VOORHEES TOWNSHIP
BOARD OF EDUCATION
KRESSON ELEMENTARY SCHOOL

1 SCHOOL LANE
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)

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.

Natural gas service is not currently provided to the Kresson Elementary School.

Table 1
Electricity Billing Data

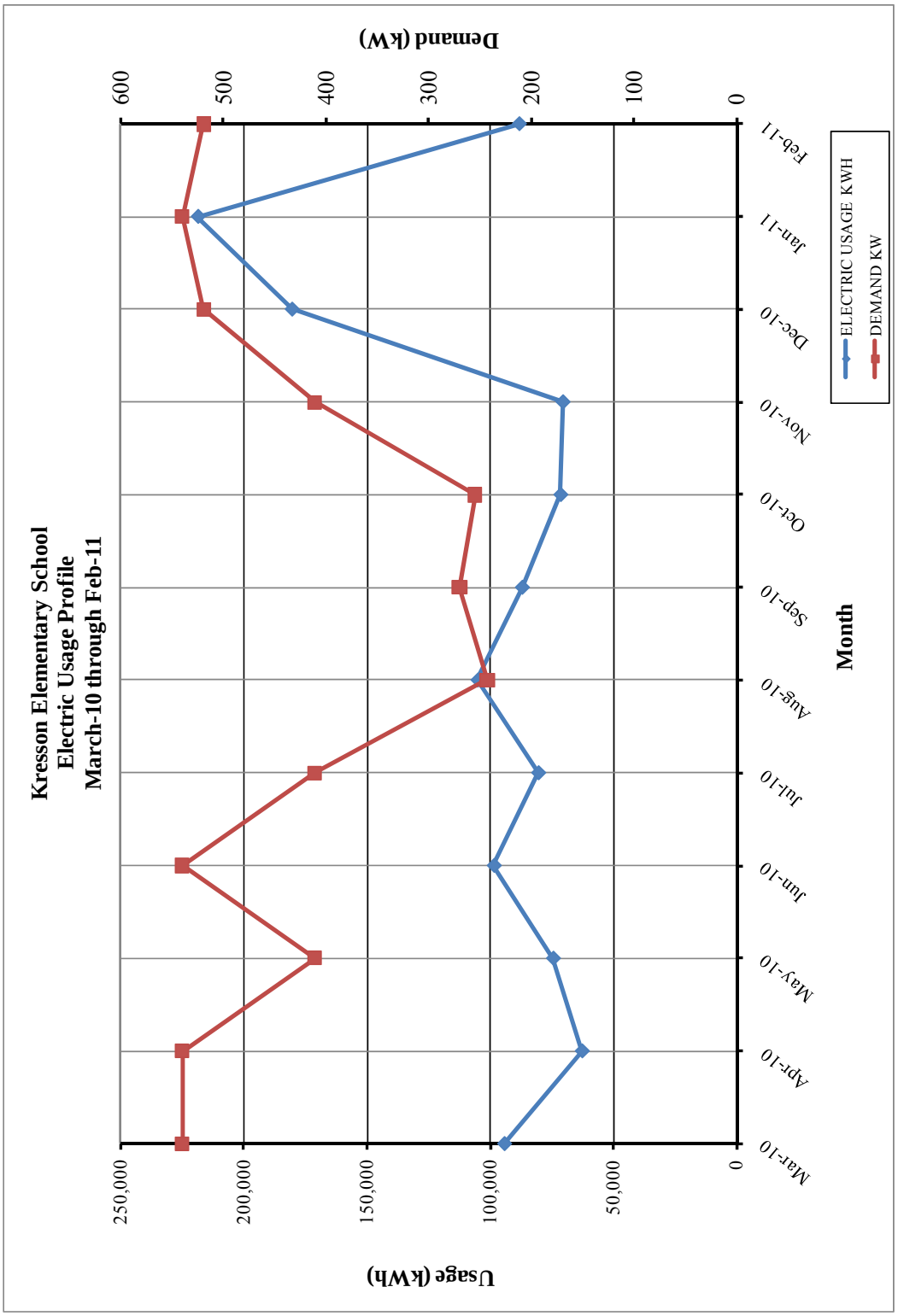
ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service (AGS)
Meter No: 81777401
Account # 0284 2749 9990
Third Party Utility Provider: GDF Suez (during this study period)
TPS Meter / Acct No: - / 38593-66003

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-10	94,500	540.0	$13,372
Apr-10	63,000	540.0	$10,172
May-10	74,700	411.0	$10,597
Jun-10	98,700	540.0	$13,024
Jul-10	80,700	411.0	$10,930
Aug-10	105,300	243.0	$13,195
Sep-10	87,300	270.0	$11,731
Oct-10	71,700	255.0	$9,890
Nov-10	70,800	411.0	$10,087
Dec-10	180,600	519.0	$18,436
Jan-11	218,700	540.0	$27,471
Feb-11	88,500	519.0	$13,163
Totals	**1,234,500**	**540.0 Max**	**$162,068**

AVERAGE DEMAND **433.3 KW average**
AVERAGE RATE **$0.131** **$/kWh**

Figure 1
Electricity Usage Profile



II. FACILITY DESCRIPTION

Kresson Elementary School is located on 1 School Lane in Voorhees, New Jersey. The 61,115 square foot elementary school was built in 1983 with an eight classroom addition in 1985, the Gymnasium addition in 1988 and a five classroom addition in 1992. The building is a single story facility comprised of library space for books, mechanical room and offices.

Occupancy Profile

The typical hours of operation for the elementary school are Monday through Friday between 7:00 am and 4:00 pm during the school year (September through June). In addition, the school is limited in occupancy over the summer months, with the administrative office open Monday through Thursday 9:00 am to 4:00 pm and summer camps being held in the gymnasium and multipurpose room.

Building Envelope

The exterior walls of the school are brick faced with a concrete block interior construction. According to building construction documents, the amount of insulation within the walls is 2" rigid foam insulation. Typical windows throughout the school are double pane, operable ¼" tinted glass with aluminum frames. The windows throughout the facility are in good condition and appear to be well maintained. Blinds are utilized throughout the classrooms of the school per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer. The majority of the roof is a sloped, standing seam metal roof on approximately 2" of rigid insulation and a metal deck. The roof over the 1988 and 1992 additions is a flat, EPDM membrane roofing on 2" rigid insulation and a metal deck.

HVAC Systems

The school heating and cooling is provided via air to air heat pumps and split system air conditioning units.

The perimeter classrooms of the school are served by thru-the-wall packaged air to air heat pumps with supplementary electric resistance heat. These units are individually controlled per occupant comfort. The heat pumps vary in size, but have an average capacity of 3.5 Tons of cooling each.

