

**VOORHEES TOWNSHIP
BOARD OF EDUCATION
SIGNAL HILL ELEMENTARY SCHOOL**

**33 SIGNAL HILL DRIVE
VOORHEES, NJ 08043**

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

Electric Utility Provider:	Atlantic City Electric
Electric Utility Rate Structure:	Annual General Service (ASG)
Third Party Supplier:	Reliant Energy (Effective June 1, 2011) GDF Suez (Prior to June 1, 2011)
Natural Gas Utility Provider:	South Jersey Gas
Utility Rate Structure:	General Service Gas (GSG) – Firm Transportation
Third Party Supplier:	HESS (Effective April 29, 2010) PEPCO (Prior to April 29, 2010)

The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile within each facility report shows the actual natural gas energy usage for the facility. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: Atlantic City Electric Rate: Annual General Service (AGS) Meter No: 86313268 Account # 0807 8429 9994 Third Party Utility Provider: GDF Suez (during this study period) TPS Meter / Acct No: - / 40808-46004			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-10	92,080	260.8	\$11,677
Apr-10	87,120	269.6	\$11,208
May-10	100,880	381.6	\$13,482
Jun-10	133,440	389.6	\$15,449
Jul-10	132,400	363.2	\$16,430
Aug-10	122,480	312.0	\$14,278
Sep-10	103,520	361.6	\$12,566
Oct-10	79,840	316.0	\$10,138
Nov-10	93,760	311.7	\$11,814
Dec-10	107,440	311.7	\$13,700
Jan-11	107,120	311.7	\$13,835
Feb-11	139,360	338.4	\$17,800
Totals	1,299,440	389.6 Max	\$162,377
AVERAGE DEMAND 327.3 KW average AVERAGE RATE \$0.125 \$/kWh			

Figure 1
Electricity Usage Profile

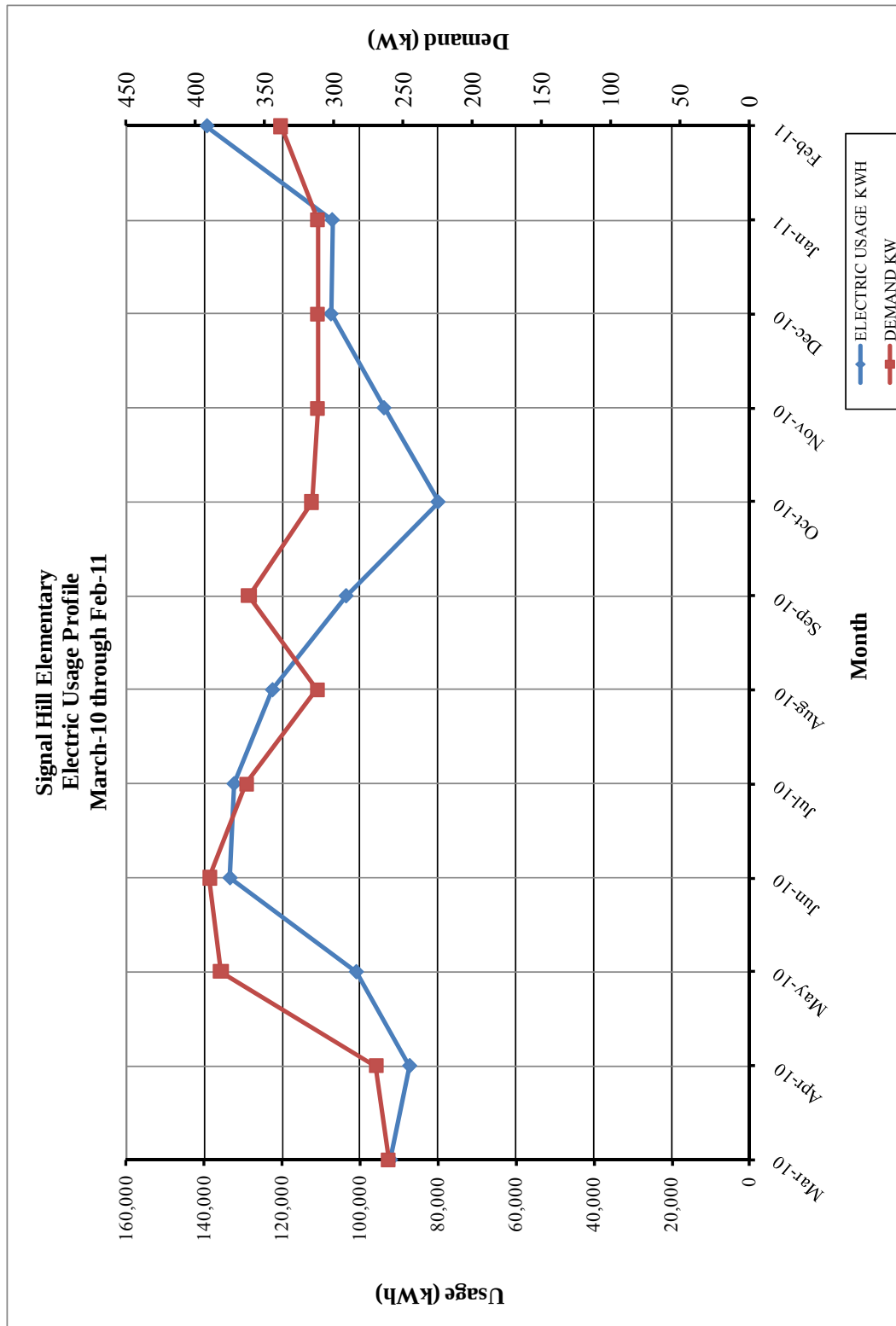
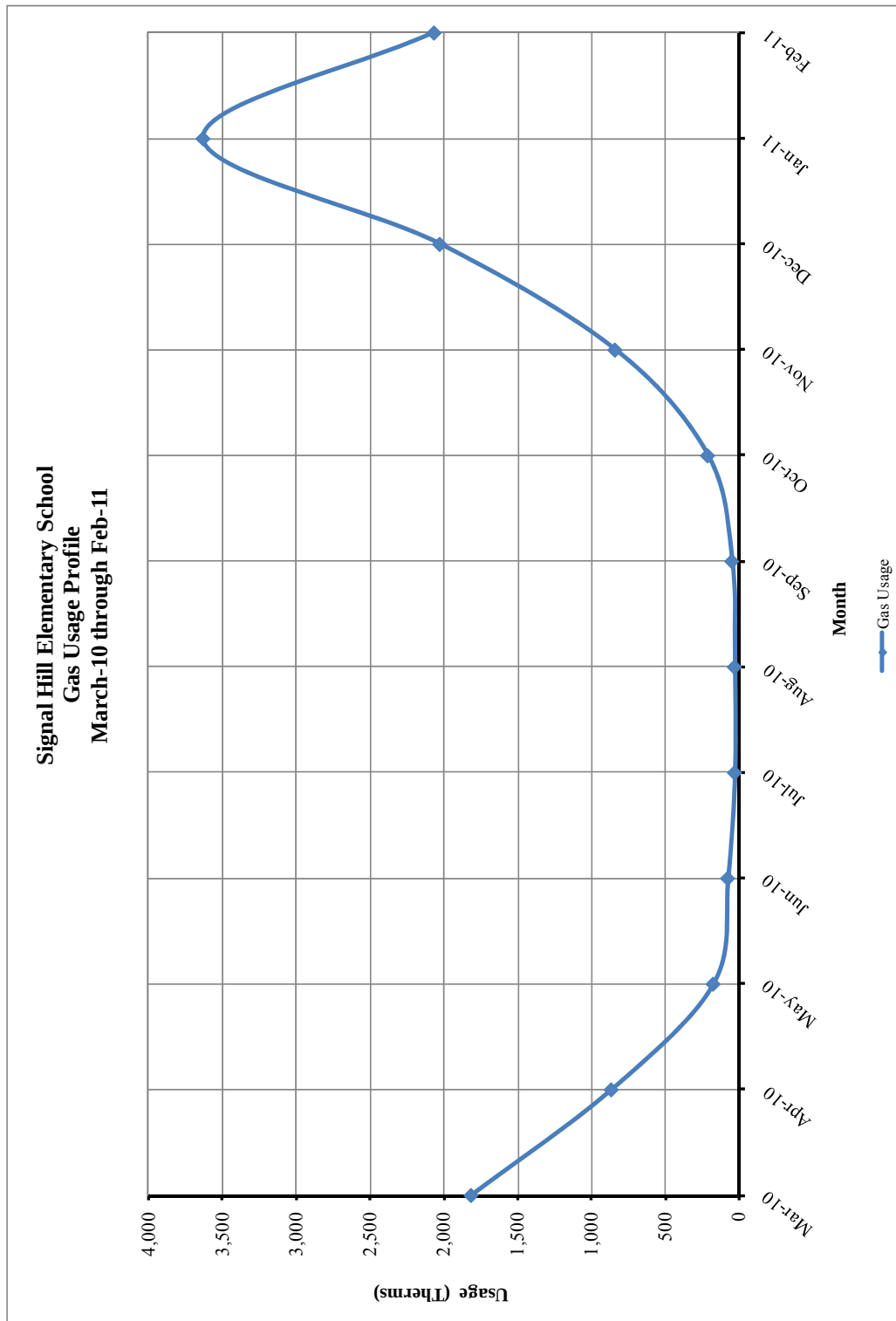


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: South Jersey Gas Rate: GSG-Firm Transportation Meter No: 0435086 Point of Delivery ID: 2 09 05 0340 0 3 Third Party Utility Provider: PEPCO/Hess TPS Meter No: 20905034003 / 564353/564404		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Mar-10	1,819.10	\$2,415.04
Apr-10	869.87	\$1,205.58
May-10	179.90	\$263.47
Jun-10	81.45	\$100.82
Jul-10	34.88	\$56.19
Aug-10	35.84	\$58.15
Sep-10	53.35	\$73.63
Oct-10	217.30	\$260.88
Nov-10	845.19	\$946.44
Dec-10	2,031.62	\$2,284.56
Jan-11	3,634.72	\$4,052.16
Feb-11	2,070.43	\$2,318.35
TOTALS	11,873.65	\$14,035.27
AVERAGE RATE: \$1.18 \$/THERM		

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

Signal Hill Elementary School is located on located on 33 Signal Drive in Voorhees, New Jersey. The 81,283 square foot elementary school was built in 1989 six classrooms were added in a 1992 addition.

Occupancy Profile

The typical hours of operation for Signal Elementary School are Monday through Friday between 7:00 am and 3:00 pm during the normal school year from September through June. In addition the school is occupied at various times in the evening and over the summer months for meetings and afterschool activities.

Building Envelope

Exterior walls of the elementary school are a 4” face brick exterior, 6” concrete block interior walls with 2” rigid foam insulation. The windows throughout the facility are ¼” double pane insulated glass. The majority of the windows are aluminum exterior frames with blinds between the window panes and wood interior framing. The blinds are valuable because they help reduce the heat loss in the winter and reduce solar heat gain in the summer. The roof is a flat, EPDM rubber roof on a metal deck and approximately 2” of rigid insulation.

HVAC Systems

The HVAC systems of the elementary school is a water source heat pump system with gas fired hot water boilers, cooling tower, circulating pumps and individual classroom heat pump units.

The boilers of the facility are Weil McLain PFG modular boilers. There are a total of seven (7) boilers all rated for 3,184 MBH input capacity with an estimated operating efficiency of 70%. Each boiler is equipped with its own, in-line fractional horsepower circulating pump.

