtu/ft ² /yr)	154

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	1,898
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	95
National Average Source EUI	167
% Difference from National Average Source EUI	-8%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

Certifying Professional

Matthew Goss
 15 British American Blvd
 Latham, NY 12110

Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	Morris Hills High School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	520 West Main St., Rockaway, NJ 07866	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Morris Hills High School (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	229,760 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	500	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	2	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	20 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	Yes	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.	☐
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ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: Acct# 100001268257 (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
06/22/2009	07/21/2009	123,600.00
05/22/2009	06/21/2009	165,000.00
04/22/2009	05/21/2009	140,400.00
03/22/2009	04/21/2009	156,600.00
02/22/2009	03/21/2009	164,400.00
01/22/2009	02/21/2009	168,000.00
12/22/2008	01/21/2009	167,400.00
11/22/2008	12/21/2008	154,500.00
10/22/2008	11/21/2008	157,800.00
09/22/2008	10/21/2008	153,000.00
08/22/2008	09/21/2008	157,500.00
Acct# 100001268257 Consumption (kWh (thousand Watt-hours))		1,708,200.00
Acct# 100001268257 Consumption (kBtu (thousand Btu))		5,828,378.40
Meter: Acct # 100001268380 (Outdoor Lighting) (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
06/22/2009	07/21/2009	2,629.00
05/22/2009	06/21/2009	3,239.00
04/22/2009	05/21/2009	3,093.00
03/22/2009	04/21/2009	3,767.00
02/22/2009	03/21/2009	3,102.00
01/22/2009	02/21/2009	3,398.00
12/22/2008	01/21/2009	3,606.00
11/22/2008	12/21/2008	3,035.00
10/22/2008	11/21/2008	3,357.00
09/22/2008	10/21/2008	3,174.00
08/22/2008	09/21/2008	2,934.00
Acct # 100001268380 (Outdoor Lighting) Consumption (kWh (thousand Watt-hours))		35,334.00
Acct # 100001268380 (Outdoor Lighting) Consumption (kBtu (thousand Btu))		120,559.61
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		5,948,938.01

Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐
Fuel Type: Natural Gas		
Meter: Acct# 201191355019 (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
06/14/2009	07/13/2009	647.29
05/14/2009	06/13/2009	2,038.56
04/14/2009	05/13/2009	568.44
03/14/2009	04/13/2009	5,282.40
02/14/2009	03/13/2009	6,882.96
01/14/2009	02/13/2009	7,787.95
12/14/2008	01/13/2009	7,852.17
11/14/2008	12/13/2008	4,643.78
10/14/2008	11/13/2008	2,750.84
09/14/2008	10/13/2008	1,033.84
08/14/2008	09/13/2008	587.53
Acct# 201191355019 Consumption (therms)		40,075.76
Acct# 201191355019 Consumption (kBtu (thousand Btu))		4,007,576.00
Total Natural Gas Consumption (kBtu (thousand Btu))		4,007,576.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility

Morris Hills High School
520 West Main St.
Rockaway, NJ 07866

Facility Owner

Morris Hills Regional District
48 Knoll Drive
Rockaway, NJ 07866

Primary Contact for this Facility

Steven Ternosky
48 Knoll Drive
Rockaway, NJ 07866

General Information

Morris Hills High School	
Gross Floor Area Excluding Parking: (ft ²)	229,760
Year Built	1953
For 12-month Evaluation Period Ending Date:	July 31, 2009

Facility Space Use Summary

Morris Hills High School	
Space Type	K-12 School
Gross Floor Area(ft ²)	229,760
Open Weekends?	Yes
Number of PCs	500
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	20
Percent Heated	100
Months ^o	12
High School?	Yes
School District ^o	Morris Hills Regional District

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	Current (Ending Date 07/31/2009)	Baseline (Ending Date 07/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	59	59	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	88	88	75	N/A	95
Source (kBtu/ft ²)	154	154	130	N/A	167
Energy Cost					
\$/year	\$ 437,132.64	\$ 437,132.64	\$ 370,948.64	N/A	\$ 474,376.68
\$/ft ² /year	\$ 1.90	\$ 1.90	\$ 1.61	N/A	\$ 2.06
Greenhouse Gas Emissions					
MtCO ₂ e/year	1,898	1,898	1,611	N/A	2,060
kgCO ₂ e/ft ² /year	8	8	7	N/A	9

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.



STATEMENT OF ENERGY PERFORMANCE

Morris Knolls High School

Building ID: 2261941
 For 12-month Period Ending: July 31, 2009¹
 Date SEP becomes ineligible: N/A

Date SEP Generated: May 17, 2010

Facility
 Morris Knolls High School
 48 Knoll Drive
 Rockaway, NJ 07866

Facility Owner
 Morris Hills Regional District
 48 Knoll Drive
 Rockaway, NJ 07866

Primary Contact for this Facility
 Steven Ternosky
 48 Knoll Drive
 Rockaway, NJ 07866

Year Built: 1964
Gross Floor Area (ft²): 263,065

Energy Performance Rating² (1-100) 47

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	8,244,388
Natural Gas (kBtu) ⁴	4,074,382
Total Energy (kBtu)	12,318,770

Energy Intensity⁵

Site (kBtu/ft ² /yr)	98
Source (kBtu/ft ² /yr)	173

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	2,465
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	96
National Average Source EUI	170
% Difference from National Average Source EUI	2%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

Certifying Professional

Matthew Goss
 15 British American Blvd
 Latham, NY 12110

Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	Morris Knolls High School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	48 Knoll Drive, Rockaway, NJ 07866	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Morris Knolls High School (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	263,065 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	Yes	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	560	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	2	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	20 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	12(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	Yes	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.	☐
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ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: Acct#100000940823 (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
06/18/2009	07/17/2009	67.00
05/18/2009	06/17/2009	47.00
04/18/2009	05/17/2009	66.00
03/18/2009	04/17/2009	68.00
02/18/2009	03/17/2009	69.00
01/18/2009	02/17/2009	91.00
12/18/2008	01/17/2009	197.00
11/18/2008	12/17/2008	101.00
10/18/2008	11/17/2008	70.00
09/18/2008	10/17/2008	116.00
08/18/2008	09/17/2008	41.00
Acct#100000940823 Consumption (kWh (thousand Watt-hours))		933.00
Acct#100000940823 Consumption (kBtu (thousand Btu))		3,183.40
Meter: Acct# 100000941151 (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
06/18/2009	07/17/2009	189,300.00
05/18/2009	06/17/2009	198,300.00
04/18/2009	05/17/2009	221,400.00
03/18/2009	04/17/2009	205,800.00
02/18/2009	03/17/2009	177,000.00
01/18/2009	02/17/2009	253,500.00
12/18/2008	01/17/2009	214,800.00
11/18/2008	12/17/2008	161,400.00
10/18/2008	11/17/2008	259,800.00
09/18/2008	10/17/2008	123,900.00
08/18/2008	09/17/2008	199,200.00
Acct# 100000941151 Consumption (kWh (thousand Watt-hours))		2,204,400.00
Acct# 100000941151 Consumption (kBtu (thousand Btu))		7,521,412.80
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		7,524,596.20

Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐
Fuel Type: Natural Gas		
Meter: Acct# 201191561015 (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
06/04/2009	07/03/2009	1,739.07
05/04/2009	06/03/2009	517.10
04/04/2009	05/03/2009	1,983.40
03/04/2009	04/03/2009	5,256.86
02/04/2009	03/03/2009	4,836.11
01/04/2009	02/03/2009	9,700.53
12/04/2008	01/03/2009	6,447.70
11/04/2008	12/03/2008	6,113.35
10/04/2008	11/03/2008	2,599.85
09/04/2008	10/03/2008	518.42
08/04/2008	09/03/2008	286.20
Acct# 201191561015 Consumption (therms)		39,998.59
Acct# 201191561015 Consumption (kBtu (thousand Btu))		3,999,859.00
Total Natural Gas Consumption (kBtu (thousand Btu))		3,999,859.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility

Morris Knolls High School
48 Knoll Drive
Rockaway, NJ 07866

Facility Owner

Morris Hills Regional District
48 Knoll Drive
Rockaway, NJ 07866

Primary Contact for this Facility

Steven Ternosky
48 Knoll Drive
Rockaway, NJ 07866

General Information

Morris Knolls High School	
Gross Floor Area Excluding Parking: (ft ²)	263,065
Year Built	1964
For 12-month Evaluation Period Ending Date:	July 31, 2009

Facility Space Use Summary

Morris Knolls High School	
Space Type	K-12 School
Gross Floor Area(ft ²)	263,065
Open Weekends?	Yes
Number of PCs	560
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	20
Percent Heated	100
Months ^o	12
High School?	Yes
School District ^o	Morris Hills Regional District

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	Current (Ending Date 07/31/2009)	Baseline (Ending Date 07/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	47	47	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	98	98	75	N/A	96
Source (kBtu/ft ²)	173	173	133	N/A	170
Energy Cost					
\$/year	\$ 567,533.76	\$ 567,533.76	\$ 435,554.54	N/A	\$ 556,949.98
\$/ft ² /year	\$ 2.16	\$ 2.16	\$ 1.66	N/A	\$ 2.12
Greenhouse Gas Emissions					
MtCO ₂ e/year	2,465	2,465	1,892	N/A	2,419
kgCO ₂ e/ft ² /year	9	9	7	N/A	9

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

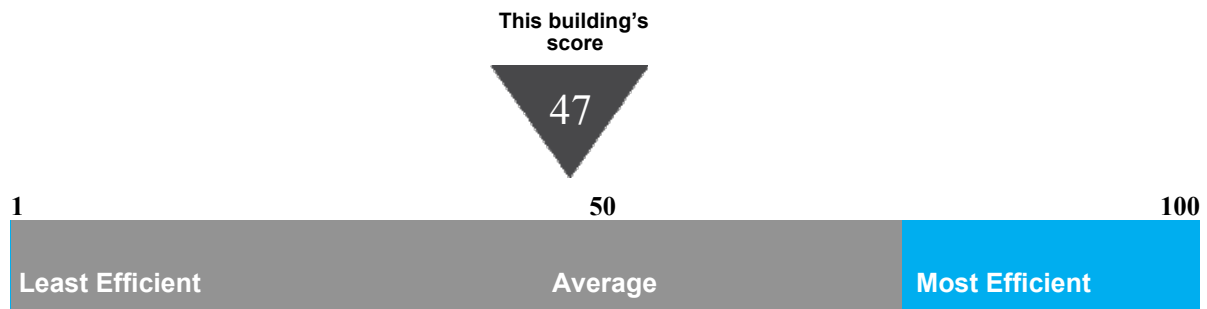
Statement of Energy Performance

2009

Morris Knolls High School
48 Knoll Drive
Rockaway, NJ 07866

Portfolio Manager Building ID: 2261941

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 173 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending July 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification





PORTFOLIO MANAGER QUICK REFERENCE GUIDE

Portfolio Manager is an interactive energy management tool that allows you to track and assess energy and water consumption across your entire portfolio of buildings in a secure online environment. Use this Quick Reference Guide to identify opportunities for energy efficiency improvements, track your progress over time, and verify results.

IDENTIFY ENERGY EFFICIENCY PROJECTS

Use Portfolio Manager to identify under-performing buildings to target for energy efficiency improvements and establish baselines for setting and measuring progress for energy efficiency improvement projects over time.

STEP	ACTIVITY	ACTION
1	Access Portfolio Manager. (step not shown)	Visit www.energystar.gov/benchmark . Scroll down to the Login section on the right-hand side in the middle of the page.
2	Access your account: (step not shown) • Create a new account. • Login to an existing account.	• Click REGISTER, and follow instructions. • Enter user name and password, and click LOGIN.
3	Review system updates and enter account. (step not shown)	Click ACCESS MY PORTFOLIO , located below Welcome to Portfolio Manager .
4	Add a new facility. (step not shown)	Click ADD a Property, located in the upper right portion of the screen.
5	Select property type and enter general facility information. (step not shown)	Select the option that most closely resembles your facility and click CONTINUE . Enter general data and click SAVE . For more information on facility space types, see: www.energystar.gov/index.cfm?c=eligibility.bus_portfolio/portfolio_manager_space_types .
6	Enter space use data.	From the Facility Summary page, shown above, go to the Space Use section, located half way down the page, and click ADD SPACE. • Enter a facility name. In the Select a Space Type menu, select the appropriate space type(s) for your building. If your space is not listed, select Other. Click CONTINUE. • Enter building characteristics. Click SAVE. Information required for each space type is listed here: www.energystar.gov/index.cfm?c=eligibility.bus_portfolio/portfolio_manager_space_types. • Repeat steps above to add all major spaces in your facility. Use bulk import service to minimize manual data entry of large sets of facility data (10 or more facilities or campuses are required). • Go back to My Portfolio by clicking on the link in the upper left portion of the page. • Click IMPORT Facility Data Using Templates, located below Add a Property.
7	Enter energy use data.	From the Facility Summary page, go to the Energy Meters section, located below the Space Use section, and click ADD METER. • Enter meter name, type, and units. Click SAVE. • Enter number of months and start date. Click CONTINUE. • Enter energy use and cost for each month. Click SAVE. • Repeat for all energy meters and fuel types.

PORTFOLIO MANAGER

[ACCOUNT INFORMATION](#)
[CONTACTS](#)
[FAQ](#)
[FREQUENTLY ASKED QUESTIONS](#)
[CONTACT US](#)
[HELP](#)
[LOGOUT](#)

[Home](#) > **My Portfolio**

Group Averages

Baseline Rating: 72 Facilities Included: 1	Current Rating: 80 Facilities Included: 1
Change from Baseline: Group Adjusted Percent Energy Use (%): -14.8% Facilities Included: 2	

Averages are weighted by Total Floor Space.
[More about Baselines](#)
[More about Change from Baseline: Adjusted Energy Use](#)

[Add a Property](#)
[Import Facility Data Using Templates](#)

Work with Facilities
[Update Multiple Meters](#)
[Share Facilities](#)
[Request Energy Performance Report](#)

Apply for Recognition
[Apply for the ENERGY STAR](#)
[ENERGY STAR Leaders](#)

Automated Benchmarking
[Get Started Now](#)

My Facilities
My Campuses

GROUP: Fire Stations

8

VIEW: Summary View

9a

[Download](#) in Excel

Search Facility Name:

Search

Results 1 - 2 of 2

All # A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Facility Name	Current Source Energy Intensity (kBtu/Sq. Ft.)	Change from Baseline: Adjusted Energy Use (%)	Change from Baseline: Energy Use Intensity (kBtu/Sq. Ft.)	Change from Baseline: GHG Emissions (MtCO ₂ e)	Total Energy Cost per Sq. Ft. (US Dollars (\$))
Fire Station 1	160.1	-12.3	-6.1	-275.86	\$0.30
Fire Station 2	172.6	-17.2	-10.7	-488.62	\$0.37

[Download](#) in Excel

9b

Search Facility Name:

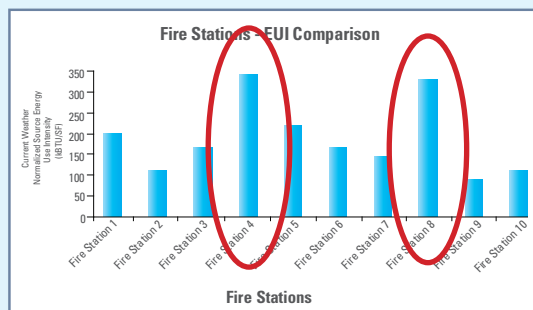
Search

Results 1 - 2 of 2

All # A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

The rating is calculated by using the last day of the latest full calendar month where all meters in the facility have meter entries; the Period Ending date reflects that particular date.

STEP	ACTIVITY	ACTION
8	Create custom groups.	Organize facilities into groups (e.g., Fire Stations, Northwest Region). Groups are completely customizable, and each facility may belong to multiple groups. - From the My Portfolio page, click CREATE GROUP, located directly to the right of the Group drop-down menu. - Follow instructions to select buildings and name your group. - Once they have been saved, custom groups will be available in the Group drop-down menu.
9	View and interpret results.	Option 1: Go to My Portfolio and view all buildings to compare performance metrics. Option 2: Export data to Microsoft® Excel. - On the My Portfolio page, select the view, from the View drop-down menu that will display the data you wish to export. The My Portfolio page will update to display the selected view. (9a) - Select the DOWNLOAD IN EXCEL link. A File Download dialog window will open. Follow the steps provided by Excel. (9b) - Use Excel functionality to view building energy performance graphically. The example below shows a comparison of Energy Use Intensity for a portfolio of fire stations, identifying under-performing buildings to target for energy efficiency improvements.



TRACK PROGRESS OVER TIME

Portfolio Manager comes pre-populated with nine standard summary views of facility data, which are displayed on the My Portfolio summary page. These standard views include:

- Summary: Energy Use
- Performance: Green House Gas Emissions
- Performance: Financial
- Performance: Water Use

Additionally, users can create and save custom downloadable views by choosing from more than 70 different metrics. The default view set by the user will display automatically after logging into Portfolio Manager, and data from all views can be exported to Microsoft® Excel.

PORTFOLIO MANAGER

Home > My Portfolio

GROUP: Fire Stations | Create Group | Edit Group | View All

VIEW: MyView | **Create View** | Edit View | View All

Download in Excel

Results 1 - 2 of 2

Facility Name	Number of Students	% Difference from National Average Source EUI	Baseline Weather Normalized Source Energy Intensity (kBtu/Sq. Ft.)	Current Weather Normalized Source Energy Intensity (kBtu/Sq. Ft.)	Baseline Rating (1-100)	Current Rating (1-100)	Total Floor Space (Sq. Ft.)
Fire Station 1	0	-32.6	180.4	160.1	72	80	300,000
Fire Station 2	0	9.9	208.4	172.6	N/A	N/A	300,000

PORTFOLIO MANAGER

Home > My Portfolio > Create New View

Create New View
How do I use this page?

Number of Facilities to display on each page:
☐ 25 ☒ 50 ☐ 100 ☐ All (note: larger Portfolios will take longer to load)

To create/edit a custom View of your facilities in Portfolio Manager, select **up to 7** columns from the list below. Use "Preferred Column Order" to set the order in which they will display in the View.

View Name: **Set this View as My Portfolio Default:** ☐

Preferred Column Order	Facility Data	Preferred Column Order	Facility Data
1	ENERGY STAR Rating	1	Water
2	Baseline Rating (1-100) (N/A for Campuses)	2	Indoor Water Cost (US Dollars (\$))
3	Current Rating (1-100) (N/A for Campuses)	3	Indoor Water Use (kGal)
4	Target Rating (1-100) (N/A for Campuses)	4	Indoor Water Use per Sq. Ft. (kGal)
5	Period Ending Dates	5	Outdoor Water Cost (US Dollars (\$))
6	Baseline Energy Period Ending Date	6	Outdoor Water Use (kGal)
7	Current Energy Period Ending Date	7	Total Indoor and Outdoor Water Cost (US Dollars (\$))
8	Water Use Period Ending	8	Total Indoor and Outdoor Water Use (kGal)
9	Site Energy	9	Wastewater/Sewer Cost (US Dollars (\$))
10	Baseline Site Electric Use (kWh)	10	Wastewater/Sewer Use (kGal)
		11	Water Use Alerts (N/A for Campuses)
		12	Performance: GHG Emissions

CREATE A CUSTOM VIEW

STEP ACTION

- From the **My Portfolio** page or the **Facility Summary** page, select the **Create View** link, located directly to the right of the **View** drop-down menu.
- Enter a name for the view. To set as the default view, select the box labeled **Set this View as My Portfolio Default**, located directly to the right of **View Name**. You may include up to 7 (seven) columns in each view.
- Choose each metric to be included in the view by selecting an order number from the **Preferred Column Order** drop-down menu to the left of the **Facility Data** column.
- Click **SAVE** at the bottom of the page. You will be returned to the **My Portfolio** page, and your custom view will be available in the **View** drop-down menu. (step not shown)

VERIFY AND DOCUMENT RESULTS

Use Portfolio Manager to quickly and accurately document reductions in energy use, greenhouse gas emissions, water use, and energy costs for an individual building or an entire portfolio. This valuable information can be used to provide a level of transparency and accountability to help demonstrate strategic use of funding.

Generate a Statement of Energy Performance that includes valuable information about your building's performance, including:

- Normalized energy use intensity
- National average comparisons
- Greenhouse gas emissions
- Energy performance rating (if available)

In addition, you can also request an Energy Performance Report to see the change in performance over time for selected buildings or an entire portfolio. Available comparative metrics in this report include:

- Normalized energy use intensity
- Total electric use
- Total natural gas use
- Energy performance rating (if available)

OMB No. 2050-0347

STATEMENT OF ENERGY PERFORMANCE Fire Station 2

Building ID: 1642681
For 12-month Period Ending: December 31, 2008
Date SEP becomes ineligible: N/A
Date SEP Generated: March 05, 2009

Facility Fire Station 2 000 Blank Street Arlington, VA 22209	Facility Owner N/A	Primary Contact for this Facility N/A
Year Built: 1990 Gross Floor Area (ft²): 300,000	Energy Intensity⁵ Site (kBtu/ft²/yr) 52 Source (kBtu/ft²/yr) 173	
Energy Performance Rating ² (1-100)	Emissions (based on site energy use) Greenhouse Gas Emissions (MTCO ₂ e/year) 2,352	
Site Energy Use Summary³ Electricity (kBtu) 15,500,000 Natural Gas (kBtu) Total Energy (kBtu)		
Energy Intensity⁴ Site (kBtu/ft²/yr) 52 Source (kBtu/ft²/yr) 173		
Emissions (based on site energy use) Greenhouse Gas Emissions (MTCO ₂ e/year) 2,352		
Electric Distribution Utility Virginia Electric & Power Co		
National Average Comparison National Average Site EUI 78 National Average Source EUI 157 % Difference from National Average Source EUI 10% Building Type Fire Station/Police Station		
Meets Industry Standards⁶ for Indoor Environmental Conditions: Ventilation for Acceptable Indoor Air Quality N/A Acceptable Thermal Environmental Conditions N/A Adequate Illumination N/A		
Notes: 1. Application for the ENERGY STAR award is submitted by EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA. 2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR. 3. Values represent energy consumption, annualized to a 12-month period. 4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code. 5. Intensity values are calculated as follows: Intensity = Total Energy / Gross Floor Area (kBtu/ft²/yr). 6. See ASHRAE 90.1-2001, Section 9.1 for more information.		
Stamp of Certifying Professional Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.		Certifying Professional N/A

ENERGY STAR **PORTFOLIO MANAGER**

Home > My Portfolio > Fire Station 2

Facility Summary: **Fire Station 2**
How do I use this page?

Building ID: 1642681
Level of Access: Building Data Administrator

Electric Distribution Utility: Virginia Electric & Power Co
Regional Power Grid: [SERC Virginia/Carolina](#)
Select my Power Generation Plant to calculate my electric emissions rate
Electric Emissions Rate (lbCO₂/kWh) 151.7 (what is this?)

Generate a Statement of Energy Performance for uses other than applying for the ENERGY STAR

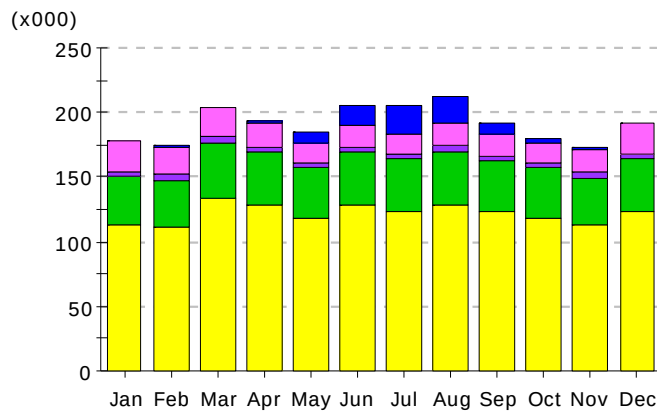
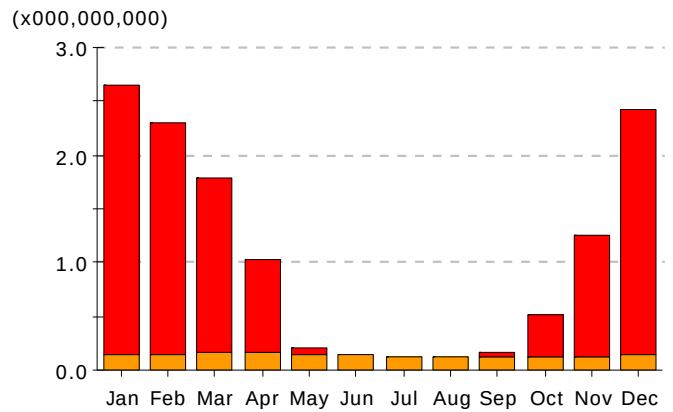
General Information Edit	
Address: 000 Blank Street, Arlington, VA 22209	
Year Built: 1990	
Property Type: Single Facility	
Baseline Rating: N/A	Current Rating: N/A
Eligibility for the ENERGY STAR	
N/A	

GENERATE A STATEMENT OF ENERGY PERFORMANCE AND AN ENERGY PERFORMANCE REPORT

STEP	ACTION
1	From your selected building's Facility Summary page, click GENERATE A STATEMENT OF ENERGY PERFORMANCE .
2	On the next page, select a period ending date. (step not shown)
3	Click GENERATE REPORT , located in the bottom right corner of the screen. (step not shown)
4	Save the Statement of Energy Performance, accompanying Data Checklist, and Facility Summary that include information on energy use intensity and greenhouse gas emissions.
5	From the My Portfolio page, click REQUEST ENERGY PERFORMANCE REPORT , located under Work with Facilities , which shows reductions in key performance indicators over a user-specified time period. Specify the type of report, the facilities to be included, and the requested report columns. The report will be e-mailed to a user-specified address within one business day. (step not shown)

APPENDIX C

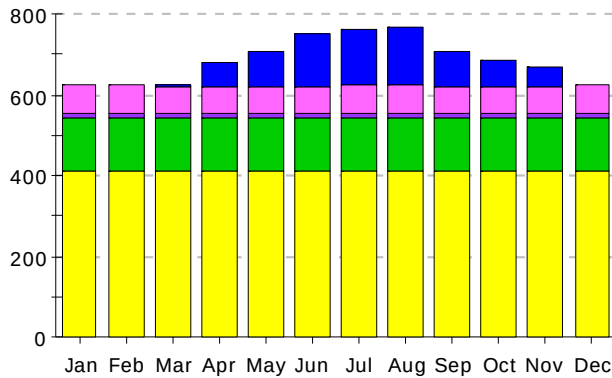
HVAC ECRM Calculations and Results

Electric Consumption (kWh)**Gas Consumption (Btu)****Electric Consumption (kWh x000)**

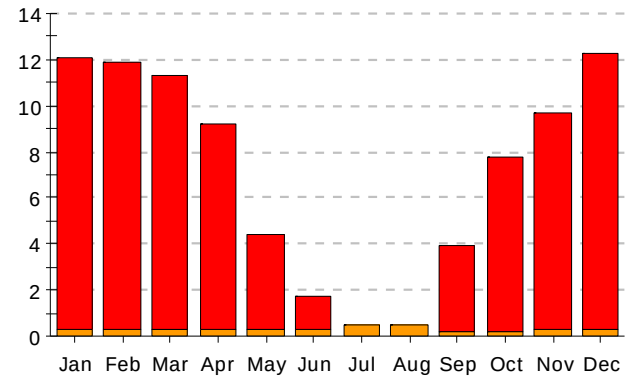
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.6	0.6	0.7	1.7	7.7	14.2	21.4	20.5	9.2	2.8	1.4	0.6	81.5
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	23.4	21.5	21.9	18.7	15.4	16.9	16.2	16.9	16.1	16.0	17.9	23.3	224.1
Pumps & Aux.	4.3	3.9	4.4	4.2	4.2	4.1	4.2	4.2	4.1	4.2	4.1	4.4	50.4
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	36.4	35.8	42.8	41.0	38.0	41.0	39.6	41.2	39.4	38.0	36.2	39.6	469.1
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	113.9	112.2	134.1	128.5	118.9	128.5	124.0	129.1	123.4	118.9	113.3	124.0	1,468.7
Total	178.5	174.0	204.0	194.1	184.2	204.7	205.4	211.9	192.3	180.0	172.9	191.9	2,293.8

