

**NORTH BRUNSWICK TOWNSHIP
PUBLIC SCHOOL DISTRICT**

JOHN ADAMS ELEMENTARY SCHOOL

**1450 REDMOND STREET
NORTH BRUNSWICK, NJ 08902**

FACILITY ENERGY REPORT

TABLE OF CONTENTS

I. HISTORIC ENERGY CONSUMPTION/COST..... 2

II. FACILITY DESCRIPTION 7

III. MAJOR EQUIPMENT LIST 9

IV. ENERGY CONSERVATION MEASURES..... 10

V. ADDITIONAL RECOMMENDATIONS 38

Appendix A – ECM Cost & Savings Breakdown

Appendix B – New Jersey Smart Start[®] Program Incentives

Appendix C – Portfolio Manager “Statement of Energy Performance”

Appendix D – Major Equipment List

Appendix E – Investment Grade Lighting Audit

Appendix F – Renewable / Distributed Energy Measures Calculations

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:	Public Service Electric & Gas
Electric Utility Rate Structure:	Large Power & Lighting Service (LPLS)
Third Party Supplier:	Direct Energy

Natural Gas Utility Provider:	Public Service Electric & Gas
Utility Rate Structure:	Large Volume Gas (LVG)
Third Party Supplier:	None

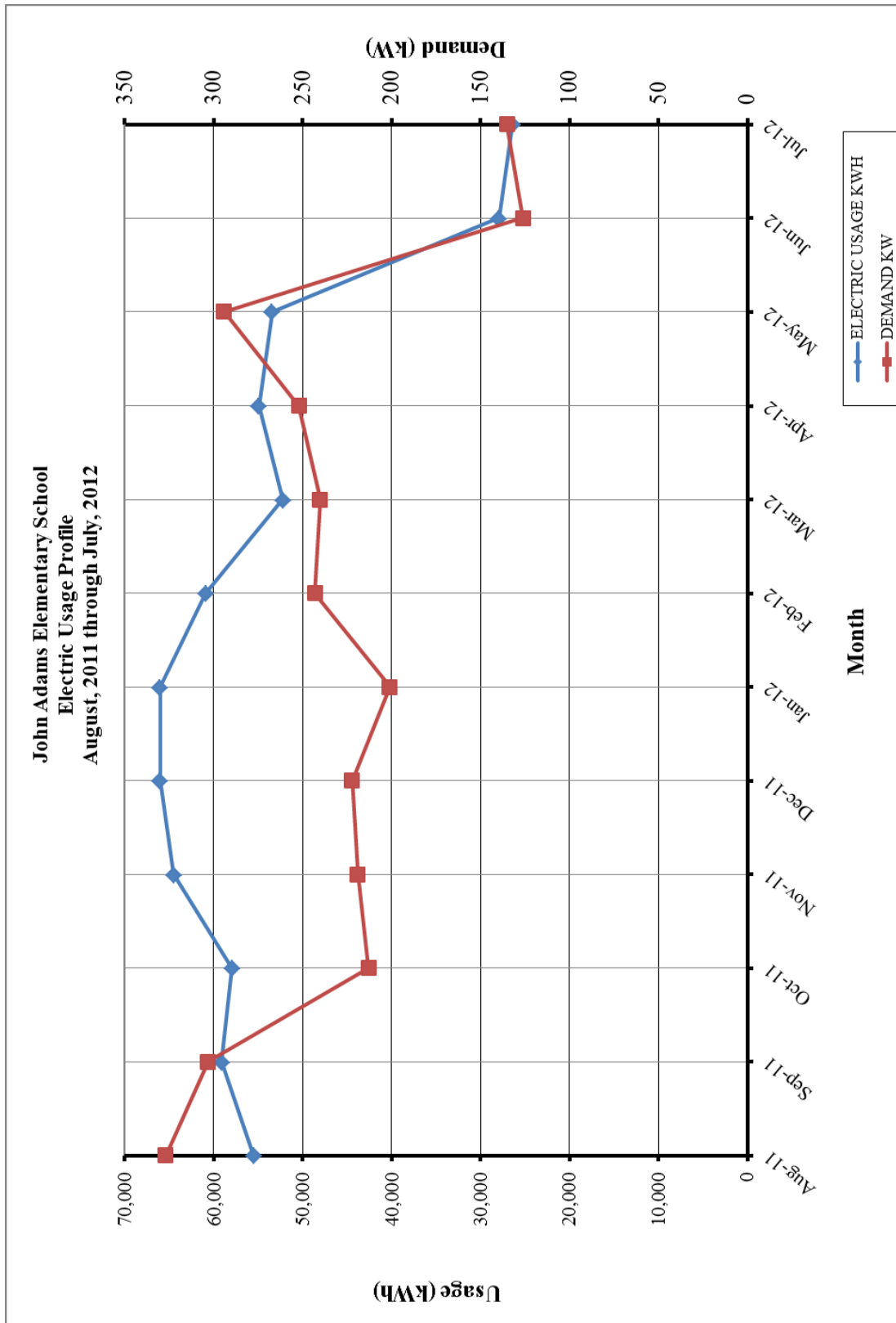
The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts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

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

**Table 1
Electricity Billing Data**

ELECTRIC USAGE SUMMARY			
Utility Provider: PSE&G			
Rate: LPLS			
Meter No: 778019829			
Account # E 42-004-925-04			
Third Party Utility Provider: Direct Energy			
TPS Meter / Acct No: 1151927			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Aug-11	55,500	327.0	\$11,360
Sep-11	59,100	303.0	\$8,827
Oct-11	57,900	213.0	\$8,388
Nov-11	64,500	219.0	\$7,789
Dec-11	66,000	222.0	\$8,810
Jan-12	66,000	201.0	\$8,746
Feb-12	60,900	243.0	\$8,301
Mar-12	52,200	240.0	\$7,281
Apr-12	54,900	252.0	\$7,636
May-12	53,400	294.0	\$10,092
Jun-12	27,900	126.0	\$5,152
Jul-12	26,400	135.0	\$5,081
Totals	644,700	327.0 Max	\$97,462
AVERAGE DEMAND		231.3 KW average	
AVERAGE RATE		\$0.151 \$/kWh	