The cooling tower is an Evapco model induced draft, counter-flow type, rated for 793 GPM. The cooling tower loop is connected to a heat exchanger in the mechanical room. This heat exchanger transfers heat from the heat pump loop to the cooling tower loop in cooling season. The cooling tower loop pump is a base mounted end suction pump, rated for 758 GPM at 108 feet of head.

The heat pump loop is circulated by three base mounted end suction pumps. One of the pumps serves the heat pump loop during cooling season. This pump is rated for a total flow of 605 GPM at 15 feet of head. The other two pumps serve the heat pump loop during heating season. These pumps are each rated for 692 GPM at 93 feet of head.

The Gymnasium is served by three (3) roof mounted 8-Ton cooling capacity heat pumps. These heat pumps are rated for 2900 CFM each.

The remainder of the building, including classrooms, administrative offices and the kitchen area, is served by approximately sixty one (61) self-contained, above the ceiling heat pumps varying in cooling capacity from 1-Ton up to 5-Tons.

There are a total of thirteen (13) roof mounted supply fans that supply un-conditioned outside air, for ventilation, to the return inlet of each heat pump.

Exhaust System

There a total of twenty (20) roof-mounted, fractional horsepower exhaust fans that exhaust air from the corridor plenum and restrooms of the school. The exhaust fans are controlled by the DDC system and operate based on the occupied/unoccupied schedule of the building.

HVAC System Controls

The HVAC system within Signal Hill Elementary School is an Alerton DDC control system with the front end control computer located in the head Custodian's office. Individual classroom and office heat pump temperature set points, run schedules and cooling/heating mode are centrally controlled by the front end computer. Remote temperature sensors are located in each heating/cooling zone. At the time of our survey, the classroom cooling set-points were all at 70°F, even though most of the spaces were unoccupied.

Domestic Hot Water

Domestic hot water for the restrooms and kitchen is provided by a Bradfor White Magnum Series, gas fired hot water heater with 80 gallons of storage and an input capacity of 725 MBH.

Lighting

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed list of the lighting throughout the facility and estimated operating hours per space.

III. MAJOR EQUIPMENT LIST

The equipment list contains major energy consuming equipment that through implementation of energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

IV. ENERGY CONSERVATION MEASURES

Energy Conservation Measures are developed specifically for this facility. The energy savings and calculations are highly dependent on the information received from the site survey and interviews with operations personnel. The assumptions and calculations should be reviewed by the owner to ensure accurate representation of this facility. The following ECMs were analyzed:

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST^A	ANNUAL SAVINGS^B	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
ECM #1	Lighting Upgrades	\$7,060	\$999	7.1	112.3%
ECM #2	Lighting Controls	\$11,310	\$3,009	3.8	299.1%
ECM #3	Condensing Boiler Installation	\$190,438	\$3,356	56.7	-64.8%
ECM #4	Water Source Heat Pump Replacement	\$463,925	\$25,492	18.2	-17.6%
ECM #5	Rooftop Heat Pump Replacement	\$47,107	\$12,787	3.7	307.2%
ECM #6	NEMA Premium Pump Motors	\$6,707	\$728	9.2	62.8%
ECM #7	Water Conservation	\$53,272	\$2,341	22.8	-34.1%
ECM #8	Geothermal Heat Pump System	\$1,504,615	\$81,507	18.5	35.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	Rooftop Solar Array	\$990,305	\$108,111	9.2	63.8%
Notes:					
A. Cost takes into consideration applicable NJ Smart Start™ incentives.					
B. Savings takes into consideration applicable maintenance savings.					

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrades	4.7	7,994	-
ECM #2	Lighting Controls	4.3	24,074	-
ECM #3	Condensing Boiler Installation	-	-	2,722
ECM #4	Water Source Heat Pump Replacement	54.1	203,938	-
ECM #5	Rooftop Heat Pump Replacement	34.1	102,292	-
ECM #6	NEMA Premium Pump Motors	1.3	5,826	-
ECM #7	Water Conservation	-	-	482
ECM #8	Geothermal Heat Pump System	-	624,353	2,935
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Rooftop Solar Array	132.8	200,352	-

Table 3
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION	ANNUAL ENERGY	PROJECT COST (\$)	SMART START	CUSTOMER COST	SIMPLE PAYBACK
Lighting Upgrades	\$999	\$7,060	\$0	\$7,060	7.1
Lighting Controls	\$3,009	\$12,150	\$840	\$11,310	3.8
<i>Condensing Boiler Installation</i>	\$3,356	\$196,000	\$5,562	\$190,438	56.7
Water Source Heat Pump Replacement	\$25,492	\$483,153	\$19,228	\$463,925	18.2
Rooftop Heat Pump Replacement	\$12,787	\$48,750	\$1,643	\$47,107	3.7
NEMA Premium Pump Motors	\$728	\$6,942	\$235	\$6,707	9.2
<i>Water Conservation</i>	\$2,341	\$53,272	\$0	\$53,272	22.8
<i>Geothermal Heat Pump System</i>	\$81,507	\$1,680,115	\$175,500	\$1,504,615	18.5
<i>Design / Construction Extras (15%)</i>		\$83,708		\$83,708	
Total Project	\$43,015	\$641,763	\$21,946	\$619,817	14.4

* Highlighted ECMs are not included in the Total Project costs

Design / Construction Extras is shown as an additional cost for the facility project summary. This cost is included to estimate the costs associated with construction management fees for a larger combined project.

ECM #1: Lighting Upgrade – Interior spaces

Description:

The majority of the interior lighting throughout Signal Hill Elementary School is provided with 32W T8 lamps with electronic ballasts. There are still a limited number of areas that utilize fluorescent fixtures with 32W T8 lamps and magnetic ballasts. In addition, the Gymnasium utilizes T5HO fixtures with reflective lenses. CEG recommends replacing the magnetic ballasts with new, more efficient electronic ballasts

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Rebates and Incentives:

There are no Smart Start Rebates or Incentives for this ECM.

Replacement and Maintenance Savings:

There is no replacement or maintenance savings for this ECM.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$7,060
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$7,060
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$999
Total Yearly Savings (\$/Yr):	\$999
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.1
Simple Lifetime ROI	112.3%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$14,985
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	\$4,866.00

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

While the lights in many of the areas of the School are controlled by occupancy sensors, both wall and remote mounted, some of the lights in the school building are still left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the “Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways,” document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors and daylight sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by SensorSwitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = (\% \text{ Savings} \times \text{Controlled Light Energy (kWh/Yr)})$$

$$\text{Savings} = \text{Energy Savings (kWh)} \times \text{Ave Elec Cost} \left(\frac{\$}{\text{kWh}} \right)$$

Rebates and Incentives:

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Smart Start Incentive

$$\begin{aligned} &= (\# \text{ Wall mount sensors} \times \$20 \text{ per sensor}) \\ &+ (\# \text{ Ceiling mount sensors} \times \$35 \text{ per sensor}) \end{aligned}$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$12,150
NJ Smart Start Equipment Incentive (\$):	\$840
Net Installation Cost (\$):	\$11,310
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$3,009
Total Yearly Savings (\$/Yr):	\$3,009
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.8
Simple Lifetime ROI	299.1%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$45,135
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	\$24,611.25

ECM #3: Condensing Boiler Installation

Description:

Space heating for Signal Hill Elementary School is provided by a heat pump loop that provides hot water to the water source heat pumps throughout the building. The source of hot water for this loop is seven (7) gas-fired modular boilers which are located in the main boiler room.

The seven boilers are Weil McLain modular gas fired boilers which heat water that feeds the heat pump water loop of the building. The boilers, which are model PFG, have a combined input of 3184 MBH and a combined output of 2484 MBH. These capacities may be reduced due to the age and condition of the boilers. The boilers are an estimated 22 years old and have exceeded their ASHRAE defined service life of 20 years. Due to their age and condition, the boilers should be replaced with high efficiency condensing modular boilers.

Typically, standard (non-condensing) boilers provide lower than nominal efficiency compared to condensing boilers. Standard boilers suffer further efficiency losses at part load operating conditions mainly due to limitations in the reduction of the flue gas temperature. Current average combustion efficiency of the boilers is estimated to be 70% due to standard non-condensing boiler technology, limited turn down ratio, cycling losses and outdated design and controls. New condensing boilers could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature.

CEG recommends replacing the seven Weil McLain boilers with high efficiency condensing hot water boilers to provide building with heating throughout the year. The annual average operating efficiency of the proposed boiler set is expected to average 92%, which gives the heating system a 22% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of seven new high efficiency condensing gas fired boilers to replace the existing Weil McLain boilers located in the mechanical room. The following is a summary of the boiler replacement recommendations.

BOILER REPLACEMENT SUMMARY		
EXISTING UNIT	LOCATION	PROPOSED UNITS
(7) Weil McLain Modular Boilers	Boiler Room	(7) Aerco MLX

The basis for this ECM is Aerco MLX454H condensing hot water boiler or equivalent. New boilers shall be setup and programmed to be the primary source of heating for the building during entire year. In addition to the boiler replacement, consideration was given to the costs

associated with converting the existing steam boilers to hot water. The owner is recommended to retain a professional engineer to confirm equipment sizing and finalize design.

Energy Savings Calculations:

The annual energy consumption of the boilers has to be estimated. In order to complete this estimation, the domestic hot water usage is estimated and subtracted from the total usage in order to determine the net natural gas usage of the boilers.

Current total hot water usage can be found in the table below:

ANNUAL GAS USAGE				
MONTH	TOTAL USAGE THERMS	DOMESTIC HW USAGE	HEATING ONLY	COST
Jan-10	1,819	41	1,778	\$2,415
Feb-10	870	41	829	\$1,206
Mar-10	180	41	139	\$263
Apr-10	81	41	40	\$101
May-10	35	41	0	\$56
Jun-10	36	41	0	\$58
Jul-10	53	41	0	\$74
Aug-10	217	41	176	\$261
Sep-10	845	41	804	\$946
Oct-10	2,032	41	1,991	\$2,285
Nov-10	3,635	41	3,594	\$4,052
Dec-10	2,070	41	2,029	\$2,318
TOTAL	11,874	492	11,381	\$14,035

Baseline Monthly Domestic Hot Water Gas Use = 41 Therms (Average from May-July Gas Use)

Existing Natural Gas Use for Heating = 11,874 Therms – (41 Therms x 12 Months)
= **11,381 Therms**

Bldg Heat Required = Heating Nat. Gas (Therm) × Heating Eff (%) × Fuel Heat Value ($\frac{\text{BTU}}{\text{Therm}}$)

Proposed Heating Gas Usage = $\frac{\text{Bldg. Heat Required (BTU)}}{\text{New Heating Eff (\%)} \times \text{Fuel Heat Value } (\frac{\text{BTU}}{\text{Therm}})}$

Energy Cost = Heating Gas Usage (Therms) × Ave Fuel Cost ($\frac{\$}{\text{Therm}}$)

Energy savings calculations are summarized in the table below:

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Hot Water Boilers	New Condensing Boilers	-
Existing Nat Gas (Therms)	11,381	-	-
Boiler Efficiency (%)	70%	92%	22%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	-
Equivalent Building Heat Usage (MMBTUs)	797	797	-
Ave. Gas Cost (\$/Therm) (Heating season only)	1.18	1.18	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	11,381	8,659	2,722
Energy Cost (\$)	\$14,036	\$10,679	\$3,356
COMMENTS:			

Project Cost, Incentives and Maintenance Savings

Estimated cost for removing the existing boilers, piping and installing seven 434 MBH condensing hot water boilers with advanced controls is \$196,000.