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.51	2.15	1.61	0.86	0.06	0.01	-	-	0.04	0.39	1.14	2.28	11.06
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.14	0.15	0.17	0.16	0.14	0.14	0.13	0.13	0.12	0.12	0.12	0.15	1.67
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2.65	2.30	1.78	1.03	0.20	0.15	0.13	0.13	0.16	0.51	1.26	2.43	12.73

Electric Demand (kW)**Gas Demand (Btu / h)**

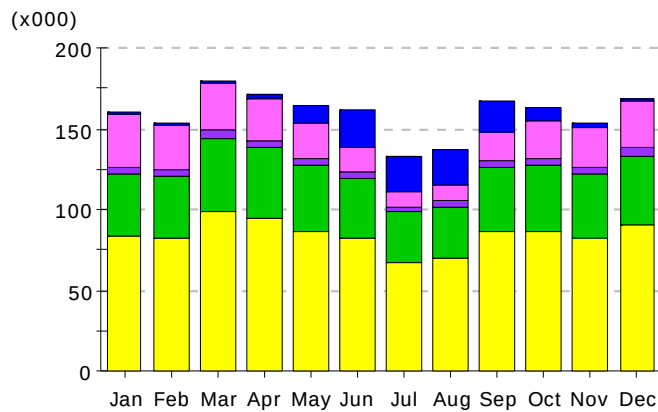
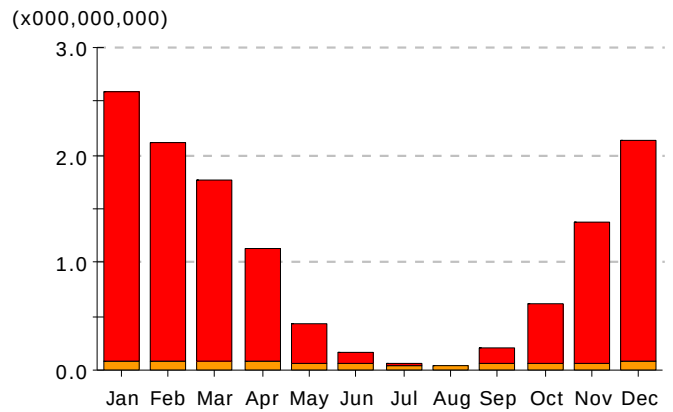
(x000,000)

**Electric Demand (kW)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.5	2.5	4.6	56.6	88.6	127.3	139.0	145.1	87.3	66.3	46.1	2.5	768.3
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	73.5	73.5	69.5	69.5	69.7	70.4	70.8	70.9	69.9	69.5	69.5	73.5	850.0
Pumps & Aux.	7.8	7.8	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.8	91.8
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	1,571.5
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	412.6	412.6	412.6	412.6	412.6	412.6	412.6	412.6	412.6	412.6	412.6	412.6	4,951.1
Total	627.3	627.3	625.2	677.3	709.4	748.8	761.0	767.1	708.3	686.9	666.7	627.3	8,232.6

Gas Demand (Btu / h x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	11.76	11.57	11.00	8.93	4.16	1.45	-	-	3.70	7.50	9.40	12.02	81.51
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.28	0.29	0.29	0.29	0.27	0.25	0.46	0.44	0.22	0.23	0.24	0.26	3.51
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	12.04	11.86	11.29	9.21	4.43	1.70	0.46	0.44	3.92	7.73	9.65	12.29	85.02

Electric Consumption (kWh)**Gas Consumption (Btu)****Electric Consumption (kWh x000)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1.2	1.2	1.6	3.4	11.6	22.9	21.3	21.7	18.7	8.6	1.5	1.3	114.8
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	31.9	28.0	29.1	25.8	21.6	15.6	9.5	9.8	18.5	22.9	25.6	30.0	268.4
Pumps & Aux.	4.8	4.4	4.9	4.6	4.2	3.8	3.5	3.5	4.0	4.4	4.5	4.8	51.5
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	38.7	38.1	45.7	43.7	40.4	38.0	31.2	32.5	39.9	40.4	38.5	42.2	469.3
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	83.2	82.0	98.3	94.1	87.0	81.6	66.9	69.5	85.8	86.9	82.8	90.7	1,008.7
Total	159.7	153.8	179.6	171.6	164.8	161.9	132.4	137.0	166.9	163.1	152.8	169.0	1,912.7

Gas Consumption (Btu x000,000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.52	2.04	1.68	1.04	0.36	0.09	0.02	0.01	0.14	0.56	1.32	2.06	11.85
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.07	0.07	0.09	0.08	0.07	0.06	0.04	0.04	0.06	0.06	0.06	0.07	0.79
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2.60	2.11	1.77	1.12	0.43	0.16	0.06	0.05	0.20	0.62	1.39	2.14	12.64

Morris Knolls Heating savings from no outside air while unoccupied

Bin Data: Newark NJ

Hours : 1 a.m.-8 a.m. and 5 p.m. - 12 a.m.

Cost/Therm	\$	1.38
cfm=		100
Unit Ventilators		85

Total Savings \$ **12,084.63**
(excl: June-Aug)

January

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	1	70	7884	7884	0.08	\$ 0.11	\$ 9.25
2	4	70	7344	29376	0.29	\$ 0.41	\$ 34.47
7	10	70	6804	68040	0.68	\$ 0.94	\$ 79.83
12	24	70	6264	150336	1.50	\$ 2.08	\$ 176.39
17	42	70	5724	240408	2.40	\$ 3.32	\$ 282.07
22	59	70	5184	305856	3.06	\$ 4.22	\$ 358.86
27	72	70	4644	334368	3.34	\$ 4.62	\$ 392.31
32	97	70	4104	398088	3.98	\$ 5.49	\$ 467.07
37	95	70	3564	338580	3.39	\$ 4.67	\$ 397.25
42	52	70	3024	157248	1.57	\$ 2.17	\$ 184.50
47	21	70	2484	52164	0.52	\$ 0.72	\$ 61.20
52	10	70	1944	19440	0.19	\$ 0.27	\$ 22.81
57	5	70	1404	7020	0.07	\$ 0.10	\$ 8.24
62	2	70	864	1728	0.02	\$ 0.02	\$ 2.03
							\$ 2,476.25

February

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	1	70	7344	7344	0.07	\$ 0.10	\$ 8.62
7	4	70	6804	27216	0.27	\$ 0.38	\$ 31.93
12	13	70	6264	81432	0.81	\$ 1.12	\$ 95.54
17	33	70	5724	188892	1.89	\$ 2.61	\$ 221.62
22	56	70	5184	290304	2.90	\$ 4.01	\$ 340.61
27	65	70	4644	301860	3.02	\$ 4.17	\$ 354.17
32	49	70	4104	201096	2.01	\$ 2.78	\$ 235.94
37	81	70	3564	288684	2.89	\$ 3.98	\$ 338.71
42	55	70	3024	166320	1.66	\$ 2.30	\$ 195.14
47	27	70	2484	67068	0.67	\$ 0.93	\$ 78.69
52	15	70	1944	29160	0.29	\$ 0.40	\$ 34.21
57	5	70	1404	7020	0.07	\$ 0.10	\$ 8.24
62	3	70	864	2592	0.03	\$ 0.04	\$ 3.04
							\$ 1,946.46

March

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	2	70	6264	12528	0.13	\$ 0.17	\$ 14.70
17	7	70	5724	40068	0.40	\$ 0.55	\$ 47.01
22	17	70	5184	88128	0.88	\$ 1.22	\$ 103.40
27	34	70	4644	157896	1.58	\$ 2.18	\$ 185.26
32	65	70	4104	266760	2.67	\$ 3.68	\$ 312.98
37	101	70	3564	359964	3.60	\$ 4.97	\$ 422.34
42	110	70	3024	332640	3.33	\$ 4.59	\$ 390.28
47	77	70	2484	191268	1.91	\$ 2.64	\$ 224.41
52	46	70	1944	89424	0.89	\$ 1.23	\$ 104.92

57	20	70	1404	28080	0.28	\$ 0.39	\$ 32.95
62	9	70	864	7776	0.08	\$ 0.11	\$ 9.12
							\$ 1,847.37

April

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	3	70	4644	13932	0.14	\$ 0.19	\$ 16.35
32	10	70	4104	41040	0.41	\$ 0.57	\$ 48.15
37	32	70	3564	114048	1.14	\$ 1.57	\$ 133.81
42	77	70	3024	232848	2.33	\$ 3.21	\$ 273.20
47	111	70	2484	275724	2.76	\$ 3.81	\$ 323.50
52	108	70	1944	209952	2.10	\$ 2.90	\$ 246.33
57	62	70	1404	87048	0.87	\$ 1.20	\$ 102.13
62	40	70	864	34560	0.35	\$ 0.48	\$ 40.55
							\$ 1,184.02

May

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	1	70	3564	3564	0.04	\$ 0.05	\$ 4.18
42	7	70	3024	21168	0.21	\$ 0.29	\$ 24.84
47	30	70	2484	74520	0.75	\$ 1.03	\$ 87.43
52	82	70	1944	159408	1.59	\$ 2.20	\$ 187.03
57	115	70	1404	161460	1.61	\$ 2.23	\$ 189.44
62	109	70	864	94176	0.94	\$ 1.30	\$ 110.49
							\$ 603.41

June

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	1	70	2484	2484	0.02	\$ 0.03	\$ 2.91
52	8	70	1944	15552	0.16	\$ 0.21	\$ 18.25
57	29	70	1404	40716	0.41	\$ 0.56	\$ 47.77
62	76	70	864	65664	0.66	\$ 0.91	\$ 77.04

							~~\$ 145.98~~
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July

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	0	70	2484	0	0.00	\$ -	\$ -
52	0	70	1944	0	0.00	\$ -	\$ -
57	2	70	1404	2808	0.03	\$ 0.04	\$ 3.29
62	16	70	864	13824	0.14	\$ 0.19	\$ 16.22
							~~\$ 19.51~~

August

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	0	70	2484	0	0.00	\$ -	\$ -
52	1	70	1944	1944	0.02	\$ 0.03	\$ 2.28
57	5	70	1404	7020	0.07	\$ 0.10	\$ 8.24
62	32	70	864	27648	0.28	\$ 0.38	\$ 32.44
							~~\$ 42.96~~

September

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	1	70	3024	3024	0.03	\$ 0.04	\$ 3.55
47	9	70	2484	22356	0.22	\$ 0.31	\$ 26.23
52	30	70	1944	58320	0.58	\$ 0.81	\$ 68.43
57	65	70	1404	91260	0.91	\$ 1.26	\$ 107.07
62	104	70	864	89856	0.90	\$ 1.24	\$ 105.43
							~~\$ 310.70~~

October

Morris Knolls Electricity Savings From turning fans off while unoccupied

Cost Per kWh	\$	0.21
Number of Unit Ventilators		85
Fan HP		0.75
Total Hours Sept - June		6720
Occupied Hours 8am-5pm Sept-June (no weekends)		1600
Unoccupied Horsepower Hours		326400 Hp-Hr
Conversion from Hp-Hr to kWh		0.746 kWh/Hp-Hr
Unoccupied kWh		243,494.40 kWh
Savings	\$	51,133.82

Morris Hills Heating savings from no outside air while unoccupied

Bin Data: Newark NJ

Hours : 1 a.m.-8 a.m. and 5 p.m. - 12 a.m.

Cost/Therm	\$	1.50
cfm=		100
Unit Ventilators		46

Total Savings \$ **7,108.60**
(excl: June-Aug)

January

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	1	70	7884	7884	0.08	\$ 0.12	\$ 5.44
2	4	70	7344	29376	0.29	\$ 0.44	\$ 20.27
7	10	70	6804	68040	0.68	\$ 1.02	\$ 46.96
12	24	70	6264	150336	1.50	\$ 2.26	\$ 103.76
17	42	70	5724	240408	2.40	\$ 3.61	\$ 165.92
22	59	70	5184	305856	3.06	\$ 4.59	\$ 211.09
27	72	70	4644	334368	3.34	\$ 5.02	\$ 230.77
32	97	70	4104	398088	3.98	\$ 5.97	\$ 274.75
37	95	70	3564	338580	3.39	\$ 5.08	\$ 233.68
42	52	70	3024	157248	1.57	\$ 2.36	\$ 108.53
47	21	70	2484	52164	0.52	\$ 0.78	\$ 36.00
52	10	70	1944	19440	0.19	\$ 0.29	\$ 13.42
57	5	70	1404	7020	0.07	\$ 0.11	\$ 4.84
62	2	70	864	1728	0.02	\$ 0.03	\$ 1.19
							\$ 1,456.62

February

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	1	70	7344	7344	0.07	\$ 0.11	\$ 5.07
7	4	70	6804	27216	0.27	\$ 0.41	\$ 18.78
12	13	70	6264	81432	0.81	\$ 1.22	\$ 56.20
17	33	70	5724	188892	1.89	\$ 2.83	\$ 130.37
22	56	70	5184	290304	2.90	\$ 4.36	\$ 200.36
27	65	70	4644	301860	3.02	\$ 4.53	\$ 208.33
32	49	70	4104	201096	2.01	\$ 3.02	\$ 138.79
37	81	70	3564	288684	2.89	\$ 4.33	\$ 199.24
42	55	70	3024	166320	1.66	\$ 2.50	\$ 114.79
47	27	70	2484	67068	0.67	\$ 1.01	\$ 46.29
52	15	70	1944	29160	0.29	\$ 0.44	\$ 20.13
57	5	70	1404	7020	0.07	\$ 0.11	\$ 4.84
62	3	70	864	2592	0.03	\$ 0.04	\$ 1.79
							\$ 1,144.98

March

Out Air	Occurrences	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	2	70	6264	12528	0.13	\$ 0.19	\$ 8.65
17	7	70	5724	40068	0.40	\$ 0.60	\$ 27.65
22	17	70	5184	88128	0.88	\$ 1.32	\$ 60.82
27	34	70	4644	157896	1.58	\$ 2.37	\$ 108.97
32	65	70	4104	266760	2.67	\$ 4.00	\$ 184.11
37	101	70	3564	359964	3.60	\$ 5.40	\$ 248.43
42	110	70	3024	332640	3.33	\$ 4.99	\$ 229.58
47	77	70	2484	191268	1.91	\$ 2.87	\$ 132.01
52	46	70	1944	89424	0.89	\$ 1.34	\$ 61.72

57	20	70	1404	28080	0.28	\$ 0.42	\$ 19.38
62	9	70	864	7776	0.08	\$ 0.12	\$ 5.37
							\$ 1,086.69

April

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	3	70	4644	13932	0.14	\$ 0.21	\$ 9.62
32	10	70	4104	41040	0.41	\$ 0.62	\$ 28.32
37	32	70	3564	114048	1.14	\$ 1.71	\$ 78.71
42	77	70	3024	232848	2.33	\$ 3.49	\$ 160.70
47	111	70	2484	275724	2.76	\$ 4.14	\$ 190.30
52	108	70	1944	209952	2.10	\$ 3.15	\$ 144.90
57	62	70	1404	87048	0.87	\$ 1.31	\$ 60.08
62	40	70	864	34560	0.35	\$ 0.52	\$ 23.85
							\$ 696.48

May

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	1	70	3564	3564	0.04	\$ 0.05	\$ 2.46
42	7	70	3024	21168	0.21	\$ 0.32	\$ 14.61
47	30	70	2484	74520	0.75	\$ 1.12	\$ 51.43
52	82	70	1944	159408	1.59	\$ 2.39	\$ 110.02
57	115	70	1404	161460	1.61	\$ 2.42	\$ 111.43
62	109	70	864	94176	0.94	\$ 1.41	\$ 65.00
							\$ 354.95

June

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	1	70	2484	2484	0.02	\$ 0.04	\$ 1.71
52	8	70	1944	15552	0.16	\$ 0.23	\$ 10.73
57	29	70	1404	40716	0.41	\$ 0.61	\$ 28.10
62	76	70	864	65664	0.66	\$ 0.99	\$ 45.32

							~~\$ 85.87~~
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July

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	0	70	2484	0	0.00	\$ -	\$ -
52	0	70	1944	0	0.00	\$ -	\$ -
57	2	70	1404	2808	0.03	\$ 0.04	\$ 1.94
62	16	70	864	13824	0.14	\$ 0.21	\$ 9.54
							~~\$ 11.48~~

August

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	0	70	3024	0	0.00	\$ -	\$ -
47	0	70	2484	0	0.00	\$ -	\$ -
52	1	70	1944	1944	0.02	\$ 0.03	\$ 1.34
57	5	70	1404	7020	0.07	\$ 0.11	\$ 4.84
62	32	70	864	27648	0.28	\$ 0.41	\$ 19.08
							~~\$ 25.27~~

September

Out Air	Occurances	Setpoint	Vent Heat (BTU/hr)	BTU	Therm	\$	Total Classrooms
-8	0	70	8424	0	0.00	\$ -	\$ -
-3	0	70	7884	0	0.00	\$ -	\$ -
2	0	70	7344	0	0.00	\$ -	\$ -
7	0	70	6804	0	0.00	\$ -	\$ -
12	0	70	6264	0	0.00	\$ -	\$ -
17	0	70	5724	0	0.00	\$ -	\$ -
22	0	70	5184	0	0.00	\$ -	\$ -
27	0	70	4644	0	0.00	\$ -	\$ -
32	0	70	4104	0	0.00	\$ -	\$ -
37	0	70	3564	0	0.00	\$ -	\$ -
42	1	70	3024	3024	0.03	\$ 0.05	\$ 2.09
47	9	70	2484	22356	0.22	\$ 0.34	\$ 15.43
52	30	70	1944	58320	0.58	\$ 0.88	\$ 40.25
57	65	70	1404	91260	0.91	\$ 1.37	\$ 62.98
62	104	70	864	89856	0.90	\$ 1.35	\$ 62.02
							~~\$ 182.77~~

October

Morris Hills Electricity Savings From turning fans off while unoccupied

Cost Per kWh	\$	0.17
Number of Unit Ventilators		46
Fan HP		0.75
Total Hours Sept - June		6720
Occupied Hours 8am-5pm Sept-June (no weekends)		1600
Unoccupied Horsepower Hours		176640 Hp-Hr
Conversion from Hp-Hr to kWh		0.746 kWh/Hp-Hr
Unoccupied kWh		131,773.44 kWh
Savings	\$	22,401.48

ECRM Morris Hills - Steam Pipe Insulation Calculation

Calculation

Length of Uninsulated pipe	100 Ft Assumed
Diameter of Uninsulated Pipe	2 In Assumed
Savings Factor	3.5 From ABT Workbook Table 1
Cost of Fuel Oil	\$1.50 per Gal
Annual Fuel Savings	350 Gal
	1.4 therms/Gallon
	490 Therms
Annual Cost Savings	\$525.00

Calculations derived from "ECM-15 Insulate Piping" found within *Energy Conservation for Housing - A Workbook* " by ABT Associates Inc.

ECRM Morris SD Hot Water Fixtures

Location	# Students	Uses/ Person/ Day	Duration of Usage (min)	Total # Sinks	Total Usage/Sink (minutes)	# Sinks Converted	High Flow GPM	Gallons/ Day	Low Flow GPM	Gallons/ Day	Water Savings/ Day	# days	Annual Water Savings (Gallons)	Gas Savings	Water Savings (\$)	Gas Savings (\$)	Total Savings (\$)
Morris Knolls HS	1400	2	0.17	103	4.530744337	55	2.2	548.2200647	0.5	124.595469	423.6245955	200	84724.91909	57,480,562.30	\$ 423.62	\$ 534.57	\$ 958.19
Morris Hills HS	800	2	0.17	71	3.755868545	57	2.2	470.9859155	0.5	107.042254	363.943662	200	72788.73239	49,382,605.63	\$ 363.94	\$ 513.58	\$ 877.52

Assumptions/References:
Uses per person per day is assumed
Duration of usage is assumed to be 10 seconds
All showers are new and assumed to be low flow type
Low Flow rate obtained from 2007 NYS Plumbing Code
Cost of water is approximately \$5.00 per 1000 gallons

APPENDIX D

LIGHTING SPREADSHEET

Appendix D - Lighting Spreadsheet

Materials & Labor Data																																		
Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Knolls High School - Interior	002	B36A Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$540.4	None Proposed	16	811.2	0.81	3285	2299.5	2665	2665	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B35	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B38	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B37	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B40 Book Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B40 Book Storage	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	76.2	0.08	3285	250	\$50.8	None Proposed	3	76.2	0.08	3285	2299.5	250	250	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	33	838.2	0.84	4015	3365	\$682.5	None Proposed	33	838.2	0.84	4015	2810.5	3365	3365	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Boys Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	Girls Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	Lobby	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	152.4	0.15	4015	612	\$124.1	None Proposed	6	152.4	0.15	4015	2810.5	612	612	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Lobby	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	88	0.09	4015	353	\$71.7	None Proposed	1	88	0.09	4015	2810.5	353	353	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Storage	60W Incandescent Fixture	1	60	0.06	500	30	\$6.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$4.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Knolls High School - Interior	002	B41	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$675.5	None Proposed	20	1014	1.01	3285	2299.5	3331	2332	Ceiling Mounted Occupancy Sensor	1	0.00	999	\$202.66	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B43	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$675.5	None Proposed	20	1014	1.01	3285	2299.5	3331	2332	Ceiling Mounted Occupancy Sensor	1	0.00	999	\$202.66	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B45	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B45A	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Automatic Wall Switch Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	33	838.2	0.84	4015	3365	\$682.5	None Proposed	33	838.2	0.84	4015	2810.5	3365	3365	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Lobby	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	13	659.1	0.66	4015	2646	\$536.7	None Proposed	13	659.1	0.66	4015	2810.5	2646	2646	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B51	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	27	2376	2.38	3285	7805	\$1,562.9	None Proposed	27	2376	2.38	3285	2299.5	7805	7805	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Lobby	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	34	2992	2.99	4015	12013	\$2,436.2	None Proposed	34	2992	2.99	4015	2810.5	12013	12013	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B55	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	20	1760	1.76	3285	5782	\$1,172.5	None Proposed	20	1760	1.76	3285	2299.5	5782	4047	Ceiling Mounted Occupancy Sensor	1	0.00	1734	\$351.75	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B55A Mech Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	500	51	\$10.3	None Proposed	2	101.4	0.10	500	350	51	51	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B59	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	22	1936	1.94	3285	6360	\$1,289.8	None Proposed	22	1936	1.94	3285	2299.5	6360	6360	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B58	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B558	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B51B	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$58.6	None Proposed	1	88	0.09	3285	2299.5	289	202	Automatic Wall Switch Occupancy Sensor	1	0.00	87	\$17.59	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B51A Prep Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Boys Restroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	56	0.06	3285	184	\$37.3	None Proposed	0	56	0.06	3285	2299.5	184	184	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Boys Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	13	659.1	0.66	4015	2646	\$536.7	None Proposed	13	659.1	0.66	4015	2810.5	2646	2646	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	B60	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	42	3696	3.70	3285	12141	\$2,462.3	None Proposed	42	3696	3.70	3285	2299.5	12141	8499	Ceiling Mounted Occupancy Sensor	1	0.00	3642	\$738.68	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B60B	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.13	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B60 Dark Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$101.3	None Proposed	3	152.1	0.15	3285	2299.5	500	350	Ceiling Mounted Occupancy Sensor	1	0.00	150	\$30.40	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B57A	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	7	616	0.62	3285	2024	\$410.4	None Proposed	7	616	0.62	3285	2299.5	2024	1416	Ceiling Mounted Occupancy Sensor	1	0.00	607	\$123.11	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	Mens Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.13	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Womens Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.13	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Gym	8 Lamp - Highbay 40W Ballasted Compact Fluorescent Fixture	55	17600	17.60	3285	57816	\$11,725.1	None Proposed	55	17600	17.60	3285	2299.5	57816	57816	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Gym	250W Metal Halide Fixtures	1	297	0.30	3285	976	\$197.9	Replace Metal Halide Fixtures with 4-Lamp Fluorescent Highbay Fixtures	1	110	0.11	3285	2299.5	361	361	None Proposed	0	0.19	614	\$1												

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Knolls High School - Interior	002	B61 Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	264	0.26	3285	867	\$175.9	None Proposed	3	264	0.26	3285	2299.5	867	607	Ceiling Mounted Occupancy Sensor	1	0.00	260	\$52.76	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B61A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Girls Locker Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	44	2230.8	2.23	3285	7328	\$1,486.2	None Proposed	44	2230.8	2.23	3285	2299.5	7328	7328	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Girls Locker Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$405.3	None Proposed	12	608.4	0.61	3285	2299.5	1999	1999	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Coach's Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	5	440	0.44	3285	1445	\$293.1	None Proposed	5	440	0.44	3285	2299.5	1445	1445	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Coach's Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	333	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Coach's Restroom	13W Compact Fluorescent Fixture	1	13	0.01	3285	43	\$8.7	None Proposed	1	13	0.01	3285	2299.5	43	43	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Storage	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	500	51	\$10.3	None Proposed	2	101.4	0.10	500	350	51	51	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	LC1D	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	14	709.8	0.71	3285	2332	\$472.9	None Proposed	14	709.8	0.71	3285	2299.5	2332	2332	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C19D	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	500	76	\$15.4	None Proposed	3	152.1	0.15	500	350	76	76	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C26	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	39	1977.3	1.98	3285	6495	\$1,317.3	None Proposed	39	1977.3	1.98	3285	2299.5	6495	6495	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C24	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	40	2028	2.03	3285	6662	\$1,351.0	None Proposed	40	2028	2.03	3285	2299.5	6662	6662	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C21 Locker Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	4015	102	\$20.7	None Proposed	1	25.4	0.03	4015	2810.5	102	102	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	1156	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	333	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Restroom	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	1	52	0.05	3285	171	\$34.6	None Proposed	1	52	0.05	3285	2299.5	171	171	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	22	1115.4	1.12	3285	3664	\$743.1	None Proposed	22	1115.4	1.12	3285	2299.5	3664	3664	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Room Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	304.2	0.30	500	152	\$30.8	None Proposed	6	304.2	0.30	500	350	152	152	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$405.3	None Proposed	12	608.4	0.61	3285	2299.5	1999	1999	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Hall	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Gym Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	11	557.7	0.56	4015	2239	\$454.1	None Proposed	11	557.7	0.56	4015	2810.5	2239	2239	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C-1 Cafeteria	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	96	8448	8.45	3285	27752	\$5,628.0	None Proposed	96	8448	8.45	3285	2299.5	27752	27752	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Faculty Dining	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	5	560	0.56	3285	1840	\$373.1	None Proposed	5	560	0.56	3285	2299.5	1840	1288	Automatic Wall Switch Occupancy Sensor	1	0.00	552	\$111.92	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	C-3 Cafeteria	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	98	8624	8.62	3285	28330	\$5,745.3	None Proposed	98	8624	8.62	3285	2299.5	28330	28330	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C-3 Cafeteria	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	704	0.70	3285	2313	\$469.0	None Proposed	8	704	0.70	3285	2299.5	2313	2313	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C-20 Trainer's Locker	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	3285	4625	\$938.0	None Proposed	16	1408	1.41	3285	2299.5	4625	4625	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Trainer's Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$117.3	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	19	963.3	0.96	4015	3868	\$784.4	None Proposed	19	963.3	0.96	4015	2810.5	3868	3868	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Lobby	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	4015	611	\$123.8	None Proposed	3	152.1	0.15	4015	2810.5	611	611	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	253.5	0.25	4015	1018	\$206.4	None Proposed	5	253.5	0.25	4015	2810.5	1018	1018	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	17	861.9	0.86	4015	3461	\$701.8	None Proposed	17	861.9	0.86	4015	2810.5	3461	3461	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	26	1318.2	1.32	4015	5293	\$1,073.3	None Proposed	26	1318.2	1.32	4015	2810.5	5293	5293	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	60W Incandescent Fixture	7	420	0.42	4015	1686	\$342.0	Replace 60W Incandescent Fixture with 13W CFL	7	91	0.09	4015	2810.5	365	365	None Proposed	0	0.33	1321	\$267.89	\$0.0	\$5.0	\$20.0	\$0.0	\$20.0	\$5.0	\$25.0	\$140.0	\$35.0	\$175.0		
Morris Knolls High School - Interior	002	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	24	1216.8	1.22	4015	4885	\$990.8	None Proposed	24	1216.8	1.22	4015	2810.5	4885	4885	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Lobby	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	7	177.8	0.18	4015	714	\$144.8	None Proposed	7	177.8	0.18	4015	2810.5	714	714	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Auditorium Hallway	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	405.6	0.41	4015	1628	\$330.3	None Proposed	8	405.6	0.41	4015	2810.5	1628	1628	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Display Case	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	50.8	0.05	4015	204	\$41.4	None Proposed	2	50.8	0.05	4015	2810.5	204	204	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	18	457.2	0.46	4015	1836	\$372.3	None Proposed	18	457.2	0.46	4015	2810.5	1836	1836	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	13W Compact Fluorescent Fixture	4	52	0.05	4015	209	\$42.3	None Proposed	4	52	0.05	4015	2810.5	209	209	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Hall	60W Incandescent Fixture</																															