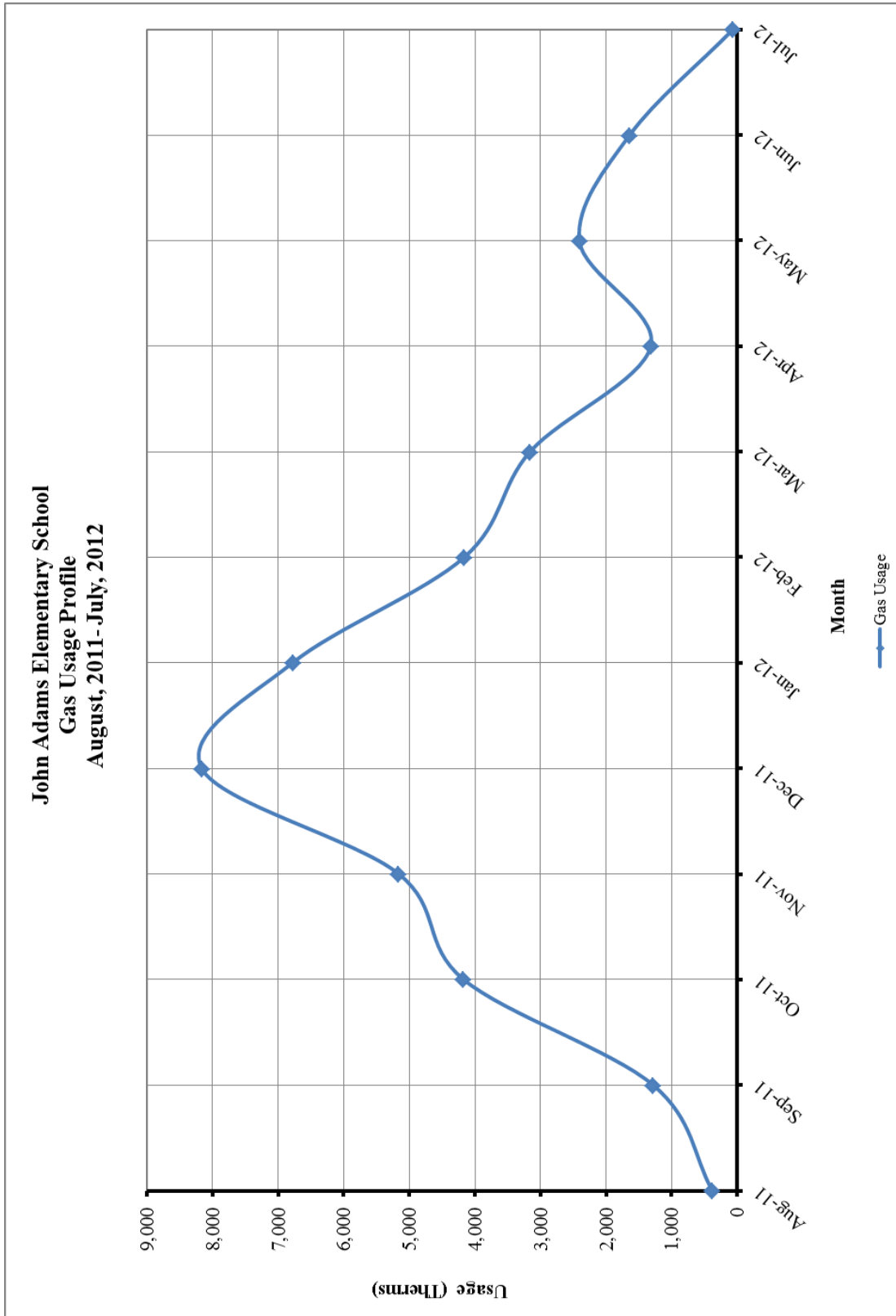
Figure 1
Electricity Usage Profile



**Table 4
Natural Gas Billing Data**

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 3275559		
Point of Delivery ID: G 42-004-925-04		
Third Party Utility Provider: N/A		
TPS Meter No: N/A		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Aug-11	382.00	\$399.06
Sep-11	1,287.00	\$1,066.55
Oct-11	4,177.00	\$4,494.87
Nov-11	5,165.00	\$5,259.04
Dec-11	8,169.00	\$7,491.13
Jan-12	6,778.00	\$5,966.83
Feb-12	4,160.00	\$3,923.45
Mar-12	3,159.00	\$1,959.35
Apr-12	1,320.00	\$875.30
May-12	2,409.00	\$1,177.62
Jun-12	1,639.00	\$1,176.19
Jul-12	63.00	\$143.75
TOTALS	38,708.00	\$33,933.14
AVERAGE RATE:	\$0.88	\$/THERM

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The John Adams Elementary School is located at 1450 Redmond Street in North Brunswick, New Jersey. The 79,257 SF John Adams Elementary School was built in 1960 with the addition of the media center in 1988 and an addition for a new classroom wing in 2008. The building is a single-story structure and consists of office space for administrative use, gymnasium, classrooms, kitchen, media center, cafeteria and mechanical rooms. John Adams Elementary School also contains a set of modular classroom which are located behind the facility.

Occupancy Profile

The typical hours of operation for John Adams Elementary School are Monday through Friday between 8:00 am and 4:30 pm, with custodial services running until 11:00 pm. The elementary school has a 12 month administrative occupancy of 55 people and 10 month occupancy with students of 714.

Building Envelope

Exterior walls for the John Adams Elementary School are brick faced with a concrete block construction. The amount of insulation within the walls is unknown. The windows in the original wing are in below average condition with single pane windows and the remaining windows in the elementary school are in average condition. The roof is a flat, built up rubber roof that appears to be in good condition. The amount of insulation below the roof is unknown.

Heating Plant

Heating is provided to the facility from the Mechanical Room which houses two natural gas fired, fire tube hot water boilers made by Cleaver Brooks. Both boilers have equivalent heating capacity characteristics having output capacities of 2,343 MBH for a combined output of 4,686 MBH. Both boilers appear to be maintained and in average condition. Combustion tests were not available for review but based on age the assumption is the overall fuel-to-thermal efficiency for the boilers is approximately 65%, based on radiation losses and inefficiencies in operation inherent to the older technology. Both boilers are approximately 52 years old which exceed their typical ASHRAE service life of 25 years. At this time, the boilers are recommended for replacement. The heating hot water is circulated throughout the building via two constant speed end-suction pumps located in the Mechanical Room. The pumps are driven with standard efficiency motors that are recommended to be replaced with NEMA premium efficient motors. The hot water heating system provides heating hot water to the classroom units, hot water fin-tube radiators and heating and ventilation units throughout the facility. Heating hot water is also distributed to the Trane and Aeon rooftop units serving the additions.

HVAC Systems

The Media Center wing is conditioned via air handling units with split system condensing units located on the roof. These units are from the 1988 library addition and are recommended for replacement due to their old age and inefficiencies compared to newer units. Additionally, there

is a Trane packaged rooftop unit which serves the larger part of the addition which contains direct expansion coils and hot water coils fed from the main hot water plant.

There are two other new additions which are conditioned by packaged rooftop unit manufactured by AAON. These units are relatively new with R-410A refrigerant and hot water heat.

The Cafeteira is conditioned via an indoor air-handling unit with a remote condensing unit on the roof; both units are that of an older vintage but appear to be functioning. This unit is not recommended for replacement based on energy savings alone at this time.

The classrooms within the facility are conditioned via vertical unit ventilators with hot water and direct expansion coils. The accompanying condensing units on the roof are 3 ton Ducane condensing units. The units appear to have been replacement units and are not recommended for upgrades at this time.

Several offices contain split system wall mounted air conditioning units which serve each area, accompanied by a hot water baseboard system.

The modular classroom buildings are conditioned via Bard air conditioning units with electric heating coils. These units are mounted on the exterior of the building.

Exhaust System

Air is exhausted from the toilet rooms and other areas of the facility through the roof exhaust fans.

HVAC System Controls

The HVAC systems within the John Adams Elementary School are controlled by various electronic controls systems. There are Tracer Summit Controls and Novar Controls. There is a modem installed in the control panel that provides supervisory control and monitoring to the Facilities Director. The Tracer Summit controls are only in place to operate the Trane rooftop unit which serves the Pre-k wing. The remaining sections of the building, including the 5th grade wing and library, are controlled by the Novar Controls.

Domestic Hot Water

The main source of domestic hot water for John Adams Elementary School is an AO Smith 300 MBH gas fired water heater with a large separate storage tank which maintains a constant hot water temperature.

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 Upgrade	\$8,505	\$1,187	7.2	109.4%
ECM #2	Lighting & Lighting Controls Upgrade (Gymnasium)	\$5,565	\$973	5.7	162.3%
ECM #3	Lighting Controls Upgrade	\$16,390	\$3,209	5.1	193.7%
ECM #4	NEMA Premium Motor Replacements	\$4,394	\$253	17.4	3.6%
ECM #5	AC Unit Upgrades	\$47,229	\$2,475	19.1	-21.4%
ECM #6	Boiler Upgrade	\$189,579	\$8,578	22.1	13.1%
ECM #7	Domestic Hot Water Heater Upgrade	\$11,874	\$1,135	10.5	14.7%
ECM #8	Computer Standby or Hibernate	\$1,717	\$2,401	0.7	1997.6%
ECM #9	Kitchen Domestic Booster Heater Replacement	\$8,050	\$733	11.0	36.6%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	270.49 KW PV System	\$1,735,415	\$108,275	16.0	-6.4%
Notes:	A. Cost takes into consideration applicable NJ Smart Start TM 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 Upgrade	2.5	7,863	0
ECM #2	Lighting & Lighting Controls Upgrade (Gymnasium)	1.5	6,443	0
ECM #3	Lighting Controls Upgrade	0	21,255	0
ECM #4	NEMA Premium Motor Replacements	0.6	1,679	0
ECM #5	AC Unit Upgrades	8.2	16,393	0
ECM #6	Boiler Upgrade	0.0	0	9,747
ECM #7	Domestic Hot Water Heater Upgrade	0.0	0	1,290
ECM #8	Computer Standby or Hibernate	0.0	15,898	0
ECM #9	Kitchen Domestic Booster Heater Replacement	0.0	6,458	(276)
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	270.49 KW PV System	270.5	316,514	0

**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 Upgrade	\$1,187	\$8,505	\$0	\$8,505	7.2
Lighting & Lighting Controls Upgrade	\$973	\$5,600	\$35	\$5,565	5.7
Lighting Controls Upgrade	\$3,209	\$17,050	\$660	\$16,390	5.1
NEMA Premium Motor Replacements	\$253	\$4,614	\$220	\$4,394	17.4
AC Unit Upgrades	\$2,475	\$48,655	\$1,426	\$47,229	19.1
Boiler Upgrade	\$8,578	\$195,579	\$6,000	\$189,579	22.1
Domestic Hot Water Heater Upgrade	\$1,135	\$12,174	\$300	\$11,874	10.5
Computer Standby or Hibernate	\$2,401	\$1,717	\$0	\$1,717	0.7
Kitchen Domestic Booster Heater Replacement	\$733	\$8,050	\$0	\$8,050	11.0
<i>Design / Construction Extras (15%)</i>	<i>\$0</i>	<i>\$37,301</i>	<i>\$0</i>	<i>\$37,301</i>	
Total Project	\$18,217	\$285,977	\$6,995	\$278,982	15

Note: ECM's with the strike-through font are not included in the ESIP.

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 – General

Description:

The majority of the interior lighting throughout John Adams Elementary School is provided with fluorescent fixtures with older generation, 700 series and 741/ECO 32W T8 lamps and electronic ballasts. Although these T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. Concord Engineering recommends that these fixtures remain unmodified due to the extensive costs which will be incurred if these fixtures are to be re-lamped and re-ballasted, which results in a long payback period unless said fixtures reside in an area which is over-lit, in which case the fixtures will be de-lamped and given a new reflector. In addition, there are a number of older and outdated fixtures with T12 lamps and magnetic ballasts. It is recommended to replace all of the T12 fixtures in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts.