From the **New Jersey Smart Start® Program Incentives Appendix**, installation of a high efficiency hot water boiler falls under the category “Gas Heating” and warrants an incentive based on efficiency at or above 84% for this type of equipment. The program incentives are calculated as follows:

BOILER REBATE SUMMARY					
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE \$/MBH	PROPOSED CAPACITY, MBH	NUMBER OF UNITS	TOTAL REBATE, \$
300 MBH - 1500 MBH	84% AFUE for Hot Water boilers	\$1.75	454	7	\$5,562
TOTAL					\$5,562

Maintenance savings associated with this ECM is estimated to be minimal.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$196,000
NJ Smart Start Equipment Incentive (\$):	\$5,562
Net Installation Cost (\$):	\$190,438
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$3,356
Total Yearly Savings (\$/Yr):	\$3,356
Estimated ECM Lifetime (Yr):	25
Simple Payback	56.7
Simple Lifetime ROI	-55.9%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$83,900
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	(\$131,999.48)

ECM #4: Water Source Heat Pump Replacement

Description:

Signal Hill Elementary School is conditioned by horizontal above the ceiling heat pump units. A number of units at the school are in fair condition and they have surpassed the end of their useful life of 15 years, which is defined by ASHRAE. The units currently installed are inefficient compared to modern equipment and can be replaced with new high efficiency units. New air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older heat pump units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	SERVICE FOR	NUMBER OF UNITS	COOLING CAPACITY, BTU/HR	TOTAL CAPACITY, TONS	REPLACE UNIT WITH
SS	HP - 1	33	48,000	132.0	McQuay - CCH/CCW - 042
SS	HP - 2	1	24,000	2.0	McQuay - CCH/CCW - 024
SS	HP - 3	11	24,000	22.0	McQuay - CCH/CCW - 024
SS	HP - 4	3	12,000	3.0	McQuay - CCH/CCW - 012
SS	HP - 5	2	18,000	3.0	McQuay - CCH/CCW - 019
SS	HP - 6	1	48,000	4.0	McQuay - CCH/CCW - 042
SS	HP - 7	8	60,000	40.0	McQuay - CCH/CCW - 042
SS	HP - 9	3	12,000	3.0	McQuay - CCH/CCW - 012
Total		62	246,000	209.0	

The manufacturers used as the basis for design are Carrier. All units are one for one style replacements with matching capacity of the new units to the old units.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity, } \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

$$\begin{aligned} &\text{Heating Energy Savings, kWh (Heat Pumps Only)} \\ &= \text{Heating Capacity, } \frac{\text{MBH}}{293.07 \frac{\text{MBH}}{\text{kW}}} \times \text{Operation Hours} \times \left(\frac{1}{\text{COP}_{\text{Old}}} - \frac{1}{\text{COP}_{\text{New}}} \right) \end{aligned}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Heating}}$$

$$\text{Heating Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS											
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	ANNUAL HEATING HOURS	EXISTING UNITS EER	NEW UNITS EER	EXISTING UNITS COP	SPLIT UNITS COP	# OF UNITS	ENERGY SAVINGS COOLING KWH	ENERGY SAVINGS HEATING KWH	DEMAND SAVINGS kW
SS	48,000	1,800	1,200	11.67 EER	15 EER	3.68 COP	4.4 COP	33	54,239	8,739	30.1
SS	24,000	1,000	4,000	9.66 EER	14.4 EER	3.82 COP	4.2 COP	1	818	7,758	1.6
SS	24,000	1,000	4,000	9.66 EER	14.4 EER	3.82 COP	4.2 COP	11	8,996	7,758	1.6
SS	12,000	1,000	4,000	7.8 EER	12.7 EER	3.32 COP	3.7 COP	3	1,781	5,067	1.0
SS	18,000	1,000	4,000	10.9 EER	14.9 EER	3.53 COP	4.4 COP	2	887	13,761	2.8
SS	48,000	1,000	4,000	11.67 EER	15 EER	3.53 COP	4.4 COP	1	913	36,696	7.3
SS	60,000	1,000	4,000	12.3 EER	14.6 EER	3.5 COP	4.3 COP	8	6,148	43,530	8.7
SS	12,000	1,000	4,000	7.8 EER	12.7 EER	3.32 COP	3.7 COP	3	1,781	5,067	1.0
Total	246,000	8,800	29,200					62		203,938	54.1

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start[®] Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category “Unitary HVAC Split System” and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart}^{\text{®}} \text{ Incentive} = (\text{CoolingTons} \times \$/\text{TonIncentive})$$

SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE \$/TON	PROPOSED CAPACITY TONS	TOTAL REBATE \$
5.4 tons or less Unitary AC and	≥14 SEER	\$92	209.0	\$19,228
TOTAL			209	\$19,228

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	INSTALLED COST	# OF UNITS	TOTAL COST	REBATES	NET COST	ENERGY SAVING	PAY BACK YEARS
SS	\$8,000	33	\$290,400	\$12,144	\$278,256	\$7,872	35.3
SS	\$6,000	1	\$6,600	\$184	\$6,416	\$1,072	6.0
SS	\$6,000	11	\$72,600	\$2,024	\$70,576	\$2,094	33.7
SS	\$2,639	3	\$8,708	\$276	\$8,432	\$856	9.9
SS	\$4,058	2	\$8,928	\$276	\$8,652	\$1,831	4.7
SS	\$8,000	1	\$8,800	\$368	\$8,432	\$4,701	1.8
SS	\$9,000	8	\$79,200	\$3,680	\$75,520	\$6,210	12.2
SS	\$2,639	3	\$7,917	\$276	\$7,641	\$856	1.0
Total	\$46,336	62	\$483,153	\$19,228	\$463,925	\$25,492	18.2

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$483,153
NJ Smart Start Equipment Incentive (\$):	\$19,228
Net Installation Cost (\$):	\$463,925
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$25,492
Total Yearly Savings (\$/Yr):	\$25,492
Estimated ECM Lifetime (Yr):	15
Simple Payback	18.2
Simple Lifetime ROI	-17.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$382,380
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	(\$159,603.16)

ECM #5: Rooftop Heat Pump Replacement

Description:

The gymnasium of Signal Hill Elementary School is conditioned by three (3) rooftop water source heat pumps. These units are in poor condition and have surpassed the end of their useful life of 15 years, as defined by ASHRAE. The units currently installed are inefficient compared to modern equipment and can be replaced with new high efficiency units. New heat pumps provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older heat pump units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	SERVICE FOR	NUMBER OF UNITS	COOLING CAPACITY, BTU/HR	TOTAL CAPACITY, TONS	REPLACE UNIT WITH
RTU	GYM	1	97,700	8.1	Carrier - 50RTP
RTU	GYM	1	97,700	8.1	Carrier - 50RTP
RTU	GYM	1	97,700	8.1	Carrier - 50RTP
Total		3	293,100	24.4	

The manufacturers used as the basis for design are McQuay. This decision due to ease of installation and compatibility as the previous units installed were also from McQuay. All units are one for one style replacements with matching capacity of the new units to the old units.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity, } \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

Heating Energy Savings, kWh (Heat Pumps Only)

$$= \text{Heating Capacity, } \frac{\text{MBH}}{293.07 \frac{\text{MBH}}{\text{kW}}} \times \text{Operation Hours} \times \left(\frac{1}{\text{COP}_{\text{Old}}} - \frac{1}{\text{COP}_{\text{New}}} \right)$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Heating}}$$

$$\text{Heating Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS											
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	ANNUAL HEATING HOURS	EXISTING UNITS EER	NEW UNITS EER	EXISTING UNITS COP	NEW UNITS COP	# OF UNITS	ENERGY SAVINGS COOLING KWH	ENERGY SAVINGS HEATING KWH	DEMAND SAVINGS kW
RTU	97,700	1,800	1,200	12.5 EER	14.3 EER	3.3 COP	4.5 COP	1	1,771	32,327	11.4
RTU	97,700	1,800	1,200	12.5 EER	14.3 EER	3.3 COP	4.5 COP	1	1,771	32,327	11.4
RTU	97,700	1,800	1,200	12.5 EER	14.3 EER	3.3 COP	4.5 COP	1	1,771	32,327	11.4
Total								3		102,292	34.1

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start[®] Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category “Unitary HVAC Split System” and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart}^{\text{®}} \text{ Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

RTU AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE \$/TON	PROPOSED CAPACITY TONS	TOTAL REBATE \$
≥ 5.4 to < 11.25 tons	11.5 EER	73	23	\$1,643
TOTAL			22.5	\$1,643

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	INSTALLED COST	# OF UNITS	TOTAL COST	REBATES	NET COST	ENERGY SAVING	PAY BACK YEARS
RTU	\$16,250	1	\$17,875	\$584	\$17,291	\$4,262	4.1
RTU	\$16,250	1	\$17,875	\$584	\$17,291	\$4,262	4.1
RTU	\$16,250	1	\$17,875	\$584	\$17,291	\$4,262	4.1
Total	\$48,750	3	\$53,625	\$1,752	\$51,873	\$12,787	4.1

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$48,750
NJ Smart Start Equipment Incentive (\$):	\$1,643
Net Installation Cost (\$):	\$47,107
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$12,787
Total Yearly Savings (\$/Yr):	\$12,787
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.7
Simple Lifetime ROI	307.2%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$191,805
Internal Rate of Return (IRR)	26%
Net Present Value (NPV)	\$105,543.38

ECM #6: Install NEMA Premium® Efficiency Motors

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95% of its total lifetime operating cost. Due to the fact that many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The electric motors driving the hot water pumps and supply fans in some of the HVAC equipment are candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing inefficient electric motors with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today.

IMPLEMENTATION SUMMARY					
EQMT ID	FUNCTION	MOTOR HP	HOURS OF OPERATION	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY
-	Cooling Tower Pump	5	4,300	89.5%	90.2%
-	Heating Pump	20	4,300	86.0%	93.0%
-	Water Treatment Pump	1.5	4,300	78.6%	88.5%

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor

Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}} \right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWh	COST SAVINGS
-	5	90%	89.5%	90.2%	0.03	126	\$16
-	20	90%	86.0%	93.0%	1.18	5,081	\$635
-	1.5	90%	78.6%	88.5%	0.14	620	\$77
TOTAL					1.3	5,826	\$728

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors:

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
1	\$50
1.5	\$50
2	\$60
3	\$60
5	\$60
7.5	\$90
10	\$100
15	\$115
20	\$125
25	\$130
30	\$150
40	\$180

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
-	5	\$1,519	\$60	\$1,459	\$16	92.8
-	20	\$4,635	\$125	\$4,510	\$635	7.1
-	1.5	\$788	\$50	\$738	\$77	9.5
TOTAL	Totals:	\$6,942	\$235	\$6,707	\$728	9.2

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$6,942
NJ Smart Start Equipment Incentive (\$):	\$235
Net Installation Cost (\$):	\$6,707
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$728
Total Yearly Savings (\$/Yr):	\$728
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.2
Simple Lifetime ROI	62.8%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$10,920
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	\$1,983.82

ECM #7: Water Conservation

Description:

Signal Hill Elementary School utilizes standard plumbing fixtures. The typical water closet and urinal water consumption only meet the minimum federally required standard for water efficiency. New fixtures are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the replacement of the existing sink faucets within the bathrooms. The estimated usage of the plumbing fixtures is based on the total population of the facility. The number of plumbing fixtures to be replaced is based on site survey of the facilities.