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Balloon/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Knolls High School - Interior	002	Girls Restroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	56	0.06	3285	184	\$37.3	None Proposed	0	56	0.06	3285	2299.5	184	184	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Girls Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	002	Girls Restroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	3285	368	\$74.6	None Proposed	0	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Girls Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	002	C2A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	11	968	0.97	3285	3180	\$644.9	None Proposed	11	968	0.97	3285	2299.5	3180	2226	Ceiling Mounted Occupancy Sensor	1	0.00	954	\$193.46	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	C18C Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	500	101	\$20.6	None Proposed	4	202.8	0.20	500	350	101	101	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C18 Fitness Center	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	45	2281.5	2.28	3285	7495	\$1,519.9	None Proposed	45	2281.5	2.28	3285	2299.5	7495	7495	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C18 Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	7	354.9	0.35	3285	1166	\$236.4	None Proposed	7	354.9	0.35	3285	2299.5	1166	1166	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C19B Custodian	75W Incandescent Fixture	1	75	0.08	500	38	\$7.6	Replace 75W Incandescent Fixture with 25W CFL	1	25	0.03	500	350	13	13	None Proposed	0	0.05	25	\$5.07	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$20.0	\$7.0	\$27.0	
Morris Knolls High School - Interior	002	C16A Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	500	101	\$20.6	None Proposed	4	202.8	0.20	500	350	101	101	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C12 Wood Shop	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	36	1825.2	1.83	3285	5996	\$1,215.9	None Proposed	36	1825.2	1.83	3285	2299.5	5996	5996	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C12C Closet	75W Incandescent Fixture	1	75	0.08	500	38	\$7.6	Replace 75W Incandescent Fixture with 25W CFL	1	25	0.03	500	350	13	13	None Proposed	0	0.05	25	\$5.07	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$20.0	\$7.0	\$27.0	
Morris Knolls High School - Interior	002	Womens Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	336	0.34	3285	1104	\$223.8	None Proposed	3	336	0.34	3285	2299.5	1104	1104	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C15	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	112	0.11	3285	368	\$74.6	None Proposed	1	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Kitchen	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	69	3498.3	3.50	3285	11492	\$2,330.6	None Proposed	69	3498.3	3.50	3285	2299.5	11492	11492	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Kitchen	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	12	304.8	0.30	3285	1001	\$203.1	None Proposed	12	304.8	0.30	3285	2299.5	1001	1001	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Girls Team Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	24	1216.8	1.22	3285	3997	\$810.6	None Proposed	24	1216.8	1.22	3285	2299.5	3997	3997	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Room Office	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	448	0.45	3285	1472	\$298.5	None Proposed	4	448	0.45	3285	2299.5	1472	1472	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Room Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	10	507	0.51	3285	1665	\$337.8	None Proposed	10	507	0.51	3285	2299.5	1665	1665	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Team Locker Room Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	304.2	0.30	500	152	\$30.8	None Proposed	6	304.2	0.30	500	350	152	152	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C10 Band Room	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	3285	4625	\$938.0	None Proposed	16	1408	1.41	3285	2299.5	4625	4625	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	C10 Storage	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	500	13	\$2.6	None Proposed	1	25.4	0.03	500	350	13	13	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	002	Practice Room 1	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Practice Room 2	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$101.3	None Proposed	3	152.1	0.15	3285	2299.5	500	350	Automatic Wall Switch Occupancy Sensor	1	0.00	150	\$30.40	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Practice Room 3	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Practice Room 4	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Sound Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$101.3	None Proposed	3	152.1	0.15	3285	2299.5	500	350	Automatic Wall Switch Occupancy Sensor	1	0.00	150	\$30.40	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Drum Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Automatic Wall Switch Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Restroom	75W Incandescent Fixture	1	75	0.08	3285	246	\$50.0	Replace 75W Incandescent Fixture with 25W CFL	1	25	0.03	3285	2299.5	82	57	Automatic Wall Switch Occupancy Sensor	1	0.05	189	\$38.31	\$0.0	\$7.0	\$20.0	\$63.5	\$45.0	\$20.0	\$7.0	\$27.0	\$65.0	\$70.5	\$135.5	
Morris Knolls High School - Interior	002	Practice Room 9	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	Practice Room 8	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	002	B7	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	27	1368.9	1.37	3285	4497	\$912.0	None Proposed	27	1368.9	1.37	3285	2299.5	4497	3148	Ceiling Mounted Occupancy Sensor	1	0.00	1349	\$273.59	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Knolls High School - Interior	002	B7	1X4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	5	428	0.43	3285	1406	\$285.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf. 0.78 Ballast Factor Ballast	5	243	0.24	3285	2299.5	798	798	None Proposed	0	0.19	608	\$123.25	\$70.0	\$10.0	\$65.0	\$80.0	\$145.0	\$335.0	\$400.0	\$725.0				
Morris Knolls High School - Interior	002	B10	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	32	1622.4	1.62	3285	5330	\$1,080.8	None Proposed	32	1622.4	1.62	3285	2299.5	5330	3731	Ceiling Mounted Occupancy Sensor	2	0.00	1599	\$324.25	\$0.0	\$0.0	\$0.0	\$206.0	\$147.0	\$0.0	\$0.0	\$0.0	\$294.0	\$412.0	\$706.0	
Morris Knolls High School - Interior	002	B5	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	32	1622.4	1.62	3285	5330	\$1,080.8	None Proposed	32	1622.4	1.62	3285	2299.5	5330	3731	Ceiling Mounted Occupancy Sensor	2	0.00	1599	\$324.25	\$0.0	\$0.0	\$0.0	\$206.0	\$147.0	\$0.0	\$0.0	\$0.0	\$294.0	\$412.0	\$706.0	
Morris Knolls High School - Interior	002	B8	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	32	1622.4	1.62	3285	5330	\$1,080.8	None Proposed	32	1622.4	1.62	3285	2299.5	5330	3731	Ceiling Mounted Occupancy Sensor	2	0.00	1599	\$324.25	\$0.0	\$0.0	\$0.0	\$206.0	\$147.0	\$0.0	\$0.0	\$0.0	\$294.0	\$412.0	\$706.0	
Morris Knolls High School - Interior	002	B6	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$675.5	None Proposed	20	1014	1.01	3285	2299.5	3331																		

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kWh Saved	Total kWh Saved	Energy Cost Savings	Balloon/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total
Morris Knolls High School - Interior	002	B29	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	002	B32	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	002	B31	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	002	B34	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	002	B33	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	Career Center	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	10	930	0.93	3285	3055	\$619.6	None Proposed	0	930	0.93	3285	2299.5	3055	2139	Ceiling Mounted Occupancy Sensor	1	0.00	917	\$185.87	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A2B Conf. Room	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	7	651	0.65	3285	2139	\$433.7	None Proposed	0	651	0.65	3285	2299.5	2139	1497	Ceiling Mounted Occupancy Sensor	1	0.00	642	\$130.11	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A2C	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2D	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2E	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2F	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2M	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2L	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2G	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2K	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2H	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2J	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A2I	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	Hall	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	28	2604	2.60	4015	10455	\$2,120.3	None Proposed	0	2604	2.60	4015	2810.5	10455	10455	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	A10 Faculty Room	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	20	1860	1.86	3285	6110	\$1,239.1	None Proposed	0	1860	1.86	3285	2299.5	6110	4277	Ceiling Mounted Occupancy Sensor	1	0.00	1833	\$371.74	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A10A Work Room	2X2 Troffers w/ 3-T8 Lamps w/ Electronic Ballasts	4	372	0.37	3285	1222	\$247.8	None Proposed	0	372	0.37	3285	2299.5	1222	855	Automatic Wall Switch Occupancy Sensor	1	0.00	367	\$74.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	L2A Faculty Mens Bathroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	3	168	0.17	3285	562	\$111.9	None Proposed	0	168	0.17	3285	2299.5	562	386	Automatic Wall Switch Occupancy Sensor	1	0.00	166	\$33.58	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	L2A Faculty Mens Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.13	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A7H Storage	75W Incandescent Fixture	1	75	0.08	500	38	\$7.6	Replace 75W Incandescent Fixture with 25W CFL	1	25	0.03	500	350	13	13	None Proposed	0	0.05	25	\$5.07	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$20.0	\$7.0	\$27.0
Morris Knolls High School - Interior	001	LA5 Womens Faculty Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A7E Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	500	13	\$2.6	None Proposed	1	25.4	0.03	500	350	13	13	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	Safe	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	500	25	\$5.1	None Proposed	1	50.7	0.05	500	350	25	25	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	Mail Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Knolls High School - Interior	001	A8A Closet	60W Incandescent Fixture	1	60	0.06	500	30	\$6.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$4.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0
Morris Knolls High School - Interior	001	A12	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$405.3	None Proposed	12	608.4	0.61	3285	2299.5	1999	1399	Ceiling Mounted Occupancy Sensor	1	0.00	600	\$121.59	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A14	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$405.3	None Proposed	12	608.4	0.61	3285	2299.5	1999	1399	Ceiling Mounted Occupancy Sensor	1	0.00	600	\$121.59	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A16	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A18	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A20	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	21	1064.7	1.06	3285	3498	\$709.3	None Proposed	21	1064.7	1.06	3285	2299.5	3498	2448	Ceiling Mounted Occupancy Sensor	1	0.00	1049	\$212.79	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A22	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$608.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2099	Ceiling Mounted Occupancy Sensor	1	0.00	899	\$182.39	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A22A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	704	0.70	3285	2313	\$469.0	None Proposed	8	704	0.70	3285	2299.5	2313	1619	Ceiling Mounted Occupancy Sensor	1	0.00	694	\$140.70	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A24	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$608.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2099	Ceiling Mounted Occupancy Sensor	1	0.00	899	\$182.39	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	48	1219.2	1.22	4015	4895	\$992.7	None Proposed	48	1219.2	1.22	4015	2810.5	4895	4895	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	Girls Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0																				

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Balloon/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Knolls High School - Interior	001	Boys Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	Boys Restroom	60W Incandescent Fixture	1	60	0.06	3285	197	\$40.0	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	3285	2299.5	43	43	None Proposed	0	0.05	154	\$31.31	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Knolls High School - Interior	001	Elevator Mech Room	60W Incandescent Fixture	2	120	0.12	3285	394	\$79.9	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$62.62	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0	
Morris Knolls High School - Interior	001	Elevator Hall	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	4015	353	\$71.7	None Proposed	1	88	0.09	4015	2810.5	353	353	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	5	127	0.13	4015	510	\$103.4	None Proposed	5	127	0.13	4015	2810.5	510	510	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	Storage	60W Incandescent Fixture	1	60	0.06	500	30	\$6.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$4.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Knolls High School - Interior	001	A21A Storage	60W Incandescent Fixture	1	60	0.06	500	30	\$6.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$4.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Knolls High School - Interior	001	A21	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A23A	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A23B	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	001	A23C	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	001	A25	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	253.5	0.25	3285	833	\$168.9	None Proposed	5	253.5	0.25	3285	2299.5	833	583	Automatic Wall Switch Occupancy Sensor	1	0.00	250	\$50.66	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	001	A25A	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167	167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	A27	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A29	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A25A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$117.3	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	A28A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$117.3	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	A26	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	8760	6662	\$1,351.0	None Proposed	15	760.5	0.76	8760	6132	6662	4663	Ceiling Mounted Occupancy Sensor	1	0.00	1999	\$405.31	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A28A	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	4015	3664	\$743.1	None Proposed	18	912.6	0.91	4015	2810.5	3664	2565	Ceiling Mounted Occupancy Sensor	1	0.00	1099	\$222.92	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A30	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	4015	3664	\$743.1	None Proposed	18	912.6	0.91	4015	2810.5	3664	2565	Ceiling Mounted Occupancy Sensor	1	0.00	1099	\$222.92	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A32	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$608.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2099	Ceiling Mounted Occupancy Sensor	1	0.00	899	\$182.39	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A34	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	15	760.5	0.76	3285	2498	\$506.6	None Proposed	15	760.5	0.76	3285	2299.5	2498	1749	Ceiling Mounted Occupancy Sensor	1	0.00	749	\$151.99	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	Hall	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	45	1143	1.14	4015	4589	\$930.7	None Proposed	45	1143	1.14	4015	2810.5	4589	4589	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	LA9 Girls Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	304.2	0.30	500	152	\$30.8	None Proposed	6	304.2	0.30	500	350	152	106	Automatic Wall Switch Occupancy Sensor	1	0.00	46	\$9.25	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Knolls High School - Interior	001	Storage	60W Incandescent Fixture	1	60	0.06	500	30	\$6.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$4.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Knolls High School - Interior	001	Boys Restroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$135.1	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Ceiling Mounted Occupancy Sensor	1	0.00	200	\$40.53	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A31	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	8	896	0.90	3285	2943	\$596.9	None Proposed	8	896	0.90	3285	2299.5	2943	2060	Ceiling Mounted Occupancy Sensor	1	0.00	883	\$179.07	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A31	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	304.2	0.30	3285	999	\$202.7	None Proposed	6	304.2	0.30	3285	2299.5	999	999	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	A31A	75W Incandescent Fixture	15	1125	1.13	3285	3696	\$749.5	Replace 75W Incandescent Fixture with 25W CFL	15	375	0.38	3285	2299.5	1232	862	Ceiling Mounted Occupancy Sensor	1	0.75	2833	\$574.60	\$0.0	\$7.0	\$20.0	\$103.0	\$73.5	\$20.0	\$7.0	\$27.0	\$373.5	\$208.0	\$581.5	
Morris Knolls High School - Interior	001	A31 Hall	60W Incandescent Fixture	2	120	0.12	3285	394	\$79.9	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$62.62	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0	
Morris Knolls High School - Interior	001	LA11	60W Incandescent Fixture	2	120	0.12	3285	394	\$79.9	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$62.62	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0	
Morris Knolls High School - Interior	001	LA11	24" Fluorescent w/ 1 T8 Lamp	1	16	0.02	3285	53	\$10.7	None Proposed	0	16	0.02	3285	2299.5	53	53	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	LA10	24" Fluorescent w/ 1 T8 Lamp	1	16	0.02	3285	53	\$10.7	None Proposed	0	16	0.02	3285	2299.5	53	53	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	LA10	60W Incandescent Fixture	2	120	0.12	3285	394	\$79.9	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$62.62	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0	
Morris Knolls High School - Interior	001	A35	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	9	456.3	0.46	3285	1499	\$304.0	None Proposed	9	456.3	0.46	3285	2299.5	1499	1049	Ceiling Mounted Occupancy Sensor	1	0.00	450	\$91.20	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A35B	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	3285	83	\$16.9	None Proposed	1	25.4	0.03	3285	2299.5	83	83	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	001	A37	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	27	1368.9	1.37	3285	4497	\$912.0	None Proposed	27	1368.9	1.37	3285	2299.5	4497	3148	Ceiling Mounted Occupancy Sensor	1	0.00	1349	\$273.59	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Knolls High School - Interior	001	A36	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$33.8	None Proposed	1	50.7	0.05	3285	2299.5	167																		

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Future Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Balasts/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total		
Morris Knolls High School - Interior	001	Boys Restroom Hall	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	1	52	0.05	4015	209	\$42.3	None Proposed	1	52	0.05	4015	2810.5	209	209	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	A58	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	704	0.70	3285	2313	\$469.0	None Proposed	8	704	0.70	3285	2299.5	2313	2313	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	A62	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	264	0.26	3285	867	\$175.9	None Proposed	3	264	0.26	3285	2299.5	867	867	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	A60	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	405.6	0.41	3285	1332	\$270.2	None Proposed	8	405.6	0.41	3285	2299.5	1332	1332	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	Hall	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	9	455.3	0.46	4015	1832	\$371.5	None Proposed	9	455.3	0.46	4015	2810.5	1832	1832	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	Lobby	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	34	1723.8	1.72	4015	6921	\$1,403.6	None Proposed	34	1723.8	1.72	4015	2810.5	6921	6921	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	Foyer	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	2	104	0.10	4015	418	\$84.7	None Proposed	2	104	0.10	4015	2810.5	418	418	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	-	Stairwell	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	8760	888	\$180.1	None Proposed	2	101.4	0.10	8760	6132	888	888	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	-	Stairwell	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	8760	1777	\$360.3	None Proposed	4	202.8	0.20	8760	6132	1777	1777	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	-	A56	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$67.6	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.27	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	Board of Education Hall	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	4015	5653	\$1,146.5	None Proposed	16	1408	1.41	4015	2810.5	5653	5653	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	117	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	9	1008	1.01	3285	3311	\$671.5	None Proposed	9	1008	1.01	3285	2299.5	3311	2318	Ceiling Mounted Occupancy Sensor	1	0.00	993	\$201.46	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Knolls High School - Interior	001	117	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	3285	368	\$74.6	None Proposed	0	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	117 Desk Light	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	1	42.8	0.04	3285	141	\$28.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	24.32	0.02	3285	2299.5	80	80	None Proposed	0	0.02	61	\$12.31	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$65.0	\$40.0	\$105.0
Morris Knolls High School - Interior	001	Closet	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	1	42.8	0.04	500	21	\$4.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	24.32	0.02	500	350	12	12	None Proposed	0	0.02	9	\$1.87	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$65.0	\$40.0	\$105.0
Morris Knolls High School - Interior	001	116	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	115	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	4	101.6	0.10	3285	334	\$67.7	None Proposed	4	101.6	0.10	3285	2299.5	334	234	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$20.31	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	114	8" T12 Fixture w/ 2 8" T12 Bulb	2	454	0.45	3285	1491	\$302.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	218	0.22	3285	2299.5	716	501	Ceiling Mounted Occupancy Sensor	1	0.24	990	\$200.79	\$15.0	\$20.0	\$65.0	\$103.0	\$73.5	\$65.0	\$35.0	\$100.0	\$203.5	\$173.0	\$376.5		
Morris Knolls High School - Interior	001	118	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	3285	4625	\$938.0	None Proposed	16	1408	1.41	3285	2299.5	4625	3238	Ceiling Mounted Occupancy Sensor	1	0.00	1388	\$281.40	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Knolls High School - Interior	001	118	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	5	560	0.56	3285	1840	\$373.1	None Proposed	5	560	0.56	3285	2299.5	1840	1840	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	118 Undercabinet	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	2	85.6	0.09	3285	281	\$57.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	48.64	0.05	3285	2299.5	160	160	None Proposed	0	0.04	121	\$24.62	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$130.0	\$80.0	\$210.0
Morris Knolls High School - Interior	001	113 Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	3285	83	\$16.9	None Proposed	1	25.4	0.03	3285	2299.5	83	83	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	LG1	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	50.8	0.05	3285	167	\$33.8	None Proposed	2	50.8	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.15	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	LG1	75W Incandescent Fixture	3	225	0.23	3285	739	\$149.9	Replace 75W Incandescent Fixture with 25W CFL	3	75	0.08	3285	2299.5	246	246	None Proposed	0	0.15	493	\$99.93	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$60.0	\$21.0	\$81.0		
Morris Knolls High School - Interior	001	LG2	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	50.8	0.05	3285	167	\$33.8	None Proposed	2	50.8	0.05	3285	2299.5	167	117	Automatic Wall Switch Occupancy Sensor	1	0.00	50	\$10.15	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	LG2	75W Incandescent Fixture	3	225	0.23	3285	739	\$149.9	Replace 75W Incandescent Fixture with 25W CFL	3	75	0.08	3285	2299.5	246	246	None Proposed	0	0.15	493	\$99.93	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$60.0	\$21.0	\$81.0		
Morris Knolls High School - Interior	001	112	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$351.8	None Proposed	6	528	0.53	3285	2299.5	1734	1214	Automatic Wall Switch Occupancy Sensor	1	0.00	520	\$105.53	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	112	2X2 Troffers w/ 4-T8 Lamps w/ Electronic Ballasts	1	120	0.12	3285	394	\$79.9	None Proposed	0	120	0.12	3285	2299.5	394	394	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	111	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	9	792	0.79	3285	2602	\$527.6	None Proposed	9	792	0.79	3285	2299.5	2602	1821	Automatic Wall Switch Occupancy Sensor	1	0.00	781	\$158.29	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	110 Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	500	13	\$2.6	None Proposed	1	25.4	0.03	500	350	13	13	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	109 Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	50.8	0.05	500	25	\$5.2	None Proposed	2	50.8	0.05	500	350	25	25	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	108 Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	50.8	0.05	500	25	\$5.2	None Proposed	2	50.8	0.05	500	350	25	25	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	107	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	3285	83	\$16.9	None Proposed	1	25.4	0.03	3285	2299.5	83	83	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	105	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$351.8	None Proposed	6	528	0.53	3285	2299.5	1734	1214	Automatic Wall Switch Occupancy Sensor	1	0.00	520	\$105.53	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	106	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	3285	2299.5	1156	809	Automatic Wall Switch Occupancy Sensor	1	0.00	347	\$70.35	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	102	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$351.8	None Proposed	6	528	0.53	3285	2299.5	1734	1214	Automatic Wall Switch Occupancy Sensor	1	0.00	520	\$105.53	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Knolls High School - Interior	001	102 Bathroom	24" Fluorescent w/ 1 T12 Lamp	1	28	0.03	3285	92	\$18.7	None Proposed	0	28	0.03	3285	2299.5	92	92	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	001	102 Closet	200W Incandescent Fixture	1	150	0.15	3285	493	\$99.9	Replace 200W Incandescent Fixture with 40W CFL	1	40	0.04	3285	2299.5	131	131	None Proposed	0	0.11	361	\$73.28	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$20.0	\$7.0	\$27.0		
Morris Knolls High School - Interior	001	101	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$234.5	None Proposed	4	352	0.35	32																					