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

Additionally, there is a canopy area which contains a high pressure sodium fixture which is to be replaced with a 28 watt LED.

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.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$8,505
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$8,505
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,187
Total Yearly Savings (\$/Yr):	\$1,187
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.2
Simple Lifetime ROI	109.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$17,810
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	\$5,669.43

ECM #2: Lighting & Controls Upgrade – Gymnasium

Description:

The gymnasium at John Adams Elementary School is currently lit via fourteen 400W Metal Halide Hi-Bay fixtures. The space would be better served with a more efficient, fluorescent lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient T5 High Output lighting system.

This measure replaces all the HID, 400 W HID MH fixtures with a well-designed T5HO lighting system. Fourteen, 54 watt, 6-Lamp T5HO fixtures will be required in order to meet the mandated 50 foot-candle average within the spaces.

In addition to the lighting upgrade, the gymnasium would also benefit from lighting controls which can be combined with the lighting ECM to further increase the savings which can be attained. 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 (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 mount sensors for the gymnasium. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of general lighting and lighting controls implemented in this ECM and outlines the proposed fixtures, 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:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

From the **Smart Start Incentive Appendix**, the installation of a lighting control device warrants the following incentive:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$5,600
NJ Smart Start Equipment Incentive (\$):	\$35
Net Installation Cost (\$):	\$5,565
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$973
Total Yearly Savings (\$/Yr):	\$973
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.7
Simple Lifetime ROI	162.3%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$14,595
Internal Rate of Return (IRR)	15%
Net Present Value (NPV)	\$6,050.61

ECM #3: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the John Adams Elementary School 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 (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 Media Centers. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

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

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

Rebates and Incentives:

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

Smart Start Incentive

$$= (\# \text{ Wall mount sensors} \times \$20 \text{ per sensor})$$

$$+ (\# \text{ Ceiling mount sensors} \times \$35 \text{ per sensor})$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$17,050
NJ Smart Start Equipment Incentive (\$):	\$660
Net Installation Cost (\$):	\$16,390
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$3,209
Total Yearly Savings (\$/Yr):	\$3,209
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.1
Simple Lifetime ROI	193.7%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$48,142
Internal Rate of Return (IRR)	18%
Net Present Value (NPV)	\$21,924.79

ECM #4: Install NEMA Premium® Efficiency Motors

Description:

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

The electric motors driving the hot and cold water pumps are candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

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

IMPLEMENTATION SUMMARY					
EQMT ID	FUNCTION	MOTOR HP	HOURS OF OPERATION	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY
P1A	Hot Water Zone Pump	5	2,745	86.5%	90.2%
P2A	Hot Water Zone Pump	5	2,745	86.5%	90.2%
P7	Hot Water Zone Pump	1.5	2,745	78.5%	88.5%
P8	Hot Water Zone Pump	1.5	2,745	78.5%	88.5%

Energy Savings Calculations:

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

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor

Motor Efficiency = Motor Nameplate Efficiency

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

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

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

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

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWh	COST SAVINGS
P1A	5	90%	86.5%	90.2%	0.16	439	\$66
P2A	5	90%	86.5%	90.2%	0.16	439	\$66
P7	1.5	90%	78.5%	88.5%	0.14	400	\$60
P8	1.5	90%	78.5%	88.5%	0.14	400	\$60
TOTAL					0.6	1,679	\$253

Equipment Cost and Incentives

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

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
1	\$50
1.5	\$50
2	\$60
3	\$60
5	\$60
7.5	\$90
10	\$100

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

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
P1A	5	\$1,519	\$60	\$1,459	\$66	22.0
P2A	5	\$1,519	\$60	\$1,459	\$66	22.0
P7	1.5	\$788	\$50	\$738	\$60	12.2
P8	1.5	\$788	\$50	\$738	\$60	12.2
TOTAL	Totals:	\$4,614	\$220	\$4,394	\$253	17.3

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$4,614
NJ Smart Start Equipment Incentive (\$):	\$220
Net Installation Cost (\$):	\$4,394
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$253
Total Yearly Savings (\$/Yr):	\$253
Estimated ECM Lifetime (Yr):	18
Simple Payback	17.4
Simple Lifetime ROI	3.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$4,554
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	(\$914.36)

ECM #5: Replace AC Units with High Efficiency Units

Description:

The John Adams Elementary School utilizes split system cooling only units as well as a packaged rooftop unit with gas heat to condition several spaces within the school. The units suggested to be replaced have capacities ranging from 2.5 tons to 3 tons. Please refer to the **Major Equipment List Appendix** for further information about these units.

These units are in average condition though the current units in operation are not high efficiency units. These units are approximately nineteen years old and have surpassed their ASHRAE service life of fifteen years.

These units can be replaced with new higher efficiency units. New split system units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and higher efficiency refrigerants such as R410A which would be used in place of R22 that is currently used in the units.

This ECM includes one-for-one replacement of the older packaged and split system units with new higher efficiency systems which include new evaporator coils and refrigerant lines as well as indoor units. 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	Dyanzone-Library	1	18,000	1.5	Carrier 24ACB
SS	Trane-Library	2	30,000	2.5	Carrier 24ACB
SS	Trane-Library	2	36,000	3.0	Carrier 24ACB
RTU	Trane-Front Office	1	36,000	3.0	Carrier 48XL-A
Total		6	186,000.0	15.5	

The manufacturers used as the basis for the calculation is Carrier. The unit pricing and install cost were estimated based on current rates quotes and labor rates. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

Energy Savings Calculations:

Cooling Energy Savings:

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

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

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

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

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	EXISTING UNITS SEER	SPLIT UNITS SEER	# OF UNITS	ENERGY SAVINGS kWh	DEMAND SAVINGS kW
SS	18,000	2,000	9 SEER	15.5 SEER	1	1,677	0.8
SS	30,000	2,001	9 SEER	15.5 SEER	2	5,594	2.8
SS	36,000	2,002	9 SEER	15.5 SEER	2	6,716	3.4
RTU	36,000	2,004	10 SEER	15 SEER	1	2,405	1.2
Total					6	16,393	8.2

Project Cost, Incentives and Maintenance Savings

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	\$4,667	1	\$4,667	\$138	\$4,529	\$253	17.9
SS	\$16,675	2	\$16,675	\$460	\$16,215	\$845	19.2
SS	\$16,675	2	\$16,675	\$552	\$16,123	\$1,014	15.9
RTU	\$10,638	1	\$10,638	\$276	\$10,362	\$363	28.5
Total	\$48,655	6	\$48,655	\$1,426	\$47,229	\$2,475	19.1

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$48,655
NJ Smart Start Equipment Incentive (\$):	\$1,426
Net Installation Cost (\$):	\$47,229
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,475
Total Yearly Savings (\$/Yr):	\$2,475
Estimated ECM Lifetime (Yr):	15
Simple Payback	19.1
Simple Lifetime ROI	-21.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$37,125
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	(\$17,682.19)

ECM #6: Condensing Boiler Installation

Description:

There are two existing Cleaver Brooks CB801-70 boilers which are used as the primary source of heat for John Adams Elementary School. These boilers serve the hot water loop throughout the building. The Cleaver Brooks boilers are approximately 52 years old and have surpassed their life expectancy of a typical fire tube boiler and should be considered for replacement. With the increased efficiency of the condensing boilers, the savings can be substantial.

New condensing boilers could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature. Due to the operating conditions of the building, the annual average operating efficiency of the proposed condensing boiler is expected to be 92%. The existing boiler's efficiency is approximately 65%, which makes the condensing boilers an 27% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of two condensing gas fired boilers to replace the existing Cleaver Brooks Fire Tube Boilers. The basis for this ECM is Aerco condensing boiler; model number BMK – 3.0. The boiler installation is based on a one for one replacement based on capacity of the existing boiler.

Energy Savings Calculations:

Baseline Hot Water Gas Use: 5,495 Therms

Existing Heating Natural Gas

For Old Boiler Section: 38,708 Therms – 5,495 Domestic HW = 33,213 Therms

*Note: Boiler usage estimated by size of boilers and area in which boilers serve.

$$\text{Bldg Heat Required} = \text{Existing Nat Gas (Therms)} \times \text{Heating Eff.}(\%) \times \text{Fuel Heat Value} \left(\frac{\text{BTU}}{\text{Therm}} \right)$$

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

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

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Cast Iron Boilers	New Condensing Boilers	
Existing Nat Gas (Therms)	33,213	0	
Boiler Efficiency (%)	65%	92%	27%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	2,159	2,159	
Gas Cost (\$/Therm)	0.88	0.88	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	33,213	23,466	9,747
Energy Cost (\$)	\$29,227	\$20,650	\$8,578
COMMENTS:			

Note: Concord Engineering is utilizing a seasonal average efficiency of 92% to account for efficiencies based on an outside air reset schedule.