The Art classroom, Nurses office, Preschool Classroom, Library and adjacent offices and storage rooms are all served by split system heat pumps. The remote condensing units for all of these areas are located in the roof, with the interior heat pump air handling units located above the ceilings. Each of these units is also individually controlled with local wall mounted thermostats.

The Multipurpose room is served by a 20-Ton split system air conditioning unit. Heating is provided to the via 56kW electric resistance heat located in the interior air handling unit.

The Gymnasium is served by two (2) packaged 13-Ton rooftop air conditioning units with 73.5 kW electric resistance heat.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters and inline cabinet fans. The fans are controlled by on/off switches located in the spaces in which are served.

HVAC System Controls

Currently, the building HVAC systems are controlled by stand alone DDC controllers. The unit ventilators are controlled at the unit, per occupant comfort. Programmable wall thermostats are provided for the split system heat pumps and rooftop units.

Domestic Hot Water

Domestic hot water for the restrooms and kitchen is provided by two (2) 120 gallon Bradford White electric hot water heater, with an input capacity of 4500 Watts each. The HWHs are located in the mechanical room.

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	$1,716	$478	3.6	317.8%
ECM #2	Lighting Controls	$4,565	$2,049	2.2	573.3%
ECM #3	Split System Heat Pump Upgrades	$82,669	$7,406	11.2	34.4%
ECM #4	Water Conservation	$69,476	$2,542	27.3	-45.1%
ECM #5	Geothermal Heat Pump System	$1,701,224	$68,538	24.8	0.7%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Rooftop Solar Array	$314,449	$33,151	9.5	58.1%
Notes:	A. Cost takes into consideration applicable NJ Smart StartTM 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	1.4	2,527	0
ECM #2	Lighting Controls	9.6	15,639	0
ECM #3	Split System Heat Pump Upgrades	18.8	56,531	0
ECM #4	Water Conservation	0.0	9,906	0
ECM #5	Geothermal Heat Pump System	0.0	523,194	-
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	40.7	61,437	-

Table 3
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrades	$478	$1,716	$0	$1,716	3.6
Lighting Controls	$2,049	$4,950	$385	$4,565	2.2
Split System Heat Pump Upgrades	$7,406	$84,739	$2,070	$82,669	11.2
Water Conservation	$2,542	$69,476	$0	$69,476	27.3
Geothermal Heat Pump System	***$68,538***	***$1,894,724***	***$193,500***	***$1,701,224***	***24.8***
Design / Construction Extras (15%)		$24,132		*$24,132*	
Total Project	**$12,475**	**$185,013**	**$2,455**	**$182,558**	**14.6**

* 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

Description:

The majority of the interior lighting throughout Kresson Elementary School is provided with a combination of 2'x4' fluorescent fixtures with 34W T8 lamps and electronic ballasts and 2'x2' fixtures with 17W T8 lamps with electronic ballasts. In addition, the all-purpose room has been retrofitted with 2'x4', high output, T5 fluorescent fixtures.

CEG recommends, removing 1 lamp from all of the 4-lamp T-8 fixtures. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need approximately 33% less lamps replaced per year for each one for one fixture replaced.

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 rebates or incentives for this ECM.

Replacement and Maintenance Savings:

The maintenance savings available for this ECM is based on the reduced number of fluorescent lamps replaced each year due to the removal of each additional lamp. The savings is calculated as follows:

$$\text{Maintenance Savings} = \frac{\text{\# T8 Lamps Removed}}{\text{Year}} \times \text{Lamp Installed Cost}$$

Lamp installation cost is estimated to be $7 per lamp ($3 Material cost)

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,716
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,716
Maintenance Savings ($/Yr):	$147
Energy Savings ($/Yr):	$331
Total Yearly Savings ($/Yr):	$478
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	317.8%
Simple Lifetime Maintenance Savings	$2,205
Simple Lifetime Savings	$7,170
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	$3,990.33

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 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:

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

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

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
= (# Wall mount sensors × $20 per sensor)
+ (# Ceiling mount sensors × $35 per sensor)

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,950
NJ Smart Start Equipment Incentive ($):	$385
Net Installation Cost ($):	$4,565
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,049
Total Yearly Savings ($/Yr):	$2,049
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.2
Simple Lifetime ROI	573.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$30,735
Internal Rate of Return (IRR)	45%
Net Present Value (NPV)	$19,895.83

ECM #3: Split System Heat Pump Upgrades

Description:

Kresson Elementary School is conditioned by split system heat pump units. The majority of the units at the school are in fair condition and while they have not yet reached their service life, replacing select areas with newer units would reduce energy consumption. 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**
SS	CU-2,3,4,6,9,10&11	7	24,000	14.0	Carrier - 25HNA9 Infinity Series
SS	CU-5 Classrooms	1	60,000	5.0	Carrier - 25HNA9 Infinity Series
SS	CU-1 Classrooms	1	42,000	3.5	Carrier - 25HNA9 Infinity Series
Total		**9**	**126,000**	**22.5**	

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:

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

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

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

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

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

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

ENERGY SAVINGS CALCULATIONS											
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	ANNUAL HEATING HOURS	EXISTING UNITS EER	NEW UNITS EER	EXISTING UNITS COP	SPLIT UNITS COP	# OF UNITS	ENERGY SAVINGS COOLING KWH	ENERGY SAVINGS HEATING KWH	DEMAND SAVINGS kW
SS	24,000	1,800	1,200	9.65 EER	14.1 EER	2.06 COP	2.4 COP	7	9,890	6,758	5.5
SS	60,000	1,800	1,200	9 EER	12.6 EER	2.28 COP	2.74 COP	1	3,429	18,090	7.2
SS	42,000	1,800	1,200	9 EER	11.6 EER	2.22 COP	2.82 COP	1	1,883	16,482	6.1
Total								9	15,201	41,330	18.8

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:

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

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 Split System	≥14 SEER	$92	22.5	$2,070
TOTAL			**22.5**	**$2,070**

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	$7,935	7	$61,100	$1,288	$59,812	$2,181	27.4
SS	$11,903	1	$13,093	$460	$12,633	$2,819	4.5
SS	$9,588	1	$10,547	$322	$10,225	$2,406	4.3
Total	$29,426	9	$84,739	$2,070	$82,669	$7,406	11.2

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

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$84,739
NJ Smart Start Equipment Incentive ($):	$2,070
Net Installation Cost ($):	$82,669
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$7,406
Total Yearly Savings ($/Yr):	$7,406
Estimated ECM Lifetime (Yr):	15
Simple Payback	11.2
Simple Lifetime ROI	34.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$111,090
Internal Rate of Return (IRR)	4%
Net Present Value (NPV)	$5,743.35