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Knolls High School - Interior	000	Storage Room	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	5	214	0.21	500	107	\$21.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	5	121.6	0.12	500	350	61	61	None Proposed	0	0.09	46	\$9.37	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$325.0	\$200.0	\$525.0	
Morris Knolls High School - Interior	000	Rifle Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	500	171	\$34.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	500	350	97	97	None Proposed	0	0.15	74	\$15.01	\$70.0	\$10.0	\$65.0	\$0.0	\$0.0	\$65.0	\$80.0	\$145.0	\$260.0	\$320.0	\$580.0	
Morris Knolls High School - Interior	000	Rifle Room	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	16	684.8	0.68	500	342	\$69.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	16	389.12	0.39	500	350	195	195	None Proposed	0	0.30	148	\$29.98	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$1,040.0	\$640.0	\$1,680.0	
Morris Knolls High School - Interior	000	Rifle Room	65W Incandescent Fixture	6	390	0.39	500	195	\$39.5	Replace 65W Incandescent Fixture with 13W CFL	6	78	0.08	500	350	39	39	None Proposed	0	0.31	156	\$31.64	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$120.0	\$30.0	\$150.0	
Morris Knolls High School - Interior	000	Grounds Garage	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	11	941.6	0.94	3285	3093	\$627.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	11	534.6	0.53	3285	2299.5	1756	1756	None Proposed	0	0.41	1337	\$271.14	\$70.0	\$10.0	\$65.0	\$0.0	\$0.0	\$65.0	\$80.0	\$145.0	\$715.0	\$880.0	\$1,595.0	
Morris Knolls High School - Interior	000	Grounds Garage	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	7	354.9	0.35	3285	1166	\$236.4	None Proposed	7	354.9	0.35	3285	2299.5	1166	1166	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	000	Sports Storage	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$608.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2998	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Interior	-	Stairwell	75W Incandescent Fixture	18	1350	1.35	8760	11826	\$2,398.3	Replace 75W Incandescent Fixture with 25W CFL	18	450	0.45	8760	6132	3942	3942	None Proposed	0	0.90	7884	\$1,598.88	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$360.0	\$126.0	\$486.0	
Morris Knolls High School - Interior	-	Stairwell	75W Incandescent Fixture	8	600	0.60	8760	5256	\$1,065.9	Replace 75W Incandescent Fixture with 25W CFL	8	200	0.20	8760	6132	1752	1752	None Proposed	0	0.40	3504	\$710.61	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$160.0	\$66.0	\$216.0	
Morris Knolls High School - Interior	-	Stairwell	75W Incandescent Fixture	10	750	0.75	8760	6570	\$1,332.4	Replace 75W Incandescent Fixture with 25W CFL	10	250	0.25	8760	6132	2190	2190	None Proposed	0	0.50	4380	\$888.26	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$200.0	\$70.0	\$270.0	
Morris Knolls High School - Interior	-	Stairwell	65W Incandescent Fixture	3	195	0.20	8760	1708	\$346.4	Replace 65W Incandescent Fixture with 13W CFL	3	39	0.04	8760	6132	342	342	None Proposed	0	0.16	1367	\$277.14	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$60.0	\$15.0	\$75.0	
Morris Knolls High School - Interior	-	Stairwell	75W Incandescent Fixture	13	975	0.98	8760	8541	\$1,732.1	Replace 75W Incandescent Fixture with 25W CFL	13	325	0.33	8760	6132	2847	2847	None Proposed	0	0.65	5694	\$1,154.74	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$260.0	\$91.0	\$351.0	
Morris Knolls High School - Interior	-	Stairwell	65W Incandescent Fixture	3	195	0.20	8760	1708	\$346.4	Replace 65W Incandescent Fixture with 13W CFL	3	39	0.04	8760	6132	342	342	None Proposed	0	0.16	1367	\$277.14	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$60.0	\$15.0	\$75.0	
Morris Knolls High School - Interior	-	Stairwell	75W Incandescent Fixture	4	300	0.30	8760	2628	\$533.0	Replace 75W Incandescent Fixture with 25W CFL	4	100	0.10	8760	6132	876	876	None Proposed	0	0.20	1752	\$355.31	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$80.0	\$28.0	\$108.0	
Morris Knolls High School - Interior	-	Stairwell	1x4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.03	8760	223	\$45.1	None Proposed	1	25.4	0.03	8760	6132	223	223	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	-	Stairwell	1x4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	8760	888	\$180.1	None Proposed	2	101.4	0.10	8760	6132	888	888	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Knolls High School - Interior	-	Exit Signs	CFL Exit Sign	58	928	0.93	8760	8129	\$1,648.6	Replace CFL Exit Sign with LED Exit Sign	58	290	0.29	8760	6132	2540	2540	None Proposed	0	0.64	5589	\$1,133.42	\$0.0	\$61.0	\$63.0	\$0.0	\$0.0	\$63.0	\$61.0	\$124.0	\$3,654.0	\$3,538.0	\$7,192.0	
Morris Knolls High School - Interior	-	Exit Signs	LED Exit Sign	173	865	0.87	8760	7577	\$1,536.7	None Proposed	173	865	0.87	8760	6132	7577	7577	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Exterior	-	Walkway Lights	Exterior Fixture - 35W High Pressure Sodium	19	874	0.87	5110	4466	\$905.7	None Proposed	19	874	0.87	5110	3577	4466	4466	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Exterior	-	Parking	400W MH Flood Light	5	2290	2.29	5110	11702	\$2,373.1	Replace 400W Fixture with Induction Light Fixture	5	1075	1.08	5110	3577	5493	5493	None Proposed	0	1.22	6209	\$1,259.11	\$0.0	\$485.0	\$137.0	\$0.0	\$0.0	\$137.0	\$485.0	\$622.0	\$685.0	\$2,425.0	\$3,110.0	
Morris Knolls High School - Exterior	-	Parking	Exterior Fixture - 400W High Pressure Sodium	4	1860	1.86	5110	9505	\$1,927.5	Replace 400W Fixture with Induction Light Fixture	4	860	0.86	5110	3577	4395	4395	None Proposed	0	1.00	5110	\$1,036.31	\$0.0	\$485.0	\$137.0	\$0.0	\$0.0	\$137.0	\$485.0	\$622.0	\$548.0	\$1,940.0	\$2,488.0	
Morris Knolls High School - Exterior	-	Parking	175W MH Fixture	3	645	0.65	5110	3296	\$668.4	Replace 175W MH Fixture with Induction Light Fixture	3	330	0.33	5110	3577	1686	1686	None Proposed	0	0.32	1610	\$326.44	\$0.0	\$390.0	\$137.0	\$0.0	\$0.0	\$137.0	\$390.0	\$527.0	\$411.0	\$1,170.0	\$1,581.0	
Morris Knolls High School - Exterior	-	Drive Way	250W HPS Fixture	8	2280	2.28	5110	11651	\$2,362.8	Replace 250W Fixture with Induction Light Fixture	8	880	0.88	5110	3577	4497	4497	None Proposed	0	1.40	7154	\$1,450.83	\$0.0	\$390.0	\$137.0	\$0.0	\$0.0	\$137.0	\$390.0	\$527.0	\$1,096.0	\$3,120.0	\$4,216.0	
Morris Knolls High School - Exterior	-	Wall Pack	70W High Pressure Sodium Wall Pack	19	1710	1.71	5110	8738	\$1,772.1	Replace 70W Fixture with Induction Light Fixture	19	836	0.84	5110	3577	4272	4272	None Proposed	0	0.87	4466	\$905.73	\$0.0	\$380.0	\$137.0	\$0.0	\$0.0	\$137.0	\$380.0	\$517.0	\$2,603.0	\$7,220.0	\$9,823.0	
Morris Knolls High School - Exterior	-	Wall Pack	Exterior Fixture - 400W High Pressure Sodium	2	930	0.93	5110	4752	\$963.8	Replace 400W Fixture with Induction Light Fixture	2	430	0.43	5110	3577	2197	2197	None Proposed	0	0.50	2555	\$518.15	\$0.0	\$485.0	\$137.0	\$0.0	\$0.0	\$137.0	\$485.0	\$622.0	\$274.0	\$970.0	\$1,244.0	
Morris Knolls High School - Exterior	-	Wall Pack	Exterior Fixture - 35W High Pressure Sodium	15	690	0.69	5110	3526	\$715.1	None Proposed	15	690	0.69	5110	3577	3526	3526	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Knolls High School - Exterior	-	Canopy	75W Incandescent Fixture	17	1275	1.28	5110	6515	\$1,321.3	Replace 75W Incandescent Fixture with 25W CFL	17	425	0.43	5110	3577	2172	2172	None Proposed	0	0.85	4344	\$880.86	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$340.0	\$119.0	\$459.0	
Morris Hills High School - Interior	002	251 Science Office	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	6	660	0.66	3285	2168	\$363.8	None Proposed	6	660	0.66	3285	2299.5	2168	2168	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	254	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	33	3630	3.63	3285	11925	\$2,000.9	None Proposed	33	3630	3.63	3285	2299.5	11925	11925	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	254 Prep Hall	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	289	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	254 Prep Room	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	264	0.26	3285	867	\$145.5	None Proposed	3	264	0.26	3285	2299.5	867	867	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	258	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	33	3630	3.63	3285	11925	\$2,000.9	None Proposed	33	3630	3.63	3285	2299.5	11925	11925	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	252	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	252 Prep Hall	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	252 Prep Room	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	257	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	257 Prep Hall	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	257 Prep Room	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	002	261	1x4 Fixtures w/ 2-T5HO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed</																								

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kWh Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total		
Morris Hills High School - Interior	002	216	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	002	231A	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Girls Restroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$83.8	None Proposed	3	152.1	0.15	3285	2299.5	500	350	Ceiling Mounted Occupancy Sensor	1	0.00	150	\$25.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	002	Hallway	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	10	880	0.88	4015	3533	\$592.9	None Proposed	10	880	0.88	4015	2810.5	3533	3533	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Hallway	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	11	968	0.97	4015	3887	\$652.2	None Proposed	11	968	0.97	4015	2810.5	3887	3887	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Hallway	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	44	2230.8	2.23	4015	8957	\$1,502.9	None Proposed	44	2230.8	2.23	4015	2810.5	8957	8957	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Hallway	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	20	1040	1.04	4015	4176	\$700.7	None Proposed	20	1040	1.04	4015	2810.5	4176	4176	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Hallway	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	4015	450	\$75.5	None Proposed	0	112	0.11	4015	2810.5	450	450	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	263	1X4 Fixtures w/ 2-T9HO Lamps w/ Electronic Ballasts	36	3960	3.96	3285	13009	\$2,182.8	None Proposed	36	3960	3.96	3285	2299.5	13009	13009	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Girls Bathroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$83.8	None Proposed	3	152.1	0.15	3285	2299.5	500	500	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Library	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	36	3168	3.17	3285	10407	\$1,746.3	None Proposed	36	3168	3.17	3285	2299.5	10407	10407	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Library	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$558.9	None Proposed	20	1014	1.01	3285	2299.5	3331	3331	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	002	Library	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	20	856	0.86	3285	2812	\$471.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	20	486.4	0.49	3285	2299.5	1598	1598	None Proposed	0	0.37	1214	\$203.73	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$1,300.0	\$800.0	\$2,100.0		
Morris Hills High School - Interior	002	212	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	264	0.26	3285	867	\$145.5	None Proposed	3	264	0.26	3285	2299.5	867	607	Ceiling Mounted Occupancy Sensor	1	0.00	260	\$43.66	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	209	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$335.4	None Proposed	12	608.4	0.61	3285	2299.5	1999	1399	Ceiling Mounted Occupancy Sensor	1	0.00	600	\$100.61	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	208	60W Incandescent Fixture	1	60	0.06	500	30	\$5.0	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$3.94	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$30.0	\$5.0	\$25.0		
Morris Hills High School - Interior	002	205 Womens Restroom	60W Incandescent Fixture	4	240	0.24	3285	788	\$132.3	Replace 60W Incandescent Fixture with 13W CFL	4	52	0.05	3285	2299.5	171	120	Automatic Wall Switch Occupancy Sensor	1	0.19	669	\$112.23	\$0.0	\$5.0	\$20.0	\$63.5	\$45.0	\$20.0	\$5.0	\$25.0	\$125.0	\$83.5	\$208.5		
Morris Hills High School - Interior	002	Rooms Above Auditorium	75W Incandescent Fixture	12	900	0.90	500	450	\$75.5	Replace 75W Incandescent Fixture with 25W CFL	12	300	0.30	500	350	150	150	None Proposed	0	0.60	300	\$50.34	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$240.0	\$84.0	\$324.0		
Morris Hills High School - Interior	002	Upper Auditorium Storage	60W Incandescent Fixture	3	180	0.18	3285	591	\$99.2	Replace 60W Incandescent Fixture with 13W CFL	3	39	0.04	3285	2299.5	128	128	None Proposed	0	0.14	463	\$77.72	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$60.0	\$15.0	\$75.0		
Morris Hills High School - Interior	002	Upper Auditorium Storage	300W Incandescent Fixture	6	1800	1.80	3285	5913	\$992.2	Replace 300W Incandescent Fixture with 65W CFL	6	390	0.39	3285	2299.5	1281	1281	None Proposed	0	1.41	4632	\$777.22	\$0.0	\$25.0	\$20.0	\$0.0	\$0.0	\$20.0	\$25.0	\$45.0	\$120.0	\$150.0	\$270.0		
Morris Hills High School - Interior	002	250	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	247	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$558.9	None Proposed	20	1014	1.01	3285	2299.5	3331	2332	Ceiling Mounted Occupancy Sensor	1	0.00	999	\$167.68	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	246	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	32	1622.4	1.62	3285	5330	\$894.3	None Proposed	32	1622.4	1.62	3285	2299.5	5330	3731	Ceiling Mounted Occupancy Sensor	2	0.00	1599	\$268.29	\$0.0	\$0.0	\$0.0	\$206.0	\$147.0	\$0.0	\$0.0	\$0.0	\$294.0	\$412.0	\$706.0		
Morris Hills High School - Interior	002	243	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	243 Closet	60W Incandescent Fixture	6	360	0.36	500	180	\$30.2	Replace 60W Incandescent Fixture with 13W CFL	6	78	0.08	500	350	39	39	None Proposed	0	0.28	141	\$23.66	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$120.0	\$30.0	\$150.0		
Morris Hills High School - Interior	002	240 Closet	60W Incandescent Fixture	6	360	0.36	500	180	\$30.2	Replace 60W Incandescent Fixture with 13W CFL	6	78	0.08	500	350	39	39	None Proposed	0	0.28	141	\$23.66	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$120.0	\$30.0	\$150.0		
Morris Hills High School - Interior	002	Display Case	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	1	42.8	0.04	4015	172	\$28.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	24.32	0.02	4015	2810.5	98	98	None Proposed	0	0.02	74	\$12.45	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$65.0	\$40.0	\$105.0		
Morris Hills High School - Interior	002	Boys Restroom Hall	1X2 Troffers w/ 2-T12 Lamps w/ Electronic Ballasts	1	56	0.06	4015	225	\$37.7	None Proposed	1	56	0.06	4015	2810.5	225	225	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Morris Hills High School - Interior	002	Janitor Closet	60W Incandescent Fixture	2	120	0.12	500	60	\$10.1	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	500	350	13	13	None Proposed	0	0.09	47	\$7.89	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0		
Morris Hills High School - Interior	002	Boys Restroom	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	336	0.34	3285	1104	\$185.2	None Proposed	3	336	0.34	3285	2299.5	1104	773	Ceiling Mounted Occupancy Sensor	1	0.00	331	\$55.56	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	Boys Restroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	3285	368	\$61.7	None Proposed	0	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Morris Hills High School - Interior	002	237	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	20	1760	1.76	3285	5782	\$970.2	None Proposed	20	1760	1.76	3285	2299.5	5782	4047	Ceiling Mounted Occupancy Sensor	1	0.00	1734	\$291.05	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	Display Case	65W Incandescent Fixture	2	130	0.13	4015	522	\$87.6	Replace 65W Incandescent Fixture with 13W CFL	2	26	0.03	4015	2810.5	104	104	None Proposed	0	0.10	418	\$70.07	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0		
Morris Hills High School - Interior	002	236	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	24	2112	2.11	3285	6938	\$1,164.2	None Proposed	24	2112	2.11	3285	2299.5	6938	4857	Ceiling Mounted Occupancy Sensor	1	0.00	2081	\$349.25	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5		
Morris Hills High School - Interior	002	226 AV Storage	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	7	354.9	0.35	500	177	\$29.8	None Proposed	7	354.9	0.35	500	350	177	124	Automatic Wall Switch Occupancy Sensor	1	0.00	53	\$8.93	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Hills High School - Interior	002	227	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$111.8	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Automatic Wall Switch Occupancy Sensor	1	0.00	200	\$33.54	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5		
Morris Hills High School - Interior	002	231B Closet	60W Incandescent Fixture	2	120	0.12	500	60	\$10.1	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	500	350	13	13	None Proposed	0	0.09	47	\$7.89	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0		
Morris Hills High School - Interior	002	224	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$503.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2998	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0		
Morris Hills High School - Interior	002	225	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	5330	\$894.3	None Proposed	12	608.4	0.61	8760	6132																				

Appendix D - Lighting Spreadsheets

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Balloon/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total
Morris Hills High School - Interior	002	207 Mens Restroom	60W Incandescent Fixture	1	60	0.06	3285	197	\$33.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	3285	2299.5	43	30	Automatic Wall Switch Occupancy Sensor	1	0.05	167	\$28.06	\$0.0	\$5.0	\$20.0	\$63.5	\$45.0	\$20.0	\$5.0	\$25.0	\$65.0	\$68.5	\$133.5
Morris Hills High School - Interior	002	207 Lounge Area	1x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	23	2953.2	2.95	3285	9701	\$1,627.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	23	1679	1.68	3285	2299.5	5516	3861	Ceiling Mounted Occupancy Sensor	1	1.27	5840	\$980.02	\$85.0	\$15.0	\$65.0	\$103.0	\$73.5	\$65.0	\$100.0	\$165.0	\$1,568.5	\$2,403.0	\$3,971.5
Morris Hills High School - Interior	002	207 Superintendent Office	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	3285	281	\$47.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	3285	2299.5	160	112	Automatic Wall Switch Occupancy Sensor	1	0.04	169	\$28.43	\$70.0	\$10.0	\$65.0	\$63.5	\$45.0	\$65.0	\$80.0	\$145.0	\$110.0	\$143.5	\$253.5
Morris Hills High School - Interior	002	207 Superintendent Office	8' T12 Fixture w/ 2' 8" T12 Bulb	1	227	0.23	3285	746	\$125.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	109	0.11	3285	2299.5	358	358	None Proposed	0	0.12	388	\$65.04	\$15.0	\$20.0	\$65.0	\$0.0	\$0.0	\$65.0	\$35.0	\$100.0	\$65.0	\$35.0	\$100.0
Morris Hills High School - Interior	002	Visual Aids Station	60W Incandescent Fixture	1	60	0.06	500	30	\$5.0	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$3.94	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0
Morris Hills High School - Interior	001	102	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	104	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	105	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	20	1014	1.01	3285	3331	\$558.9	None Proposed	20	1014	1.01	3285	2299.5	3331	2332	Ceiling Mounted Occupancy Sensor	1	0.00	999	\$167.68	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	Stairwell	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	8760	1542	\$258.7	None Proposed	2	176	0.18	8760	6132	1542	1542	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Stairwell	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	8760	771	\$129.4	None Proposed	1	88	0.09	8760	6132	771	771	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Stairwell	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	8760	444	\$74.5	None Proposed	1	50.7	0.05	8760	6132	444	444	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	108	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	107	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	109	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	12	1056	1.06	3285	3469	\$562.1	None Proposed	12	1056	1.06	3285	2299.5	3469	2428	Ceiling Mounted Occupancy Sensor	1	0.00	1041	\$174.63	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	110	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	18	912.6	0.91	3285	2998	\$503.0	None Proposed	18	912.6	0.91	3285	2299.5	2998	2099	Ceiling Mounted Occupancy Sensor	1	0.00	899	\$150.91	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	110 Storage	75W Incandescent Fixture	4	300	0.30	500	150	\$25.2	Replace 75W Incandescent Fixture with 25W CFL	4	100	0.10	500	350	50	50	None Proposed	0	0.20	100	\$16.78	\$0.0	\$7.0	\$20.0	\$0.0	\$0.0	\$20.0	\$7.0	\$27.0	\$80.0	\$28.0	\$108.0
Morris Hills High School - Interior	001	111	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	14	709.8	0.71	3285	2332	\$391.3	None Proposed	14	709.8	0.71	3285	2299.5	2332	2332	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	113	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$335.4	None Proposed	12	608.4	0.61	3285	2299.5	1999	1999	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	118	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$335.4	None Proposed	12	608.4	0.61	3285	2299.5	1999	1399	Ceiling Mounted Occupancy Sensor	1	0.00	600	\$100.61	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	120	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	12	608.4	0.61	3285	1999	\$335.4	None Proposed	12	608.4	0.61	3285	2299.5	1999	1399	Ceiling Mounted Occupancy Sensor	1	0.00	600	\$100.61	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	Boys Restroom	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.26	3285	844	\$141.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.15	3285	2299.5	479	335	Ceiling Mounted Occupancy Sensor	1	0.11	508	\$85.30	\$70.0	\$10.0	\$65.0	\$103.0	\$73.5	\$65.0	\$80.0	\$145.0	\$268.5	\$343.0	\$611.5
Morris Hills High School - Interior	001	Boys Restroom Hall	1X2 Troffers w/ 2-T12 Lamps w/ Electronic Ballasts	1	56	0.06	4015	225	\$37.7	None Proposed	1	56	0.06	4015	2810.5	225	225	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Janitor Closet	60W Incandescent Fixture	2	120	0.12	500	60	\$10.1	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	500	350	13	13	None Proposed	0	0.09	47	\$7.89	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0
Morris Hills High School - Interior	001	133 Stock Room	60W Incandescent Fixture	4	240	0.24	500	120	\$20.1	Replace 60W Incandescent Fixture with 13W CFL	4	52	0.05	500	350	26	26	None Proposed	2	0.19	94	\$15.77	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$80.0	\$20.0	\$100.0
Morris Hills High School - Interior	001	125	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	15	1320	1.32	3285	4336	\$727.6	None Proposed	15	1320	1.32	3285	2299.5	4336	3035	Ceiling Mounted Occupancy Sensor	1	0.00	1301	\$218.28	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	127	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	20	1760	1.76	3285	5782	\$870.2	None Proposed	20	1760	1.76	3285	2299.5	5782	4047	Ceiling Mounted Occupancy Sensor	1	0.00	1734	\$291.05	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	126	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	124	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	3285	4625	\$776.1	None Proposed	16	1408	1.41	3285	2299.5	4625	3238	Ceiling Mounted Occupancy Sensor	1	0.00	1388	\$232.84	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	129	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	16	811.2	0.81	3285	2665	\$447.2	None Proposed	16	811.2	0.81	3285	2299.5	2665	1865	Ceiling Mounted Occupancy Sensor	1	0.00	799	\$134.15	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	-	Stairwell	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	8760	1542	\$258.7	None Proposed	2	176	0.18	8760	6132	1542	1542	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	-	Stairwell	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	8760	771	\$129.4	None Proposed	1	88	0.09	8760	6132	771	771	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	-	Stairwell	60W Incandescent Fixture	2	120	0.12	8760	1051	\$176.4	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	8760	6132	228	228	None Proposed	0	0.09	823	\$138.17	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0
Morris Hills High School - Interior	001	Gym 1	400W Metal Halide Fixtures	17	7786	7.79	3285	25577	\$4,291.8	Replace Metal Halide Fixtures with 6-Lamp Fluorescent Highbay Fixtures	17	3842	3.84	3285	2299.5	12621	12621	None Proposed	0	3.94	12956	\$2,174.02	\$168.0	\$105.0	\$100.0	\$0.0	\$0.0	\$100.0	\$273.0	\$373.0	\$1,700.0	\$4,641.0	\$6,341.0
Morris Hills High School - Interior	001	Boys Locker Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	18	1584	1.58	3285	5203	\$873.1	None Proposed	18	1584	1.58	3285	2299.5	5203	3642	Ceiling Mounted Occupancy Sensor	2	0.00	1561	\$261.94	\$0.0	\$0.0	\$0.0	\$206.0	\$147.0	\$0.0	\$0.0	\$0.0	\$294.0	\$412.0	\$706.0
Morris Hills High School - Interior	001	Boys Locker Shower	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	8	416	0.42	3285	1367	\$229.3	None Proposed	8	416	0.42	3285	2299.5	1367	1367	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	327 Gym Tech Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	405	Automatic Wall Switch Occupancy Sensor	1	0.00	173	\$29.10	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Hills High School - Interior	001	Boys Team Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$291.0	None Proposed	6	528	0.53	3285	2299.5	1734	1214	Automatic Wall Switch Occupancy Sensor	1	0.00	520	\$87.31	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5
Morris Hills High School - Interior	001	Locker Room Hall	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	4015	353	\$59.3	None Proposed	1	88	0.09	4015	2810.5	353	353	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Locker Room Hall	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1																													

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total		
Morris Hills High School - Interior	001	327 Coach's Bath	1x4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$65.9	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Automatic Wall Switch Occupancy Sensor	1	0.00	100	\$16.77	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	437	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$194.0	None Proposed	4	352	0.35	3285	2299.5	1156	1156	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	439	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	704	0.70	3285	2313	\$388.1	None Proposed	8	704	0.70	3285	2299.5	2313	2313	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	441	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	4	352	0.35	3285	1156	\$194.0	None Proposed	4	352	0.35	3285	2299.5	1156	1156	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	10	507	0.51	4015	2036	\$341.6	None Proposed	10	507	0.51	4015	2610.5	2036	2036	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	433	2x2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	56	0.06	3285	184	\$30.9	None Proposed	0	56	0.06	3285	2299.5	184	184	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	433	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	1	52	0.05	3285	171	\$28.7	None Proposed	1	52	0.05	3285	2299.5	171	171	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	433	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	6	770.4	0.77	3285	2531	\$424.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	438	0.44	3285	2299.5	1439	1439	None Proposed	0	0.33	1092	\$183.23	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$390.0	\$600.0	\$990.0		
Morris Hills High School - Interior	001	422	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	4	513.6	0.51	3285	1687	\$283.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	292	0.29	3285	2299.5	959	959	None Proposed	0	0.22	728	\$122.15	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$260.0	\$400.0	\$660.0		
Morris Hills High School - Interior	001	424	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	8	1027.2	1.03	3285	3374	\$566.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	8	584	0.58	3285	2299.5	1918	1918	None Proposed	0	0.44	1456	\$244.30	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$520.0	\$800.0	\$1,320.0		
Morris Hills High School - Interior	001	426	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	4	513.6	0.51	3285	1687	\$283.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	292	0.29	3285	2299.5	959	959	None Proposed	0	0.22	728	\$122.15	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$260.0	\$400.0	\$660.0		
Morris Hills High School - Interior	001	404A	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	500	25	\$4.3	None Proposed	1	50.7	0.05	500	350	25	25	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	417	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	7	898.8	0.90	3285	2953	\$495.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	7	511	0.51	3285	2299.5	1679	1679	None Proposed	0	0.39	1274	\$213.76	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$455.0	\$700.0	\$1,155.0		
Morris Hills High School - Interior	001	417	2x4 Fixtures w/ 3-T12 Lamp Fixture w/ Magnetic Ballast	2	256.8	0.26	3285	844	\$141.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	146	0.15	3285	2299.5	480	480	None Proposed	0	0.11	364	\$61.08	\$85.0	\$15.0	\$65.0	\$0.0	\$0.0	\$65.0	\$100.0	\$165.0	\$130.0	\$200.0	\$330.0		
Morris Hills High School - Interior	001	404B	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	500	51	\$8.5	None Proposed	2	101.4	0.10	500	350	51	51	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	415	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	43	2180.1	2.18	3285	7162	\$1,201.7	None Proposed	43	2180.1	2.18	3285	2299.5	7162	7162	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	415	1x2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	9	456.3	0.46	3285	1499	\$251.5	None Proposed	9	456.3	0.46	3285	2299.5	1499	1499	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	413	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	42	2129.4	2.13	3285	6995	\$1,173.8	None Proposed	42	2129.4	2.13	3285	2299.5	6995	6995	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	413	1x2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	5	253.5	0.25	3285	833	\$139.7	None Proposed	5	253.5	0.25	3285	2299.5	833	833	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	407	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	34	1723.8	1.72	3285	5663	\$950.2	None Proposed	34	1723.8	1.72	3285	2299.5	5663	5663	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	411	1x4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	5	253.5	0.25	3285	833	\$139.7	None Proposed	5	253.5	0.25	3285	2299.5	833	833	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	411	2x4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	112	0.11	3285	368	\$61.7	None Proposed	1	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Cafeteria	2x2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	7	392	0.39	3285	1288	\$216.1	None Proposed	0	392	0.39	3285	2299.5	1288	1288	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Cafeteria	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	98	4968.6	4.97	3285	16322	\$2,738.8	None Proposed	98	4968.6	4.97	3285	2299.5	16322	16322	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Cafeteria	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	32	2816	2.82	3285	9251	\$1,552.2	None Proposed	32	2816	2.82	3285	2299.5	9251	9251	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Kitchen	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	11	941.6	0.94	3285	3093	\$519.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	11	534.6	0.53	3285	2299.5	1756	1756	None Proposed	0	0.41	1337	\$224.35	\$70.0	\$10.0	\$65.0	\$0.0	\$0.0	\$65.0	\$80.0	\$145.0	\$715.0	\$880.0	\$1,595.0		
Morris Hills High School - Interior	001	Kitchen	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	10	856	0.86	3285	2812	\$471.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	10	486	0.49	3285	2299.5	1597	1597	None Proposed	0	0.37	1215	\$203.95	\$70.0	\$10.0	\$65.0	\$0.0	\$0.0	\$65.0	\$80.0	\$145.0	\$650.0	\$800.0	\$1,450.0		
Morris Hills High School - Interior	001	Kitchen Office	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	289	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	303C Storage	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	4	684.8	0.68	3285	2250	\$377.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	389.2	0.39	3285	2299.5	1279	895	Automatic Wall Switch Occupancy Sensor	1	0.30	1355	\$227.30	\$105.0	\$20.0	\$65.0	\$63.5	\$45.0	\$65.0	\$125.0	\$190.0	\$305.0	\$563.5	\$868.5		
Morris Hills High School - Interior	001	Kitchen Storage	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	3285	562	\$94.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	3285	2299.5	319	224	Automatic Wall Switch Occupancy Sensor	1	0.07	339	\$56.96	\$70.0	\$10.0	\$65.0	\$63.5	\$45.0	\$65.0	\$80.0	\$145.0	\$175.0	\$223.5	\$398.5		
Morris Hills High School - Interior	001	Boys Restroom	2x4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	112	0.11	3285	368	\$61.7	None Proposed	1	112	0.11	3285	2299.5	368	258	Automatic Wall Switch Occupancy Sensor	1	0.00	110	\$18.52	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Restroom	2x4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	112	0.11	3285	368	\$61.7	None Proposed	1	112	0.11	3285	2299.5	368	258	Automatic Wall Switch Occupancy Sensor	1	0.00	110	\$18.52	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Storage Closet	60W Incandescent Fixture	1	60	0.06	500	30	\$5.0	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	500	350	7	7	None Proposed	0	0.05	24	\$3.94	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$30.0	\$5.0	\$25.0	\$30.0	
Morris Hills High School - Interior	001	302	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	405.6	0.41	3285	1332	\$223.6	None Proposed	8	405.6	0.41	3285	2299.5	1332	933	Ceiling Mounted Occupancy Sensor	1	0.00	400	\$67.07	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	001	Health Office	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	405.6	0.41	3285	1332	\$223.6	None Proposed	8	405.6	0.41	3285	2299.5	1332	933	Ceiling Mounted Occupancy Sensor	1	0.00	400	\$67.07	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	001	Sick Room	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	405.6	0.41	3285	1332	\$223.6	None Proposed	8	405.6	0.41	3285	2299.5	1332	933	Ceiling Mounted Occupancy Sensor	1	0.00	400	\$67.07	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	001	Display Case	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	2	85.6	0.09	4015	344	\$57.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	48.64	0.05	4015	2810.5	195	195	None Proposed	0	0.04	148	\$24.90	\$35.0	\$5.0	\$65.0	\$0.0	\$0.0	\$65.0	\$40.0	\$105.0	\$130.0	\$80.0	\$210.0		
Morris Hills High School - Interior	001																																		