From the **NJ Smart Start Appendix**, the installation of new condensing boilers warrants the following incentive: \$1.00 per MBH.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$195,579
NJ Smart Start Equipment Incentive (\$):	\$6,000
Net Installation Cost (\$):	\$189,579
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$8,578
Total Yearly Savings (\$/Yr):	\$8,578
Estimated ECM Lifetime (Yr):	25
Simple Payback	22.1
Simple Lifetime ROI	13.1%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$214,450
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	(\$40,209.24)

ECM #7: High Efficiency Gas Hot Water Heater

Description:

The John Adams Elementary School has one A.O. Smith gas-fired hot water heater that serves the entirety of the original building. The gas fired heater has surpassed its life expectancy of a typical hot water heater. Currently the school has a 722 gallon storage tank attached to the AO Smith water heater which, after calculating the domestic load for the building, seems oversized. The new domestic hot water load is estimated to only require approximately 120 gallons per hour which will allow the district to discontinue use of the existing storage tank setup.

This ECM will replace the original gas fired domestic water heaters with Natural Gas fired 99.1% thermal efficient Bradford White eF Series. The unit will be replaced with a 150 MBH and 100 gallon heater. (Before proceeding with installation of aforementioned system, Concord Engineering suggests consulting a plumber to evaluate the system fully.)

Energy Savings Calculations:

DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Gas Hot Water Heater	High Efficiency Heater	
Building Type	Education		
Building Square-foot	79,257	79,257	
Domestic Water Usage, kBtu	412,136.40	412,136.40	
DHW Heating Fuel Type	Gas	Gas	
Heating Efficiency	75%	98%	23%
Total Usage (kBtu)	549,515	420,547	128,968
Nat Gas Cost (\$/Therm)	\$ 0.880	\$ 0.880	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	5,495	4,205	1,290
Energy Cost (\$)	\$4,836	\$3,701	\$1,135
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Density for “Education” type building = 5.2 kBtu / SF / year

$$DHW \text{ Heat Usage} = \text{Energy Density} \left(\frac{kBtu \text{ yr}}{SF} \right) \times \text{Building Square Footage (SF)}$$

$$DHW \text{ Total Usage} = \frac{\text{Dom HW Heat Cons. (Btu)}}{\text{Heating Eff. (\%)} \times \text{Fuel Heat Value} \left(\frac{BTU}{\text{Fuel Unit}} \right)}$$

$$\text{Energy Cost} = \text{Heating Fuel Usage (Fuel Units)} \times \text{Ave Fuel Cost} \left(\frac{\$}{\text{Fuel Unit}} \right)$$

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$12,174
NJ Smart Start Equipment Incentive (\$):	\$300
Net Installation Cost (\$):	\$11,874
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,135
Total Yearly Savings (\$/Yr):	\$1,135
Estimated ECM Lifetime (Yr):	12
Simple Payback	10.5
Simple Lifetime ROI	14.7%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$13,620
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	(\$576.21)

ECM #8: Set Computers to Automatic Stand-by or Hibernate Modes

Description:

During the survey, it was noticed that the majority of the computers were left at ON position with the monitors at Screen Saver or OFF positions.

Many personal computers (PC) came equipped with automatic Sleep Mode or Hibernate (power down) mode features. Normally computers boot up from Sleep Mode or Hibernate mode much faster than powering up from Shut Down position.

Based on an independent study by the U.S. Department of Energy, Energy star® rated computers use approximately 70% less power during Sleep Mode. It is recommended to set up the PCs at this facility to switch into Sleep Mode after a short period of inactivity and Hibernate mode after a long period of inactivity.

This ECM includes configuring the computers in the classrooms and the offices such that they automatically switch into:

- Sleep Mode after 15 minutes of inactivity
- Hibernate after 60 minutes of inactivity

The inactivity times above can be adjusted based on experience or preference. Even though this ECM can be implemented easily in house, the calculations assume an independent computer technician performing the task at a typical market rate.

Energy Savings Calculations:

No. of Computers:	231
Operating Weeks per Yr:	42
Estimated percentage of computers left ON over night:	75%

$$\text{Electric Usage} = \frac{\# \text{ of Computers} \times \text{Computer Power (W)} \times \text{Operation (Hrs)}}{1000 \left(\frac{\text{W}}{\text{KW}} \right)}$$

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

The cost of configuring the computers to automatically sleep or hibernate is based on 10 minutes per computer per technician at an hourly rate indicated below.

Implementation Costs: = # Computers X Configuration Time X Cost per Hour
 = 103 Computers X 10 Minutes/Computer X \$100 per Hour

 = \$1,717

AUTOMATIC SLEEP OR HIBERNATE MODES FOR COMPUTERS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Manual Operation	Auto Power Save	-
# of Computers	103	103	-
% Computers left ON	75%	75%	-
Power when left ON (Watt)	50	50	-
Power at Stand-by (Watt)	5	5	-
Power at Hibernate (Watt)	4	4	-
Power when OFF (Watt)	0	0	-
Operating Weeks per Yr	42	42	-
Operating Hours per Week	168	168	-
Hours/Wk Computers ON	120	20	-
Hours/Wk at Sleep Mode	0	20	-
Hours/Wk at Hibernate Mode	0	80	-
Hours/Wk at Power Down	48	48	-
Elec Cost (\$/kWh)	0.151	0.151	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Electric Usage (kWh)	19,467	3,569	15,898
Energy Cost (\$)	\$2,940	\$539	\$2,401
COMMENTS:	Calculation assumes computers currently run throughout work week and get shut down over the weekend.		

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,717
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$1,717
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,401
Total Yearly Savings (\$/Yr):	\$2,401
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.7
Simple Lifetime ROI	1997.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$36,015
Internal Rate of Return (IRR)	140%
Net Present Value (NPV)	\$26,945.98

ECM #9: Kitchen Domestic Gas Booster Heater

Description:

Tankless style hot water heaters provide improved efficiencies compared to standard hot water heaters. In addition, heating with natural gas is far less expensive than domestic hot water heated with electric heat.

The existing commercial dishwasher at John Adams Elementary School utilizes a 36 kW electric booster heater to provide approximately 180°F hot water for sterilization.

This ECM includes replacement of the existing domestic water booster heater for the commercial kitchen dishwasher. The existing electric booster will be replaced with a Hatco natural gas fired booster model PMG-100 rated at 80% efficient. This ECM is based on installation of the hot water heater within the boiler room and piping hot water to the commercial kitchen dishwasher.

Energy Savings Calculations:

Booster HW Heat (BTU)

$$= \text{Washer} \left(\frac{\text{Gal}}{\text{Min}} \right) \times 8.33 \left(\frac{\text{Lbs}}{\text{Gal}} \right) \times \text{Use} \left(\frac{\text{Min}}{\text{Wk}} \right) \times \left(\frac{\text{Wk}}{\text{Yr}} \right) \times \text{Temp Rise } (^\circ\text{F}) \\ \times 1.0 \left(\frac{\text{BTU}}{\text{Lb} \times ^\circ\text{F}} \right)$$

$$\text{Elec Booster Energy} = \frac{\text{Booster HW Heat (BTU)}}{\text{Elec Heat Value} \left(\frac{\text{BTU}}{\text{kWh}} \right)}$$

$$\text{Gas Booster Energy} = \frac{\text{Booster HW Heat (BTU)}}{\text{HWH Eff. (\%)} \times \text{Gas Heat Value} \left(\frac{\text{BTU}}{\text{Therm}} \right)}$$

$$\text{Elec Energy Cost} = \text{Energy Use, kWh} \times \text{Cost of Elec} \left(\frac{\$}{\text{kWh}} \right)$$

$$\text{Nat Gas Energy Cost} = \text{Energy Use, Therms} \times \text{Cost of Nat Gas} \left(\frac{\$}{\text{Therm}} \right)$$

INSTANT DOM. HWH BOOSTER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Elec Booster Heater	Nat Gas HWH	
Estimated Dish Washer Use (GPM)	3.5	3.5	
Dish Washer Use (Min/Week) *1 Hr Per Day	300	300	
Dish Washer Use (Week/Yr)	42	42	
Booster Temp Rise (°F)	60	60	
Dom. HWH Efficiency (%)	100%	80%	-20%
Booster HW Heat Required (kBTUs)	22,041	22,041	
Elec Cost (\$/kWh)	0.151	0.151	
Gas Cost (\$/Therm)	0.88	0.88	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Proposed Booster Dom. HW Natural Gas Usage (Therms)	0	276	-276
Elec Booster Energy (kWh)	6,458	0	6,458
Elec Energy Cost (\$)	\$975	\$0	\$975
Gas Energy Cost (\$)	\$0	\$242	-\$242
Total Energy Cost (\$)	\$975	\$242	\$733
COMMENTS:	This ECM is based on savings due to the fuel switching from electric to natural gas and includes affects from efficiency change.		