ECM #4: Water Conservation

Description:

Kresson 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	393	393	-
% 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	197	197	-
Total WC Flushes Per Day	393	393	-
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	$8.00	-
Electric Cost ($/Kwh)	$0.13	$0.13	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Water Consumption, Urinal and WC (Gal)	206,325	131,901	74,424
Water Consumption, Faucets (Gal)	110,531	29,475	81,056
Total Water Consumption, (Gal)	316,856	161,376	155,481
Water Cost ($)	$2,535	$1,291	$1,244
Electric Consumption (Kwh)	13,508	3,602	9,906
Electric Cost ($/Year)	$1,770	$472	$1,298
TOTAL SAVINGS			**$2,542**
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 #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$69,476
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$69,476
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,542
Total Yearly Savings ($/Yr):	$2,542
Estimated ECM Lifetime (Yr):	15
Simple Payback	27.3
Simple Lifetime ROI	-45.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$38,130
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($39,129.77)

ECM #5: Geothermal Heat Pump System Installation

Description:

The HVAC Systems at Kresson Elementary School is a combination of split system heat pump units, rooftop heat pumps and individual classroom heat pumps.

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 is 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 a boiler) or heat rejection equipment (such as a 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. 430-Ton (Heating Dominant) bore field located Southwest end of the building. (143 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.
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 #5 GEOTHERMAL SYSTEM CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Energy Consumption	Proposed Energy Consumption	
Elec Usage (KWH)	1,234,500	711,306	523,194
Electric Cost ($/KWH)	$0.131	$0.131	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy Cost ($)	$161,720	$93,181	$68,538
Total Energy Cost ($)	$161,720	$93,181	$68,538
COMMENTS:	This ECM is based on energy models performed on energy analysis software by Trane (Trace 700).		

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,894,724
NJ Smart Start Equipment Incentive ($):	$193,500
Net Installation Cost ($):	$1,701,224
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$68,538
Total Yearly Savings ($/Yr):	$68,538
Estimated ECM Lifetime (Yr):	25
Simple Payback	24.8
Simple Lifetime ROI	0.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,713,450
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($507,761.43)

***Note:** ECM #5 – Geothermal System Installation is an alternate ECM. Implementation of ECM #5 would eliminate the potential for ECM #3.

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 - Kresson Elementary School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	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)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Lighting Upgrades	$0	$1,716	$0	$1,716	$331	$147	$478	15	$7,170	$2,205	317.8%	3.6	27.09%	$3,990.33
ECM #2	Lighting Controls	$1,980	$2,970	$385	$4,565	$2,049	$0	$2,049	15	$30,735	$0	573.3%	2.2	44.71%	$19,895.83
ECM #3	Split System Heat Pump Upgrades	$50,843	$33,896	$2,070	$82,669	$7,406	$0	$7,406	15	$111,090	$0	34.4%	11.2	3.94%	$5,743.35
ECM #4	Water Conservation	$34,738	$34,738	$0	$69,476	$2,542	$0	$2,542	15	$38,130	$0	-45.1%	27.3	-6.71%	($39,129.77)
ECM #5	Geothermal Heat Pump System	$785,136	$1,109,588	$193,500	$1,701,224	$68,538	$0	$68,538	25	$1,713,450	$0	0.7%	24.8	0.06%	($507,761.43)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Rooftop Solar Array	$314,449	$0	$0	$314,449	$9,461	$23,690	$33,151	15	$497,265	$355,350	58.1%	9.5	6.36%	$81,305.49

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 ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit, AFUE ≥ 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 ≤ 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 ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Kresson Elementary School

Building ID: 2820704
For 12-month Period Ending: February 28, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 03, 2011

Facility
Kresson Elementary School
1 SCHOOL LANE
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: 1981
Gross Floor Area (ft²): 61,115

Energy Performance Rating[2] (1-100) 8

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	4,212,114
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	4,212,114

Energy Intensity[5]

Site (kBtu/ft²/yr)	69
Source (kBtu/ft²/yr)	230

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	596

Electric Distribution Utility
Atlantic City Electric Co [Pepco Holdings Inc]

National Average Comparison

National Average Site EUI	43
National Average Source EUI	145
% Difference from National Average Source EUI	59%
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 Standards[6] **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	Kresson Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	1 SCHOOL LANE, 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		☐
Kresson Elementary School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	61,115 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	107 (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	90 %	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'.		☐

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	88,500.00
01/01/2011	01/31/2011	218,700.00
12/01/2010	12/31/2010	180,600.00
11/01/2010	11/30/2010	70,800.00
10/01/2010	10/31/2010	71,700.00
09/01/2010	09/30/2010	87,300.00
08/01/2010	08/31/2010	105,300.00
07/01/2010	07/31/2010	80,700.00
06/01/2010	06/30/2010	98,700.00
05/01/2010	05/31/2010	74,700.00
04/01/2010	04/30/2010	63,000.00
03/01/2010	03/31/2010	94,500.00
Electric Consumption (kWh (thousand Watt-hours))		**1,234,500.00**
Electric Consumption (kBtu (thousand Btu))		**4,212,114.00**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**4,212,114.00**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity 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
Kresson Elementary School
1 SCHOOL LANE
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

Kresson Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	61,115
Year Built	1981
For 12-month Evaluation Period Ending Date:	February 28, 2011

Facility Space Use Summary

Kresson Elementary School	
Space Type	K-12 School
Gross Floor Area(ft^2)	61,115
Open Weekends?	No
Number of PCs[d]	107
Number of walk-in refrigeration/freezer units[d]	1
Presence of cooking facilities	Yes
Percent Cooled	90
Percent Heated	90
Months[o]	10
High School?	No
School District[o]	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 02/28/2011)	**Baseline** (Ending Date 02/28/2011)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	8	8	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	69	69	34	N/A	43
Source (kBtu/ft^2)	230	230	113	N/A	145
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					
$MtCO_2e$/year	596	596	293	N/A	375
$kgCO_2e/ft^2$/year	10	10	5	N/A	6

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.