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Future Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total		
Morris Hills High School - Interior	001	123	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	21	1848	1.85	3285	6071	\$1,018.7	None Proposed	21	1848	1.85	3285	2299.5	6071	4248	Ceiling Mounted Occupancy Sensor	1	0.00	1821	\$305.60	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5
Morris Hills High School - Interior	001	123 Work Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	202.8	0.20	3285	666	\$111.8	None Proposed	4	202.8	0.20	3285	2299.5	666	466	Automatic Wall Switch Occupancy Sensor	1	0.00	200	\$33.54	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Girls Room	1X4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	3285	333	\$55.9	None Proposed	2	101.4	0.10	3285	2299.5	333	233	Ceiling Mounted Occupancy Sensor	1	0.00	100	\$16.77	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	001	Girls Room	1X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$27.9	None Proposed	1	50.7	0.05	3285	2299.5	167	167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	10	880	0.88	4015	3533	\$592.9	None Proposed	10	880	0.88	4015	2810.5	3533	3533	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	122	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	16	1408	1.41	3285	4625	\$776.1	None Proposed	16	1408	1.41	3285	2299.5	4625	3238	Ceiling Mounted Occupancy Sensor	1	0.00	1388	\$232.84	\$0.0	\$0.0	\$0.0	\$103.0	\$73.5	\$0.0	\$0.0	\$0.0	\$0.0	\$73.5	\$103.0	\$176.5	
Morris Hills High School - Interior	001	Hallway	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	4015	707	\$118.6	None Proposed	2	176	0.18	4015	2810.5	707	707	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	46	2332.2	2.33	4015	9364	\$1,571.2	None Proposed	46	2332.2	2.33	4015	2810.5	9364	9364	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	4015	450	\$75.5	None Proposed	0	112	0.11	4015	2810.5	450	450	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	20	1040	1.04	4015	4176	\$700.7	None Proposed	20	1040	1.04	4015	2810.5	4176	4176	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Girls Bathroom	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	152.1	0.15	3285	500	\$83.8	None Proposed	3	152.1	0.15	3285	2299.5	500	500	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	159	1X4 Fixtures w/ 2-T9HO Lamps w/ Electronic Ballasts	18	1980	1.98	3285	6504	\$1,091.4	None Proposed	18	1980	1.98	3285	2299.5	6504	6504	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	169	1X4 Fixtures w/ 2-T9HO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	167	1X4 Fixtures w/ 2-T9HO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	170	1X4 Fixtures w/ 2-T9HO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Gym Lobby Area	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	4015	707	\$118.6	None Proposed	2	176	0.18	4015	2810.5	707	707	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	338 Girls Locker Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	17	1496	1.50	3285	4914	\$824.6	None Proposed	17	1496	1.50	3285	2299.5	4914	4914	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Locker Restroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Locker Shower Area	2 Lamp - 26W Ballasted Compact Fluorescent Fixture	8	416	0.42	3285	1367	\$229.3	None Proposed	8	416	0.42	3285	2299.5	1367	1367	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	264	0.26	3285	867	\$145.5	None Proposed	3	264	0.26	3285	2299.5	867	867	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	330 Girls Team Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$291.0	None Proposed	6	528	0.53	3285	2299.5	1734	1734	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Auditorium	300W Incandescent Fixture	34	10200	10.20	3285	33507	\$5,622.5	Replace 300W Incandescent Fixture with 65W CFL	34	2210	2.21	3285	2299.5	7260	7260	None Proposed	0	7.99	26247	\$4,404.27	\$0.0	\$25.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$680.0	\$850.0	\$1,530.0		
Morris Hills High School - Interior	001	Right Stage Mezzanine	60W Incandescent Fixture	9	540	0.54	3285	1774	\$297.7	Replace 60W Incandescent Fixture with 13W CFL	9	117	0.12	3285	2299.5	384	384	None Proposed	0	0.42	1390	\$233.17	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$180.0	\$45.0	\$225.0		
Morris Hills High School - Interior	001	Stage	60W Incandescent Fixture	3	180	0.18	3285	591	\$99.2	Replace 60W Incandescent Fixture with 13W CFL	3	39	0.04	3285	2299.5	128	128	None Proposed	0	0.14	463	\$77.72	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$60.0	\$15.0	\$75.0		
Morris Hills High School - Interior	001	Stage	60W Incandescent Fixture	2	120	0.12	3285	394	\$66.1	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$51.81	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0		
Morris Hills High School - Interior	001	Stage Right Storage	60W Incandescent Fixture	2	120	0.12	3285	394	\$66.1	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	3285	2299.5	85	85	None Proposed	0	0.09	309	\$51.81	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$40.0	\$10.0	\$50.0		
Morris Hills High School - Interior	001	Right Stage Atrium	60W Incandescent Fixture	1	60	0.06	3285	197	\$33.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	3285	2299.5	43	43	None Proposed	0	0.05	154	\$25.91	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0		
Morris Hills High School - Interior	001	Chorus Room Bathroom	1X2 Fixture w/ 1-112 Lamp w/ Magnetic Ballasts	1	32	0.03	3285	105	\$17.6	Replace 112 Bulb With High Perf. T8 Bulb, Replace Ballast w/ High Perf. 0.78 Ballast Factor Ballast	1	24.32	0.02	3285	2299.5	80	56	Automatic Wall Switch Occupancy Sensor	1	0.01	49	\$8.26	\$35.0	\$5.0	\$20.0	\$63.5	\$45.0	\$20.0	\$40.0	\$60.0	\$65.0	\$103.5	\$168.5		
Morris Hills High School - Interior	001	Girls Bathroom	60W Incandescent Fixture	3	180	0.18	3285	591	\$99.2	Replace 60W Incandescent Fixture with 13W CFL	3	39	0.04	3285	2299.5	128	128	None Proposed	0	0.14	463	\$77.72	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$60.0	\$15.0	\$75.0		
Morris Hills High School - Interior	001	Band Room Practice Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	202	Automatic Wall Switch Occupancy Sensor	1	0.00	87	\$14.55	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Band Room Practice Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	202	Automatic Wall Switch Occupancy Sensor	1	0.00	87	\$14.55	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Band Room Practice Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	202	Automatic Wall Switch Occupancy Sensor	1	0.00	87	\$14.55	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Band Room Practice Room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	3285	289	\$48.5	None Proposed	1	88	0.09	3285	2299.5	289	202	Automatic Wall Switch Occupancy Sensor	1	0.00	87	\$14.55	\$0.0	\$0.0	\$0.0	\$63.5	\$45.0	\$0.0	\$0.0	\$0.0	\$0.0	\$45.0	\$63.5	\$108.5	
Morris Hills High School - Interior	001	Band Room Hall	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	4015	353	\$59.3	None Proposed	1	88	0.09	4015	2810.5	353	353	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Boys Team Restroom	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	2	112	0.11	3285	368	\$61.7	None Proposed	0	112	0.11	3285	2299.5	368	368	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Boys Team Shower	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	3	168	0.17	3285	552	\$92.6	None Proposed	0	168	0.17	3285	2299.5	552	552	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Hallway	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	22	1115.4	1.12	4015	4478	\$751.5	None Proposed	22	1115.4	1.12	4015	2810.5	4478	4478	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Girls Team Room Coach's Office	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	6	528	0.53	3285	1734	\$291.0	None Proposed	6	528	0.53	3285	2299.5	1734	1734	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Morris Hills High School - Interior	001	Girls Team Room Coach's Bath	2X2 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	56	0.06	3285	184	\$30.9	None Proposed	0	56	0.06	3285	2299.5	184	184	None Proposed	0	0.00	0														

Appendix D - Lighting Spreadsheet

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	
Morris Hills High School - Interior	001	Janitor's Closet	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	500	25	\$4.3	None Proposed	1	50.7	0.05	500	350	25	25	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Bathroom	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$27.9	None Proposed	1	50.7	0.05	3285	2299.5	167	167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	-	Stairwell	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	8	704	0.70	8760	6167	\$1,034.8	None Proposed	8	704	0.70	8760	6132	6167	6167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	157 Tel/Data	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	158	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	30	3300	3.30	3285	10841	\$1,819.0	None Proposed	30	3300	3.30	3285	2299.5	10841	10841	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	158 Closet	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	88	0.09	500	44	\$7.4	None Proposed	1	88	0.09	500	350	44	44	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	159	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	18	1980	1.98	3285	6504	\$1,091.4	None Proposed	18	1980	1.98	3285	2299.5	6504	6504	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	161	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	161 Prep Room	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	161 Prep Hall	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	163	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	160	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	164	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	165	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	166	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	15	1650	1.65	3285	5420	\$909.5	None Proposed	15	1650	1.65	3285	2299.5	5420	5420	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	163 Prep Room	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	163 Prep Hall	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	3285	578	\$97.0	None Proposed	2	176	0.18	3285	2299.5	578	578	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	169	1x4 Fixtures w/ 2-TSHO Lamps w/ Electronic Ballasts	24	2640	2.64	3285	8672	\$1,455.2	None Proposed	24	2640	2.64	3285	2299.5	8672	8672	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	-	Stairwell	2x4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	2	176	0.18	4015	707	\$118.6	None Proposed	2	176	0.18	4015	2810.5	707	707	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	000	Science Wing Basement	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	59	2991.3	2.99	3285	9826	\$1,648.9	None Proposed	59	2991.3	2.99	3285	2299.5	9826	9826	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	000	Boiler Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.26	3285	844	\$141.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.15	3285	2299.5	479	479	None Proposed	0	0.11	365	\$61.19	\$70.0	\$10.0	\$65.0	\$0.0	\$0.0	\$65.0	\$80.0	\$145.0	\$195.0	\$240.0	\$435.0	
Morris Hills High School - Interior	001	Boiler Room	175W Metal Halide Fixtures	3	645.5	0.65	3285	2119	\$355.5	Replace Metal Halide Fixtures with 4-Lamp Fluorescent Highway Fixtures	3	330	0.33	3285	2299.5	1084	1084	None Proposed	0	0.32	1035	\$173.64	\$168.0	\$105.0	\$60.0	\$0.0	\$100.0	\$273.0	\$373.0	\$300.0	\$819.0	\$1,119.0		
Morris Hills High School - Interior	001	Boiler Room	1x4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	253.5	0.25	3285	833	\$139.7	None Proposed	5	253.5	0.25	3285	2299.5	833	833	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Electric Room	60W Incandescent Fixture	1	60	0.06	3285	197	\$33.1	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	3285	2299.5	43	43	None Proposed	0	0.05	154	\$25.91	\$0.0	\$5.0	\$20.0	\$0.0	\$0.0	\$20.0	\$5.0	\$25.0	\$20.0	\$5.0	\$25.0	
Morris Hills High School - Interior	001	Boiler Storage Room	1x4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	7	354.9	0.35	3285	1166	\$195.6	None Proposed	7	354.9	0.35	3285	2299.5	1166	1166	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	001	Boiler Storage Room	1x4 Troffers w/ 2-T8 Lamps w/ Electronic Ballasts	1	50.7	0.05	3285	167	\$27.9	None Proposed	1	50.7	0.05	3285	2299.5	167	167	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Interior	-	Exit Signs	CFL Exit Sign	96	1536	1.54	8760	13455	\$2,257.8	Replace CFL Exit Sign with LED Exit Sign	96	480	0.48	8760	6132	4205	4205	None Proposed	0	1.06	9251	\$1,552.24	\$0.0	\$61.0	\$63.0	\$0.0	\$0.0	\$63.0	\$61.0	\$124.0	\$6,048.0	\$5,856.0	\$11,904.0	
Morris Hills High School - Interior	-	Exit Signs	LED Exit Sign	143	715	0.72	8760	6263	\$1,051.0	None Proposed	143	715	0.72	8760	6132	6263	6263	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Exterior	001	Wallpack	70W High Pressure Sodium Wall Pack	2	180	0.18	3285	591	\$99.2	Replace 70W Fixture with Induction Light Fixture	2	88	0.09	3285	2299.5	289	289	None Proposed	0	0.09	302	\$50.71	\$0.0	\$380.0	\$137.0	\$0.0	\$0.0	\$137.0	\$380.0	\$517.0	\$274.0	\$760.0	\$1,034.0	
Morris Hills High School - Exterior	001	Wallpack	400W MH Flood Light	16	7328	7.33	3285	24072	\$4,039.4	Replace 400W Fixture with Induction Light Fixture	16	3440	3.44	3285	2299.5	11300	11300	None Proposed	0	3.89	12772	\$2,143.16	\$0.0	\$485.0	\$137.0	\$0.0	\$0.0	\$137.0	\$485.0	\$622.0	\$2,192.0	\$7,760.0	\$9,952.0	
Morris Hills High School - Exterior	001	Wallpack	100W High Pressure Sodium Wall Pack	11	990	0.99	3285	3252	\$545.7	Replace 100W Fixture with Induction Light Fixture	11	484	0.48	3285	2299.5	1590	1590	None Proposed	0	0.51	1662	\$278.92	\$0.0	\$380.0	\$137.0	\$0.0	\$0.0	\$137.0	\$380.0	\$517.0	\$1,507.0	\$4,180.0	\$5,687.0	
Morris Hills High School - Exterior	001	Sports Field	1500W MH Sports Light	6	9660	9.66	3285	31733	\$5,324.8	None Proposed	0	9660	9.66	3285	2299.5	31733	31733	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Exterior	001	Canopy	Exterior Fixture - 35W High Pressure Sodium	17	782	0.78	3285	2569	\$431.1	None Proposed	17	782	0.78	3285	2299.5	2569	2569	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Morris Hills High School - Exterior	001	Street	250W HPS Fixture	7	1995	2.00	8760	17476	\$2,932.5	Replace 250W Fixture with Induction Light Fixture	7	770	0.77	8760	6132	6745	6745	None Proposed	0	1.23	10731	\$1,800.66	\$0.0	\$390.0	\$137.0	\$0.0	\$0.0	\$137.0	\$390.0	\$527.0	\$959.0	\$2,730.0	\$3,689.0	
Morris Hills High School - Exterior	001	Gas Pump	250W MH Fixture	2	570	0.57	3285	1872	\$314.2	Replace 250W Fixture with Induction Light Fixture	2	220	0.22	3285	2299.5	723	723	None Proposed	0	0.35	1150	\$192.93	\$0.0	\$390.0	\$137.0	\$0.0	\$0.0	\$137.0	\$390.0	\$527.0	\$274.0	\$780.0	\$1,054.0	
Morris Hills High School - Exterior	001	Parking	250W MH Fixture	12	3420	3.42	3285	11235	\$1,885.2	Replace 250W Fixture with Induction Light Fixture	12	1320	1.32	3285	2299.5	4336	4336	None Proposed	0	2.10	6899	\$1,157.57	\$0.0	\$390.0	\$137.0	\$0.0	\$0.0	\$137.0	\$390.0	\$527.0	\$1,644.0	\$4,680.0	\$6,324.0	
Morris Hills High School - Exterior	001	Sign Lighting	100W High Pressure Sodium	1	130	0.13	8760	1139	\$191.1	None Proposed	1	130	0.13	8760	6132	1139	1139	None Proposed	0	0.00	0	\$0.00	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0

APPENDIX E

SOLAR ENERGY FINANCING WORKSHEET

Morris Knolls High School
Design Goal: Provide
44% of average annual electricity

Existing Conditions
Average Annual Electrical Usage (kWh) 2,416,292
Current Utility Price (\$/kWh) \$0.2028

Calculations
Solar Rating (Zip Code: 07740) 4.68 kWh/sq-m/day
Solar Capacity Required (kW) 847.99
Roof Space Needed (sq-ft) 84,799
Annual Solar kWh (PV Watts) 1,060,192
Net System installation Cost (\$9/kWh) \$7,631,910
Electrical Service Modification Cost \$100,000
Total System Installation Cost **\$7,731,910**
Materials \$5,412,337
Labor \$2,319,573
Engineer's Opinion of Probable Cost \$9,664,888

Assumptions
Annual System Degredation 0.50%
Annual Utility Inflation 3.00%
Annual Maintenance Costs 2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor (\$/kWh)*	REC Factor (\$/kWh)
Install									
1	0.2028	1,060,192.0	\$215,006.9	\$448,461	(\$21,204)	\$642,264.3	\$642,264.3	\$0.423	
2	0.2089	1,054,891.0	\$220,349.9	\$446,219	(\$21,098)	\$645,470.9	\$1,287,735.3	\$0.423	
3	0.2152	1,049,616.6	\$225,825.6	\$443,988	(\$20,992)	\$648,821.0	\$1,936,556.3	\$0.423	
4	0.2216	1,044,368.5	\$231,437.3	\$441,768	(\$20,887)	\$652,317.8	\$2,588,874.1	\$0.423	
5	0.2283	1,039,146.7	\$237,188.5	\$439,559	(\$20,783)	\$655,964.6	\$3,244,838.8	\$0.423	
6	0.2351	1,033,950.9	\$243,082.7	\$437,361	(\$20,679)	\$659,764.9	\$3,904,603.7	\$0.423	
7	0.2422	1,028,781.2	\$249,123.3	\$435,174	(\$20,576)	\$663,722.1	\$4,568,325.7	\$0.423	
8	0.2494	1,023,637.3	\$255,314.0	\$432,999	(\$20,473)	\$667,839.8	\$5,236,165.6	\$0.423	
9	0.2569	1,018,519.1	\$261,658.5	\$430,834	(\$20,370)	\$672,121.7	\$5,908,287.3	\$0.423	
10	0.2646	1,013,426.5	\$268,160.8	\$428,679	(\$20,269)	\$676,571.6	\$6,584,858.9	\$0.423	
11	0.2725	1,008,359.4	\$274,824.6	\$426,536	(\$20,167)	\$681,193.4	\$7,266,052.3	\$0.423	
12	0.2807	1,003,317.6	\$281,653.9	\$424,403	(\$20,066)	\$685,990.9	\$7,952,043.2	\$0.423	
13	0.2891	998,301.0	\$288,653.0	\$422,281	(\$19,966)	\$690,968.3	\$8,643,011.5	\$0.423	
14	0.2978	993,309.5	\$295,826.1	\$420,170	(\$19,866)	\$696,129.8	\$9,339,141.3	\$0.423	
15	0.3068	988,342.9	\$303,177.3	\$418,069	(\$19,767)	\$701,479.5	\$10,040,620.9	\$0.423	
16	0.3160	983,401.2	\$310,711.3	\$415,585	(\$19,668)	\$315,628.3	\$10,356,249.2		\$0.025
17	0.3254	978,484.2	\$318,432.5	\$24,462	(\$19,570)	\$323,324.9	\$10,679,574.1		\$0.025
18	0.3352	973,591.8	\$326,345.5	\$24,340	(\$19,472)	\$331,213.5	\$11,010,787.6		\$0.025
19	0.3453	968,723.8	\$334,455.2	\$24,218	(\$19,374)	\$339,298.8	\$11,350,086.4		\$0.025
20	0.3556	963,880.2	\$342,766.4	\$24,097	(\$19,278)	\$347,585.8	\$11,697,672.2		\$0.025
21	0.3663	959,060.8	\$351,284.2	\$23,977	(\$19,181)	\$356,079.5	\$12,053,751.7		\$0.025
22	0.3773	954,265.5	\$360,013.6	\$23,857	(\$19,085)	\$364,784.9	\$12,418,536.6		\$0.025
23	0.3886	949,494.2	\$368,959.9	\$23,737	(\$18,990)	\$373,707.4	\$12,792,244.0		\$0.025
24	0.4002	944,746.7	\$378,128.6	\$23,619	(\$18,895)	\$382,852.3	\$13,175,096.3		\$0.025
25	0.4123	940,023.0	\$387,525.1	\$23,501	(\$18,800)	\$392,225.2	\$13,567,321.5		\$0.025

* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

Morris Hills High School

Design Goal: Provide

34% of average annual electricity

Existing Conditions

Average Annual Electrical Usage (kWh) 1,889,443
 Current Utility Price (\$/kWh) \$0.1678

Calculations

Solar Rating (Zip Code: 07740) 4.68 kWh/sq-m/day
 Solar Capacity Required (kW) 512.93
 Roof Space Needed (sq-ft) 51,293
 Annual Solar kWh (PV Watts) 641,286
 Net System installation Cost (\$9/kWh) \$4,616,370
 Electrical Service Modification Cost \$100,000
 Total System Installation Cost **\$4,716,370**
 Materials \$3,301,459
 Labor \$1,414,911
 Engineer's Opinion of Probable Cost \$5,895,463

Assumptions

Annual System Degredation 0.50%
 Annual Utility Inflation 3.00%
 Annual Maintenance Costs 2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor (\$/kWh)*	REC Factor (\$/kWh)
Install									
1	0.1678	641,286.0	\$107,607.8	\$271,264	(\$12,826)	\$366,046.0	\$366,046.0	\$0.423	
2	0.1728	638,079.6	\$110,281.8	\$269,908	(\$12,762)	\$367,427.9	\$733,474.0	\$0.423	
3	0.1780	634,889.2	\$113,022.3	\$268,558	(\$12,698)	\$368,882.7	\$1,102,356.6	\$0.423	
4	0.1834	631,714.7	\$115,831.0	\$267,215	(\$12,634)	\$370,412.0	\$1,472,768.6	\$0.423	
5	0.1889	628,556.2	\$118,709.4	\$265,879	(\$12,571)	\$372,017.5	\$1,844,786.1	\$0.423	
6	0.1945	625,413.4	\$121,659.3	\$264,550	(\$12,508)	\$373,700.9	\$2,218,487.0	\$0.423	
7	0.2004	622,286.3	\$124,682.5	\$263,227	(\$12,446)	\$375,463.9	\$2,593,950.9	\$0.423	
8	0.2064	619,174.9	\$127,780.9	\$261,911	(\$12,383)	\$377,308.3	\$2,971,259.2	\$0.423	
9	0.2126	616,079.0	\$130,956.2	\$260,601	(\$12,322)	\$379,236.1	\$3,350,495.3	\$0.423	
10	0.2189	612,998.6	\$134,210.5	\$259,298	(\$12,260)	\$381,248.9	\$3,731,744.2	\$0.423	
11	0.2255	609,933.6	\$137,545.6	\$258,002	(\$12,199)	\$383,348.9	\$4,115,093.1	\$0.423	
12	0.2323	606,883.9	\$140,963.6	\$256,712	(\$12,138)	\$385,537.9	\$4,500,630.9	\$0.423	
13	0.2392	603,849.5	\$144,466.6	\$255,428	(\$12,077)	\$387,817.9	\$4,888,448.9	\$0.423	
14	0.2464	600,830.3	\$148,056.6	\$254,151	(\$12,017)	\$390,191.2	\$5,278,640.1	\$0.423	
15	0.2538	597,826.1	\$151,735.8	\$252,880	(\$11,957)	\$392,659.7	\$5,671,299.8	\$0.423	
16	0.2614	594,837.0	\$155,506.4	\$14,871	(\$11,897)	\$158,480.6	\$5,829,780.4		\$0.025
17	0.2693	591,862.8	\$159,370.7	\$14,797	(\$11,837)	\$162,330.1	\$5,992,110.4		\$0.025
18	0.2773	588,903.5	\$163,331.1	\$14,723	(\$11,778)	\$166,275.6	\$6,158,386.0		\$0.025
19	0.2857	585,959.0	\$167,389.9	\$14,649	(\$11,719)	\$170,319.7	\$6,328,705.7		\$0.025
20	0.2942	583,029.2	\$171,549.5	\$14,576	(\$11,661)	\$174,464.7	\$6,503,170.4		\$0.025
21	0.3031	580,114.0	\$175,812.5	\$14,503	(\$11,602)	\$178,713.1	\$6,681,883.5		\$0.025
22	0.3122	577,213.5	\$180,181.5	\$14,430	(\$11,544)	\$183,067.5	\$6,864,951.0		\$0.025
23	0.3215	574,327.4	\$184,659.0	\$14,358	(\$11,487)	\$187,530.6	\$7,052,481.6		\$0.025
24	0.3312	571,455.8	\$189,247.8	\$14,286	(\$11,429)	\$192,105.0	\$7,244,586.7		\$0.025
25	0.3411	568,598.5	\$193,950.6	\$14,215	(\$11,372)	\$196,793.6	\$7,441,380.2		\$0.025

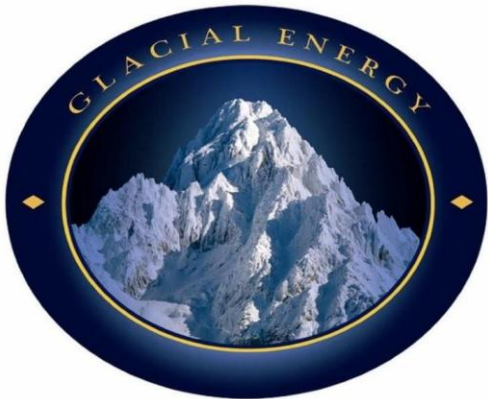
* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

APPENDIX F

GLACIAL ENERGY - ALTERNATIVE ELECTRIC SUPPLIER QUOTE

Savings Analysis Proposal - JCP&L

Glacial Energy



This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier. This proposal is based on your organization's estimated usage (kwh) and demand (kw) over the coming year.

Secure your savings today!