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

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$8,050
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$8,050
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$733
Total Yearly Savings (\$/Yr):	\$733
Estimated ECM Lifetime (Yr):	15
Simple Payback	11.0
Simple Lifetime ROI	36.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$10,995
Internal Rate of Return (IRR)	4%
Net Present Value (NPV)	\$700.51

REM #1: 270.49 kW Solar System

Description:

The John Adams Elementary School has available roof and parking lot space that could accommodate a significant amount of solar generation. Based on the available areas a 270.49 kilowatt solar array could be installed, assuming the existing roof structure is capable of supporting an array. The array will produce approximately 316,514 kilowatt-hours annually that will reduce the overall electric usage of the facility by 49.09%.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas. Financial results in table below are based on 100% financing of the system over a fifteen year period.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
System Size (KW_{DC}):	270.49
Electric Generation (KWH/Yr):	316,514
Installation Cost (\$):	\$1,735,415
SREC Revenue (\$/Yr):	\$60,481
Energy Savings (\$/Yr):	\$47,794
Total Yearly Savings (\$/Yr):	\$108,275
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	16.0
Analysis Period Electric Savings (\$):	\$888,909
Analysis Period SREC Revenue (\$):	\$876,139
Net Present Value (NPV)	(\$664,743.80)

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

North Brunswick Twp. School District - John Adams Elementary School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN	NET PRESENT VALUE
		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 #1	Lighting Upgrade	\$2,635	\$5,870	\$0	\$8,505	\$1,187	\$0	\$1,187	15	\$17,810	\$0	109.4%	7.2	11.07%	\$5,669.43
ECM #2	Lighting & Lighting Controls Upgrade (Gymnasium)	\$3,400	\$2,200	\$35	\$5,565	\$973	\$0	\$973	15	\$14,595	\$0	162.3%	5.7	15.46%	\$6,050.61
ECM #3	Lighting Controls Upgrade	\$14,850	\$2,200	\$660	\$16,390	\$3,209	\$0	\$3,209	15	\$48,142	\$0	193.7%	5.1	17.93%	\$21,924.79
ECM #4	NEMA Premium Motor Replacements	\$3,132	\$1,482	\$220	\$4,394	\$253	\$0	\$253	18	\$4,554	\$0	3.6%	17.4	0.38%	(\$914.36)
ECM #5	AC Unit Upgrades	\$25,511	\$23,144	\$1,426	\$47,229	\$2,475	\$0	\$2,475	15	\$37,125	\$0	-21.4%	19.1	-2.87%	(\$17,682.19)
ECM #6	Boiler Upgrade	\$112,010	\$83,569	\$6,000	\$189,579	\$8,578	\$0	\$8,578	25	\$214,450	\$0	13.1%	22.1	0.97%	(\$40,209.24)
ECM #7	Domestic Hot Water Heater Upgrade	\$8,174	\$4,000	\$300	\$11,874	\$1,135	\$0	\$1,135	12	\$13,620	\$0	14.7%	10.5	2.18%	(\$576.21)
ECM #8	Computer Standby or Hibernate	\$0	\$1,717	\$0	\$1,717	\$2,401	\$0	\$2,401	15	\$36,015	\$0	1997.6%	0.7	139.84%	\$26,945.98
ECM #9	Kitchen Domestic Booster Heater Replacement	\$3,500	\$4,550	\$0	\$8,050	\$733	\$0	\$733	15	\$10,995	\$0	36.6%	11.0	4.18%	\$700.51
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	270.49 KW PV System	\$1,735,415	\$0	\$0	\$1,735,415	\$47,794	\$60,481	\$108,275	15	\$1,624,118	\$907,214	-6.4%	16.0	-0.82%	(\$442,840.39)

- 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

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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 15, 2011:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

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 - \$92 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 90.1-2007

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%

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per VFD rated hp
Compressors	\$5,250 to \$12,500 per drive
Cooling Towers \geq 10 hp	\$60 per VFD rated hp

Natural Gas Water Heating

Gas Water Heaters \leq 50 gallons, 0.67 energy factor or better	\$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 (1-4 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 Including Parking Lot	\$25 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$200 per fixture
HID \geq 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	\$50 per fixture
HID \geq 100w Replacement with new HID \geq 100w	\$70 per fixture

Prescriptive Lighting - LED

LED New Exit Sign Fixture Existing Facility < 75 kw Existing Facility > 75 kw	\$20 per fixture \$10 per fixture
LED Display Case Lighting	\$30 per display case
LED Shelf-Mtd. Display & Task Lights	\$15 per linear foot
LED Portable Desk Lamp	\$20 per fixture
LED Wall-wash Lights	\$30 per fixture
LED Recessed Down Lights	\$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	\$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	\$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	\$100 per fixture
LED Parking Garage Luminaries	\$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	\$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	\$150 per fixture
LED High-Bay-Aisle Lighting	\$150 per fixture
LED Bollard Fixtures	\$50 per fixture
LED Linear Panels (2x2 Troffers only)	\$100 per fixture
LED Fuel Pump Canopy	\$100 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 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	\$0.16 KWh and \$1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C



STATEMENT OF ENERGY PERFORMANCE

North Brunswick BOE - John Adams Elementary School

Building ID: 3315896
For 12-month Period Ending: July 31, 2012¹
Date SEP becomes ineligible: N/A

Date SEP Generated: November 07, 2012

Facility

North Brunswick BOE - John Adams
 Elementary School
 1450 Redmond Street
 North Brunswick, NJ 08902

Facility Owner

North Brunswick Township Board of
 Education
 300 Old Georges Road
 North Brunswick, NJ 08902

Primary Contact for this Facility

Susan Irons
 300 Old Georges Road
 North Brunswick, NJ 08902

Year Built: 1960

Gross Floor Area (ft²): 79,257

Energy Performance Rating² (1-100) 38

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	2,266,174
Natural Gas (kBtu) ⁴	4,102,355
Total Energy (kBtu)	6,368,529

Energy Intensity⁴

Site (kBtu/ft ² /yr)	80
Source (kBtu/ft ² /yr)	150

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	539
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Electric Distribution Utility

Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	72
National Median Source EUI	135
% Difference from National Median Source EUI	11%
Building Type	K-12 School

Meets Industry Standards⁵ for Indoor Environmental Conditions:

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

Notes:

- 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.
- 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.
- Values represent energy consumption, annualized to a 12-month period.
- Values represent energy intensity, annualized to a 12-month period.
- 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.

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

Certifying Professional

Michael Fischette
 520 South Burnt Mill Road
 Voorhees, NJ 08043

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	<input checked="" type="checkbox"/>
Building Name	North Brunswick BOE - John Adams Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	K-12 School	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	1450 Redmond Street, North Brunswick, NJ 08902	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		<input type="checkbox"/>
John Adams Elementary School (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	79,257 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.		<input type="checkbox"/>
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.		<input type="checkbox"/>
Number of PCs	103	Is this the number of personal computers in the K12 School?		<input type="checkbox"/>
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		<input type="checkbox"/>
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".		<input type="checkbox"/>
Percent Cooled	90 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		<input type="checkbox"/>
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		<input type="checkbox"/>
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		<input type="checkbox"/>

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'.		<input type="checkbox"/>
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ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Public Service Electric & Gas Co

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))
06/23/2012	07/22/2012	27,900.00
05/23/2012	06/22/2012	53,400.00
04/23/2012	05/22/2012	54,900.00
03/23/2012	04/22/2012	52,200.00
02/23/2012	03/22/2012	60,900.00
01/23/2012	02/22/2012	66,000.00
12/23/2011	01/22/2012	66,000.00
11/23/2011	12/22/2011	64,500.00
10/23/2011	11/22/2011	57,900.00
09/23/2011	10/22/2011	59,100.00
08/23/2011	09/22/2011	55,500.00
Electric Consumption (kWh (thousand Watt-hours))		618,300.00
Electric Consumption (kBtu (thousand Btu))		2,109,639.60
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		2,109,639.60
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>
Fuel Type: Natural Gas		
Meter: gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
06/23/2012	07/22/2012	1,639.00
05/23/2012	06/22/2012	2,409.00
04/23/2012	05/22/2012	1,320.00
03/23/2012	04/22/2012	3,159.00
02/23/2012	03/22/2012	4,160.00
01/23/2012	02/22/2012	6,778.00
12/23/2011	01/22/2012	8,169.00
11/23/2011	12/22/2011	5,165.00
10/23/2011	11/22/2011	4,177.00
09/23/2011	10/22/2011	1,287.00
08/23/2011	09/22/2011	382.00

gas Consumption (therms)	38,645.00
gas Consumption (kBtu (thousand Btu))	3,864,500.00
Total Natural Gas Consumption (kBtu (thousand Btu))	3,864,500.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	<input type="checkbox"/>

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.	<input type="checkbox"/>

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.	<input type="checkbox"/>

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

North Brunswick BOE - John Adams Elementary School
1450 Redmond Street
North Brunswick, NJ 08902

Facility Owner

North Brunswick Township Board of Education
300 Old Georges Road
North Brunswick, NJ 08902

Primary Contact for this Facility

Susan Irons
300 Old Georges Road
North Brunswick, NJ 08902

General Information

North Brunswick BOE - John Adams Elementary School	
Gross Floor Area Excluding Parking: (ft ²)	79,257
Year Built	1960
For 12-month Evaluation Period Ending Date:	July 31, 2012

Facility Space Use Summary

John Adams Elementary School	
Space Type	K-12 School
Gross Floor Area (ft ²)	79,257
Open Weekends?	No
Number of PCs	103
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	90
Percent Heated	100
Months °	10
High School?	No
School District °	north brunswick twp

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 07/31/2012)	Baseline (Ending Date 07/31/2012)	Rating of 75	Target	National Median
Energy Performance Rating	38	38	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	80	80	57	N/A	72
Source (kBtu/ft ²)	150	150	106	N/A	135
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	539	539	380	N/A	486
kgCO ₂ e/ft ² /year	7	7	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 Median column presents energy performance data your building would have if your building had a median rating of 50.