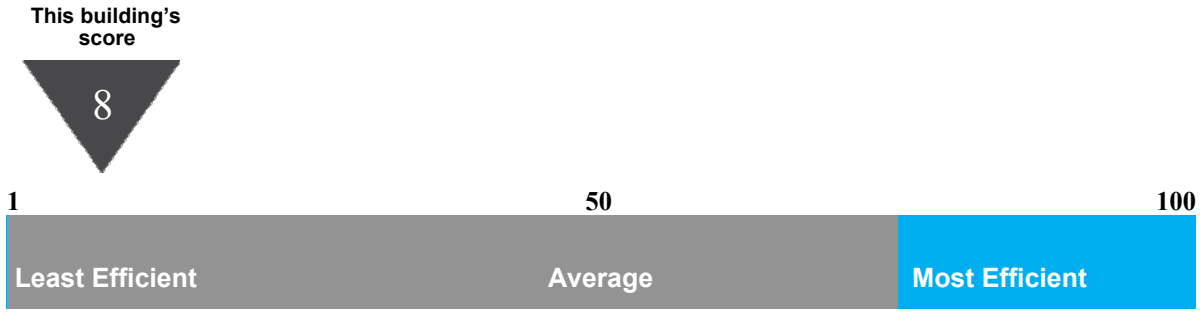
Statement of Energy Performance

2011

Kresson Elementary School
1 SCHOOL LANE
Voorhees, NJ 08043

Portfolio Manager Building ID: 2820704

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 230 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

EPA United States Environmental Protection Agency

Date Generated: 08/03/2011

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

AC/HP Units

Tag	CU-1	CU-2	CU-3
Unit Type	Split System Heat Pump	Split System Heat Pump	Split System Heat Pump
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Art Classroom	A/V Storage	Nurses Office
Manufacturer	Payne	Payne	Payne
Model #	PH10JA042C	PH10JA018C	PH10JA018E
Serial #	1404E27829	4501E12726	2204E5383
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	3.5 Tons	1.5 Tons	1.5 Tons
Cooling Efficiency (SEER/EER)	10 SEER/9.0 EER	10 SEER/9.65 EER	10 SEER/9.65 EER
Heating Type	Heat Pump	Heat Pump	Heat Pump
Heating Input (MBH)	-	-	-
Efficiency	2.22 COP @ Low Temp	2.06 COP @ Low Temp	2.06 COP @ Low Temp
Fuel	Heat Pump	Heat Pump	Heat Pump
Approx Age	10	10	10
ASHRAE Service Life	15	15	15
Remaining Life	5	5	5
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

AC/HP Units

Tag	CU-4	CU-5	CU-6
Unit Type	Split System Heat Pump	Split System Heat Pump	Split System Heat Pump
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Nurses Office	Pre-School Classroom	Classrooms
Manufacturer	Payne	Payne	Payne
Model #	PH10JA018-E	PH10JA060	PH10JA0180-E
Serial #	2204E35382	2398E04690-A	2204E5381
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	1.5 Tons	5.0 Tons	1.5 Tons
Cooling Efficiency (SEER/EER)	10 SEER/9.0 EER	10 SEER/9.0 EER	10 SEER/9.0 EER
Heating Type	Heat Pump	Heat Pump	Heat Pump
Heating Input (MBH)	-	-	-
Efficiency	2.06 COP @ Low Temp	2.28 COP @ Low Temp	2.06 COP @ Low Temp
Fuel	Heat Pump	Heat Pump	Heat Pump
Approx Age	10	10	10
ASHRAE Service Life	15	15	15
Remaining Life	5	5	5
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

AC/HP Units

Tag	CU-7	CU-8	CU-9
Unit Type	Ductless Split System Heat Pump	Ductless Split System Heat Pump	Split System Heat Pump
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Speech Room	SGI Room	Classrooms
Manufacturer	EMI	EMI	Payne
Model #	SHC120A	SHC18DEO	PH10JA0180-E
Serial #	1-00-B-8150	1-00-B-1601-21	2002E41456
Cooling Type	DX	DX	DX, R-22
Cooling Capacity (Tons)	1.5	2	1.5 Tons
Cooling Efficiency (SEER/EER)	-	-	10 SEER/9.0 EER
Heating Type	-	-	Heat Pump
Heating Input (MBH)	-	-	-
Efficiency	-	-	2.06 COP @ Low Temp
Fuel	-	-	Heat Pump
Approx Age	7	7	10
ASHRAE Service Life	15	15	15
Remaining Life	8	8	5
Comments	Unit is in good condition	Ujnit is in good condition	

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

AC/HP Units

Tag	CU-10	CU-11	CU-12
Unit Type	Split System Heat Pump	Split System Heat Pump	Split System A/C Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Classrooms	Classrooms	Multipurpose Room
Manufacturer	Payne	Payne	Carrier
Model #	PH10JA0180E	PH10JA0180E	38AKS924-621
Serial #	1604E25845	2204E35379	2104F35189
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	1.5 Tons	1.5 Tons	20 Tons
Cooling Efficiency (SEER/EER)	10 SEER/9.0 EER	10 SEER/9.0 EER	10.5 SEER/10.5 EER
Heating Type	Heat Pump	Heat Pump	N/A
Heating Input (MBH)	-	-	-
Efficiency	2.06 COP @ Low Temp	2.06 COP @ Low Temp	N/A
Fuel	Heat Pump	Heat Pump	N/A
Approx Age	10	10	6
ASHRAE Service Life	15	15	15
Remaining Life	5	5	9
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

AC/HP Units

Tag	CU-13	CU-14	
Unit Type	Split System Heat Pump	Split System Heat Pump	
Qty	1	1	
Location	Roof	Roof	
Area Served	Library	Library	
Manufacturer	Carrier	Carrier	
Model #	38ARQ012-601	38ARQ012-601	
Serial #	2504G30040	2504G30039	
Cooling Type	DX, R-22	DX, R-22	
Cooling Capacity (Tons)	10 Tons	10 Tons	
Cooling Efficiency (SEER/EER)	10.1 SEER/10.1 EER	10.1 SEER/10.1 EER	
Heating Type	Heat Pump	Heat Pump	
Heating Input (MBH)	-	-	
Efficiency	-	-	
Fuel	Heat Pump	Heat Pump	
Approx Age	6	6	
ASHRAE Service Life	15	15	
Remaining Life	9	9	
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

Uvs

Tag	UV-1	UV-2	UV-3
Unit Type	Thru-wall Classroom Heat Pump	Thru-wall Classroom Heat Pump	Thru-wall Classroom Heat Pump
Qty	8	5	18
Location	Classrooms 17 thru 20 & 21 thru 24	Classrooms 151 thru 155	Original Building Classrooms
Area Served	Classrooms 17 thru 20 & 21 thru 24	Classrooms 151 thru 155	Perimter Classrooms
Manufacturer	Trane	American Air Filter	American Air Filter
Model #	THPB-040	SAEY 42342209	-
Serial #	-	82-K-T-AG-0283	-
Cooling Type	D/X	D/X	D/X
Cooling Capacity (MBH)	42.9	41.8	42.5
Cooling Efficiency (SEER/EER)	11.6	8.2	8.0 (est)
Heating Type	Heat Pump	Heat Pump	Heat Pump
Heating Input (MBH)	32.6	-	-
Efficiency (COP)	3.08	-	-
Aux. Electric Heat	12.6 kW	8.0 kW	9.0 kW
Approx Age	7	19	28
ASHRAE Service Life	15	15	15
Remaining Life	8	(4)	(13)
Comments	Units are in good condition	Units are in fair condition	U nits are in fair to poor condition