Contract Summary - Forecasted Price Comparison

Company Name: CDM on behalf of Morris Hills Regional BOE
Billing Address: 48 Knoll Dr, Rockaway, NJ 07866

Forecasted Customer Usage Data Summary

Start Month: Jun-10
Number of LDC Accounts: 4
Retail Margin Adder: \$0.00535/kwh

Usage (kwh): 4,184,672
Avg Monthly Usage (kwh): 348,723
Peak Monthly kw: 1307
Peak Load Factor: 37%
Capacity PLC: 918
Transmission PLC: 916

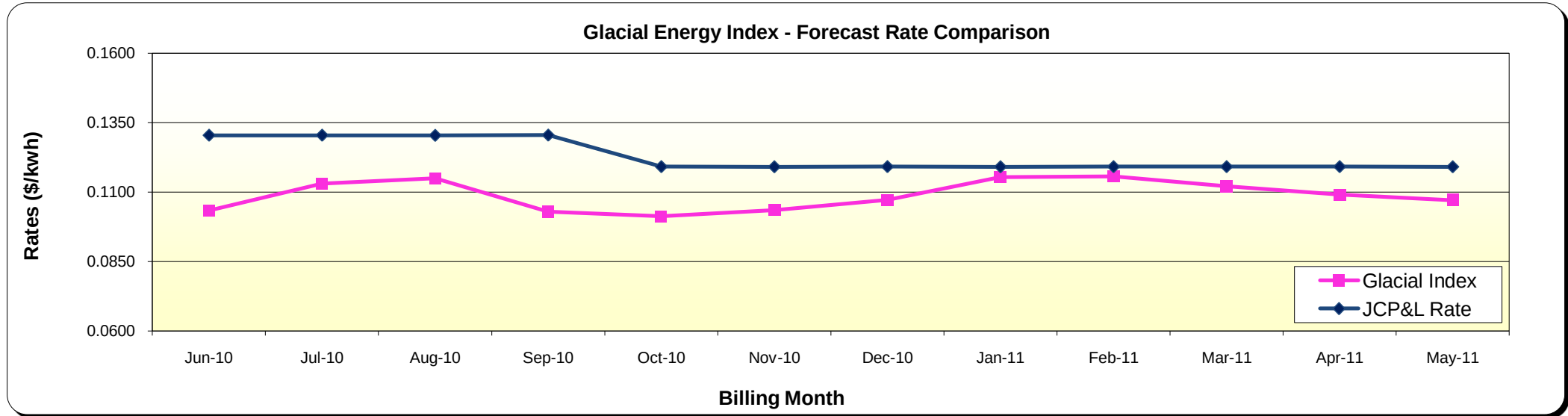
Estimated Rate Comparison over the next 12 months

Avg Rate (\$/kwh)*: \$ 0.12275
Annual Utility Charges: \$ 513,652
Glacial Energy Index: \$ 0.10864
Glacial Charges: \$ 454,643

Savings Summary

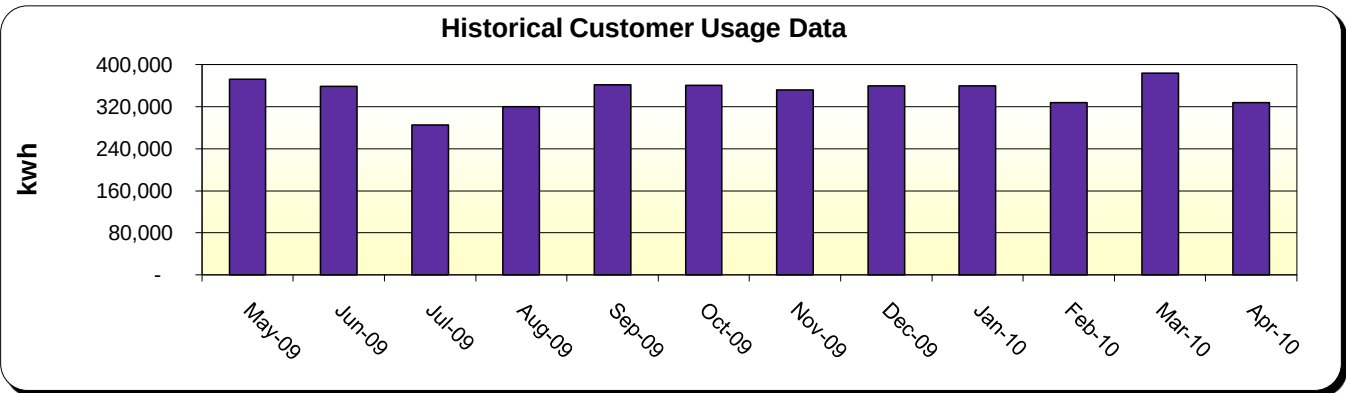
Estimated Savings vs. Utility \$ 59,008
Savings (Glacial vs. Utility) 11%

The savings in this proposal are estimated, not guaranteed. Actual savings may vary.



- Glacial Index Includes:
- a. Wholesale Delivery Price of Energy
 - b. Energy Losses and Unaccounted for Energy (UFE)
 - c. Ancillary Services & other ISO Charges
 - d. Zonal Congestion
 - e. Retail Adder
 - f. Transmission Losses & Charges
 - g. Capacity Charges
 - h. NJ SUT (Tariff Rate also includes NJ SUT)

- Glacial Index Excludes:
- a. Distribution or other (wires) charges from the utility
 - b. Non NJ SUT Taxes.



LDC Account No:	Physical Address:
1 08001776560000538023	48 Knoll Dr, Rockaway, NJ 07866
2 08001776560000538030	48 Franklin Ave, Rockaway, NJ 07866
3 08001776560000633114	48 Overlook Dr, Rockaway, NJ 07866
4 08001776560005005268	PO960071, 48 Overlook Dr, Rockaway, NJ 07866

- The Glacial Index price is a monthly variable rate, it is not a fixed rate.
- The index is based in part on forecasted ISO charges, estimated future zonal energy prices and the cost to provide service.
- The forward tariff rates are based on the latest, pending or estimated utility rates (inclusive of NJ SUT), as published by the utility forecasted for this rate schedule.

Savings Analysis Proposal - JCP&L

Glacial Energy



This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier.

Contract Summary - Historical Utility Charges

Company Name: CDM on behalf of Morris Hills Regional BOE
Billing Address: 48 Knoll Dr, Rockaway, NJ 07866

Historical Timeframe (mo.): 6
Start Month: Nov-09
Number of LDC Accounts: 4

6 month Period Summary

Usage (kwh): 2,111,373
Avg Monthly Usage (kwh): 351,895
Peak Monthly kw: 1,307
Peak Load Factor: 37%
Capacity PLC: 918
Transmission PLC: 916

Estimated Historical Utility Charges

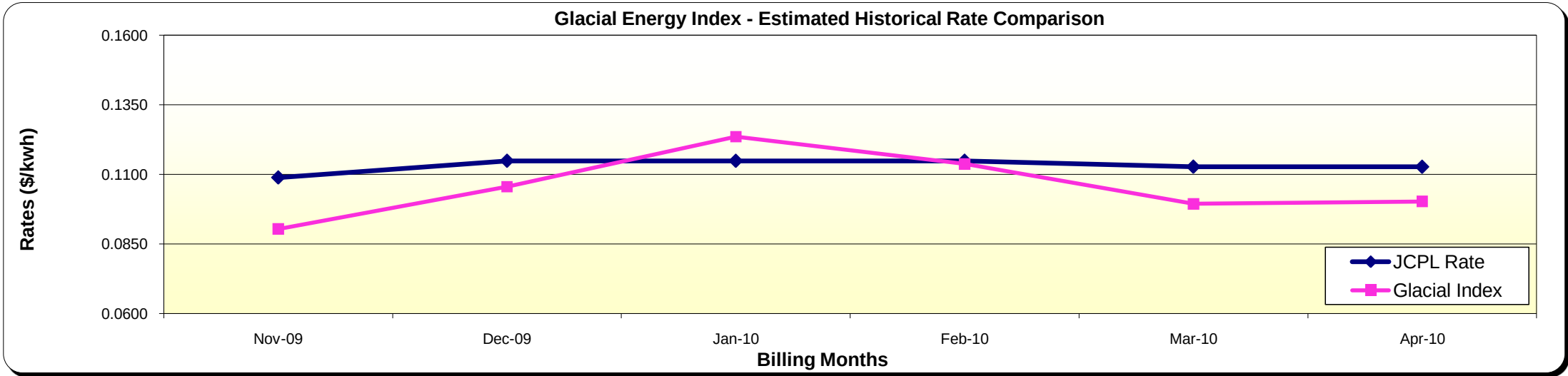
Avg Rate (\$/kwh): \$ 0.11318
Annual Utility Charges: \$ 238,971

Glacial Energy Index: \$ 0.10546
Glacial Charges: \$ 222,662

Savings Summary

Estimated Savings vs. Utility \$ 16,309
Savings (Glacial vs. Utility) 7%

The savings in this proposal are estimated, not guaranteed. Actual savings will vary.



Glacial Index Includes:

- a. Wholesale Delivery Price of Energy
- b. Energy Losses and Unaccounted for Energy (UFE)
- c. Ancillary Services & other ISO Charges
- d. Zonal Congestion
- e. Retail Adder
- f. Transmission Losses & Charges
- g. Capacity Charges
- h. NJ SUT (Tariff Rate also includes NJ SUT)

Glacial Index Excludes:

- a. Distribution or other (wires) charges from the utility
- b. Non NJ SUT Taxes.

1. The historic tariff rate comparison is based on the customer's historical usage as provided or estimated and provided or estimated demand over the previous term.
2. Savings are based on the corresponding utility rates for the appropriate rate schedule over the analysis term.

APPENDIX G

NJ SMARTSTART INCENTIVES INFORMATION AND WORKSHEETS



2010 Prescriptive Lighting Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date
Facility Address	City	State	Zip
Type of Project ☐ New Construction ☐ Renovation ☐ Equipment Replacement	Size of Building		
Company Mailing Address	City	State	Zip
Contact Person (Name/Title)	Telephone No. ()	Fax No. ()	
Incorporated? ☐ Yes ☐ No ☐ Exempt	Federal Tax ID# or SSN	Email Address	
Incentive Payment to ☐ Customer ☐ Contractor ☐ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature		

Payee Information (must submit W-9 form with application)

Payee Information (must submit W-9 form with application)					Email Address
Company	Contact Name	Incorporated? Yes No	Federal Tax ID#		
Street Address	City	State	Zip	Telephone No. ()	Fax No. ()

Contractor/Vendor Information (if different from Payee)

Contractor/Vendor Information (if different from Payee)					Email Address
Company	Contact Name	Incorporated? ☐ Yes ☐ No	Federal Tax ID#		
Street Address	City	State	Zip	Telephone No. ()	Fax No. ()

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Prescriptive Lighting Incentive

\$_____ Total Incentive (per attached worksheet calculations)

Note: Prescriptive Lighting Worksheet must accompany this application.

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of $\leq 20\%$.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
 - Fixtures must be new and ENERGY STAR qualified
 - Fixtures must have replaceable electronic ballasts
 - Total Harmonic Distortion (THD) must not exceed 33%
 - Power factor of the ballast must be no less than 90%
 - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
 - The installer must warrant fixture installation – minimum of 1 yr.
- 5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
 - The lamp must be warranted by the manufacturer for 8,000 hours
 - Total Harmonic Distortion must not exceed 33%
 - Power factor of the ballast must be $\geq 90\%$
6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:
 - 7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.
 - 7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.
 - 7.3 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a Total Harmonic Distortion of $\leq 20\%$. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.
 - 7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.
 - 7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.
8. LED Refrigerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

- ☐ Payee Information is filled out and a W-9 form of the payee is included
- ☐ Manufacturer's specification sheets for proposed technology are included
- ☐ A copy (all pages) of a recent month's utility bill is included

ACKNOWLEDGEMENT

CUSTOMER'S SIGNATURE _____	By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).
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Prescriptive Lighting Measures and Incentives*

Type of Fixture		Incentive	
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD$\leq 33\%$ and BF>0.9		\$25 per 1-lamp fixture \$30 per 2-lamp or more fixture	
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above		\$7 per lamp replaced	
High-Efficiency Fluorescent Fixtures: For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts		\$15 per fixture (1-4 lamps retrofits)	
For replacement of fixtures with new T-5 or T-8 fixtures			
Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	\$284
HID, T-12, Incandescent	400-999 Watt	T-5, T-8	\$100
HID, T-12, Incandescent	250-399 Watt	T-5, T-8	\$50
HID only	175-249 Watt	T-5, T-8	\$45
HID only	100-174 Watt	T-5, T-8	\$30
HID only	75-99 Watt	T-5, T-8	\$16
T-12 only	<250 Watt	T-5, T-8 (1 & 2 lamp)	\$25
T-12 only	<250 Watt	T-5, T-8 (3 & 4 lamp)	\$30
For retrofit of T-8 fixtures by permanent delamping & new reflectors are available only for fixtures with a total Harmonic Distortion of $\leq 20\%$. Electronic ballast replacement required for all eligible delamped fixtures.		\$20 per fixture	
New Construction & Complete Renovation		Performance based only	
LED Exit Signs (new fixtures only): For existing facilities with connected load <75 kW For existing facilities with connected load ≥ 75 kW		\$20 per fixture \$10 per fixture	
Pulse Start Metal Halide (for fixtures ≥ 150 watts)		\$25 per fixture (includes parking lot lighting)	
Parking lot low bay - LED		\$45 per fixture	
T-12 to T-8 fixtures by permanent delamping & new reflectors. Electronic ballast replacement is necessary for all eligible delamped fixtures.		\$30 per fixture	
Retrofit of existing 32 watt T-8 system to Reduced Wattage (28W/25W 4')		\$10 per fixture (1-4 lamps)	
LED Refrigerated/Freezer Case Lighting: Incentive for replacement of fluorescent lighting systems in medium or low temperature display cases		\$42 per 5' LED fixture \$65 per 6' LED fixture	
Induction Lighting Fixtures Retrofit of HID		\$50 per HID ($\geq 100W$) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 30% less wattage per fixture than existing HID system	
Replacement of HID		\$70 per HID ($\geq 100W$) fixture with a new induction fixture	

Mail or fax your application package DIRECTLY to the Commercial/Industrial Market Manager.

New Jersey's Clean Energy Program
 c/o TRC Energy Services
 900 Route 9 North, Suite 104 • Woodbridge, NJ 07095
 Phone: 866-657-6278 • Fax: 732-855-0422

Visit our web site: NJCleanEnergy.com/ssb



Program Terms and Conditions

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under “Incentive Amount” heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to “Exceptions for Approval”). In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer’s cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager’s approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than \$5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager’s initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to \$500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation.

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.



Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of $\leq 20\%$.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
 - Fixtures must be new and Energy Star qualified
 - Fixtures must have replaceable electronic ballasts
 - Total Harmonic Distortion (THD) must not exceed 33%
 - Power factor of the ballast must be no less than 90%
 - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
 - The installer must warrant fixture installation – minimum of 1 yr.
- 5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
 - The lamp must be warranted by the manufacturer for 8,000 hours
 - Total Harmonic Distortion must not exceed 33%
 - Power factor of the ballast must be $\geq 90\%$
6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:
 - 7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.
 - 7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.
 - 7.3 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a total Harmonic Distortion of $\leq 20\%$. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.
 - 7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.
 - 7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.
8. LED Refrigerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

ACKNOWLEDGEMENT

CUSTOMER'S SIGNATURE	By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form. I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).
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Prescriptive Lighting Measures and Incentives*

Type of Fixture		Incentive	
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD$\leq 33\%$ and BF≥ 0.9		\$25 per 1-lamp fixture \$30 per 2-lamp or more fixture	
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above		\$7 per lamp replaced	
High-Efficiency Fluorescent Fixtures: For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts		\$15 per fixture (1-4 lamps retrofits)	
For replacement of fixtures with new T-5 or T-8 fixtures			
Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	\$284
HID, T-12, Incandescent	400-999 Watt	T-5, T-8	\$100
HID, T-12, Incandescent	250-399 Watt	T-5, T-8	\$50
HID only	175-249 Watt	T-5, T-8	\$43
HID only	100-174 Watt	T-5, T-8	\$30
HID only	75-99 Watt	T-5, T-8	\$16
T-12 only	≤ 250 Watt	T-5, T-8 (1 & 2 lamp)	\$25
T-12 only	≤ 250 Watt	T-5, T-8 (3 & 4 lamp)	\$50
For retrofit of T-8 fixtures by permanent delamping & new reflectors are available only for fixtures with a total Harmonic Distortion of $\leq 20\%$. Electronic ballast replacement required for all eligible delamped fixtures.		\$20 per fixture	
New Construction & Complete Renovation		Performance based only	
LED Exit Signs (new fixtures only): For existing facilities with connected load < 75 kW		\$20 per fixture	
For existing facilities with connected load ≥ 75 kW		\$10 per fixture	
Pulse Start Metal Halide (for fixtures ≥ 150 watts)		\$25 per fixture (includes parking lot lighting)	
Parking lot low bay - LED		\$43 per fixture	
T-12 to T-8 fixtures by permanent delamping & new reflectors. Electronic ballast replacement is necessary for all eligible delamped fixtures.		\$30 per fixture	
Retrofit of existing 32 watt T-8 system to Reduced Wattage (28W/25W 4')		\$10 per fixture (1-4 lamps)	
LED Refrigerated/Freezer Case Lighting: Incentive for replacement of fluorescent lighting systems in medium or low temperature display cases		\$42 per 5' LED Fixture \$65 per 6' LED Fixture	
Induction Lighting Fixtures Retrofit of HID		\$50 per HID ($\geq 100W$) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 50% less wattage per fixture than existing HID system	
Replacement of HID		\$70 per HID ($\geq 100W$) fixture with a new induction fixture	

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Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under “Incentive Amount” heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to “Exceptions for Approval”). In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer’s cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager’s approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than \$5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager’s initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to \$500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation.

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.



2010 Lighting Controls Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date
Facility Address	City	State	Zip
Type of Project ☐ New Construction ☐ Renovation ☐ Equipment Replacement	Size of Building		
Company Mailing Address	City	State	Zip
Contact Person (Name/Title)	Telephone No. ()	Fax No. ()	
Incorporated? ☐ Yes ☐ No ☐ Exempt	Federal Tax ID# or SSN	Email Address	
Incentive Payment to ☐ Customer ☐ Contractor ☐ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature		

Payee Information (must submit W-9 form with application)

Payee Information (must submit W-9 form with application)						Email Address
Company	Contact Name	Incorporated? Yes No		Federal Tax ID#		
Street Address	City	State	Zip	Telephone No. ()	Fax No. ()	

Contractor/Vendor Information (if different from Payee)

Contractor/Vendor Information (if different from Payee)						Email Address
Company	Contact Name	Incorporated? ☐ Yes ☐ No		Federal Tax ID#		
Street Address	City	State	Zip	Telephone No. ()	Fax No. ()	

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Lighting Control Incentive

\$_____ Total Incentive (per attached worksheet calculations)

Note: Lighting Controls Incentive Worksheet must accompany this application.

Specific Program Requirements* (These requirements are in addition to the Program Terms and Conditions.)

1. Please refer to the Program Guide for additional applicable technical requirements, including special requirements for lighting controls.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. All lighting controls eligible for incentives must be UL listed.
4. Lighting control incentives are only available for control of eligible energy efficient lighting fixtures.
5. If more than one eligible lighting control device is associated with the same eligible fixture, the incentive paid will be for the lighting control device that yields the largest incentive only.
6. Occupancy Sensor Controls (existing facilities only):
 - There is no incentive available for occupancy sensors installed in a space where they are prohibited by state or local building or safety code. Additionally, no incentive is eligible for occupancy sensors in the following specific spaces in all cases: stairways, restrooms (remote mounted only allowed), elevators, corridors/hallways, lobbies, and closets/storage areas.
 - Incentives will only be paid for eligible occupancy sensors (OSW & OSR) controlling at least 2 eligible lighting fixtures and, for OSR installations, a minimum total connected load of 180 watts.
 - Incentives will only be paid for eligible OSRH occupancy sensors controlling eligible fixtures when the controlled wattage is greater than 180 watts.
 - Occupancy sensors with manual override to the "ON" position are ineligible for incentive.
7. High-Low Controls (OHLF and OHLH):
 - Incentives will not be paid for high-low controls on eligible fluorescent fixtures where daylight dimming controls can be effectively employed.
 - Incentives will not be paid for spaces smaller than 250 square feet.
 - Incentives available only when "low level" is no more than 60% of "high level."
 - Incentives are not available for the following spaces: stairways, elevators, corridors/hallways, or lobbies.
 - OHLF will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
 - OHLH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.
8. Daylight Dimming Controls for eligible fixtures:
 - Incentives will only be paid for eligible daylight dimming controls operating at least 4 eligible ballasts with a minimum total connected load of 240 watts.
 - Dimming shall be continuous or stepped at 4 or more levels.
 - Incentives will be paid only for eligible daylight dimming control systems designed in accordance with IESNA practice as delineated in "RP-5-99, IESNA Recommended Practice of Daylighting."
 - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
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Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

- ☐ Payee Information is filled out and a W-9 form of the payee is included
- ☐ Manufacturer's specification sheets for proposed technology are included
- ☐ A copy (all pages) of a recent month's utility bill is included

ACKNOWLEDGEMENT**CUSTOMER'S SIGNATURE**

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Lighting Control Prescriptive Incentives*

Control Device Type	Incentive per Unit
OSW – Occupancy Sensor Wall Mounted (Existing facilities only)	\$20 per control
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 - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
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OHLF – Occupancy Controlled High-Low with Step Ballast	\$25 per fixture controlled
OSRH – Occupancy Sensor Remote Mounted	\$35 per control
OHLH – Occupancy Controlled High-Low with Step Ballast	\$75 per fixture controlled
DDH – Daylight Dimming	\$75 per fixture controlled

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New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to Participating Customers pursuant to the Program offered herein (see description under “Incentive Amount” heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to “Exceptions for Approval”). In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer’s cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager’s approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than \$5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager’s initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to \$500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation.

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.



Incentive Structure for NJ Pay For Performance Program

Incentive #1: Energy Reduction Plan

Incentive Amount:.....\$0.10 per sq ft
 Minimum Incentive:.....\$5,000
 Maximum Incentive:.....\$50,000 or 50% of facility annual energy cost

This incentive will be developed to offset the cost of services associated with the development of the Energy Reduction Plan. Projects must identify efficiency improvements that meet the minimum performance level in order to become eligible for Incentive #1. Incentive amount will be based on the square footage of the building.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target:.....15%

Electric Incentives

Base Incentive based on 15% savings:.....\$0.11 per projected kWh saved
 For each % over 15% add:.....\$0.005 per projected kWh saved
 Maximum Incentive:.....\$0.13 per projected kWh saved

Gas Incentives

Base Incentive base on 15% savings:\$1.10 per projected Therm saved
 For each % over 15% add:.....\$0.05 per projected Therm saved
 Maximum Incentive:.....\$1.45 per projected Therm saved

Incentive Cap: 30% of total project cost

This incentive will be based on projected energy savings and designed to pay approximately 60% of the total performance-based incentive. Savings projections will be calculated using calibrated energy simulation and rounded to the nearest percent. Incentive #2 may not exceed 30% of the total project cost.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target:.....15%

Electric Incentives

Base Incentive based on 15% savings:.....\$0.07 per projected kWh saved
 For each % over 15% add:.....\$0.005 per projected kWh saved
 Maximum Incentive:.....\$0.09 per projected kWh saved

Gas Incentives

Base Incentive base on 15% savings:\$0.70 per projected Therm saved
 For each % over 15% add:.....\$0.05 per projected Therm saved
 Maximum Incentive:.....\$1.05 per projected Therm saved

Incentive Cap: 20% of total project cost

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. This incentive will "true up" proposed savings and the related payment for Incentive #2 so that the total incentive is based on actual savings. For buildings not covered by EPA, the process used by LEED EB shall be followed.

Advanced Measure Incentive: Combined Heat and Power

Eligible Technology	Incentive (per Watt) Max: \$1 Million	Maximum % of Project Cost
Level 1:		
Fuel cells not fueled by Class I renewable fuel	\$4.00.....	60%
Level 2:		
Microturbines	\$1.00.....	30% ⁽¹⁾
Internal Combustion Engines		
Combustion Turbines		
Level 3:		
Heat Recovery or other Mechanical Recovery from Existing Equipment	\$0.50.....	30%

(1) The maximum % of project cost will go to 40% where a cooling application is used or included with the CHP system.

Note: Incentives for renewable fueled projects (Class 1) are currently being developed. This document will be updated when the incentive levels are finalized.

APPENDIX H

ENGINEERS OPINION OF PROBABLE CONSTRUCTION COSTS

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Morris Hills Regional District Board Of Education
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Knolls High School Interior Lighting Upgrades	1	ls.		\$ 33,930.50	1	ls.	\$ 29,355.00	\$ 29,355.00	\$ 63,285.50
	Subtotal				33,930.50				29,355.00	

SUBTOTAL = \$ 63,285.50
MARKUP % = \$ 0.15
MARKUP = \$ 9,492.83
SUB-TOTAL w/ OH & P = \$ 72,778.33
CONTINGENCY % = 0.25
CONTINGENCY = \$ 18,194.58
BUDGET COST ESTIMATE = \$ 90,972.91

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	Morris Knolls High School Exterior Lighting Upgrades	1	ls.		\$ 16,964.00	1	ls.	\$ 5,957.00	\$ 5,957.00	\$ 22,921.00
	Subtotal				16,964.00				5,957.00	

SUBTOTAL = \$ 22,921.00
MARKUP % = \$ 0.15
MARKUP = \$ 3,438.15
SUB-TOTAL w/ OH & P = \$ 26,359.15
CONTINGENCY % = 0.25
CONTINGENCY = \$ 6,589.79
BUDGET COST ESTIMATE = \$ 32,948.94

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	Morris Knolls High School Combined Lighting Upgrades	1	ls.		\$ 50,894.50	1	ls.	\$ 35,312.00	\$ 35,312.00	\$ 86,206.50
	Subtotal				50,894.50				35,312.00	

SUBTOTAL = \$ 86,206.50
MARKUP % = \$ 0.15
MARKUP = \$ 12,930.98
SUB-TOTAL w/ OH & P = \$ 99,137.48
CONTINGENCY % = 0.25
CONTINGENCY = \$ 24,784.37
BUDGET COST ESTIMATE = \$ 123,921.84

CDM

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Morris Hills Regional District Board Of Education
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Hills High School Interior Lighting Upgrades	1	ls.		\$ 46,548.50	1	ls.	\$ 40,363.00	\$ 40,363.00	\$ 86,911.50
	Subtotal				46,548.50				40,363.00	

SUBTOTAL = \$ 86,911.50
MARKUP % = \$ 0.15
MARKUP = \$ 13,036.73
SUB-TOTAL w/ OH & P = \$ 99,948.23
CONTINGENCY % = 0.25
CONTINGENCY = \$ 24,987.06
BUDGET COST ESTIMATE = \$ 124,935.28

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
2	Morris Hills High School Exterior Lighting Upgrades	1	ls.		\$ 20,890.00	1	ls.	\$ 6,850.00	\$ 6,850.00	\$ 27,740.00
	Subtotal				20,890.00				6,850.00	

SUBTOTAL = \$ 27,740.00
MARKUP % = \$ 0.15
MARKUP = \$ 4,161.00
SUB-TOTAL w/ OH & P = \$ 31,901.00
CONTINGENCY % = 0.25
CONTINGENCY = \$ 7,975.25
BUDGET COST ESTIMATE = \$ 39,876.25

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
3	Morris Hills High School Combined Lighting Upgrades	1	ls.		\$ 67,438.50	1	ls.	\$ 47,213.00	\$ 47,213.00	\$ 114,651.50
	Subtotal				67,438.50				47,213.00	

SUBTOTAL = \$ 114,651.50
MARKUP % = \$ 0.15
MARKUP = \$ 17,197.73
SUB-TOTAL w/ OH & P = \$ 131,849.23
CONTINGENCY % = 0.25
CONTINGENCY = \$ 32,962.31
BUDGET COST ESTIMATE = \$ 164,811.53

CDM

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Morris Hills Regional District Board Of Education
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Knolls High School Solar PV System	1	ls.		\$ 5,412,337.00	1	ls.	\$ 2,319,573.00	\$ 2,319,573.00	\$ 7,731,910.00
	Subtotal				5,412,337.00				2,319,573.00	

SUBTOTAL = \$ 7,731,910.00
CONTINGENCY % = \$ 0.25
CONTINGENCY = \$ 1,932,977.50
BUDGET COST ESTIMATE = \$ 9,664,887.50

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Hills High School Solar PV System	1	ls.		\$ 3,301,459.00	1	ls.	\$ 1,414,911.00	\$ 1,414,911.00	\$ 4,716,370.00
	Subtotal				3,301,459.00				1,414,911.00	

SUBTOTAL = \$ 4,716,370.00
CONTINGENCY % = \$ 0.25
CONTINGENCY = \$ 1,179,092.50
BUDGET COST ESTIMATE = \$ 5,895,462.50

CDM

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Morris Hills Regional District Board Of Education
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Knolls & Morris Hills High Schools 10KW Wind Turbine	1	Is.		\$ 43,645.00	1	Is.	\$ 4,000.00	\$ 4,000.00	\$ 47,645.00
	Subtotal				43,645.00				4,000.00	

SUBTOTAL = \$ 47,645.00
 MARKUP % = \$ 0.15
 MARKUP = \$ 7,146.75
 SUB-TOTAL w/ OH & P = \$ 54,791.75
 CONTINGENCY % = 0.25
 CONTINGENCY = \$ 13,697.94
 BUDGET COST ESTIMATE = \$ 68,489.69

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Morris Knolls
Estimate by: AJJ
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Knolls Unit ventilator Controls	85	ea.	\$ 200.00	\$ 17,000.00	85	ea.	\$ 200.00	\$ 17,000.00	34,000.00
	Subtotal				17,000.00				17,000.00	

Cost data from Senior Instrumentation Engineer

SUBTOTAL = \$	34,000.00
MARKUP % = \$	0.15
MARKUP = \$	5,100.00
SUB-TOTAL w/ OH & P = \$	39,100.00
CONTINGENCY % =	0.25
CONTINGENCY = \$	9,775.00
BUDGET COST ESTIMATE = \$	48,875.00

Notes:

1. CDM has no control over the cost of labor, materials, equipment, services furnished, or market conditions
2. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.
5. Any necessary asbestos abatement is not included in estimate.