Notes:

- o - This attribute is optional.
- d - A default value has been supplied by Portfolio Manager.

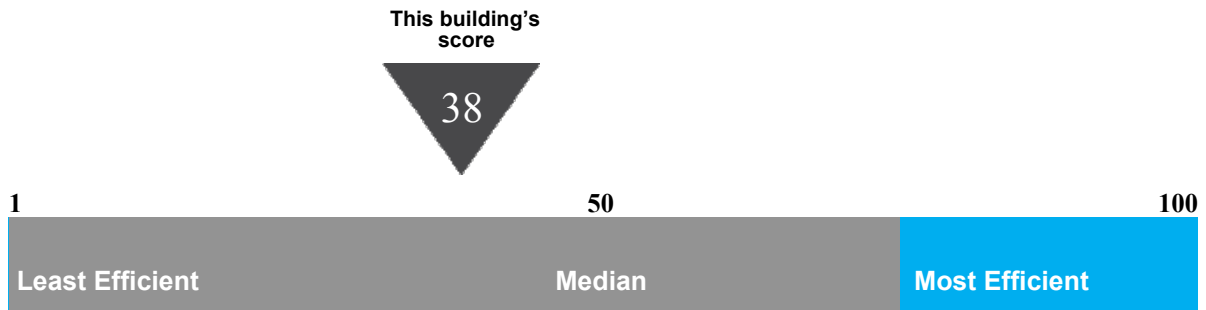
Statement of Energy Performance

2012

North Brunswick BOE - John Adams Elementary School
1450 Redmond Street
North Brunswick, NJ 08902

Portfolio Manager Building ID: 3315896

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 150 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending July 2012

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

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

Date of certification



APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

John Adams Elementary School

AC Units

Tag			
Unit Type	Split System Condensing Unit	Packaged Rooftop Unit	Split System Condensing Unit
Qty	25	1	1
Location	Roof	Roof	Roof
Area Served	Classroom Unit Ventilators	New Wing	Small office
Manufacturer	Ducane	Trane	Sanyo
Model #	2AC13B36P-1A	SLHFF40E4B45	C1211
Serial #	4606C63620	C08C02542	0155493
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	3 Tons	40 Tons	1 Ton
Cooling Efficiency (SEER/EER)	13 SEER	-	10 SEER
Heating Type	N/A	Hot Water Heat	N/A
Heating Input (MBH)	N/A	See Boilers Main HW Boilers	N/A
Efficiency	N/A	See Boilers Main HW Boilers	N/A
Fuel	N/A	Hot Water Heat	N/A
Approx Age	6	4	11
ASHRAE Service Life	15	15	15
Remaining Life	9	11	4
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag			
Unit Type	Split System Condensing Unit	Split System Condensing Unit	Split System Condensing Unit
Qty	1	2	2
Location	Roof	Roof	Roof
Area Served	Computer Lab	Library	Library
Manufacturer	Rheem	Trane	Trane
Model #	RAKB-024JAZ	TTD730B100A0	TTA036A300A0
Serial #	6950F190502369	C49238062	D06252308
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	2 Tons	2.5 Tons	3 Tons
Cooling Efficiency (SEER/EER)	10 SEER	9 SEER	9 SEER
Heating Type	N/A	N/A	N/A
Heating Input (MBH)	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A
Fuel	N/A	N/A	N/A
Approx Age	7	24	23
ASHRAE Service Life	15	15	15
Remaining Life	8	(9)	(8)
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag		RTU-2	RTU-4
Unit Type	Split System Condensing Unit	Packaged Rooftop Unit	Packaged Rooftop Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Library	New Wing	New Wing
Manufacturer	Dynazone	Aaon	Aaon
Model #	S181FS/C181C	RN-026-8-C-BB04- EJH	RM-016-8-0-BB02-EJJ
Serial #	DC 106530	200801-BNWS00536	200801-AMWM02854
Cooling Type	DX, R-22	DX, R410A	DX, R410A
Cooling Capacity (Tons)	1.5 Tons	26 Tons	16 Tons
Cooling Efficiency (SEER/EER)	9 SEER	9.5 EER	9.5 EER
Heating Type	N/A	Hot Water Heat	Hot Water Heat
Heating Input (MBH)	N/A	See Boilers Main HW Boilers	See Boilers Main HW Boilers
Efficiency	N/A	See Boilers Main HW Boilers	See Boilers Main HW Boilers
Fuel	N/A	Hot Water Heat	Hot Water Heat
Approx Age	15	4	4
ASHRAE Service Life	15	15	15
Remaining Life	0	11	11
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag			
Unit Type	Packaged Rooftop Unit	Gas Fired Outdoor Unit Heater	Split System Condensing Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Front office	Front Area	Cafeteria Air Handler
Manufacturer	Trane	Trane	Trane
Model #	YCD036A3H0AB	GRBA10GAGB0N2C H205HO	RAUCC50GBK13BDF
Serial #	F401423060	A96B32681	J96D81130
Cooling Type	DX, R-22	N/A	DX, R-22
Cooling Capacity (Tons)	3 Tons	N/A	50 Tons
Cooling Efficiency (SEER/EER)	9 EER	N/A	11 EER
Heating Type	Natural Gas	Natural Gas	N/A
Heating Input (MBH)	120 MBH	100 MBH	N/A
Efficiency	80%	80%	N/A
Fuel	Natural Gas	Natural Gas	N/A
Approx Age	21	6	16
ASHRAE Service Life	15	15	15
Remaining Life	(6)	9	(1)
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag		
Unit Type	Split System Condensing Unit	Packaged Rooftop Unit
Qty	1	1
Location	Roof	Roof
Area Served	Small office	Front Area
Manufacturer	Sanyo	Trane
Model #	C0911	YCD036C3L0BE
Serial #	96334	L24101203D
Cooling Type	DX, R-22	DX, R-22
Cooling Capacity (Tons)	9,000 BTU/hr	3 Tons
Cooling Efficiency (SEER/EER)	10 SEER	9 EER
Heating Type	N/A	Natural Gas
Heating Input (MBH)	N/A	80 MBH
Efficiency	N/A	80%
Fuel	N/A	Natural Gas
Approx Age	12	6
ASHRAE Service Life	15	15
Remaining Life	3	9
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

John Adams Elementary School

Boilers

Tag			
Unit Type	Firetube Boilers		
Qty	2		
Location	Boiler Room		
Area Served	Hot Water Loop		
Manufacturer	Cleaver Brooks		
Model #	CB801-70		
Serial #	L-24009		
Input Capacity (Btu/Hr)	-		
Rated Output Capacity (Btu/Hr)	2,343		
Approx. Efficiency %	65.0%		
Fuel	Natural Gas		
Approx Age	52		
ASHRAE Service Life	35	24	
Remaining Life	(17)	24	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

John Adams Elementary School

Domestic Water Heaters

Tag			
Unit Type	Domestic Hot Water Heater		
Qty	1		
Location	Boiler Room		
Area Served	Domestic Hot Water Loop		
Manufacturer	A.O. Smith		
Model #	HW 300 892		
Serial #	892 L 91 15108		
Size (Gallons)	722 Gallons (Separate Storage Tank)		
Input Capacity (MBH/KW)	300 MBH		
Recovery (Gal/Hr)	-		
Efficiency %	75%		
Fuel	Natural Gas		
Approx Age	23		
ASHRAE Service Life	12		
Remaining Life	(11)		
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

John Adams Elementary School

Pumps

Tag	P1A,P2A	P3,P4	P7,P8
Unit Type	Base Mounted End Suction	Base Mounted End Suction	In-Line
Qty	2	2	2
Location	Boiler Room	Boiler Room	Boiler Room
Area Served	Gym, Kindergarten, 1st, 2nd Grade Wing	3rd, 4th, 5th Grade wing	Media Center
Manufacturer	-	-	Bell & Gossett
Model #	-	-	-
Serial #	-	-	149199
Horse Power	5 HP	2 HP	1.5 HP
Flow	-	-	23 GPM @ 55 FT/HD
Motor Info	Leland-Faraday / Dayton	GE Energy Saver	Baldor / Marathon
Electrical Power	208-220/440/3/60	200-230/460/3/60	208-230/460/3/60
RPM	1725 / 1755 RPM	1165 RPM	1725 RPM
Motor Efficiency %	86% / 86.5%	86.5% / 87.5%	78.5%
Approx Age	20	15	10
ASHRAE Service Life	18	18	18
Remaining Life	(2)	3	8
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