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

RTUs

Tag	RTU-1,2		
Unit Type	Packaged Rooftop Unit		
Qty	2		
Location	Roof		
Area Served	Gymnasium		
Manufacturer	McQuay		
Model #	-		
Serial #	-		
Cooling Type	D/X		
Cooling Capacity (Tons)	13		
Cooling Efficiency (SEER/EER)	8.0 (est)		
Heating Type	Electric		
Heating Input (MBH)	251		
Efficiency	-		
Fuel	Electric		
Approx Age	23		
ASHRAE Service Life	15		
Remaining Life	(8)		
Comments	Units are in poor condition		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Kresson Elementary School

Domestic Water Heaters

Tag	WH-1 & 2		
Unit Type	Electric Storage Water Heater		
Qty	2		
Location	Boiler Room		
Area Served	Domestic Hot Water		
Manufacturer	Bradford White		
Model #	MII 120-27		
Serial #	ZE-01-1825, & ZE-01-1826		
Size (Gallons)	120		
Input Capacity (MBH/KW)	4.5		
Recovery (Gal/Hr)	-		
Efficiency %	-		
Fuel	Electric		
Approx Age	8		
ASHRAE Service Life	12		
Remaining Life	4		
Comments	Water heaters are in good condition		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

APPENDIX E

Investment Grade Lighting Audit

CEG Job #: 9C11026
Project: Voorhees Township BOE LGEA
1 School Lane
Voorhees, NJ 08043
Bldg. Sq. Ft. 61,115

Kresson Elementary School

KWH COST: $0.131

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
221.13	Mechanical Room	800	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.29	232.0	$30.39	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211	Custodian's Office	800	8	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.27	217.6	$28.51	8	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
362.34	APR	1800	17	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.02	10,832.4	$1,419.04	17	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	19	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	18	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	17	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	20	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Small Group	1800	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.26	464.4	$60.84	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22	JC	500	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.12	58.0	$7.60	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22	Girl's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.17	313.2	$41.03	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22	Boy's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.17	313.2	$41.03	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	6	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	5	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	4	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	7	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Speech	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	928.8	$121.67	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	8	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	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

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
232.22	9	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.15	P-5	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.23	417.6	$54.71	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22	Corridor - P-5 - 19	3600	14	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.81	2,923.2	$382.94	14	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	23	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	22	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	21	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	24	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	12	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	13	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	14	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	11	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	10	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	15	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Teacher's Women's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Teacher's Men's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.211	16	1800	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.94	1,684.8	$220.71	9	3	Remove 1 Lamp - No Ballast Change Required	86	0.77	1393.2	$182.51	$22.00	$198.00	0.16	291.6	$38.20	5.18
222.22	Corridor - 23 - 16	3600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.58	2,088.0	$273.53	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	31.0	$4.06	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Boy's Room	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	$58.48	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

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	Girl's Room	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	$58.48	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.211	154	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.25	2,246.4	$294.28	12	3	Remove 1 Lamp - No Ballast Change Required	86	1.03	1857.6	$243.35	$22.00	$264.00	0.22	388.8	$50.93	5.18
242.211	153	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.25	2,246.4	$294.28	12	3	Remove 1 Lamp - No Ballast Change Required	86	1.03	1857.6	$243.35	$22.00	$264.00	0.22	388.8	$50.93	5.18
242.211	155	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.25	2,246.4	$294.28	12	3	Remove 1 Lamp - No Ballast Change Required	86	1.03	1857.6	$243.35	$22.00	$264.00	0.22	388.8	$50.93	5.18
242.211	152	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.25	2,246.4	$294.28	12	3	Remove 1 Lamp - No Ballast Change Required	86	1.03	1857.6	$243.35	$22.00	$264.00	0.22	388.8	$50.93	5.18
242.211	151	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.25	2,246.4	$294.28	12	3	Remove 1 Lamp - No Ballast Change Required	86	1.03	1857.6	$243.35	$22.00	$264.00	0.22	388.8	$50.93	5.18
242.211	Small Group	1800	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.94	1,684.8	$220.71	9	3	Remove 1 Lamp - No Ballast Change Required	86	0.77	1393.2	$182.51	$22.00	$198.00	0.16	291.6	$38.20	5.18
232.22	Storage	500	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.09	43.0	$5.63	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	P-9 Electric	1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.09	154.8	$20.28	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211	Boy's Room	1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.03	61.2	$8.02	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.06	104.4	$13.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211	Girl's Room	1800	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.03	61.2	$8.02	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.22		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.06	104.4	$13.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Corridor - 154 - Girl's Room	3600	11	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.95	3,405.6	$446.13	11	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211		3600	3	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.10	367.2	$48.10	3	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Conference	1000	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	344.0	$45.06	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Music	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	928.8	$121.67	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

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
221.22	Library	1800	42	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	62	2.60	4,687.2	$614.02	42	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Library Office	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	928.8	$121.67	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	AVE Room	1800	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.34	619.2	$81.12	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211	Guidance	1800	6	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.20	367.2	$48.10	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211	Art Room	1800	22	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.75	1,346.4	$176.38	22	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
237.22		1800	2	3	2x2, 3 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	51	0.10	183.6	$24.05	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.13	Art Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.12	58.0	$7.60	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	2	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.03	1,857.6	$243.35	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	3	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	$182.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	1	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.03	1,857.6	$243.35	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211		1800	4	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.14	244.8	$32.07	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Nurse's	1800	10	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.86	1,548.0	$202.79	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Men's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	104.4	$13.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.41	Women's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.06	104.4	$13.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Corridor - Library	3600	14	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.20	4,334.4	$567.81	14	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.22		3600	23	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	2.39	8,611.2	$1,128.07	23	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.22		3600	21	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	1.22	4,384.8	$574.41	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
211.37		3600	10	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.30	1,080.0	$141.48	10	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.22	Main Office	1800	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.52	939.6	$123.09	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