The proposed retrofit includes installation of auto flow sink faucets and low flow aerators. For the basis of this calculation the LEED rating system was used to estimate the occupancy usage for students within the school. When water consumption information was not available, the GPF values were estimated for the existing fixtures.

Energy Savings Calculations:

Faucets:

$$\text{Water Consumption} = \text{Occupancy} \left(\frac{\text{Days}}{\text{Yr}} \right) \times \text{Use} \left(\frac{\text{Use}}{\text{Person per Day}} \right) \times \text{Use Time} \left(\frac{\text{Sec}}{\text{Use}} \right) \times \text{Fixture} \left(\frac{\text{Gal}}{\text{Min}} \right)$$

$$\text{Water Cost} = \frac{\text{Water Consumption (Gallons)} \times \text{Ave Cost} \left(\frac{\$}{1000 \text{ Gal}} \right)}{1000(\text{Gal})}$$

$$\text{Gas Cost (Therms)} = \text{Faucet Water Consumption (Gallons)} \times \frac{8.34 \text{ BTU}}{\text{Gal}} \times \frac{\text{Therm}}{100,000 \text{ BTU}}$$

WATER CONSERVATION CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Fixtures	Low Flow / Auto Flow Fixtures	-
Total Number of Students	560	560	-
% Male to Female	50%	50%	-
Estimated % Floor Area Served by Older Bathrooms	100%	100%	-
Occupied Days Per Year	250	250	-
Lavatory Uses per Day per Person	3	3	-
Sink flow time per use, sec	15	12	-
Sink Aerator Flow, GPM	1.5	0.5	-
WC Uses per Day per Person	2.0	2.0	-
Urinal Uses per Day per Person	1.0	1.0	-
Total Urinal Flushes Per Day	280	280	-
Total WC Flushes Per Day	560	560	-
Urinal Gallons Per Flush (GPF)	1.0	0.125	0.875
WC Gallons Per Flush (GPF)	1.6	1.28	0.32
** Water Cost (\$/1000 Gal)	\$8.00	\$8.00	-
Gas Cost (\$/Therm)	\$1.18	\$1.18	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Water Consumption, Urinal and WC (Gal)	294,000	187,950	106,050
Water Consumption, Faucets (Gal)	157,500	42,000	115,500
Total Water Consumption, (Gal)	451,500	229,950	221,550
Water Cost (\$)	\$3,612	\$1,840	\$1,772
Gas Consumption (Therms)	657	175	482
Gas Cost (\$/Year)	\$775	\$207	\$568
TOTAL SAVINGS			\$2,341
COMMENTS:	*Savings are based on LEED Reference Guide for Green Building Design and Construction - 2009 Edition for WC and Urinal water usage. ** Cost of Water estimated.		

There are no Smart Start rebates for installation of low flow plumbing fixtures.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$53,272
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$53,272
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,341
Total Yearly Savings (\$/Yr):	\$2,341
Estimated ECM Lifetime (Yr):	15
Simple Payback	22.8
Simple Lifetime ROI	-34.1%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$35,115
Internal Rate of Return (IRR)	-5%
Net Present Value (NPV)	(\$25,325.29)

ECM #8: Geothermal Heat Pump System Installation

Description:

The HVAC Systems at Signal Hill Elementary School is a water source heat pump system. Hot water for the heat pump loop is supplied via gas fired boilers. Heat is removed from the heat pump loop through a cooling tower, outside of the main mechanical room.

A geothermal heat pump system utilizes the ground as a heat sink to extract and reject heat to depending on the season. Due to the large thermal mass provided by the ground, the HVAC equipment is able to take advantage of cooler temperatures in the summer and warmer temperatures in the winter compared to the ambient air. The benefits include substantial energy efficiency increase with respect to air source systems. In addition, no electrical resistance heat is required in the heating season also reducing electric usage. A geothermal system sized properly requires no additional heat production equipment (such as the building's existing boilers) or heat rejection equipment (such as the existing cooling tower). All loads are handled by the heat pumps and the geothermal water loop. Due to the inefficiency of the boiler and poor operational characteristics of the air to air heat pumps, a geothermal system energy costs become very appealing.

This ECM includes the installation of ground source heat pumps installed above the ceilings of each classroom, or mounted upright in a closet style configuration. This is in place of the existing unit ventilators in the classrooms and offices. Outside air would be provided by a dedicated central outside air heat pump distributed by ductwork above the corridor to each occupied zone. This system would provide ventilation air to replace the outside air openings currently ducted to each unit ventilator. The air to air heat pumps would be replaced with packaged rooftop ground source heat pumps. The proposed outside air unit would include an energy recovery wheel for additional savings on ventilation air. This ECM also includes installation of new ground loop water pumps with VFD drives. The pumping system is included to pump transfer fluid from the building to the well field and back. The geothermal system would require (not limited to) the following major components:

1. 390-Ton (Heating Dominant) bore field located Southwest end of the building. (130 bores, 450 ft deep each). Bore field sizing is based on 150 linear feet of bore per ton of cooling. A complete geotechnical analysis will have to be performed in order to confirm the actual soil thermal conductivity at the site.
2. (3) Loop condenser water pumps.
3. Condenser water piping distribution system from the well field to the roof top units and indoor heat pumps. Additional piping was estimated since not all areas of the building are currently served by the water source heat pump loop.
4. Installation of high-efficiency (16 EER) geothermal rooftop units to provide heated and cooled ventilation air and (18 EER) geothermal indoor heat pumps to replace the classroom unit ventilators.
5. Removal all existing AC units, air handlers and air to air heat pumps.

This ECM is based on Climate Master Tranquility Series water source heat pumps model TRE for the rooftop units, and model TS or TV for the horizontal / vertical units or equal. **Note:** Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

The energy savings calculations are based on the energy analysis performed on the energy modeling software by Trane (Trace 700 ver. 6.2.4). The energy consumption of the baseline is compared to the proposed model to determine energy savings for each utility. The savings are applied to the average energy costs based on the facilities actual usage. Note: Heating and cooling is provided for the entire building the geothermal system model. Heating and cooling is only provided for the new addition in the baseline model with heating only provided for the original building. This ECM represents a significant upgrade to the building's HVAC system.

ECM #8 GEOTHERMAL SYSTEM CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Energy Consumption	Proposed Energy Consumption	
Elec Usage (KWH)	1,299,440	675,087	624,353
Natural Gas Usage (Therms)	11,874	8,939	2,935
Electric Cost (\$/KWH)	\$0.125	\$0.125	
Natural Gas Cost (\$/Therm)	\$1.18	\$1.18	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Electric Energy Cost (\$)	\$162,430	\$84,386	\$78,044
Natural Gas Energy Cost (\$)	14010.907	\$10,548	\$3,463
Total Energy Cost (\$)	\$176,441	\$94,934	\$81,507
COMMENTS:	This ECM is based on energy models performed on energy analysis software by Trane (Trace 700).		

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,680,115
NJ Smart Start Equipment Incentive (\$):	\$175,500
Net Installation Cost (\$):	\$1,504,615
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$81,507
Total Yearly Savings (\$/Yr):	\$81,507
Estimated ECM Lifetime (Yr):	25
Simple Payback	18.5
Simple Lifetime ROI	35.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$2,037,675
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	(\$85,321.57)

***Note:** ECM #8 – Geothermal System Installation is an alternate ECM. Implementation of ECM #8 would eliminate the potential for ECM #s – 3, 4, 5 & 6.

V. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

- A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
- B. Maintain all weather stripping on windows and doors.
- C. Clean all light fixtures to maximize light output.
- D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.
- E. Turn off computers when not in use. Ensure computers are not running in screen saver mode which saves the monitor screen not energy.
- F. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Voorhees Township Public Schools - Signal Hill Elementary School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^N \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^N \frac{C_n}{(1+DR)^n}$
		(\$)	(\$)	(\$)	(\$)	(\$/Yr)	(\$/Yr)	(\$/Yr)		(\$)	(\$)	(%)	(Yr)	(\$)	(\$)
ECM #1	Lighting Upgrades	\$2,824	\$4,236	\$0	\$7,060	\$999	\$0	\$999	15	\$14,985	\$0	112.3%	7.1	11.32%	\$4,866.00
ECM #2	Lighting Controls	\$4,860	\$7,290	\$840	\$11,310	\$3,009	\$0	\$3,009	15	\$45,135	\$0	299.1%	3.8	25.75%	\$24,611.25
ECM #3	Condensing Boiler Installation	\$98,000	\$98,000	\$5,562	\$190,438	\$3,356	\$0	\$3,356	20	\$67,120	\$0	-64.8%	56.7	-8.38%	(\$140,509.19)
ECM #4	Water Source Heat Pump Replacement	\$217,419	\$265,734	\$19,228	\$463,925	\$25,492	\$0	\$25,492	15	\$382,380	\$0	-17.6%	18.2	-2.32%	(\$159,603.16)
ECM #5	Rooftop Heat Pump Replacement	\$29,250	\$19,500	\$1,643	\$47,107	\$12,787	\$0	\$12,787	15	\$191,805	\$0	307.2%	3.7	26.33%	\$105,543.38
ECM #6	NEMA Premium Pump Motors	\$4,859	\$2,083	\$235	\$6,707	\$728	\$0	\$728	15	\$10,920	\$0	62.8%	9.2	6.82%	\$1,983.82
ECM #7	Water Conservation	\$26,636	\$26,636	\$0	\$53,272	\$2,341	\$0	\$2,341	15	\$35,115	\$0	-34.1%	22.8	-4.81%	(\$25,325.29)
ECM #8	Geothermal Heat Pump System	\$752,218	\$927,897	\$175,500	\$1,504,615	\$81,507	\$0	\$81,507	25	\$2,037,675	\$0	35.4%	18.5	2.48%	(\$85,321.57)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Rooftop Solar Array	\$990,305	\$0	\$0	\$990,305	\$30,854	\$77,257	\$108,111	15	\$1,621,665	\$1,158,855	63.8%	9.2	6.91%	\$300,317.10

- Notes:** 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

APPENDIX B

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508



SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

Water-Cooled Chillers	\$12 - \$170 per ton
Air-Cooled Chillers	\$8 - \$52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

Gas Absorption Chillers	\$185 - \$400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

\$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	\$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	\$450 per ton, EER $\geq$ 16
	\$600 per ton, EER $\geq$ 18
	\$750 per ton, EER $\geq$ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

Gas Fired Boilers < 300 MBH	\$300 per unit
Gas Fired Boilers $\geq$ 300 - 1500 MBH	\$1.75 per MBH
Gas Fired Boilers $\geq$ 1500 - $\leq$ 4000 MBH	\$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	\$300 - \$400 per unit, AFUE $\geq$ 92%

Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per hp
Compressors	\$5,250 to \$12,500 per drive

Natural Gas Water Heating

Gas Water Heaters $\leq$ 50 gallons	\$50 per unit
Gas-Fired Water Heaters > 50 gallons	\$1.00 - \$2.00 per MBH
Gas-Fired Booster Water Heaters	\$17 - \$35 per MBH
Gas Fired Tankless Water Heaters	\$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$25 per fixture (1-2 lamps) \$30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	\$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	\$10 per fixture
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture
HID $\geq$ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	\$50 per fixture
HID $\geq$ 100w Replacement with new HID $\geq$ 100w	\$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	\$42 per 5 foot \$65 per 6 foot

Lighting Controls – Occupancy Sensors

Wall Mounted	\$20 per control
Remote Mounted	\$35 per control
Daylight Dimmers	\$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	\$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	\$75 per fixture controlled
Daylight Dimming	\$75 per fixture controlled
Daylight Dimming - office	\$50 per fixture controlled