Pumps

Tag	P-1,2	P10		
Unit Type				
Qty	2	1		
Location	Boiler Room	Boiler Room		
Area Served	Cafeteria	Offices		
Manufacturer	No equipment tags provided.	No equipment tags provided.		
Model #				
Serial #				
Horse Power				
Flow				
Motor Info				
Electrical Power				
RPM				
Motor Efficiency %				
Approx Age				
ASHRAE Service Life				
Remaining Life				
Comments				

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

CEG Project #: 9C12053
 Facility Name: John Adams Elementary School
 Address: 1450 Redmond Street
 City, State, Zip: North Brunswick, NJ 08902

Fixture Reference #	Location	Average Burn Hours	Description	Existing Fixtures				Proposed Fixtures Retrofit				Retrofit Energy Savings			Lighting Retrofit Costs				Proposed Lighting Controls										
				Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Energy Savings, kWh	Energy Savings, kWh	Energy Savings, \$	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
651	Copy Room	2600	Industrial Reflector, 26w CFL	1	26	3	0.08	203	Existing to Remain	Existing to Remain	1	26	0	0.08	203	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	41	\$6
221.31	Classroom 21	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.43	21 Restroom	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mat., Direct/Indirect	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.31	Classroom 22	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.43	22 Restroom	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mat., Direct/Indirect	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.31	Classroom 23	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 24	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 25	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 26	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 27	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 28	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 29	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 30	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Classroom 31	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	451	\$68
221.31	Classroom 32	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
121.21	Boys Restroom	2600	1x4, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	2	78	2	0.16	406	Reballast & Relamp	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	2	50	2	0.10	260	0.06	146	\$22	\$60.00	\$140.00	\$200.00	\$0.00	9.10	0	No New Controls	0	0.0%	0	\$0
121.41	Boys Restroom	2600	1x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mat., Prismatic Lens	2	78	1	0.08	203	Reballast & Relamp	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	2	50	1	0.05	130	0.03	73	\$11	\$30.00	\$70.00	\$100.00	\$0.00	9.10	0	No New Controls	0	0.0%	0	\$0
227.21	Boys Restroom	2600	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	1	0.07	169	Existing to Remain	Existing to Remain	2	65	0	0.07	169	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
121.41	Girls Restroom	2600	1x4, 2 Lamp, 34w T12, Mag. Ballast, Wall Mat., Prismatic Lens	2	78	1	0.08	203	Reballast & Relamp	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	2	50	1	0.05	130	0.03	73	\$11	\$30.00	\$70.00	\$100.00	\$0.00	9.10	0	No New Controls	0	0.0%	0	\$0
227.21	Girls Restroom	2600	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	1	0.07	169	Existing to Remain	Existing to Remain	2	65	0	0.07	169	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
242.21	Classroom 16	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Delamp - Provide Reflector	Defeat Socket, Install Specular Reflector	3	86	4	0.34	894	0.08	218	\$33	\$100.00	\$300.00	\$400.00	\$0.00	12.13	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	179	\$27
227.21	Boys Restroom	2600	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	2	0.13	338	Existing to Remain	Existing to Remain	2	65	0	0.13	338	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
227.21	Girls Restroom	2600	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	2	0.13	338	Existing to Remain	Existing to Remain	2	65	0	0.13	338	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.11	Custodial Closet	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	1	0.06	161	Existing to Remain	Existing to Remain	2	62	0	0.06	161	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
227.22	Lounge 51	2600	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	65	1	0.07	169	Existing to Remain	Existing to Remain	2	65	0	0.07	169	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Lighting Retrofit Costs				Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Energy Savings, kWh	Energy Savings, kWh	Energy Savings, \$	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh
232.22	Lounge 51	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	14	1.20	3,130	Existing to Remain	Existing to Remain	3	86	0	1.20	3,130	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
232.22	Counselor 53	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	4	0.34	894	Existing to Remain	Existing to Remain	3	86	0	0.34	894	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.11	Classroom 55	2600	1x4, 2 Lamp, 32w TR, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
232.21	Classroom 57	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	\$61
232.21	Classroom 58	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	12	1.03	2,683	Existing to Remain	Existing to Remain	3	86	0	1.03	2,683	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$81
232.21	Classroom 59	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	\$61
232.21	Classroom 60	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	12	1.03	2,683	Existing to Remain	Existing to Remain	3	86	0	1.03	2,683	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$81
231.33	Classroom 61	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
232.21	Classroom 62	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	12	1.03	2,683	Existing to Remain	Existing to Remain	3	86	0	1.03	2,683	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	\$81
231.33	Classroom 63	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
231.33	Classroom 65	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
231.33	Classroom 66	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	8	0.69	1,789	Existing to Remain	Existing to Remain	3	86	0	0.69	1,789	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
231.33	Classroom 67	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
231.33	Classroom 68	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
231.33	Classroom 69	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.29	Teachers Restroom	1200	2x4, 2 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Wallwasher	2	62	2	0.12	149	Existing to Remain	Existing to Remain	2	62	0	0.12	149	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
222.21	Girls Restroom	2600	2x4, 2 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
222.21	Boys Restroom	2600	2x4, 2 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
221.11	Classroom 54	2600	1x4, 2 Lamp, 32w TR, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.11	Classroom 52	2600	1x4, 2 Lamp, 32w TR, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.11	Classroom 50	2600	1x4, 2 Lamp, 32w TR, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	18	1.12	2,902	Existing to Remain	Existing to Remain	2	62	0	1.12	2,902	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mnt.	1	20.0%	580	\$88
221.31	Boiler Room 2	1800	1x4, 2 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	4	0.25	446	Existing to Remain	Existing to Remain	2	62	0	0.25	446	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
222.22	Classroom 70	2600	2x4, 2 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	21	1.30	3,385	Existing to Remain	Existing to Remain	2	62	0	1.30	3,385	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0
232.22	Media Center	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	40	3.44	8,944	Existing to Remain	Existing to Remain	3	86	0	3.44	8,944	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	2	20.0%	1,789	\$270
232.22	Media Center Office	2600	2x4, 3 Lamp, 32w TR, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	447	\$68
231.33	Classroom 80	2600	1x4, 3 Lamp, 32w TR, Elect. Ballast, Pendant Mnt., Direct/Indirect	3	86	8	0.69	1,789	Existing to Remain	Existing to Remain	3	86	0	0.69	1,789	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/yr	Energy Savings, kWh	Energy Savings, \$	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$	
231.33	Classroom 81	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 82	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 83	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 84	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 85	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	8	0.69	1,789	Existing to Remain	Existing to Remain	3	86	0	0.69	1,789	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 86	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 87	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 88	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Girls Restroom	2600	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	5	0.31	806	Existing to Remain	Existing to Remain	2	62	0	0.31	806	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Boys Restroom	2600	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	5	0.31	806	Existing to Remain	Existing to Remain	2	62	0	0.31	806	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Office 74	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	3	0.26	671	Existing to Remain	Existing to Remain	3	86	0	0.26	671	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Office 72	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	3	0.26	671	Existing to Remain	Existing to Remain	3	86	0	0.26	671	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
242.11	Speech	2600	2x4, 4 Lamp, 32w TR, Elec. Ballast, Surface Mt., Prismatic Lens	4	107	5	0.54	1,391	Existing to Remain	Existing to Remain	4	107	0	0.54	1,391	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mt.	1	20.0%	278	\$42	
242.11	Classroom 47	2600	2x4, 4 Lamp, 32w TR, Elec. Ballast, Surface Mt., Prismatic Lens	4	107	11	1.18	3,060	Existing to Remain	Existing to Remain	4	107	0	1.18	3,060	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	612	\$92	
221.11	Classroom 41	2600	1x4, 2 Lamp, 32w TR, Elec. Ballast, Surface Mt., Prismatic Lens	2	62	21	1.30	3,385	Existing to Remain	Existing to Remain	2	62	0	1.30	3,385	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	3	Dual Tech. Occupancy Sensor w/2 Pole Powerpack - Remote Mt.	1	20.0%	677	\$102	
231.33	Classroom 6	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 7	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	16	1.38	3,578	Existing to Remain	Existing to Remain	3	86	0	1.38	3,578	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 8	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	16	1.38	3,578	Existing to Remain	Existing to Remain	3	86	0	1.38	3,578	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 9	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	16	1.38	3,578	Existing to Remain	Existing to Remain	3	86	0	1.38	3,578	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
231.33	Classroom 10	2600	1x4, 3 Lamp, 32w TR, Elec. Ballast, Pendant Mt., Direct/Indirect	3	86	12	1.03	2,683	Existing to Remain	Existing to Remain	3	86	0	1.03	2,683	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Conference Room 5	2600	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Office 4	2600	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mt.	1	20.0%	129	\$19	
222.21	Men's Restroom	1200	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	2	0.12	149	Existing to Remain	Existing to Remain	2	62	0	0.12	149	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Women's Restroom	1200	2x4, 2 Lamp, 32w TR, Elec. Ballast, Recessed Mt., Prismatic Lens	2	62	2	0.12	149	Existing to Remain	Existing to Remain	2	62	0	0.12	149	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
221.43	Lobby	3000	1x4, 2 Lamp, 32w TR, Elec. Ballast, Wall Mt., Direct/Indirect	2	62	9	0.56	1,674	Existing to Remain	Existing to Remain	2	62	0	0.56	1,674	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
121.14	Lobby	3000	1x4, 2 Lamp, 34w T12, Mag. Ballast, Surface Mt., No Lens	2	78	4	0.31	936	Reballast & Relamp	Reballast & Relamp; Sybasta Lamp FO28/841/SS/ECO	2	50	4	0.20	600	0.11	336	\$51	\$120.00	\$280.00	\$400.00	\$0.00	7.88	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Lighting Retrofit Costs				Proposed Lighting Controls						
			Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kWh	Energy Savings, kWh	Energy Savings, \$	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
222.21	Main Office	2600	2	62	9	0.56	1,451	Existing to Remain	Existing to Remain	2	62	0	0.56	1,451	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	290	\$44	
222.21	Principal's Office	2600	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mt.	1	20.0%	129	\$19	
221.21	Nurse	2600	2	62	1	0.06	161	Existing to Remain	Existing to Remain	2	62	0	0.06	161	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Nurse	2600	2	62	7	0.43	1,128	Existing to Remain	Existing to Remain	2	62	0	0.43	1,128	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	226	\$34	
221.31	Boiler Room	1200	2	62	10	0.62	744	Existing to Remain	Existing to Remain	2	62	0	0.62	744	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
242.21	Cafeteria	2600	4	107	40	4.28	11,128	Delamp - Provide Reflector	Defeat Socket; Install Specular Reflector	3	86	40	3.44	8,944	0.84	2,184	\$330	\$1,000.00	\$3,000.00	\$4,000.00	\$0.00	12.13	4	Dual Technology Occupancy Sensor - Remote Mt.	3	20.0%	1,789	\$270
242.21	Servery	2600	4	107	8	0.86	2,226	Delamp - Provide Reflector	Defeat Socket; Install Specular Reflector	3	86	8	0.69	1,789	0.17	437	\$66	\$200.00	\$600.00	\$800.00	\$0.00	12.13	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	358	\$54
242.21	Kitchen	2600	4	107	6	0.64	1,669	Delamp - Provide Reflector	Defeat Socket; Install Specular Reflector	3	86	6	0.52	1,342	0.13	328	\$49	\$150.00	\$450.00	\$600.00	\$0.00	12.13	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	268	\$41
617	Kitchen Hood	2600	1	100	3	0.30	780	Relamp	26w CFL Lamp	1	26	3	0.08	203	0.22	577	\$87	\$45.00	\$60.00	\$105.00	\$0.00	1.20	0	No New Controls	0	0.0%	0	\$0
242.31	Elec. Room	1200	4	107	2	0.21	257	Existing to Remain	Existing to Remain	4	107	0	0.21	257	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Corridor	3000	2	62	101	6.26	18,786	Existing to Remain	Existing to Remain	2	62	0	6.26	18,786	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	0	No New Controls	0	0.0%	0	\$0	
222.21	Corridor	3000	2	62	11	0.68	2,046	Existing to Remain	Existing to Remain	2	62	0	0.68	2,046	0.00	0	\$0	\$0.00	\$0.00	\$0.00	-	2	Daylight Sensor (Sensoswitch PP-20 & CMLPC or equal)	2	20.0%	409	\$62	
713	Canopy	4000	1	125	9	1.13	4,500	Remove and Return	28w LED	1	28	9	0.25	1,008	0.87	3,492	\$527	\$900.00	\$900.00	\$1,800.00	\$0.00	3.41	0	No New Controls	0	0.0%	0	\$0
Pods																												
221.11	Classroom T 1	2600	2	62	16	0.99	2,579	Existing to Remain	Existing to Remain	2	62	0	0.99	2,579	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	516	\$78
221.11	Classroom T 2	2600	2	62	16	0.99	2,579	Existing to Remain	Existing to Remain	2	62	0	0.99	2,579	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	516	\$78
221.11	Classroom T 3	2600	2	62	16	0.99	2,579	Existing to Remain	Existing to Remain	2	62	0	0.99	2,579	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	516	\$78
221.11	Classroom T 4	2600	2	62	16	0.99	2,579	Existing to Remain	Existing to Remain	2	62	0	0.99	2,579	0.00	0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mt.	1	20.0%	516	\$78
TOTAL					1,003	74	54,387				78	71.45	187,135	2.54	7,863	\$1,187	\$2,635.00	\$5,870.00	\$8,505.00	\$0.00	7.16			44		21,255	\$3,200	