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
227.22	Principal	1800	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.23	417.6	$54.71	4	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	Principal Toilet	800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	27.2	$3.56	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.22	Conference Room	1800	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.35	626.4	$82.06	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.22	Break Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.10	187.2	$24.52	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.15	Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.06	29.0	$3.80	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
362.34	MPR	500	17	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.02	3,009.0	$394.18	17	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen	1800	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	1.30	2,343.6	$307.01	21	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Locker Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	$14.62	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Kitchen Office	1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	$29.24	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Dishwasher Room	1800	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.31	558.0	$73.10	5	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Lounge	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.03	1,857.6	$243.35	12	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.22	lounge Closet #1	500	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.12	58.0	$7.60	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.22	Lounge Closet #1	500	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.12	58.0	$7.60	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.11	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	31.0	$4.06	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	Boy's Room	1800	2	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.07	122.4	$16.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
200	Girl's Room	1800	2	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.07	122.4	$16.03	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
242.22	Gym Corridor	3600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.21	748.8	$98.09	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
227.211		3600	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.03	122.4	$16.03	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		670	249			61	113,614	$14,883	670	21			6.7	12,074	$1,582		$1,716	1.4	2,527	$331	5.18

CEG Job #: 9C11026
Project: Voorhees Township BOE LGEA
Address: 1 School Lane
Voorhees, NJ 08043
Building SF: 61,115