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	\$40 per electronic communicated motor

Other Equipment Incentives

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1- 2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	\$0.16 KWh and \$1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C



STATEMENT OF ENERGY PERFORMANCE

Signal Hill Elementary

Building ID: 2820750

For 12-month Period Ending: February 28, 2011¹

Date SEP becomes ineligible: N/A

Date SEP Generated: August 03, 2011

Facility

Signal Hill Elementary
33 Signal Hill Drive
Voorhees, NJ 08043

Facility Owner

Voorhees Township Board of Education
329 Route 73
Voorhees, NJ 08043

Primary Contact for this Facility

Frank DeBerardinis
329 Route 73
Voorhees, NJ 08043

Year Built: 1989**Gross Floor Area (ft²):** 81,283**Energy Performance Rating² (1-100)** 19**Site Energy Use Summary³**

Electricity - Grid Purchase(kBtu)	4,433,689
Natural Gas (kBtu) ⁴	1,187,365
Total Energy (kBtu)	5,621,054

Energy Intensity⁵

Site (kBtu/ft ² /yr)	69
Source (kBtu/ft ² /yr)	197

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	691
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Electric Distribution Utility

Atlantic City Electric Co [Peppo Holdings Inc]

National Average Comparison

National Average Site EUI	51
National Average Source EUI	147
% Difference from National Average Source EUI	34%
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

Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

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. Values represent energy intensity, annualized to a 12-month period.
5. 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) or a Registered Architect (RA) 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 or RA 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	Signal Hill Elementary	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	33 Signal Hill Drive, Voorhees, NJ 08043	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		☐
Signal Hill Elementary (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	81,283 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?	No	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	142 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1 (Default)	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	90 %	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	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	No	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: Atlantic City Electric Co [Pepco Holdings Inc]

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
02/01/2011	02/28/2011	139,360.00
01/01/2011	01/31/2011	107,120.00
12/01/2010	12/31/2010	107,440.00
11/01/2010	11/30/2010	93,760.00
10/01/2010	10/31/2010	79,840.00
09/01/2010	09/30/2010	103,520.00
08/01/2010	08/31/2010	122,480.00
07/01/2010	07/31/2010	132,400.00
06/01/2010	06/30/2010	133,440.00
05/01/2010	05/31/2010	100,880.00
04/01/2010	04/30/2010	87,120.00
03/01/2010	03/31/2010	92,080.00
Electric Consumption (kWh (thousand Watt-hours))		1,299,440.00
Electric Consumption (kBtu (thousand Btu))		4,433,689.28
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		4,433,689.28
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐
Fuel Type: Natural Gas		
Meter: Gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
02/01/2011	02/28/2011	2,070.43
01/01/2011	01/31/2011	3,634.72
12/01/2010	12/31/2010	2,031.62
11/01/2010	11/30/2010	845.19
10/01/2010	10/31/2010	217.30
09/01/2010	09/30/2010	53.35
08/01/2010	08/31/2010	35.84
07/01/2010	07/31/2010	34.88
06/01/2010	06/30/2010	81.45
05/01/2010	05/31/2010	179.90

04/01/2010	04/30/2010	869.87
03/01/2010	03/31/2010	1,819.10
Gas Consumption (therms)		11,873.65
Gas Consumption (kBtu (thousand Btu))		1,187,365.00
Total Natural Gas Consumption (kBtu (thousand Btu))		1,187,365.00
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 PE or RA 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

Signal Hill Elementary
33 Signal Hill Drive
Voorhees, NJ 08043

Facility Owner

Voorhees Township Board of Education
329 Route 73
Voorhees, NJ 08043

Primary Contact for this Facility

Frank DeBerardinis
329 Route 73
Voorhees, NJ 08043

General Information

Signal Hill Elementary	
Gross Floor Area Excluding Parking: (ft ²)	81,283
Year Built	1989
For 12-month Evaluation Period Ending Date:	February 28, 2011

Facility Space Use Summary

Signal Hill Elementary	
Space Type	K-12 School
Gross Floor Area(ft ²)	81,283
Open Weekends?	No
Number of PCs ^d	142
Number of walk-in refrigeration/freezer units ^d	1
Presence of cooking facilities	Yes
Percent Cooled	90
Percent Heated	100
Months ^o	10
High School?	No
School District ^o	N/A

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 02/28/2011)	Baseline (Ending Date 02/28/2011)	Rating of 75	Target	National Average
Energy Performance Rating	19	19	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	69	69	40	N/A	51
Source (kBtu/ft ²)	197	197	115	N/A	147
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	691	691	402	N/A	514
kgCO ₂ e/ft ² /year	9	9	5	N/A	7

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.

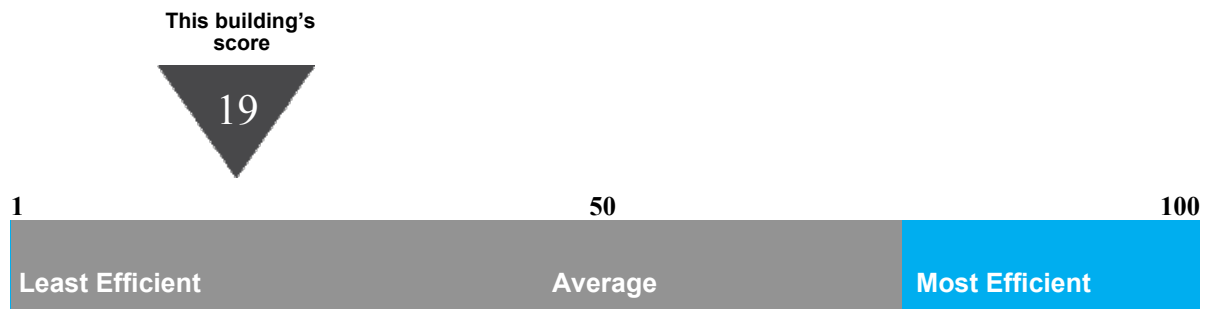
Statement of Energy Performance

2011

Signal Hill Elementary
33 Signal Hill Drive
Voorhees, NJ 08043

Portfolio Manager Building ID: 2820750

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 197 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending February 2011

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



APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

AC Units

Tag	HP-1	HP-2	
Unit Type	Rooftop Heat Pump	Above Ceiling Heat Pump	
Qty	3	61	
Location	Gym Roof	Above ceiling	
Area Served	Gym	Classrooms, Offices, Kitchen	
Manufacturer	McQuay	McQuay	
Model #	RTH 950	Varies	
Serial #	85110410(1003), (1002), (1001)	Varies	
Cooling Type	R22, DX	R-22	
Cooling Capacity (Tons)	7.5	1 Ton to 5 Tons	
Cooling Efficiency (SEER/EER)	10.0 (est)	11.0 (avg)	
Heating Type	Heat Pump	Heat Pump	
Heating Input (MBH)	116 MBH	Varies	
Efficiency (COP)	3.5	3.5 (avg)	
Fuel	Heat Pump	Heat Pump	
Approx Age	23	23	
ASHRAE Service Life	15	15	
Remaining Life	(8)	(8)	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

AHUs

Tag			
Unit Type	Exhaust Hood		
Qty	1		
Location	Kitchen		
Area Served	Kitchen		
Manufacturer	Aerocator Exhaust Hood		
Model #	ACW		
Serial #	-		
Cooling Type	N/A		
Cooling Capacity (Tons)	N/A		
Cooling Efficiency (SEER/EER)	N/A		
Flow (CFM)	2750		
Heating Type	N/A		
Heating Input (MBH)	N/A		
Efficiency	N/A		
Fuel	N/A		
Approx Age			
ASHRAE Service Life			
Remaining Life			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Boilers

Tag			
Unit Type	Gas Fired Hot Water Boiler		
Qty	7		
Location	Mechanical Room		
Area Served	Building Heating Hot Water		
Manufacturer	Weil McLain		
Model #	PFG		
Serial #	Varies		
Input Capacity (Btu/Hr)	3184 MBH (Total)		
Rated Output Capacity (Btu/Hr)	2484 MBH		
Approx. Efficiency %	70% (est)		
Fuel	Gas		
Approx Age	22		
ASHRAE Service Life	20		
Remaining Life	(2)		
Comments	No Nameplate		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Heat Exchanger

Tag			
Unit Type	Heat Exchanger		
Qty	1		
Location	Mechanical Room		
Area Served	Water Loop		
Manufacturer	Baltimore Air Coil		
Model #	HK10-10-2-2A		
Serial #	88101667		
Input Capacity (MBH)	-		
Flow Hot Side (GPM)	-		
Flow Cold Side (GPM)	-		
Approx. Efficiency %	-		
Fuel	N/A		
Approx Age			
ASHRAE Service Life			
Remaining Life			
Comments			

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Cooling Tower

Tag			
Unit Type	Cooling Tower		
Qty	1		
Location	Outside at Grade		
Area Served	Building Water Loop		
Manufacturer	Evapco		
Model #	AT-19-79		
Serial #	9-354381		
Rated Flow GPM	758		
EWI / LWT	95°/85°		
Airflow (CFM)	49,800		
Motor HP	15 (Fan)		
Electrical	-		
Approx Age			
ASHRAE Service Life			
Remaining Life			
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Domestic Water Heaters

Tag	DHW		
Unit Type	Gas Fired Domestic Hot Water Heater		
Qty	1		
Location	Mechanical Room		
Area Served	Building Hot Water		
Manufacturer	Bradford White		
Model #	Magnum Series - D80T7253NA		
Serial #	XAZ959690		
Size (Gallons)	80		
Input Capacity (MBH/KW)	725		
Recovery (Gal/Hr)	659		
Efficiency %	80%		
Fuel	Natural Gas		
Approx Age	10		
ASHRAE Service Life	12		
Remaining Life	2		
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Pumps

Tag			
Unit Type	In-line circulation pump	In-line circulation pump	Base mounted end suction pump
Qty	3	4	1
Location	Mechanical Room	Mechanical Room	Mechanical Room
Area Served	Boilers	Boilers	Cooling Tower Loop
Manufacturer	Taco	Armstrong	Bell & Gossett
Model #	SA55JXF5N-3748	E6312LR37479	7VB28TTDC4026BB5
Serial #	Varies	Varies	CL0795-001510
Horse Power	1/8	1/6	25
Flow	-	-	758
Motor Info	Taco Motor	-	Marathon
Electrical Power	208V	-	208-230V
RPM	1725	-	1750
Motor Efficiency %	-	-	92.4%
Approx Age	15	15	15
ASHRAE Service Life	10	10	20
Remaining Life	(5)	(5)	5
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Signal Hill Elementary School

Pumps

Tag			
Unit Type	Base mounted end suction pump	Base mounted end suction pump	Base mounted end suction pump
Qty	1	1	1
Location	Mechanical Room	Mechanical Room	Mechanical Room
Area Served	Heating Loop	Heat Pump Loop (heating)	Heat Pump Loop (heating)
Manufacturer	Taco	Taco	Baldor High Eff
Model #	-	FM401D 9.60	M2515T
Serial #	-	-	-
Horse Power	5	20	20
Flow	605 @ 15 ft HD	692 @ 92 ft HD	692 @ 92 ft HD
Motor Info	US Motors	US Motors	Baldor
Electrical Power	-		208V
RPM	1760	1775	1760
Motor Efficiency %	89.5%	92.4%	86.0%
Approx Age	22	15	22
ASHRAE Service Life	20	20	20
Remaining Life	(2)	5	(2)
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