CDM

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Latham, NY 12110
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Fax (518) 786-3810

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Morris Hills
Estimate by: AJJ
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Hills Unit ventilator Controls	46	ea.	\$ 200.00	\$ 9,200.00	46	ea.	\$ 200.00	\$ 9,200.00	18,400.00
	Subtotal				9,200.00				9,200.00	

Cost data from Senior Instrumentation Engineer

SUBTOTAL = \$	18,400.00
MARKUP % = \$	0.15
MARKUP = \$	2,760.00
SUB-TOTAL w/ OH & P = \$	21,160.00
CONTINGENCY % =	0.25
CONTINGENCY = \$	5,290.00
BUDGET COST ESTIMATE = \$	26,450.00

Notes:

1. CDM has no control over the cost of labor, materials, equipment, services furnished, or market conditions
2. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.
5. Any necessary asbestos abatement is not included in estimate.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Morris Hills
Estimate by: AJJ
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Hills Insulate Piping	100	LF	\$ 1.21	\$ 121.00	100	ea.	\$ 3.94	\$ 394.00	515.00
	Subtotal				121.00				394.00	

Cost data from RS Means Costworks adjusted for Newark NJ

SUBTOTAL =	\$	515.00
MARKUP % =	\$	0.15
MARKUP =	\$	77.25
SUB-TOTAL w/ OH & P =	\$	592.25
CONTINGENCY % =		0.25
CONTINGENCY =	\$	148.06
BUDGET COST ESTIMATE =	\$	740.31

Notes:

1. CDM has no control over the cost of labor, materials, equipment, services furnished, or market conditions
2. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.
5. Any necessary asbestos abatement is not included in estimate.

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Morris Knolls
Estimate by: AJJ
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Knolls Hot Water Fixtures	55	ea	\$ 44.50	\$ 2,447.50	55	ea.	\$ 52.50	\$ 2,887.50	5,335.00
	Subtotal				2,447.50				2,887.50	

Cost data from RS Means Costworks adjusted for Newark NJ

SUBTOTAL =	\$	5,335.00
MARKUP % =	\$	0.15
MARKUP =	\$	800.25
SUB-TOTAL w/ OH & P =	\$	6,135.25
CONTINGENCY % =		0.25
CONTINGENCY =	\$	1,533.81
BUDGET COST ESTIMATE =	\$	7,669.06

Notes:

1. CDM has no control over the cost of labor, materials, equipment, services furnished, or market conditions
2. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.
5. Any necessary asbestos abatement is not included in estimate.

CDM

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Morris Hills
 Estimate by: AJJ
 Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Morris Hills Hot Water Fixtures	57	ea	\$ 44.50	\$ 2,536.50	57	ea.	\$ 52.50	\$ 2,992.50	5,529.00
	Subtotal				2,536.50				2,992.50	

Cost data from RS Means Costworks adjusted for Newark NJ

SUBTOTAL =	\$	5,529.00
MARKUP % =	\$	0.15
MARKUP =	\$	829.35
SUB-TOTAL w/ OH & P =	\$	6,358.35
CONTINGENCY % =		0.25
CONTINGENCY =	\$	1,589.59
BUDGET COST ESTIMATE =	\$	7,947.94

Notes:

1. CDM has no control over the cost of labor, materials, equipment, services furnished, or market conditions
2. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.
5. Any necessary asbestos abatement is not included in estimate.

APPENDIX I

FACILITY DATA FORMS

APPENDIX C - FACILITY DATA FORM

Complete one Facility Data Form for each building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Morris Hills High School			
Street Address 520 West Main Street		County	
City Rockaway	State NJ	Zip 07866	
Facility's Description 9-12 School			
Total Sq Ft 229760	Year Built 1953	Hours/Week Occupied 60-80	Number of Employees 230
Building Type (Check only one of the following):			
☐ Emergency Services	☐ Garage		
☐ Center/Meeting Hall/Library	☐ Offices		
☐ Recreation/Entertainment/Parks	☐ Religious		
☒ School	☐ School: College		
☐ Water Treatment/Pumping	☐ Other: _____		

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 0 7 / 1 / 0 8 to 0 7 / 1 / 0 9



ELECTRICITY

Electric Utility Name & Account Number(s) JCP&L: 10 00 01 2682 57	
Annual kWh Use 1,851,300	Annual Electricity Cost \$305,422.44
Max Summer kW 611	Max Winter kW 532

NATURAL GAS

Natural Gas Utility Name & Account Number(s) New Jersey Natural Gas: 20-1191-3550-19	
Annual Use in Therms 40,197	Annual Natural Gas Cost \$26,517

FUEL OIL

Fuel Oil Utility Name & Account Number(s) Finch Fuel Oil: 4508	
Annual Use in Gallons 70,078	Annual Fuel Oil Cost \$114,047

PROPANE

Propane Utility Name & Account Number(s) NA	
Annual Use in Gallons	Annual Propane Cost

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
Annual Energy Use (indicate units)	Annual Energy Cost

STAFF USE ONLY

Date Received: _____	Project No.: _____
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APPENDIX C - FACILITY DATA FORM

Complete one Facility Data Form for ***each*** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name Morris Knolls High School			
Street Address 48 Knoll Drive		County	
City Rockaway	State NJ	Zip 07866	
Facility's Description 9-12 School			
Total Sq Ft 263065	Year Built 1964	Hours/Week Occupied 60-80	Number of Employees 250
Building Type (Check only one of the following):			
☐	Emergency Services	☐	Garage
☐	Center/Meeting Hall/Library	☐	Offices
☐	Recreation/Entertainment/Parks	☐	Religious
☒	School	☐	School: College
☐	Water Treatment/Pumping	☐	Other: _____

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 0 7 / 1 / 0 8 to 0 7 / 1 / 0 9



ELECTRICITY

Electric Utility Name & Account Number(s) JCP&L: 10 00 00 9408 23 & 10 00 00 9411 51	
Annual kWh Use 2,416,352 (combined)	Annual Electricity Cost \$399,106
Max Summer kW 777	Max Winter kW 662

NATURAL GAS

Natural Gas Utility Name & Account Number(s) New Jersey Natural Gas: 20-1191-5610-15	
Annual Use in Therms 40,453	Annual Natural Gas Cost \$22,545

FUEL OIL

Fuel Oil Utility Name & Account Number(s) Finch Fuel Oil: 4509	
Annual Use in Gallons 105,570	Annual Fuel Oil Cost \$177,268

PROPANE

Propane Utility Name & Account Number(s)	
Annual Use in Gallons	Annual Propane Cost

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
Annual Energy Use (indicate units)	Annual Energy Cost

STAFF USE ONLY

Date Received: _____	Project No.: _____
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APPENDIX J

ECRM FINANCIAL ANALYSIS

Lighting Maintenance Cost Savings

T12 to T8 Retrofit	T12 Bulb Cost	T8 Bulb Cost	T12 Bulb Average Lifetime (Years)	T8 Bulb Average Lifetime (Years)	Quantity of T12 Replacements vs. T8 Replacements	Cost of T12 Replacement over T8 Life	T8 Bulb Replacements Over Lifetime (15 Yrs)
1 Lamp	\$25.0	\$23.5	4.6	5.7	1.25	\$31.2	3
2 Lamp	\$69.9	\$67.0	4.6	5.7	1.25	\$87.4	3
3 Lamp	\$94.9	\$90.5	4.6	5.7	1.25	\$118.6	3
4 Lamp	\$119.8	\$114.0	4.6	5.7	1.25	\$149.8	3

Incandescent to CFL Retrofit	Incandescent Cost	CFL Cost	Incandescent Average Lifetime (Years)	CFL Average Lifetime (Years)	Quantity of Incandescent Replacements vs. CFL Replacements	Cost of Incandescent Replacement over CFL Life	CFL Replacements Over Lifetime (15 Yrs)
13 Watt	\$23.0	\$25.0	0.5	2.3	5	\$115.0	7
25 Watt	\$23.0	\$27.0	0.5	2.3	5	\$115.0	7
40 Watt	\$23.0	\$32.0	0.5	2.3	5	\$115.0	7
65 Watt	\$23.4	\$45.0	0.5	2.3	5	\$117.0	7

Metal Halide to Induction Retrofit	Metal Halide Cost	Induction Cost	Metal Halide Average Lifetime (Years)	Induction Average Lifetime (years)	Quantity of Metal Halide Replacements vs. Induction Replacements	Cost of Metal Halide Replacement over Induction Life	Induction Replacements Over Lifetime (15 Yrs)
400 Watt	\$86.0	\$487.0	4.6	22.8	5	\$430.0	1
250 Watt	\$80.0	\$390.0	4.6	22.8	5	\$400.0	1
175 Watt	\$78.0	\$390.0	4.6	22.8	5	\$390.0	1

HPS to Induction Retrofit	HPS Cost	Induction Cost	HPS Average Lifetime (Years)	Induction Average Lifetime (years)	Quantity of HPS Replacements vs. Induction Replacements	Cost of HPS over Induction Life	Induction Replacements Over Lifetime (15 Yrs)
400 Watt	\$86.0	\$487.0	4.6	22.8	5	\$430.0	1
250 Watt	\$80.0	\$390.0	4.6	22.8	5	\$400.0	1
175 Watt	\$78.0	\$390.0	4.6	22.8	5	\$390.0	1
150 Watt	\$74.0	\$380.0	4.6	22.8	5	\$370.0	1
100 Watt	\$55.0	\$380.0	4.6	22.8	5	\$275.0	1
70 Watt	\$25.0	\$380.0	4.6	22.8	5	\$125.0	1

High Pressure Sodium/Metal Halide to Fluorescent		Metal Halide Cost	Fluorescent Cost	Metal Halide Average Lifetime (Years)	Fluorescent Average Lifetime (years)	Quantity of Metal Halide Replacements vs. Fluorescent Replacements	Cost of Metal Halide Replacement over Fluorescent Life	Fluorescent Replacements Over Lifetime (15 Yrs)
4	Lamp	\$86.0	\$216.0	4.6	5.7	1.25	\$107.4	3
6	Lamp	\$86.0	\$288.0	4.6	5.7	1.25	\$107.5	3

Interior Option

Building	INC-CFL (13W)	INC-CFL (25W)	INC-CFL (40W)	INC-CFL (65W)	T12->T8 (1 Lamp)	T12->T8 (2 Lamp)	T12->T8 (3 Lamp)	T12->T8 (4 Lamp)	HID->Fluorescent	Total Maintenance Cost Savings	Annual Maintenance Cost Savings	Building
Morris Knolls High School	\$22,213.2	\$40,547.9	\$352.6	\$7,174.4	\$540.9	\$1,974.7	\$0.0	\$78.7	\$621.5	\$73,503.97	\$4,900.26	Morris Knolls High School
Morris Hills High School	\$34,553.8	\$6,699.2	\$0.0	\$14,348.9	\$409.8	\$3,765.8	\$5,483.8	\$314.8	\$2,260.1	\$67,836.27	\$4,522.42	Morris Hills High School

Exterior Option

Building	MH->Induction (400W)	MH->Induction (250W)	MH->Induction (175W)	HPS->Induction (400W)	HPS->Induction (250W)	HPS->Induction (100W)	HPS->Induction (70W)	INC-CFL (25W)	Total Maintenance Cost Savings	Annual Maintenance Cost Savings	Building
Morris Knolls High School	\$94.2	\$0.0	\$102.5	\$113.0	\$140.2	\$0.0	\$307.9	\$5,994.0	\$6,751.77	\$450.12	Morris Knolls High School
Morris Hills High School	\$301.3	\$245.3	\$0.0	\$0.0	\$122.6	\$132.5	\$11.0	\$0.0	\$812.71	\$54.18	Morris Hills High School

Combined Option

Building	Total Maintenance Cost Savings	Total Annual Maintenance Cost Savings
Morris Knolls High School	\$80,255.74	\$5,350.38
Morris Hills High School	\$68,648.98	\$4,576.60

IRR, NPV, AROI

Inflation Rate: 3%

Lighting - Interior Morris Knolls High School		Lighting - Interior Morris Hills High School	
Life of ECRM (Yrs): 15		Life of ECRM (Yrs): 15	
Year	Cash Flow	Year	Cash Flow
0	(\$82,391.16)	0	(\$114,325.28)
1	\$48,191.50	1	\$35,051.62
2	\$49,637.25	2	\$36,103.17
3	\$51,126.36	3	\$37,186.26
4	\$52,660.15	4	\$38,301.85
5	\$54,239.96	5	\$39,450.91
6	\$55,867.16	6	\$40,634.43
7	\$57,543.17	7	\$41,853.47
8	\$59,269.47	8	\$43,109.07
9	\$61,047.55	9	\$44,402.34
10	\$62,878.98	10	\$45,734.41
11	\$64,765.35	11	\$47,106.45
12	\$66,708.31	12	\$48,519.64
13	\$68,709.56	13	\$49,975.23
14	\$70,770.84	14	\$51,474.49
15	\$72,893.97	15	\$53,018.72
IRR	61.42%	IRR	33.00%
NPV	\$619,426.80	NPV	\$396,135.21
AROI	51.82%	AROI	23.99%

Lighting - Exterior Morris Knolls High School		Lighting - Exterior Morris Hills High School	
Life of ECRM (Yrs): 15		Life of ECRM (Yrs): 15	
Year	Cash Flow	Year	Cash Flow
0	(\$31,408.94)	0	(\$36,516.25)
1	\$6,827.56	1	\$5,678.12
2	\$7,032.39	2	\$5,848.46
3	\$7,243.36	3	\$6,023.92
4	\$7,460.66	4	\$6,204.64
5	\$7,684.48	5	\$6,390.77
6	\$7,915.01	6	\$6,582.50
7	\$8,152.46	7	\$6,779.97
8	\$8,397.04	8	\$6,983.37
9	\$8,648.95	9	\$7,192.87
10	\$8,908.42	10	\$7,408.66
11	\$9,175.67	11	\$7,630.92
12	\$9,450.94	12	\$7,859.85
13	\$9,734.47	13	\$8,095.64
14	\$10,026.50	14	\$8,338.51
15	\$10,327.30	15	\$8,588.67
IRR	23.27%	IRR	15.90%
NPV	\$68,021.55	NPV	\$46,174.82
AROI	15.07%	AROI	8.88%

Lighting - Combined Morris Knolls High School		Lighting - Combined Morris Hills High School	
Life of ECRM (Yrs): 15		Life of ECRM (Yrs): 15	
Year	Cash Flow	Year	Cash Flow
0	(\$113,800.09)	0	(\$150,841.53)
1	\$55,019.06	1	\$40,729.74
2	\$56,669.63	2	\$41,951.63
3	\$58,369.72	3	\$43,210.18
4	\$60,120.81	4	\$44,506.49
5	\$61,924.44	5	\$45,841.68
6	\$63,782.17	6	\$47,216.93
7	\$65,695.63	7	\$48,633.44
8	\$67,666.50	8	\$50,092.44
9	\$69,696.50	9	\$51,595.22
10	\$71,787.39	10	\$53,143.07
11	\$73,941.02	11	\$54,737.36
12	\$76,159.25	12	\$56,379.49
13	\$78,444.02	13	\$58,070.87
14	\$80,797.34	14	\$59,813.00
15	\$83,221.26	15	\$61,607.39
IRR	51.19%	IRR	29.09%
NPV	\$687,448.36	NPV	\$442,310.02
AROI	41.68%	AROI	20.34%

ECM	Morris Knolls High School - Interior	Morris Hills High School - Interior
Assumed Inflation (Gas)		
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$43,291.24	\$30,529.20
Assumed Average Useful Life (Years)	15	15
Lifetime Savings	\$805,170.04	\$567,809.96
Year	Annual Savings	Annual Savings
1	\$43,291.24	\$30,529.20
2	\$44,589.98	\$31,445.08
3	\$45,927.68	\$32,388.43
4	\$47,305.51	\$33,360.08
5	\$48,724.67	\$34,360.88
6	\$50,186.41	\$35,391.71
7	\$51,692.00	\$36,453.46
8	\$53,242.76	\$37,547.07
9	\$54,840.05	\$38,673.48
10	\$56,485.25	\$39,833.68
11	\$58,179.81	\$41,028.69
12	\$59,925.20	\$42,259.55
13	\$61,722.96	\$43,527.34
14	\$63,574.65	\$44,833.16
15	\$65,481.88	\$46,178.15

ECM	Morris Knolls High School - Exterior	Morris Hills High School - Exterior
Assumed Inflation (Gas)		
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$6,377.44	\$5,623.94
Assumed Average Useful Life (Years)	15	15
Lifetime Savings	\$118,613.46	\$104,599.18
Year	Annual Savings	Annual Savings
1	\$6,377.44	\$5,623.94
2	\$6,568.76	\$5,792.66
3	\$6,765.83	\$5,966.44
4	\$6,968.80	\$6,145.43
5	\$7,177.86	\$6,329.79
6	\$7,393.20	\$6,519.69
7	\$7,615.00	\$6,715.28
8	\$7,843.45	\$6,916.74
9	\$8,078.75	\$7,124.24
10	\$8,321.11	\$7,337.97
11	\$8,570.75	\$7,558.11
12	\$8,827.87	\$7,784.85
13	\$9,092.70	\$8,018.39
14	\$9,365.49	\$8,258.95
15	\$9,646.45	\$8,506.71

ECM	Morris Knolls High School - Combined	Morris Hills High School - Combined
Assumed Inflation (Gas)		
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$49,668.68	\$36,153.14
Assumed Average Useful Life (Years)	15	15
Lifetime Savings	\$923,783.50	\$672,409.14
Year	Annual Savings	Annual Savings
1	\$49,668.68	\$36,153.14
2	\$51,158.74	\$37,237.73
3	\$52,693.50	\$38,354.87
4	\$54,274.31	\$39,505.51
5	\$55,902.54	\$40,690.68
6	\$57,579.61	\$41,911.40
7	\$59,307.00	\$43,168.74
8	\$61,086.21	\$44,463.80
9	\$62,918.80	\$45,797.72
10	\$64,806.36	\$47,171.65
11	\$66,750.55	\$48,586.80
12	\$68,753.07	\$50,044.40
13	\$70,815.66	\$51,545.73
14	\$72,940.13	\$53,092.10
15	\$75,128.34	\$54,684.87

ECM	Morris Knolls High School - PV Solar System	Morris Hills High School - PV Solar System
Assumed Inflation (Gas)		
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$215,006.90	\$107,607.80
Assumed Average Useful Life (Years)	15	15
Lifetime Savings	\$7,838,993.40	\$3,923,301.22
Year	Annual Savings	Annual Savings
1	\$215,006.90	\$107,607.80
2	\$221,457.11	\$110,836.03
3	\$228,100.82	\$114,161.12
4	\$234,943.84	\$117,585.95
5	\$241,992.16	\$121,113.53
6	\$249,251.92	\$124,746.93
7	\$256,729.48	\$128,489.34
8	\$264,431.37	\$132,344.02
9	\$272,364.31	\$136,314.34
10	\$280,535.24	\$140,403.77
11	\$288,951.29	\$144,615.88
12	\$297,619.83	\$148,954.36
13	\$306,548.43	\$153,422.99
14	\$315,744.88	\$158,025.68
15	\$325,217.23	\$162,766.45
16	\$334,973.74	\$167,649.45
17	\$345,022.96	\$172,678.93
18	\$355,373.65	\$177,859.30
19	\$366,034.85	\$183,195.08
20	\$377,015.90	\$188,690.93
21	\$388,326.38	\$194,351.66
22	\$399,976.17	\$200,182.21
23	\$411,975.45	\$206,187.67
24	\$424,334.72	\$212,373.30
25	\$437,064.76	\$218,744.50

ECM	Wind Turbine - Min Wind Speed	Wind Turbine - Max Wind Speed	Wind Turbine - Avg wind Speed
Assumed Inflation (Gas)			
Initial Yearly Savings (Gas)			
Assumed Inflation (Electricity)	3%	3%	3%
Initial Yearly Savings (Electricity)	\$906.70	\$2,565.40	\$1,724.40
Assumed Average Useful Life (Years)	25	25	25
Lifetime Savings	\$33,057.61	\$93,532.60	\$62,870.36
Year	Annual Savings	Annual Savings	Annual Savings
1	\$906.70	\$2,565.40	\$1,724.40
2	\$933.90	\$2,642.36	\$1,776.13
3	\$961.92	\$2,721.63	\$1,829.42
4	\$990.78	\$2,803.28	\$1,884.30
5	\$1,020.50	\$2,887.38	\$1,940.83
6	\$1,051.11	\$2,974.00	\$1,999.05
7	\$1,082.65	\$3,063.22	\$2,059.02
8	\$1,115.13	\$3,155.12	\$2,120.79
9	\$1,148.58	\$3,249.77	\$2,184.42
10	\$1,183.04	\$3,347.27	\$2,249.95
11	\$1,218.53	\$3,447.68	\$2,317.45
12	\$1,255.08	\$3,551.11	\$2,386.97
13	\$1,292.74	\$3,657.65	\$2,458.58
14	\$1,331.52	\$3,767.38	\$2,532.34
15	\$1,371.47	\$3,880.40	\$2,608.31
16	\$1,412.61	\$3,996.81	\$2,686.56
17	\$1,454.99	\$4,116.71	\$2,767.16
18	\$1,498.64	\$4,240.22	\$2,850.17
19	\$1,543.60	\$4,367.42	\$2,935.68
20	\$1,589.90	\$4,498.44	\$3,023.75
21	\$1,637.60	\$4,633.40	\$3,114.46
22	\$1,686.73	\$4,772.40	\$3,207.89
23	\$1,737.33	\$4,915.57	\$3,304.13
24	\$1,789.45	\$5,063.04	\$3,403.25
25	\$1,843.13	\$5,214.93	\$3,505.35

IRR, NPV, AROI - PV Solar Energy Systems

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Morris Knolls High School - PV Solar System

Year	Energy Savings	SREC Sales	Cash Flow
0			(\$9,664,888)
1	\$215,006.9	\$448,461	\$663,468
2	\$220,349.9	\$446,219	\$666,569
3	\$225,825.6	\$443,988	\$669,813
4	\$231,437.3	\$441,768	\$673,205
5	\$237,188.5	\$439,559	\$676,748
6	\$243,082.7	\$437,361	\$680,444
7	\$249,123.3	\$435,174	\$684,298
8	\$255,314.0	\$432,999	\$688,313
9	\$261,658.5	\$430,834	\$692,492
10	\$268,160.8	\$428,679	\$696,840
11	\$274,824.6	\$426,536	\$701,361
12	\$281,653.9	\$424,403	\$706,057
13	\$288,653.0	\$422,281	\$710,934
14	\$295,826.1	\$420,170	\$715,996
15	\$303,177.3	\$418,069	\$721,246
16	\$310,711.3	\$24,585	\$335,296
17	\$318,432.5	\$24,462	\$342,895
18	\$326,345.5	\$24,340	\$350,685
19	\$334,455.2	\$24,218	\$358,673
20	\$342,766.4	\$24,097	\$366,863
21	\$351,284.2	\$23,977	\$375,261
22	\$360,013.6	\$23,857	\$383,870
23	\$368,959.9	\$23,737	\$392,697
24	\$378,128.6	\$23,619	\$401,747
25	\$387,525.1	\$23,501	\$411,026
IRR			3.6%
NPV			\$568,650
AROI			2.9%

Morris Hills High School - PV Solar System

Year	Energy Savings	SREC Sales	Cash Flow
0			(\$5,895,463)
1	\$107,607.8	\$271,264	\$378,872
2	\$110,281.8	\$269,908	\$380,190
3	\$113,022.3	\$268,558	\$381,580
4	\$115,831.0	\$267,215	\$383,046
5	\$118,709.4	\$265,879	\$384,589
6	\$121,659.3	\$264,550	\$386,209
7	\$124,682.5	\$263,227	\$387,910
8	\$127,780.9	\$261,911	\$389,692
9	\$130,956.2	\$260,601	\$391,558
10	\$134,210.5	\$259,298	\$393,509
11	\$137,545.6	\$258,002	\$395,548
12	\$140,963.6	\$256,712	\$397,676
13	\$144,466.6	\$255,428	\$399,895
14	\$148,056.6	\$254,151	\$402,208
15	\$151,735.8	\$252,880	\$404,616
16	\$155,506.4	\$14,871	\$170,377
17	\$159,370.7	\$14,797	\$174,167
18	\$163,331.1	\$14,723	\$178,054
19	\$167,389.9	\$14,649	\$182,039
20	\$171,549.5	\$14,576	\$186,125
21	\$175,812.5	\$14,503	\$190,315
22	\$180,181.5	\$14,430	\$194,612
23	\$184,659.0	\$14,358	\$199,017
24	\$189,247.8	\$14,286	\$203,534
25	\$193,950.6	\$14,215	\$208,166
IRR			2.6%
NPV			(\$218,743)
AROI			2.4%

IRR, NPV, AROI - Wind Energy Systems

Financial Calculations

Based on inflation of: 3%
O&M inflation: 3%

Wind Turbine - Minimum Wind Speed			
REIP Incentive:		\$17,395	
Year	Energy Savings	REC Sales	Cash Flow
0			(\$51,095)
1	\$906.7	\$136	\$1,043
2	\$929.3	\$135	\$1,064
3	\$952.3	\$135	\$1,087
4	\$976.0	\$134	\$1,110
5	\$1,000.3	\$133	\$1,133
6	\$1,025.1	\$133	\$1,158
7	\$1,050.6	\$132	\$1,182
8	\$1,076.7	\$131	\$1,208
9	\$1,103.5	\$131	\$1,234
10	\$1,130.9	\$130	\$1,261
11	\$1,159.0	\$129	\$1,288
12	\$1,187.8	\$129	\$1,316
13	\$1,217.3	\$128	\$1,345
14	\$1,247.6	\$127	\$1,375
15	\$1,278.6	\$127	\$1,405
16	\$1,310.3	\$126	\$1,436
17	\$1,342.9	\$125	\$1,468
18	\$1,376.3	\$125	\$1,501
19	\$1,410.5	\$124	\$1,535
20	\$1,445.5	\$124	\$1,569
21	\$1,481.4	\$123	\$1,604
22	\$1,518.2	\$122	\$1,641
23	\$1,556.0	\$122	\$1,678
24	\$1,594.6	\$121	\$1,716
25	\$1,634.3	\$120	\$1,755
		IRR	-2.7%
		NPV	-\$28,111
		AROI	-2.0%