KWH COST: $0.131

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
221.13	Mechanical Room	800	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.29	232	30.392	5		No Change	58	0.29	0%	232	$30.39		$0.00	0.00	0	$0.00	0.00
227.211	Custodian's Office	800	8	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.272	217.6	28.5056	8		No Change	34	0.27	0%	217.6	$28.51		$0.00	0.00	0	$0.00	0.00
362.34	APR	1800	17	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.018	10832.4	1419.0444	17	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	354	4.81	20%	8665.92	$1,135.24	$450.00	$900.00	1.20	2166.48	$283.81	3.17
232.22	19	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	18	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	17	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	20	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	Small Group	1800	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.258	464.4	60.8364	3		Existing Occupancy Sensor - Remote Mnt.	86	0.21	20%	371.52	$48.67		$0.00	0.05	92.88	$12.17	0.00
222.22	JC	500	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.116	58	7.598	2		No Change	58	0.12	0%	58	$7.60		$0.00	0.00	0	$0.00	0.00
222.22	Girl's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.174	313.2	41.0292	3		Existing Occupancy Sensor - Remote Mnt.	58	0.14	20%	250.56	$32.82		$0.00	0.03	62.64	$8.21	0.00
222.22	Boy's Room	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.174	313.2	41.0292	3		Existing Occupancy Sensor - Remote Mnt.	58	0.14	20%	250.56	$32.82		$0.00	0.03	62.64	$8.21	0.00
232.22	6	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	5	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	4	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	7	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	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
232.22	Speech	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.516	928.8	121.6728	6		Existing Occupancy Sensor - Remote Mnt.	86	0.41	20%	743.04	$97.34		$0.00	0.10	185.76	$24.33	0.00
232.22	8	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	9	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
221.15	P-5	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.232	417.6	54.7056	4		No Change	58	0.23	0%	417.6	$54.71		$0.00	0.00	0	$0.00	0.00
222.22	Corridor - P-5 - 19	3600	14	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.812	2923.2	382.9392	14		No Change	58	0.81	0%	2923.2	$382.94		$0.00	0.00	0	$0.00	0.00
232.21	23	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	22	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	21	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	24	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	12	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	13	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	14	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	11	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	10	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.21	15	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
221.11	Teacher's Women's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$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	Teacher's Men's Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$0.00	0.00	0	$0.00	0.00
242.211	16	1800	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.936	1684.8	220.7088	9		Existing Occupancy Sensor - Remote Mnt.	104	0.75	20%	1347.84	$176.57		$0.00	0.19	336.96	$44.14	0.00
222.22	Corridor - 23 - 16	3600	10	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.58	2088	273.528	10		No Change	58	0.58	0%	2088	$273.53		$0.00	0.00	0	$0.00	0.00
221.11	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	31	4.061	1		No Change	62	0.06	0%	31	$4.06		$0.00	0.00	0	$0.00	0.00
221.11	Boy's Room	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	58.4784	4		Existing Occupancy Sensor - Remote Mnt.	62	0.20	20%	357.12	$46.78		$0.00	0.05	89.28	$11.70	0.00
221.11	Girl's Room	1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	58.4784	4		Existing Occupancy Sensor - Remote Mnt.	62	0.20	20%	357.12	$46.78		$0.00	0.05	89.28	$11.70	0.00
242.211	154	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.248	2246.4	294.2784	12		Existing Occupancy Sensor - Remote Mnt.	104	1.00	20%	1797.12	$235.42		$0.00	0.25	449.28	$58.86	0.00
242.211	153	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.248	2246.4	294.2784	12		Existing Occupancy Sensor - Remote Mnt.	104	1.00	20%	1797.12	$235.42		$0.00	0.25	449.28	$58.86	0.00
242.211	155	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.248	2246.4	294.2784	12		Existing Occupancy Sensor - Remote Mnt.	104	1.00	20%	1797.12	$235.42		$0.00	0.25	449.28	$58.86	0.00
242.211	152	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.248	2246.4	294.2784	12		Existing Occupancy Sensor - Remote Mnt.	104	1.00	20%	1797.12	$235.42		$0.00	0.25	449.28	$58.86	0.00
242.211	151	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	1.248	2246.4	294.2784	12		Existing Occupancy Sensor - Remote Mnt.	104	1.00	20%	1797.12	$235.42		$0.00	0.25	449.28	$58.86	0.00
242.211	Small Group	1800	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	104	0.936	1684.8	220.7088	9		Existing Occupancy Sensor - Remote Mnt.	104	0.75	20%	1347.84	$176.57		$0.00	0.19	336.96	$44.14	0.00
232.22	Storage	500	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.086	43	5.633	1		No Change	86	0.09	0%	43	$5.63		$0.00	0.00	0	$0.00	0.00
232.22	P-9 Electric	1800	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.086	154.8	20.2788	1		No Change	86	0.09	0%	154.8	$20.28		$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	0.034	61.2	8.0172	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	34	0.03	20%	48.96	$6.41	$450.00	$450.00	0.01	12.24	$1.60	280.65
221.21	Boy's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$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
222.22		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.058	104.4	13.6764	1		No Change	58	0.06	0%	104.4	$13.68		$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	0.034	61.2	8.0172	1		No Change	34	0.03	0%	61.2	$8.02		$0.00	0.00	0	$0.00	0.00
221.21	Girl's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$0.00	0.00	0	$0.00	0.00
222.22		1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.058	104.4	13.6764	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.05	20%	83.52	$10.94	$450.00	$450.00	0.01	20.88	$2.74	164.52
232.22	Corridor - 154 - Girl's Room	3600	11	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.946	3405.6	446.1336	11		No Change	86	0.95	0%	3405.6	$446.13		$0.00	0.00	0	$0.00	0.00
227.211		3600	3	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.102	367.2	48.1032	3		No Change	34	0.10	0%	367.2	$48.10		$0.00	0.00	0	$0.00	0.00
232.22	Conference	1000	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.344	344	45.064	4		Existing Occupancy Sensor - Remote Mnt.	86	0.28	20%	275.2	$36.05		$0.00	0.07	68.8	$9.01	0.00
232.22	Music	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.516	928.8	121.6728	6		Existing Occupancy Sensor - Remote Mnt.	86	0.41	20%	743.04	$97.34		$0.00	0.10	185.76	$24.33	0.00
221.22	Library	1800	42	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	62	2.604	4687.2	614.0232	42	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	62	2.08	20%	3749.76	$491.22	$450.00	$450.00	0.52	937.44	$122.80	3.66
232.22	Library Office	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.516	928.8	121.6728	6		Existing Occupancy Sensor - Remote Mnt.	86	0.41	20%	743.04	$97.34		$0.00	0.10	185.76	$24.33	0.00
232.22	AVE Room	1800	4	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.344	619.2	81.1152	4		Existing Occupancy Sensor - Remote Mnt.	86	0.28	20%	495.36	$64.89		$0.00	0.07	123.84	$16.22	0.00
227.211	Guidance	1800	6	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.204	367.2	48.1032	6		Existing Occupancy Sensor - Remote Mnt.	34	0.16	20%	293.76	$38.48		$0.00	0.04	73.44	$9.62	0.00
227.211	Art Room	1800	22	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.748	1346.4	176.3784	22		Existing Occupancy Sensor - Remote Mnt.	34	0.60	20%	1077.12	$141.10		$0.00	0.15	269.28	$35.28	0.00
237.22		1800	2	3	2x2, 3 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	51	0.102	183.6	24.0516	2		No Change	51	0.10	0%	183.6	$24.05		$0.00	0.00	0	$0.00	0.00
221.13	Art Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.116	58	7.598	2		No Change	58	0.12	0%	58	$7.60		$0.00	0.00	0	$0.00	0.00
232.22	2	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.032	1857.6	243.3456	12		Existing Occupancy Sensor - Remote Mnt.	86	0.83	20%	1486.08	$194.68		$0.00	0.21	371.52	$48.67	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
232.22	3	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	182.5092	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	$146.01		$0.00	0.15	278.64	$36.50	0.00
232.22	1	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.032	1857.6	243.3456	12		Existing Occupancy Sensor - Remote Mnt.	86	0.83	20%	1486.08	$194.68		$0.00	0.21	371.52	$48.67	0.00
227.211		1800	4	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.136	244.8	32.0688	4		No Change	34	0.14	0%	244.8	$32.07		$0.00	0.00	0	$0.00	0.00
232.22	Nurse's	1800	10	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.86	1548	202.788	10		No Change	86	0.86	0%	1548	$202.79		$0.00	0.00	0	$0.00	0.00
221.41	Men's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	104.4	13.6764	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.05	20%	83.52	$10.94	$450.00	$450.00	0.01	20.88	$2.74	164.52
221.41	Women's Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic	58	0.058	104.4	13.6764	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.05	20%	83.52	$10.94	$450.00	$450.00	0.01	20.88	$2.74	164.52
232.21	Corridor - Library	3600	14	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	1.204	4334.4	567.8064	14		No Change	86	1.20	0%	4334.4	$567.81		$0.00	0.00	0	$0.00	0.00
242.22		3600	23	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	2.392	8611.2	1128.0672	23		No Change	104	2.39	0%	8611.2	$1,128.07		$0.00	0.00	0	$0.00	0.00
227.22		3600	21	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	1.218	4384.8	574.4088	21		No Change	58	1.22	0%	4384.8	$574.41		$0.00	0.00	0	$0.00	0.00
211.37		3600	10	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.3	1080	141.48	10		No Change	30	0.30	0%	1080	$141.48		$0.00	0.00	0	$0.00	0.00
227.22	Main Office	1800	9	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.522	939.6	123.0876	9	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	58	0.42	20%	751.68	$98.47	$450.00	$450.00	0.10	187.92	$24.62	18.28
227.22	Principal	1800	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.232	417.6	54.7056	4		Existing Occupancy Sensor - Remote Mnt.	58	0.19	20%	334.08	$43.76		$0.00	0.05	83.52	$10.94	0.00
200	Principal Toilet	800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	27.2	3.5632	1		No Change	34	0.03	0%	27.2	$3.56		$0.00	0.00	0	$0.00	0.00
227.22	Conference Room	1800	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.348	626.4	82.0584	6		Existing Occupancy Sensor - Remote Mnt.	58	0.28	20%	501.12	$65.65		$0.00	0.07	125.28	$16.41	0.00
242.22	Break Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.104	187.2	24.5232	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	104	0.08	20%	149.76	$19.62	$450.00	$450.00	0.02	37.44	$4.90	91.75
221.15	Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.058	29	3.799	1		No Change	58	0.06	0%	29	$3.80		$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
362.34	MPR	500	17	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.018	3009	394.179	17	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	354	4.81	20%	2407.2	$315.34	$450.00	$900.00	1.20	601.8	$78.84	11.42
221.11	Kitchen	1800	21	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	1.302	2343.6	307.0116	21		No Change	62	1.30	0%	2343.6	$307.01		$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Locker Room	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Toilet	1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.6196	1		No Change	62	0.06	0%	111.6	$14.62		$0.00	0.00	0	$0.00	0.00
221.21	Kitchen Office	1800	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	29.2392	2		No Change	62	0.12	0%	223.2	$29.24		$0.00	0.00	0	$0.00	0.00
221.11	Kitchen Dishwasher Room	1800	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.31	558	73.098	5		No Change	62	0.31	0%	558	$73.10		$0.00	0.00	0	$0.00	0.00
232.22	Lounge	1800	12	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.032	1857.6	243.3456	12		Existing Occupancy Sensor - Remote Mnt.	86	0.83	20%	1486.08	$194.68		$0.00	0.21	371.52	$48.67	0.00
227.22	lounge Closet #1	500	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.116	58	7.598	2		No Change	58	0.12	0%	58	$7.60		$0.00	0.00	0	$0.00	0.00
227.22	Lounge Closet #1	500	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.116	58	7.598	2		No Change	58	0.12	0%	58	$7.60		$0.00	0.00	0	$0.00	0.00
221.11	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	31	4.061	1		No Change	62	0.06	0%	31	$4.06		$0.00	0.00	0	$0.00	0.00
200	Boy's Room	1800	2	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.068	122.4	16.0344	2		Existing Occupancy Sensor - Remote Mnt.	34	0.05	20%	97.92	$12.83		$0.00	0.01	24.48	$3.21	0.00
200	Girl's Room	1800	2	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.068	122.4	16.0344	2		Existing Occupancy Sensor - Remote Mnt.	34	0.05	20%	97.92	$12.83		$0.00	0.01	24.48	$3.21	0.00
242.22	Gym Corridor	3600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.208	748.8	98.0928	2		No Change	104	0.21	0%	748.8	$98.09		$0.00	0.00	0	$0.00	0.00
227.211		3600	1	2	2x2, 2 Lamp, 17w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	34	0.034	122.4	16.0344	1		No Change	34	0.03	0%	122.4	$16.03		$0.00	0.00	0	$0.00	0.00
	Totals		670	249			60.7	113,614.2	$14,883	670	11			51.1		97,974.8	$12,834.70		$4,950	9.59	15,639	$2,049	2.42