Investment Grade Lighting Audit

APPENDIX E
1 of 18

CEG Job #: 9C11026

Project: Voorhees Township BOE LGEA

33 Signal Drive

Voorhees, NJ 08043

Bldg. Sq. Ft. 81,283

Signal Hill Elementary School

KWH COST: \$0.125

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
242.21	34	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.18	2,118.6	\$264.83	11	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.211		1800	3	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.10	183.6	\$22.95	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	35	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.18	2,118.6	\$264.83	11	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.20	351.0	\$43.88	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	21	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	15	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.20	351.0	\$43.88	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	20	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	19	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	14	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.20	351.0	\$43.88	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	18	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	17	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.211	Girl's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$27.90	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.211		1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.211		1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$27.90	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
227.211	Boy's Room	1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.211	Corridor - 34 - 17	3600	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.74	2,678.4	\$334.80	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.211		3600	2	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.07	244.8	\$30.60	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.22	JC	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.06	29.0	\$3.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	37	1800	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.54	963.0	\$120.38	5	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.211	P-7 Electrical	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	31.0	\$3.88	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.211	Storage	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	31.0	\$3.88	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.211	Library	1800	9	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.31	550.8	\$68.85	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
128.34		1800	22	2	8' Channel, 2 Lamp, 75w T12, Mag. Ballast, Pendant Mnt., No Lens	142	3.12	5,623.2	\$702.90	22	4	(2) 8' Lamps to (4) 4' Lamps - 32w T8, Elect Ballast; retrofit	104	2.29	4118.4	\$514.80	\$100.00	\$2,200.00	0.84	1504.8	\$188.10	11.70			
128.46		1800	5	1	6' Channel, 2 Lamp, 57w T12, Mag. Ballast, Surface Mnt., No Lens	142	0.71	1,278.0	\$159.75	5	1	6' Lamp to (1) 4' Lamp - 32w T8, Elect Ballast; retrofit	29	0.15	261	\$32.63	\$80.00	\$400.00	0.57	1017	\$127.13	3.15			
242.22	Library Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.42	748.8	\$93.60	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.22	Library AV Room	1800	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.83	1,497.6	\$187.20	8	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.22	P-6 Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.10	52.0	\$6.50	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
221.37	13	1800	24	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	1.39	2,505.6	\$313.20	24	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Server	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	31	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	33	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.21		1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234.0	\$29.25	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING												SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback					
242.21	32	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
142.21	30	1800	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$421.20	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$232.20	\$100.00	\$1,200.00	0.84	1512	\$189.00	6.35					
242.21	9	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	12	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.20	351.0	\$43.88	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	11	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.20	351.0	\$43.88	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	8	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	7	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	10	1800	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.07	1,926.0	\$240.75	10	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
227.21		1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234.0	\$29.25	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	6	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	5	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00					

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
232.21	Corridor - 31 - 5	3600	14	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.20	4,334.4	\$541.80	14	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		3600	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	468.0	\$58.50	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21	Storage	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	32.5	\$4.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Speech	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	AEP	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	770.4	\$96.30	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	4	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	3	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Assistant Principal	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$144.45	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Assistant Principal Closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Testing	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$144.45	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Testing closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	2	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	JC	500	2	1	Surface Mnt., 100w A19 Lamp	100	0.20	100.0	\$12.50	2	1	(1) 26w CFL Lamp	26	0.05	26	\$3.25	\$20.00	\$40.00	0.15	74	\$9.25	4.32		
222.21	Boy's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$27.90	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.21	Girl's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$27.90	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING							SAVINGS							
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	1	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	107.0	\$13.38	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	P-3 Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11	Stage	1800	13	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.81	1,450.8	\$181.35	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Stage Closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Corridor around Library	3600	45	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	4.82	17,334.0	\$2,166.75	45	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		3600	10	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.65	2,340.0	\$292.50	10	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Instructor	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$144.45	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Counsler	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$144.45	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Nurse	1800	7	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.75	1,348.2	\$168.53	7	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Nurse's Office	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11	Nurse's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21	Nurse's Closet	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	32.5	\$4.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	27	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	26	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Main Office	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.39	2,503.8	\$312.98	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21	Principal	1800	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.59	1,053.0	\$131.63	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21	Conference Room	3600	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.59	2,106.0	\$263.25	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
222.21	Copy Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$27.90	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	107.0	\$13.38	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
621	Closet	500	1	1	Recessed Light, 100w A Lamp	100	0.10	50.0	\$6.25	1	1	(1) 26w CFL Lamp	26	0.03	13	\$1.63	\$20.00	\$20.00	0.07	37	\$4.63	4.32		
211.11	Main Office Women's Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
211.11	Main Office Men's Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Main Office Storage	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
241.11	Boiler Room	800	9	4	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	104	0.94	748.8	\$93.60	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21	Maintenance Office	1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234.0	\$29.25	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.21	Maintenance Break Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
211.11	Maintenance Toilet Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	28 Music Room	1800	15	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.61	2,889.0	\$361.13	15	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	28 Music Room Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	770.4	\$96.30	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	107.0	\$13.38	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Music Closet	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	107.0	\$13.38	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
362.34	APR	1800	24	6	2x4, 4 Lamp, 54w T5HO Fixture	354	8.50	15,292.8	\$1,911.60	24	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
745		1800	4	1	250w MH Down Light w/Prismatic Lens	295	1.18	2,124.0	\$265.50	4	6	2x4, 6 Lamp, 32w T8, Elect. Ballast, Lo Bay	168	0.67	1209.6	\$151.20	\$220.00	\$880.00	0.51	914.4	\$114.30	7.70		
362.34	GYM	1800	12	6	2x4, 4 Lamp, 54w T5HO Fixture	354	4.25	7,646.4	\$955.80	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING						SAVINGS							
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
142	Kitchen	1800	19	4	1x4, 4-Lamp, 34w T8, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.96	5,335.2	\$666.90	19	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.63	2941.2	\$367.65	\$100.00	\$1,900.00	1.33	2394	\$299.25	6.35	
142	Kitchen Dishwasher	1800	4	4	1x4, 4-Lamp, 34w T8, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.62	1,123.2	\$140.40	4	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.34	619.2	\$77.40	\$100.00	\$400.00	0.28	504	\$63.00	6.35	
242.21	Kitchen JC	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	53.5	\$6.69	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.11	Kitchen Corridor	3600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.62	2,232.0	\$279.00	10	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Kitchen Office	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Kitchen Break Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	192.6	\$24.08	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
211.11	Kitchen Toilet	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
211.41		1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Boys's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	\$13.95	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
211.41		1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
211.37	P-2 Storage	500	5	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.15	75.0	\$9.38	5	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Corridor - P-1 - P-3	3600	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.39	5,007.6	\$625.95	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.11	GYM Storage	500	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.19	93.0	\$11.63	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	GYM Office #1	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.15	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
211.11	GYM Office #2	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.03	61.2	\$7.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
621	GYM Closet	500	1	1	Recessed Light, 100w A Lamp	100	0.10	50.0	\$6.25	1	1	(1) 26w CFL Lamp	26	0.03	13	\$1.63	\$20.00	\$20.00	0.07	37	\$4.63	4.32	

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
222.21	P-8 Electrical	500	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	62.0	\$7.75	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.21	25 Art	1800	16	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.99	1,785.6	\$223.20	16	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	24	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.39	2,503.8	\$312.98	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.41	24 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Office Special	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	770.4	\$96.30	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	23	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.39	2,503.8	\$312.98	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.41	23 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	22	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.39	2,503.8	\$312.98	13	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.41	22 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.41	Men's Room	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.41	Women's Room	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54.0	\$6.75	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Faculty Dining	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$288.90	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.63	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
560	Men's & Women's Vestibule	3600	1	1	Recessed Down Light, 26w CFL Lamp	26	0.03	93.6	\$11.70	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.21	Entrance 1	3600	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	234.0	\$29.25	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Corridor - Up to 26	3600	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	4,622.4	\$577.80	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
222.21	Entrance 2	3600	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	223.2	\$27.90	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Corridor - 26 - Music	3600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.43	1,540.8	\$192.60	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
	Totals		883	439				190,634	\$23,829	883	23			6.2	11,059	\$1,382		\$7,060	4.7	7,994	\$999	7.07			

CEG Job #: 9C11026
Project: Voorhees Township BOE LG EA
Address: 33 Signal Drive
Voorhees, NJ 08043
Building SF: 81,283

KWH COST: \$0.125

FALSE

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback
242.21	34	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.177	2118.6	264.825	11		Existing Occupancy Sensor - Remote Mnt.	107	0.94	20%	1694.88	\$211.86		\$0.00	0.00	423.72	\$52.97	0.00
227.211		1800	3	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.102	183.6	22.95	3		No Change	34	0.10	0%	183.6	\$22.95		\$0.00	0.00	0	\$0.00	0.00
242.21	35	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.177	2118.6	264.825	11		Existing Occupancy Sensor - Remote Mnt.	107	0.94	20%	1694.88	\$211.86		\$0.00	0.00	423.72	\$52.97	0.00
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.195	351	43.875	3		No Change	65	0.20	0%	351	\$43.88		\$0.00	0.00	0	\$0.00	0.00
242.21	21	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
242.21	15	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.195	351	43.875	3		No Change	65	0.20	0%	351	\$43.88		\$0.00	0.00	0	\$0.00	0.00
242.21	20	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
242.21	19	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
242.21	14	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.195	351	43.875	3		No Change	65	0.20	0%	351	\$43.88		\$0.00	0.00	0	\$0.00	0.00
242.21	18	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
242.21	17	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00
222.211	Girl's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	27.9	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.32		\$0.00	0.00	44.64	\$5.58	0.00
227.211		1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00	
222.211	Boy's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	27.9	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.32		\$0.00	0.00	44.64	\$5.58	0.00	
227.211		1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00	
222.211	Corridor - 34 - 17	3600	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.744	2678.4	334.8	12		No Change	62	0.74	0%	2678.4	\$334.80		\$0.00	0.00	0	\$0.00	0.00	
227.211		3600	2	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.068	244.8	30.6	2		No Change	34	0.07	0%	244.8	\$30.60		\$0.00	0.00	0	\$0.00	0.00	
222.22	JC	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.058	29	3.625	1		No Change	58	0.06	0%	29	\$3.63		\$0.00	0.00	0	\$0.00	0.00	
242.21	37	1800	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.535	963	120.375	5	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.43	20%	770.4	\$96.30	\$450.00	\$450.00	0.11	192.6	\$24.08	18.69	
222.211	P-7 Electrical	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	31	3.875	1		No Change	62	0.06	0%	31	\$3.88		\$0.00	0.00	0	\$0.00	0.00	
222.211	Storage	500	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	31	3.875	1		No Change	62	0.06	0%	31	\$3.88		\$0.00	0.00	0	\$0.00	0.00	
227.211	Library	1800	9	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.306	550.8	68.85	9		No Change	34	0.31	0%	550.8	\$68.85		\$0.00	0.00	0	\$0.00	0.00	
128.34		1800	22	2	8' Channel, 2 Lamp, 75w T12, Mag. Ballast, Pendant Mnt., No Lens	142	3.124	5623.2	702.9	22		No Change	142	3.12	0%	5623.2	\$702.90		\$0.00	0.00	0	\$0.00	0.00	
128.46		1800	5	1	6' Channel, 2 Lamp, 57w T12, Mag. Ballast, Surface Mnt., No Lens	142	0.71	1278	159.75	5		No Change	142	0.71	0%	1278	\$159.75		\$0.00	0.00	0	\$0.00	0.00	
242.22	Library Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.416	748.8	93.6	4	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	104	0.33	20%	599.04	\$74.88	\$450.00	\$450.00	0.08	149.76	\$18.72	24.04	
242.22	Library AV Room	1800	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.832	1497.6	187.2	8	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	104	0.67	20%	1198.08	\$149.76	\$450.00	\$450.00	0.17	299.52	\$37.44	12.02	
242.22	P-6 Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.104	52	6.5	1		No Change	104	0.10	0%	52	\$6.50		\$0.00	0.00	0	\$0.00	0.00	