Wind Turbine - Maximum Wind Speed			
REIP Incentive:		\$49,216	
Year	Energy Savings	REC Sales	Cash Flow
0			(\$19,274)
1	\$2,565.4	\$385	\$2,950
2	\$2,629.1	\$383	\$3,012
3	\$2,694.5	\$381	\$3,075
4	\$2,761.4	\$379	\$3,140
5	\$2,830.0	\$377	\$3,207
6	\$2,900.4	\$375	\$3,275
7	\$2,972.4	\$373	\$3,346
8	\$3,046.3	\$371	\$3,418
9	\$3,122.0	\$369	\$3,491
10	\$3,199.6	\$368	\$3,567
11	\$3,279.1	\$366	\$3,645
12	\$3,360.6	\$364	\$3,724
13	\$3,444.1	\$362	\$3,806
14	\$3,529.7	\$360	\$3,890
15	\$3,617.4	\$358	\$3,976
16	\$3,707.3	\$357	\$4,064
17	\$3,799.4	\$355	\$4,154
18	\$3,893.8	\$353	\$4,247
19	\$3,990.6	\$351	\$4,342
20	\$4,089.8	\$350	\$4,439
21	\$4,191.4	\$348	\$4,539
22	\$4,295.6	\$346	\$4,642
23	\$4,402.3	\$344	\$4,747
24	\$4,511.7	\$343	\$4,854
25	\$4,623.8	\$341	\$4,965
		IRR	16.9%
		NPV	\$45,753
		AROI	11.3%

Wind Turbine - Average Wind Speed			
REIP Incentive:		\$33,082	
Year	Energy Savings	REC Sales	Cash Flow
0			(\$35,408)
1	\$1,724.4	\$258	\$1,983
2	\$1,767.2	\$257	\$2,024
3	\$1,811.1	\$256	\$2,067
4	\$1,856.2	\$255	\$2,111
5	\$1,902.3	\$253	\$2,156
6	\$1,949.5	\$252	\$2,202
7	\$1,998.0	\$251	\$2,249
8	\$2,047.6	\$250	\$2,297
9	\$2,098.5	\$248	\$2,347
10	\$2,150.7	\$247	\$2,398
11	\$2,204.1	\$246	\$2,450
12	\$2,258.9	\$245	\$2,503
13	\$2,315.0	\$243	\$2,558
14	\$2,372.6	\$242	\$2,615
15	\$2,431.5	\$241	\$2,672
16	\$2,491.9	\$240	\$2,732
17	\$2,553.9	\$239	\$2,792
18	\$2,617.3	\$237	\$2,855
19	\$2,682.4	\$236	\$2,919
20	\$2,749.0	\$235	\$2,984
21	\$2,817.3	\$234	\$3,051
22	\$2,887.3	\$233	\$3,120
23	\$2,959.1	\$231	\$3,191
24	\$3,032.6	\$230	\$3,263
25	\$3,108.0	\$229	\$3,337
		IRR	4.8%
		NPV	\$8,301
		AROI	1.6%

ECRM: Computer Power Management Software Installation

Software Cost (per computer) \$18.40

Location	Desktop Computer Quantity	Watts	Electricity Costs (\$/kWh)	Annual Operational Hours Before Software	kWh Consumed Before Software	Operational Hours After Software	kWh Consumed After Software	Annual Energy Usage Cost Before	Annual Energy Usage Cost After	Annual Energy Cost Savings	Annual kWh Savings	Software Cost	Simple Payback
Morris Knolls High School	560.0	92.1	0.20	3,840.0	353.7	1,520.0	140.0	\$40,165	\$15,899	\$24,266.3	213.7	\$10,304.0	0.42
Morris Hills High School	500.0	92.1	0.17	3,840.0	353.7	1,520.0	140.0	\$29,672	\$11,745	\$17,927.1	213.7	\$9,200.0	0.51
Totals							280.0	\$69,837	\$27,644	\$42,193	427.3	\$19,504	0.46

Assumptions	Before Implementation	After Implementation
Hours that computers are on:	24	9.5
Days per week computers are used:	5	5
Weeks per month used:	4	4
Months per year computers are used:	8	8

IRR, NPV, AROI - Computer Power Management Software

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Morris Knolls High School Computer Power Management Software			Morris Hills High School Computer Power Management Software		
Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow
0		(\$10,304)	0		(\$9,200)
1	\$24,266.3	\$24,266	1	\$17,927.1	\$17,927
2	\$24,994.29	\$24,994	2	\$18,464.89	\$18,465
3	\$25,744.12	\$25,744	3	\$19,018.84	\$19,019
4	\$26,516.44	\$26,516	4	\$19,589.41	\$19,589
5	\$27,311.94	\$27,312	5	\$20,177.09	\$20,177
IRR 237.88%			IRR 196.88%		
NPV \$107,493.58			NPV \$77,824.66		
AROI 231.50%			AROI 190.86%		

ECM	Morris Knolls High School - Computer Power Management Software	Morris Hills High School - Computer Power Management Software
Assumed Inflation (Gas)		
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$24,266.3	\$17,927.1
Assumed Average Useful Life (Years)	5	5
Lifetime Savings	\$128,833.09	\$95,177.31
<u>Year</u>	<u>Annual Savings</u>	<u>Annual Savings</u>
1	\$24,266.30	\$17,927.08
2	\$24,994.29	\$18,464.89
3	\$25,744.12	\$19,018.84
4	\$26,516.44	\$19,589.41
5	\$27,311.94	\$20,177.09

IRR, NPV, AROI - Unit Vent Controls**Financial Calculations**

Based on inflation of: 3%

O&M inflation: 3%

Morris Knolls High School			Morris Hills High School		
Unit Vent Controls			Unit Vent Controls		
Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow
0		(\$48,875)	0		(\$26,450)
1	\$63,218.5	\$63,218	1	\$29,510.1	\$29,510
2	\$65,115.00	\$65,115	2	\$30,395.38	\$30,395
3	\$67,068.45	\$67,068	3	\$31,307.24	\$31,307
4	\$69,080.51	\$69,081	4	\$32,246.46	\$32,246
5	\$71,152.92	\$71,153	5	\$33,213.86	\$33,214
6	\$73,287.51	\$73,288	6	\$34,210.27	\$34,210
7	\$75,486.14	\$75,486	7	\$35,236.58	\$35,237
8	\$77,750.72	\$77,751	8	\$36,293.68	\$36,294
9	\$80,083.24	\$80,083	9	\$37,382.49	\$37,382
10	\$82,485.74	\$82,486	10	\$38,503.96	\$38,504
	IRR	132.31%		IRR	114.50%
	NPV	\$564,896.36		NPV	\$260,055.63
	AROI	125.35%		AROI	107.57%

ECM	Morris Knolls High School - Unit Vent Controls	Morris Hills High School - Unit Vent Controls
Assumed Inflation (Gas)	3%	3%
Initial Yearly Savings (Gas)	\$12,084.63	\$7,108.60
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	\$51,133.82	\$22,401.48
Assumed Average Useful Life (Years)	10	10
Lifetime Savings	\$724,728.68	\$338,300.00
<u>Year</u>	<u>Annual Savings</u>	<u>Annual Savings</u>
1	\$63,218.45	\$29,510.08
2	\$65,115.00	\$30,395.38
3	\$67,068.45	\$31,307.24
4	\$69,080.51	\$32,246.46
5	\$71,152.92	\$33,213.86
6	\$73,287.51	\$34,210.27
7	\$75,486.14	\$35,236.58
8	\$77,750.72	\$36,293.68
9	\$80,083.24	\$37,382.49
10	\$82,485.74	\$38,503.96

IRR, NPV, AROI - Insulate Piping

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Morris Hills High School		
Insulate Piping		
Year	Energy Savings	Cash Flow
0		(\$740)
1	\$525.0	\$525
2	\$540.75	\$541
3	\$556.97	\$557
4	\$573.68	\$574
5	\$590.89	\$591
6	\$608.62	\$609
7	\$626.88	\$627
8	\$645.68	\$646
9	\$665.05	\$665
10	\$685.01	\$685
11	\$705.56	\$706
12	\$726.72	\$727
13	\$748.52	\$749
14	\$770.98	\$771
15	\$794.11	\$794
16	\$817.93	\$818
17	\$842.47	\$842
18	\$867.75	\$868
19	\$893.78	\$894
20	\$920.59	\$921
IRR		73.91%
NPV		\$9,453.86
AROI		66.92%

ECM	Morris Hills High School - Insulate Piping
Assumed Inflation (Oil)	3%
Initial Yearly Savings (Oil)	\$525.00
Assumed Inflation (Electricity)	3%
Initial Yearly Savings (Electricity)	\$0.00
Assumed Average Useful Life (Years)	20
Lifetime Savings	\$14,106.95
<u>Year</u>	<u>Annual Savings</u>
1	\$525.00
2	\$540.75
3	\$556.97
4	\$573.68
5	\$590.89
6	\$608.62
7	\$626.88
8	\$645.68
9	\$665.05
10	\$685.01
11	\$705.56
12	\$726.72
13	\$748.52
14	\$770.98
15	\$794.11
16	\$817.93
17	\$842.47
18	\$867.75
19	\$893.78
20	\$920.59

Based on inflation of:

3%

Based on inflation of:

3%

O&M inflation:

3%

O&M inflation:

3%

Morris Knolls High School			Morris Hills High School		
Low Flow Fixtures			Low Flow Fixtures		
Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow
0		(\$7,669)	0		(\$7,948)
1	\$958.2	\$958	1	\$877.5	\$878
2	\$986.94	\$987	2	\$903.85	\$904
3	\$1,016.54	\$1,017	3	\$930.96	\$931
4	\$1,047.04	\$1,047	4	\$958.89	\$959
5	\$1,078.45	\$1,078	5	\$987.66	\$988
6	\$1,110.80	\$1,111	6	\$1,017.29	\$1,017
7	\$1,144.13	\$1,144	7	\$1,047.80	\$1,048
8	\$1,178.45	\$1,178	8	\$1,079.24	\$1,079
9	\$1,213.81	\$1,214	9	\$1,111.62	\$1,112
10	\$1,250.22	\$1,250	10	\$1,144.96	\$1,145
11	\$1,287.73	\$1,288	11	\$1,179.31	\$1,179
12	\$1,326.36	\$1,326	12	\$1,214.69	\$1,215
13	\$1,366.15	\$1,366	13	\$1,251.13	\$1,251
14	\$1,407.13	\$1,407	14	\$1,288.67	\$1,289
15	\$1,449.35	\$1,449	15	\$1,327.33	\$1,327
16	\$1,492.83	\$1,493	16	\$1,367.15	\$1,367
17	\$1,537.61	\$1,538	17	\$1,408.16	\$1,408
18	\$1,583.74	\$1,584	18	\$1,450.41	\$1,450
19	\$1,631.25	\$1,631	19	\$1,493.92	\$1,494
20	\$1,680.19	\$1,680	20	\$1,538.74	\$1,539
	IRR	13.79%		IRR	11.96%
	NPV	\$10,936.57		NPV	\$9,091.28
	ARO	8.49%		ARO	7.04%

ECM	Morris Knolls High School - Low Flow Fixtures	Morris Hills High School - Low Flow Fixtures
Assumed Inflation (Gas)	3%	3%
Initial Yearly Savings (Gas)	\$534.57	\$513.58
Assumed Inflation (Water)	3%	3%
Initial Yearly Savings (Water)	\$423.62	\$363.94
Assumed Average Useful Life (Years)	20	20
Lifetime Savings	\$25,746.92	\$23,579.29
<u>Year</u>	<u>Annual Savings</u>	<u>Annual Savings</u>
1	\$958.19	\$877.52
2	\$986.94	\$903.85
3	\$1,016.54	\$930.96
4	\$1,047.04	\$958.89
5	\$1,078.45	\$987.66
6	\$1,110.80	\$1,017.29
7	\$1,144.13	\$1,047.80
8	\$1,178.45	\$1,079.24
9	\$1,213.81	\$1,111.62
10	\$1,250.22	\$1,144.96
11	\$1,287.73	\$1,179.31
12	\$1,326.36	\$1,214.69
13	\$1,366.15	\$1,251.13
14	\$1,407.13	\$1,288.67
15	\$1,449.35	\$1,327.33
16	\$1,492.83	\$1,367.15
17	\$1,537.61	\$1,408.16
18	\$1,583.74	\$1,450.41
19	\$1,631.25	\$1,493.92
20	\$1,680.19	\$1,538.74

APPENDIX K

WIND CAD MODELING

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For: **Morris Hills Regional Board of Educaiton**

Site Location: **Morris Knolls High School**

Data Source: **NASA**

Date: **5/26/2010**

10 kW

Inputs:

Min. Wind (m/s) = 3.75
Weibull K = 2
Site Altitude (m) = 72
Wind Shear Exp. = 0.180
Anem. Height (m) = 30
Tower Height (m) = 30
Turbulence Factor = 5.0%

Results:

Hub Average Wind Speed (m/s) = 3.75
Air Density Factor = -1%
Average Output Power (kW) = 0.62
Daily Energy Output (kWh) = 14.9
Annual Energy Output (kWh) = **5,436**
Monthly Energy Output = 453
Percent Operating Time = 50.1%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	10.65%	0.000
2	0.00	17.99%	0.000
3	0.13	20.36%	0.027
4	0.41	18.30%	0.074
5	0.83	13.78%	0.114
6	1.43	8.90%	0.127
7	2.22	4.99%	0.111
8	3.24	2.45%	0.079
9	4.53	1.06%	0.048
10	6.06	0.40%	0.024
11	7.75	0.14%	0.011
12	9.46	0.04%	0.004
13	10.73	0.01%	0.001
14	11.10	0.00%	0.000
15	11.38	0.00%	0.000
16	11.46	0.00%	0.000
17	11.47	0.00%	0.000
18	11.42	0.00%	0.000
19	11.25	0.00%	0.000
20	10.80	0.00%	0.000
Totals:		99.06%	0.621

Weibull Calculations:

Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.

Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For: **Morris Hills Regional Board of Educaiton**

Site Location: **Morris Knolls High School**

Data Source: **NASA**

Date: **5/26/2010**

10 kW

Inputs:

Max. Wind (m/s) = 5.41
Weibull K = 2
Site Altitude (m) = 72
Wind Shear Exp. = 0.180
Anem. Height (m) = 30
Tower Height (m) = 30
Turbulence Factor = 5.0%

Results:

Hub Average Wind Speed (m/s) = 5.41
Air Density Factor = -1%
Average Output Power (kW) = 1.76
Daily Energy Output (kWh) = 42.1
Annual Energy Output (kWh) = **15,380**
Monthly Energy Output = 1,282
Percent Operating Time = 71.8%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	5.27%	0.000
2	0.00	9.71%	0.000
3	0.13	12.73%	0.017
4	0.41	14.04%	0.057
5	0.83	13.76%	0.114
6	1.43	12.26%	0.175
7	2.22	10.06%	0.223
8	3.24	7.66%	0.248
9	4.53	5.44%	0.246
10	6.06	3.61%	0.219
11	7.75	2.25%	0.175
12	9.46	1.32%	0.125
13	10.73	0.73%	0.078
14	11.10	0.38%	0.042
15	11.38	0.18%	0.021
16	11.46	0.08%	0.010
17	11.47	0.04%	0.004
18	11.42	0.02%	0.002
19	11.25	0.01%	0.001
20	10.80	0.00%	0.000
Totals:		99.55%	1.756

Weibull Calculations:

Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.

Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For: **Morris Hills Regional Board of Educaiton**

Site Location: **Morris Knolls High School**

Data Source: **NASA**

Date: **5/26/2010**

10 kW

Inputs:

Ave. Wind (m/s) = 4.67
Weibull K = 2
Site Altitude (m) = 72
Wind Shear Exp. = 0.180
Anem. Height (m) = 30
Tower Height (m) = 30
Turbulence Factor = 5.0%

Results:

Hub Average Wind Speed (m/s) = 4.67
Air Density Factor = -1%
Average Output Power (kW) = 1.18
Daily Energy Output (kWh) = 28.3
Annual Energy Output (kWh) = **10,338**
Monthly Energy Output = 862
Percent Operating Time = 64.1%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	7.00%	0.000
2	0.00	12.56%	0.000
3	0.13	15.72%	0.021
4	0.41	16.25%	0.066
5	0.83	14.65%	0.122
6	1.43	11.79%	0.168
7	2.22	8.58%	0.190
8	3.24	5.69%	0.184
9	4.53	3.45%	0.156
10	6.06	1.92%	0.116
11	7.75	0.99%	0.076
12	9.46	0.47%	0.044
13	10.73	0.20%	0.022
14	11.10	0.08%	0.009
15	11.38	0.03%	0.004
16	11.46	0.01%	0.001
17	11.47	0.00%	0.000
18	11.42	0.00%	0.000
19	11.25	0.00%	0.000
20	10.80	0.00%	0.000
Totals:		99.39%	1.180

Weibull Calculations:

Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis. Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

APPENDIX L

WIND ENERGY FINANCING WORKSHEET

Morris Hills Regional District Board of Education
(Minimum Average Site Wind Speed @30m – 8.4 mph)

Annual kWh 5,436
Engineer's Opinion of Probable Cost \$68,489.69

Assumptions
Annual System Degredation 0.50%
Annual Utility Inflation 3.00%
Annual Maintenance Costs \$0.02/kWh Production
REC Factor \$25/MWh Production
REIP Incentive \$3.20/kWh First 16,000 kWh
\$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1668	5,436.0	\$906.7	\$136	\$17,395	(\$109)	\$933.9	\$933.9
2	0.1718	5,408.8	\$929.3	\$135	\$0	(\$108)	\$956.3	\$1,890.2
3	0.1770	5,381.8	\$952.3	\$135	\$0	(\$108)	\$979.3	\$2,869.5
4	0.1823	5,354.9	\$976.0	\$134	\$0	(\$107)	\$1,002.8	\$3,872.3
5	0.1877	5,328.1	\$1,000.3	\$133	\$0	(\$107)	\$1,026.9	\$4,899.2
6	0.1934	5,301.5	\$1,025.1	\$133	\$0	(\$106)	\$1,051.6	\$5,950.8
7	0.1992	5,274.9	\$1,050.6	\$132	\$0	(\$105)	\$1,077.0	\$7,027.8
8	0.2051	5,248.6	\$1,076.7	\$131	\$0	(\$105)	\$1,103.0	\$8,130.7
9	0.2113	5,222.3	\$1,103.5	\$131	\$0	(\$104)	\$1,129.6	\$9,260.3
10	0.2176	5,196.2	\$1,130.9	\$130	\$0	(\$104)	\$1,156.9	\$10,417.2
11	0.2242	5,170.2	\$1,159.0	\$129	\$0	(\$103)	\$1,184.8	\$11,602.0
12	0.2309	5,144.4	\$1,187.8	\$129	\$0	(\$103)	\$1,213.5	\$12,815.5
13	0.2378	5,118.7	\$1,217.3	\$128	\$0	(\$102)	\$1,242.9	\$14,058.4
14	0.2450	5,093.1	\$1,247.6	\$127	\$0	(\$102)	\$1,273.0	\$15,331.4
15	0.2523	5,067.6	\$1,278.6	\$127	\$0	(\$101)	\$1,303.9	\$16,635.3
16	0.2599	5,042.3	\$1,310.3	\$126	\$0	(\$101)	\$1,335.5	\$17,970.9
17	0.2677	5,017.1	\$1,342.9	\$125	\$0	(\$100)	\$1,368.0	\$19,338.8
18	0.2757	4,992.0	\$1,376.3	\$125	\$0	(\$100)	\$1,401.2	\$20,740.1
19	0.2840	4,967.0	\$1,410.5	\$124	\$0	(\$99)	\$1,435.3	\$22,175.3
20	0.2925	4,942.2	\$1,445.5	\$124	\$0	(\$99)	\$1,470.2	\$23,645.6
21	0.3013	4,917.5	\$1,481.4	\$123	\$0	(\$98)	\$1,506.0	\$25,151.6
22	0.3103	4,892.9	\$1,518.2	\$122	\$0	(\$98)	\$1,542.7	\$26,694.3
23	0.3196	4,868.4	\$1,556.0	\$122	\$0	(\$97)	\$1,580.3	\$28,274.6
24	0.3292	4,844.1	\$1,594.6	\$121	\$0	(\$97)	\$1,618.9	\$29,893.5
25	0.3391	4,819.8	\$1,634.3	\$120	\$0	(\$96)	\$1,658.4	\$31,551.8

Morris Hills Regional District Board of Education
(Maximum Average Site Wind Speed @30m - 12.1 mph)

Annual kWh	15,380
Engineer's Opinion of Probable Cost	\$68,489.69

Assumptions	
Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	\$0.02/kWh Production
REC Factor	\$25/MWh Production
REIP Incentive	\$3.20/kWh First 16,000 kWh
	\$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1668	15,380.0	\$2,565.4	\$385	\$49,216	(\$308)	\$2,642.3	\$2,642.3
2	0.1718	15,303.1	\$2,629.1	\$383	\$0	(\$306)	\$2,705.6	\$5,347.9
3	0.1770	15,226.6	\$2,694.5	\$381	\$0	(\$305)	\$2,770.6	\$8,118.5
4	0.1823	15,150.5	\$2,761.4	\$379	\$0	(\$303)	\$2,837.2	\$10,955.7
5	0.1877	15,074.7	\$2,830.0	\$377	\$0	(\$301)	\$2,905.4	\$13,861.1
6	0.1934	14,999.3	\$2,900.4	\$375	\$0	(\$300)	\$2,975.4	\$16,836.5
7	0.1992	14,924.3	\$2,972.4	\$373	\$0	(\$298)	\$3,047.1	\$19,883.6
8	0.2051	14,849.7	\$3,046.3	\$371	\$0	(\$297)	\$3,120.6	\$23,004.1
9	0.2113	14,775.5	\$3,122.0	\$369	\$0	(\$296)	\$3,195.9	\$26,200.0
10	0.2176	14,701.6	\$3,199.6	\$368	\$0	(\$294)	\$3,273.1	\$29,473.1
11	0.2242	14,628.1	\$3,279.1	\$366	\$0	(\$293)	\$3,352.2	\$32,825.4
12	0.2309	14,554.9	\$3,360.6	\$364	\$0	(\$291)	\$3,433.4	\$36,258.7
13	0.2378	14,482.2	\$3,444.1	\$362	\$0	(\$290)	\$3,516.5	\$39,775.3
14	0.2450	14,409.7	\$3,529.7	\$360	\$0	(\$288)	\$3,601.7	\$43,377.0
15	0.2523	14,337.7	\$3,617.4	\$358	\$0	(\$287)	\$3,689.1	\$47,066.1
16	0.2599	14,266.0	\$3,707.3	\$357	\$0	(\$285)	\$3,778.6	\$50,844.7
17	0.2677	14,194.7	\$3,799.4	\$355	\$0	(\$284)	\$3,870.4	\$54,715.1
18	0.2757	14,123.7	\$3,893.8	\$353	\$0	(\$282)	\$3,964.5	\$58,679.6
19	0.2840	14,053.1	\$3,990.6	\$351	\$0	(\$281)	\$4,060.9	\$62,740.4
20	0.2925	13,982.8	\$4,089.8	\$350	\$0	(\$280)	\$4,159.7	\$66,900.1
21	0.3013	13,912.9	\$4,191.4	\$348	\$0	(\$278)	\$4,261.0	\$71,161.0
22	0.3103	13,843.3	\$4,295.6	\$346	\$0	(\$277)	\$4,364.8	\$75,525.8
23	0.3196	13,774.1	\$4,402.3	\$344	\$0	(\$275)	\$4,471.2	\$79,997.0
24	0.3292	13,705.3	\$4,511.7	\$343	\$0	(\$274)	\$4,580.2	\$84,577.2
25	0.3391	13,636.7	\$4,623.8	\$341	\$0	(\$273)	\$4,692.0	\$89,269.2

Morris Hills Regional District Board of Education
(Average Site Wind Speed @30m - 10.5 mph)

Annual kWh 10,338
Engineer's Opinion of Probable Cost \$68,489.69

Assumptions
Annual System Degredation 0.50%
Annual Utility Inflation 3.00%
Annual Maintenance Costs \$0.02/kWh Production
REC Factor \$25/MWh Production
REIP Incentive \$3.20/kWh First 16,000 kWh
\$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1668	10,338.0	\$1,724.4	\$258	\$33,082	(\$207)	\$1,776.1	\$1,776.1
2	0.1718	10,286.3	\$1,767.2	\$257	\$0	(\$206)	\$1,818.7	\$3,594.7
3	0.1770	10,234.9	\$1,811.1	\$256	\$0	(\$205)	\$1,862.3	\$5,457.0
4	0.1823	10,183.7	\$1,856.2	\$255	\$0	(\$204)	\$1,907.1	\$7,364.1
5	0.1877	10,132.8	\$1,902.3	\$253	\$0	(\$203)	\$1,952.9	\$9,317.1
6	0.1934	10,082.1	\$1,949.5	\$252	\$0	(\$202)	\$2,000.0	\$11,317.0
7	0.1992	10,031.7	\$1,998.0	\$251	\$0	(\$201)	\$2,048.2	\$13,365.2
8	0.2051	9,981.6	\$2,047.6	\$250	\$0	(\$200)	\$2,097.6	\$15,462.7
9	0.2113	9,931.6	\$2,098.5	\$248	\$0	(\$199)	\$2,148.2	\$17,610.9
10	0.2176	9,882.0	\$2,150.7	\$247	\$0	(\$198)	\$2,200.1	\$19,811.0
11	0.2242	9,832.6	\$2,204.1	\$246	\$0	(\$197)	\$2,253.3	\$22,064.3
12	0.2309	9,783.4	\$2,258.9	\$245	\$0	(\$196)	\$2,307.8	\$24,372.1
13	0.2378	9,734.5	\$2,315.0	\$243	\$0	(\$195)	\$2,363.7	\$26,735.8
14	0.2450	9,685.8	\$2,372.6	\$242	\$0	(\$194)	\$2,421.0	\$29,156.8
15	0.2523	9,637.4	\$2,431.5	\$241	\$0	(\$193)	\$2,479.7	\$31,636.5
16	0.2599	9,589.2	\$2,491.9	\$240	\$0	(\$192)	\$2,539.9	\$34,176.4
17	0.2677	9,541.3	\$2,553.9	\$239	\$0	(\$191)	\$2,601.6	\$36,777.9
18	0.2757	9,493.6	\$2,617.3	\$237	\$0	(\$190)	\$2,664.8	\$39,442.7
19	0.2840	9,446.1	\$2,682.4	\$236	\$0	(\$189)	\$2,729.6	\$42,172.3
20	0.2925	9,398.9	\$2,749.0	\$235	\$0	(\$188)	\$2,796.0	\$44,968.3
21	0.3013	9,351.9	\$2,817.3	\$234	\$0	(\$187)	\$2,864.1	\$47,832.4
22	0.3103	9,305.1	\$2,887.3	\$233	\$0	(\$186)	\$2,933.9	\$50,766.3
23	0.3196	9,258.6	\$2,959.1	\$231	\$0	(\$185)	\$3,005.4	\$53,771.7
24	0.3292	9,212.3	\$3,032.6	\$230	\$0	(\$184)	\$3,078.7	\$56,850.4
25	0.3391	9,166.2	\$3,108.0	\$229	\$0	(\$183)	\$3,153.8	\$60,004.2