CEG Project #: 9C12053
 Facility Name: John Adams Elementary School
 Address: 1450 Redmond Street
 City, State, Zip: North Brunswick, NJ 08902

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures					Proposed Fixtures Retrofit					Retrofit Energy Savings			Lighting Retrofit Costs				Proposed Lighting Controls									
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kWh	Energy Savings, \$	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$	
769	Gym	2600	400w MH, Hi-Bay	1	465	14	6.51	16,926	Remove and Return	1x4, 6 Lamp, 54w TSHO, Elect. Ballast, Lo Bay	6	360	14	5.04	13,104	1.47	3,822	\$577	\$2,800.00	\$2,100.00	\$4,900.00	\$0.00	8.49	4	Dual Technology Occupancy Sensor - Remote Mt.	2	20.0%	2,621	\$396
TOTAL					14	7	16,926					14	5	13,104	1	3,822	577	2,800	2,100	4,900	0				2	0	2,621	396	

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
John Adams Elementary	21850	SHARP NU-U235F2	1151	17.5	20,189	270.49	316,514	219.1	48,227	13.40



= Proposed Roof PV Layout = Proposed Parking PV Layout

Notes:

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

Project Name: LGEA Solar PV Project - John Adams Elementary Location: North Brunswick, NJ Description: Photovoltaic System 100% Financing - 15 year									
Simple Payback Analysis									
		Photovoltaic System 100% Financing - 15 year							
Total Construction Cost		\$1,735,415							
Annual kWh Production		316,514							
Annual Energy Cost Reduction		\$47,794							
Average Annual SREC Revenue		\$60,481							
Simple Payback:		16.03							
Years									
Life Cycle Cost Analysis									
Analysis Period (years):		15				Financing %:		100%	
Discount Rate:		3%				Maintenance Escalation Rate:		3.0%	
Average Energy Cost (\$/kWh)		\$0.151				Energy Cost Escalation Rate:		3.0%	
Financing Rate:		6.00%				Average SREC Value (\$/kWh)		\$0.191	
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	316,514	\$47,794	\$0	\$79,129	\$102,122	\$73,611	(\$48,811)	(\$48,811)
2	\$0	314,931	\$49,227	\$0	\$78,733	\$97,582	\$78,151	(\$47,773)	(\$96,584)
3	\$0	313,357	\$50,704	\$0	\$78,339	\$92,762	\$82,971	(\$46,690)	(\$143,273)
4	\$0	311,790	\$52,225	\$0	\$77,947	\$87,645	\$88,088	(\$45,560)	(\$188,833)
5	\$0	310,231	\$53,792	\$3,195	\$77,558	\$82,212	\$93,521	(\$47,578)	(\$236,412)
6	\$0	308,680	\$55,406	\$3,179	\$61,736	\$76,443	\$99,290	(\$61,771)	(\$298,182)
7	\$0	307,136	\$57,068	\$3,164	\$61,427	\$70,319	\$105,414	(\$60,401)	(\$358,584)
8	\$0	305,601	\$58,780	\$3,148	\$61,120	\$63,818	\$111,915	(\$58,980)	(\$417,564)
9	\$0	304,073	\$60,544	\$3,132	\$60,815	\$56,915	\$118,818	(\$57,507)	(\$475,071)
10	\$0	302,552	\$62,360	\$3,116	\$45,383	\$49,587	\$126,146	(\$71,107)	(\$546,177)
11	\$0	301,040	\$64,231	\$3,101	\$45,156	\$41,806	\$133,927	(\$69,447)	(\$615,625)
12	\$0	299,534	\$66,158	\$3,085	\$44,930	\$33,546	\$142,187	(\$67,731)	(\$683,355)
13	\$0	298,037	\$68,142	\$3,070	\$44,706	\$24,776	\$150,957	(\$65,955)	(\$749,310)
14	\$0	296,547	\$70,187	\$3,054	\$29,655	\$15,465	\$160,268	(\$78,946)	(\$828,256)
15	\$0	295,064	\$72,292	\$3,039	\$29,506	\$5,581	\$170,152	(\$76,974)	(\$905,230)
Totals:		4,585,087	\$888,909	\$34,283	\$876,139	\$900,580	\$1,735,415	(\$905,230)	(\$6,591,267)
Net Present Value (NPV)							(\$664,744)		