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
221.37	13	1800	24	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Indirect	58	1.392	2505.6	313.2	24		Existing Occupancy Sensor - Remote Mnt.	58	1.11	20%	2004.48	\$250.56		\$0.00	0.00	501.12	\$62.64	0.00			
242.21	Server	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
242.21	31	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	33	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
227.21		1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234	29.25	2		No Change	65	0.13	0%	234	\$29.25		\$0.00	0.00	0	\$0.00	0.00			
242.21	32	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
142.21	30	1800	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	421.2	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$336.96		\$0.00	0.00	673.92	\$84.24	0.00			
242.21	9	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	12	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.195	351	43.875	3		No Change	65	0.20	0%	351	\$43.88		\$0.00	0.00	0	\$0.00	0.00			
242.21	11	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
227.21		1800	3	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.195	351	43.875	3		No Change	65	0.20	0%	351	\$43.88		\$0.00	0.00	0	\$0.00	0.00			
242.21	8	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	7	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	10	1800	10	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.07	1926	240.75	10		Existing Occupancy Sensor - Remote Mnt.	107	0.86	20%	1540.8	\$192.60		\$0.00	0.00	385.2	\$48.15	0.00			
227.21		1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234	29.25	2		No Change	65	0.13	0%	234	\$29.25		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
242.21	6	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	5	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2		Existing Occupancy Sensor - Remote Mnt.	107	0.17	20%	308.16	\$38.52		\$0.00	0.00	77.04	\$9.63	0.00			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00			
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2		Existing Occupancy Sensor - Remote Mnt.	107	0.17	20%	308.16	\$38.52		\$0.00	0.00	77.04	\$9.63	0.00			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00			
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
232.21	Corridor - 31 - 5	3600	14	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.204	4334.4	541.8	14		No Change	86	1.20	0%	4334.4	\$541.80		\$0.00	0.00	0	\$0.00	0.00			
227.21		3600	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	468	58.5	2		No Change	65	0.13	0%	468	\$58.50		\$0.00	0.00	0	\$0.00	0.00			
227.21	Storage	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	32.5	4.0625	1		No Change	65	0.07	0%	32.5	\$4.06		\$0.00	0.00	0	\$0.00	0.00			
242.21	Speech	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.52	\$450.00	\$450.00	0.04	77.04	\$9.63	46.73			
242.21	AEP	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	770.4	96.3	4		No Change	107	0.43	0%	770.4	\$96.30		\$0.00	0.00	0	\$0.00	0.00			
242.21	4	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	3	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
242.21	Assistant Principal	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	144.45	6		Existing Occupancy Sensor - Remote Mnt.	107	0.51	20%	924.48	\$115.56		\$0.00	0.00	231.12	\$28.89	0.00			
242.21	Assistant Principal Closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
242.21	Testing	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	144.45	6		No Change	107	0.64	0%	1155.6	\$144.45		\$0.00	0.00	0	\$0.00	0.00			
242.21	Testing closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
242.21	2	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
612	JC	500	2	1	Surface Mnt., 100w A19 Lamp	100	0.2	100	12.5	2		No Change	100	0.20	0%	100	\$12.50		\$0.00	0.00	0	\$0.00	0.00			
222.21	Boy's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	27.9	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.32		\$0.00	0.00	44.64	\$5.58	0.00			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00			
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
222.21	Girl's Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	27.9	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.32		\$0.00	0.00	44.64	\$5.58	0.00			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00			
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
242.21	1	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	107	13.375	2		No Change	107	0.21	0%	107	\$13.38		\$0.00	0.00	0	\$0.00	0.00			
242.21	P-3 Electrical	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
221.11	Stage	1800	13	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.806	1450.8	181.35	13		No Change	62	0.81	0%	1450.8	\$181.35		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
242.21	Stage Closet	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
242.21	Corridor around Library	3600	45	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	4.815	17334	2166.75	45		No Change	107	4.82	0%	17334	\$2,166.75		\$0.00	0.00	0	\$0.00	0.00			
227.21		3600	10	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.65	2340	292.5	10		No Change	65	0.65	0%	2340	\$292.50		\$0.00	0.00	0	\$0.00	0.00			
242.21	Instructor	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	144.45	6	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.51	20%	924.48	\$115.56	\$450.00	\$450.00	0.13	231.12	\$28.89	15.58			
242.21	Counsler	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	144.45	6	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.51	20%	924.48	\$115.56	\$450.00	\$450.00	0.13	231.12	\$28.89	15.58			
242.21	Nurse	1800	7	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.749	1348.2	168.525	7	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	107	0.60	20%	1078.56	\$134.82	\$600.00	\$600.00	0.15	269.64	\$33.71	17.80			
242.21	Nurse's Office	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.52	\$450.00	\$450.00	0.04	77.04	\$9.63	46.73			
221.11	Nurse's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
227.21	Nurse's Closet	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	32.5	4.0625	1		No Change	65	0.07	0%	32.5	\$4.06		\$0.00	0.00	0	\$0.00	0.00			
242.21	27	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	26	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			
242.21	Main Office	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.391	2503.8	312.975	13		No Change	107	1.39	0%	2503.8	\$312.98		\$0.00	0.00	0	\$0.00	0.00			
227.21	Principal	1800	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.585	1053	131.625	9	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	65	0.47	20%	842.4	\$105.30	\$600.00	\$600.00	0.12	210.6	\$26.33	22.79			
227.21	Conference Room	3600	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.585	2106	263.25	9	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	65	0.47	20%	1684.8	\$210.60	\$600.00	\$600.00	0.12	421.2	\$52.65	11.40			
222.21	Copy Roon	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	27.9	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.32		\$0.00	0.00	44.64	\$5.58	0.00			
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	107	13.375	2		No Change	107	0.21	0%	107	\$13.38		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
621	Closet	500	1	1	Recessed Light, 100w A Lamp	100	0.1	50	6.25	1		No Change	100	0.10	0%	50	\$6.25		\$0.00	0.00	0	\$0.00	0.00			
211.11	Main Office Women's Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00			
211.11	Main Office Men's Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00			
242.21	Main Office Storage	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00			
241.11	Boiler Room	800	9	4	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	104	0.936	748.8	93.6	9	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	104	0.75	20%	599.04	\$74.88	\$450.00	\$450.00	0.19	149.76	\$18.72	24.04			
227.21	Maintenance Office	1800	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	234	29.25	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	65	0.10	20%	187.2	\$23.40	\$450.00	\$450.00	0.03	46.8	\$5.85	76.92			
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00			
222.21	Maintenance Break Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	13.95	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	62	0.05	20%	89.28	\$11.16	\$450.00	\$450.00	0.01	22.32	\$2.79	161.29			
211.11	Maintenance Toilet Room	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00			
242.21	28 Music Room	1800	15	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.605	2889	361.125	15	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	107	1.28	20%	2311.2	\$288.90	\$600.00	\$600.00	0.32	577.8	\$72.23	8.31			
227.21		1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00			
242.21	28 Music Room Office	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	770.4	96.3	4		Existing Occupancy Sensor - Remote Mnt.	107	0.34	20%	616.32	\$77.04		\$0.00	0.00	154.08	\$19.26	0.00			
242.21	Storage	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	107	13.375	2		No Change	107	0.21	0%	107	\$13.38		\$0.00	0.00	0	\$0.00	0.00			
242.21	Music Closet	500	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	107	13.375	2		No Change	107	0.21	0%	107	\$13.38		\$0.00	0.00	0	\$0.00	0.00			
362.34	APR	1800	24	6	2x4, 4 Lamp, 54w T5HO Fixture	354	8.496	15292.8	1911.6	24	3	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	354	6.80	20%	12234.24	\$1,529.28	\$600.00	\$1,800.00	1.70	3058.56	\$382.32	4.71			
745		1800	4	1	250w MH Down Light w/Prismatic Lens	295	1.18	2124	265.5	4		No Change	295	1.18	0%	2124	\$265.50		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
362.34	GYM	1800	12	6	2x4, 4 Lamp, 54w T5HO Fixture	354	4.248	7646.4	955.8	12	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole & (1) 1 Pole Powerpacks - Remote Mnt.	354	3.40	20%	6117.12	\$764.64	\$600.00	\$1,200.00	0.85	1529.28	\$191.16	6.28	
142	Kitchen	1800	19	4	1x4, 4-Lamp, 34w T8, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.964	5335.2	666.9	19		No Change	156	2.96	0%	5335.2	\$666.90		\$0.00	0.00	0	\$0.00	0.00	
142	Kitchen Dishwasher	1800	4	4	1x4, 4-Lamp, 34w T8, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.624	1123.2	140.4	4		No Change	156	0.62	0%	1123.2	\$140.40		\$0.00	0.00	0	\$0.00	0.00	
242.21	Kitchen JC	500	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	53.5	6.6875	1		No Change	107	0.11	0%	53.5	\$6.69		\$0.00	0.00	0	\$0.00	0.00	
221.11	Kitchen Corridor	3600	10	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.62	2232	279	10		No Change	62	0.62	0%	2232	\$279.00		\$0.00	0.00	0	\$0.00	0.00	
242.21	Kitchen Office	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.52	\$450.00	\$450.00	0.04	77.04	\$9.63	46.73	
242.21	Kitchen Break Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	192.6	24.075	1		No Change	107	0.11	0%	192.6	\$24.08		\$0.00	0.00	0	\$0.00	0.00	
211.11	Kitchen Toilet	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00	
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.52	\$450.00	\$450.00	0.04	77.04	\$9.63	46.73	
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00	
211.41		1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1		No Change	30	0.03	0%	54	\$6.75		\$0.00	0.00	0	\$0.00	0.00	
242.21	Boys's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.52	\$450.00	\$450.00	0.04	77.04	\$9.63	46.73	
222.21		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	13.95	1		No Change	62	0.06	0%	111.6	\$13.95		\$0.00	0.00	0	\$0.00	0.00	
211.41		1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1		No Change	30	0.03	0%	54	\$6.75		\$0.00	0.00	0	\$0.00	0.00	
211.37	P-2 Storage	500	5	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.15	75	9.375	5		No Change	30	0.15	0%	75	\$9.38		\$0.00	0.00	0	\$0.00	0.00	
242.21	Corridor - P-1 - P-3	3600	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.391	5007.6	625.95	13		No Change	107	1.39	0%	5007.6	\$625.95		\$0.00	0.00	0	\$0.00	0.00	