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
Kresson Elementary School	19377	SHARP NU-U235F2	956	17.5	16,769	224.66	264,872	181.9	40,056	13.40

.= Proposed PV Layout

Notes:

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:	50.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	40.7 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	13.1 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.58	3267	427.98
2	3.33	3857	505.27
3	4.31	5387	705.70
4	5.20	6136	803.82
5	5.85	7008	918.05
6	6.14	6822	893.68
7	6.06	6891	902.72
8	5.54	6333	829.62
9	4.85	5445	713.30
10	3.76	4446	582.43
11	2.65	3115	408.07
12	2.23	2728	357.37
Year	4.38	61437	8048.25

South Array on Sloped Roof

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	70.7 kW
DC to AC Derate Factor:	0.810
AC Rating:	57.3 kW
Array Type:	Fixed Tilt
Array Tilt:	15.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	13.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m 2/day)	AC Energy (kWh)	Energy Value ($)
1	2.80	5055	662.21
2	3.53	5786	757.97
3	4.46	7834	1026.25
4	5.28	8754	1146.77
5	5.86	9865	1292.32
6	6.10	9544	1250.26
7	6.05	9679	1267.95
8	5.60	8987	1177.30
9	4.99	7879	1032.15
10	3.97	6618	866.96
11	2.86	4785	626.84
12	2.43	4253	557.14
Year	4.50	89040	11664.24

East Arry on Sloped Roof

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	46.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	37.5 kW
Array Type:	Fixed Tilt
Array Tilt:	15.0°
Array Azimuth:	90.0°
Energy Specifications	
Cost of Electricity:	13.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m 2/day)	AC Energy (kWh)	Energy Value ($)
1	2.10	2336	306.02
2	2.85	2966	388.55
3	3.90	4459	584.13
4	4.85	5271	690.50
5	5.59	6141	804.47
6	5.99	6133	803.42
7	5.85	6091	797.92
8	5.25	5513	722.20
9	4.42	4573	599.06
10	3.30	3538	463.48
11	2.23	2343	306.93
12	1.81	1917	251.13
Year	4.02	51281	6717.81

West Array on Sloped Roof

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	57.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	46.4 kW
Array Type:	Fixed Tilt
Array Tilt:	15.0°
Array Azimuth:	270.0°
Energy Specifications	
Cost of Electricity:	13.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ^{2}/day)	AC Energy (kWh)	Energy Value ($)
1	2.06	2817	369.03
2	2.84	3655	478.81
3	3.88	5498	720.24
4	4.89	6574	861.19
5	5.69	7725	1011.98
6	5.99	7567	991.28
7	5.89	7621	998.35
8	5.23	6810	892.11
9	4.41	5612	735.17
10	3.20	4224	553.34
11	2.14	2712	355.27
12	1.76	2299	301.17
Year	4.00	63114	8267.93

Project Name: **Kresson Elementary School**
Location: **Voorhees, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$1,084,741
Annual kWh Production	264,872
Annual Energy Cost Reduction	$34,698
Average Annual SREC Revenue	$102,136

Simple Payback: **7.93** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.131**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/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	264,872	$34,698	$0	$145,680	$63,833	$46,011	$70,534	$70,534
2	$0	263,548	$35,739	$0	$144,951	$60,995	$48,849	$70,846	$141,380
3	$0	262,230	$36,811	$0	$131,115	$57,982	$51,862	$58,082	$199,463
4	$0	260,919	$37,916	$0	$117,413	$54,783	$55,061	$45,485	$244,948
5	$0	259,614	$39,053	$2,674	$116,826	$51,387	$58,457	$43,362	$288,310
6	$0	258,316	$40,225	$2,661	$116,242	$47,782	$62,062	$43,962	$332,272
7	$0	257,025	$41,432	$2,647	$102,810	$43,954	$65,890	$31,750	$364,022
8	$0	255,739	$42,674	$2,634	$102,296	$39,890	$69,954	$32,492	$396,514
9	$0	254,461	$43,955	$2,621	$89,061	$35,575	$74,268	$20,551	$417,065
10	$0	253,188	$45,273	$2,608	$88,616	$30,995	$78,849	$21,437	$438,503
11	$0	251,922	$46,632	$2,595	$75,577	$26,131	$83,712	$9,770	$448,272
12	$0	250,663	$48,030	$2,582	$75,199	$20,968	$88,876	$10,804	$459,076
13	$0	249,410	$49,471	$2,569	$62,352	$15,487	$94,357	($589)	$458,487
14	$0	248,162	$50,956	$2,556	$62,041	$9,667	$100,177	$596	$459,083
15	$0	246,922	$52,484	$2,543	$49,384	$3,488	$106,356	($10,519)	$448,564
	Totals:	3,836,990	$645,349	$28,690	$1,479,563	$562,918	$1,084,741	$448,564	$5,166,492

Net Present Value (NPV) **$371,484**

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 **Kresson ES**													
Electric													
On-Pk Cons. (kWh)	147,427	199,338	126,286	57,006	69,813	54,563	82,211	94,370	77,552	62,502	95,612	137,834	1,204,514
On-Pk Demand (kW)	1,504	1,551	1,350	829	860	807	819	816	780	842	1,322	1,433	1,551

Energy Consumption		
Building	67,267	Btu/(ft2-year)
Source	201,820	Btu/(ft2-year)
Floor Area	61,115	ft2

Environmental Impact Analysis	
CO2	858,573 lbm/year
SO2	2,333 gm/year
NOX	1,203 gm/year

Alternative: 2	Kresson ES												
Electric													
On-Pk Cons. (kWh)	80,017	84,589	76,893	45,137	50,819	34,783	45,490	51,385	51,035	49,920	64,044	77,194	711,306
On-Pk Demand (kW)	523	523	523	523	498	439	470	478	463	523	523	523	523

Energy Consumption		
Building	39,723	Btu/(ft2-year)
Source	119,182	Btu/(ft2-year)
Floor Area	61,115	ft2

Environmental Impact Analysis	
CO2	507,016 lbm/year
SO2	1,378 gm/year
NOX	711 gm/year