ECM #2: Lighting Controls

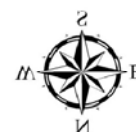
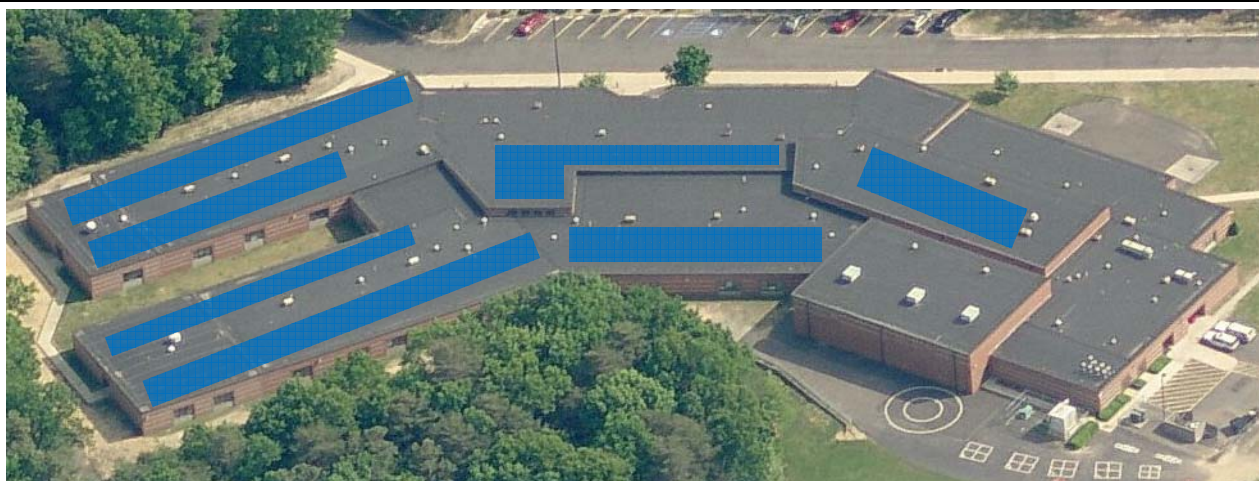
EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
221.11	GYM Storage	500	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.186	93	11.625	3		No Change	62	0.19	0%	93	\$11.63		\$0.00	0.00	0	\$0.00	0.00			
242.21	GYM Office #1	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.15	2		No Change	107	0.21	0%	385.2	\$48.15		\$0.00	0.00	0	\$0.00	0.00			
211.11	GYM Office #2	1800	1	2	1x3 2 Lamp, 32w T8, Elect. Ballast, Pendent Mnt., Prismatic Lens	34	0.034	61.2	7.65	1		No Change	34	0.03	0%	61.2	\$7.65		\$0.00	0.00	0	\$0.00	0.00			
621	GYM Closet	500	1	1	Recessed Light, 100w A Lamp	100	0.1	50	6.25	1		No Change	100	0.10	0%	50	\$6.25		\$0.00	0.00	0	\$0.00	0.00			
222.21	P-8 Electrical	500	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	62	7.75	2		No Change	62	0.12	0%	62	\$7.75		\$0.00	0.00	0	\$0.00	0.00			
222.21	25 Art	1800	16	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.992	1785.6	223.2	16		Existing Occupancy Sensor - Remote Mnt.	62	0.79	20%	1428.48	\$178.56		\$0.00	0.00	357.12	\$44.64	0.00			
242.21	24	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.391	2503.8	312.975	13		Existing Occupancy Sensor - Remote Mnt.	107	1.11	20%	2003.04	\$250.38		\$0.00	0.00	500.76	\$62.60	0.00			
211.41	24 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1		No Change	30	0.03	0%	54	\$6.75		\$0.00	0.00	0	\$0.00	0.00			
242.21	Office Special	1800	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	770.4	96.3	4		Existing Occupancy Sensor - Remote Mnt.	107	0.34	20%	616.32	\$77.04		\$0.00	0.00	154.08	\$19.26	0.00			
242.21	23	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.391	2503.8	312.975	13		Existing Occupancy Sensor - Remote Mnt.	107	1.11	20%	2003.04	\$250.38		\$0.00	0.00	500.76	\$62.60	0.00			
211.41	23 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1		No Change	30	0.03	0%	54	\$6.75		\$0.00	0.00	0	\$0.00	0.00			
242.21	22	1800	13	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.391	2503.8	312.975	13		Existing Occupancy Sensor - Remote Mnt.	107	1.11	20%	2003.04	\$250.38		\$0.00	0.00	500.76	\$62.60	0.00			
211.41	22 Toilet	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1		No Change	30	0.03	0%	54	\$6.75		\$0.00	0.00	0	\$0.00	0.00			
211.41	Men's Room	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.02	20%	43.2	\$5.40	\$450.00	\$450.00	0.01	10.8	\$1.35	333.33			
211.41	Women's Room	1800	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	30	0.03	54	6.75	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	30	0.02	20%	43.2	\$5.40	\$450.00	\$450.00	0.01	10.8	\$1.35	333.33			
242.21	Exhibit Dining	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	288.9	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$231.12		\$0.00	0.00	462.24	\$57.78	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
227.21	Faculty Lounge	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.625	1		No Change	65	0.07	0%	117	\$14.63		\$0.00	0.00	0	\$0.00	0.00	
560	Men's & Women's Vestibule	3600	1	1	Recessed Down Light, 26w CFL Lamp	26	0.026	93.6	11.7	1		No Change	26	0.03	0%	93.6	\$11.70		\$0.00	0.00	0	\$0.00	0.00	
227.21	Entrance 1	3600	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	234	29.25	1		No Change	65	0.07	0%	234	\$29.25		\$0.00	0.00	0	\$0.00	0.00	
242.21	Corridor - Up to 26	3600	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	4622.4	577.8	12		No Change	107	1.28	0%	4622.4	\$577.80		\$0.00	0.00	0	\$0.00	0.00	
222.21	Entrance 2	3600	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	223.2	27.9	1		No Change	62	0.06	0%	223.2	\$27.90		\$0.00	0.00	0	\$0.00	0.00	
242.21	Corridor - 26 - Music	3600	4	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.428	1540.8	192.6	4		No Change	107	0.43	0%	1540.8	\$192.60		\$0.00	0.00	0	\$0.00	0.00	
	Totals		883	439			96.5	190,634.4	\$23,829	883	24			83.2		166,560.1	\$20,820.02		\$12,150	4.32	24,074	\$3,009	4.04	

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW _{DC}	Total Annual kWh	Total KW _{AC}	Panel Weight (41.9 lbs)	W/SQFT
Signal Hill Elementary	17090	SHARP NU-U235F2	698	17.5	12,243	164.03	200,352	132.8	29,246	13.40



Notes: [REDACTED] = Proposed PV Layout

1. Estimated kWh based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	164.0 kW
DC to AC Derate Factor:	0.810
AC Rating:	132.8 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	12.5 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.58	10653	1331.62
2	3.33	12579	1572.38
3	4.31	17568	2196.00
4	5.20	20012	2501.50
5	5.85	22855	2856.88
6	6.14	22246	2780.75
7	6.06	22473	2809.12
8	5.54	20652	2581.50
9	4.85	17757	2219.62
10	3.76	14500	1812.50
11	2.65	10159	1269.88
12	2.23	8897	1112.12
Year	4.38	200352	25044.00

Project Name: Signal Hill Elementary										
Location: Voorhees, NJ										
Description: Photovoltaic System 100% Financing - 15 year										
Simple Payback Analysis										
		Photovoltaic System 100% Financing - 15 year								
Total Construction Cost		\$990,305								
Annual kWh Production		200,352								
Annual Energy Cost Reduction		\$25,044								
Average Annual SREC Revenue		\$77,257								
Simple Payback:		9.68						Years		
Life Cycle Cost Analysis										
Analysis Period (years):		15						Financing %:		100%
Discount Rate:		3%						Maintenance Escalation Rate:		3.0%
Average Energy Cost (\$/kWh)		\$0.125						Energy Cost Escalation Rate:		3.0%
Financing Rate:		6.00%						Average SREC Value (\$/kWh)		\$0.386
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow	
0	\$0	0	0	0	\$0	0	0	0	0	
1	\$0	200,352	\$25,044	\$0	\$110,194	\$58,276	\$42,005	\$34,957	\$34,957	
2	\$0	199,350	\$25,795	\$0	\$109,643	\$55,685	\$44,596	\$35,157	\$70,113	
3	\$0	198,353	\$26,569	\$0	\$99,177	\$52,934	\$47,347	\$25,465	\$95,578	
4	\$0	197,362	\$27,366	\$0	\$88,813	\$50,014	\$50,267	\$15,898	\$111,476	
5	\$0	196,375	\$28,187	\$2,023	\$88,369	\$46,914	\$53,367	\$14,252	\$125,729	
6	\$0	195,393	\$29,033	\$2,013	\$87,927	\$43,622	\$56,659	\$14,666	\$140,395	
7	\$0	194,416	\$29,904	\$2,002	\$77,766	\$40,127	\$60,154	\$5,387	\$145,781	
8	\$0	193,444	\$30,801	\$1,992	\$77,378	\$36,417	\$63,864	\$5,905	\$151,687	
9	\$0	192,477	\$31,725	\$1,983	\$67,367	\$32,478	\$67,803	(\$3,172)	\$148,515	
10	\$0	191,514	\$32,677	\$1,973	\$67,030	\$28,296	\$71,985	(\$2,547)	\$145,968	
11	\$0	190,557	\$33,657	\$1,963	\$57,167	\$23,857	\$76,425	(\$11,420)	\$134,548	
12	\$0	189,604	\$34,667	\$1,953	\$56,881	\$19,143	\$81,138	(\$10,686)	\$123,862	
13	\$0	188,656	\$35,707	\$1,943	\$47,164	\$14,138	\$86,143	(\$19,353)	\$104,509	
14	\$0	187,713	\$36,778	\$1,933	\$46,928	\$8,825	\$91,456	(\$18,508)	\$86,000	
15	\$0	186,774	\$37,881	\$1,924	\$37,355	\$3,184	\$97,097	(\$26,969)	\$59,032	
Totals:		2,902,340	\$465,791	\$21,701	\$1,119,158	\$513,911	\$990,305	\$59,032	\$1,678,150	
Net Present Value (NPV)							\$71,019			

APPENDIX G

MONTHLY ENERGY CONSUMPTION

By CONCORD ENGINEERING GROUP

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1 Signal Hill ES													
Electric													
On-Pk Cons. (kWh)	144,839	165,695	140,276	78,144	74,488	59,525	85,451	97,490	78,404	83,038	107,503	140,699	1,255,552
On-Pk Demand (kW)	707	780	665	597	476	695	842	843	674	594	658	713	843
Gas													
On-Pk Cons. (therms)	30	27	33	28	31	11	10	11	28	31	30	28	298
On-Pk Demand (therms/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water													
Cons. (1000gal)	0	0	0	0	36	75	177	215	102	0	0	0	605
Energy Consumption				Environmental Impact Analysis									
Building	52,883 Btu/(ft2-year)			CO2	901,180 lbm/year								
Source	157,952 Btu/(ft2-year)			SO2	2,449 gm/year								
				NOX	1,263 gm/year								
Floor Area	81,596 ft2												

MONTHLY ENERGY CONSUMPTION

By CONCORD ENGINEERING GROUP

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2 Signal Hill ES													
Electric													
On-Pk Cons. (kWh)	82,376	88,347	79,610	41,545	40,613	29,390	39,055	43,671	40,779	46,027	64,333	79,345	675,087
On-Pk Demand (kW)	460	460	460	460	435	399	430	436	400	460	460	460	460
Gas													
On-Pk Cons. (therms)	1,658	2,581	1,649	250	31	11	10	11	28	183	895	1,632	8,939
On-Pk Demand (therms/hr)	21	21	21	19	0	0	0	0	0	20	20	21	21

Energy Consumption	
Building	39,193 Btu/(ft2-year)
Source	96,253 Btu/(ft2-year)
Floor Area	81,596 ft2

Environmental Impact Analysis	
CO2	667,896 lbm/year
SO2	1,815 gm/year
NOX	936 gm/year