Steven Winter Associates, Inc.
Building Systems Consultants
www.swinter.com

293 Route 18 South, Suite 330
East Brunswick, NJ 08816

Telephone (866) 676-1972
Facsimile (203) 852-0741

April 30, 2012

Local Government Energy Program
Energy Audit Report

Washington Township Public School District

Grenloch Terrace Early Childhood Center
251 Woodbury-Turnersville Rd
Sewell, NJ 08080

Project Number: LGEA95

Table of Contents

EXECUTIVE SUMMARY

The Washington Township Grenloch Terrace Early Childhood Center (Grenloch Terrace) consists of two independent buildings that account for a total floor area of 31,140 SF. One building is a single story, slab-on-grade building while the other is a 2 story building with 1 below grade level. The original structure was built in 1967 with a major addition and renovation in 1996. The following chart provides a comparison of the current building energy usage based on the period from September 2010 through August 2011 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/yr)	Current Annual Cost of Energy ($)	Site Energy Use Intensity (kBtu/sq ft. /yr)	Source Energy Use Intensity (kBtu/sq ft. /yr)	Joint Energy Consumption (MMBtu/yr)
Current	75,573	8,626	$22,669	36.0	57	1,120
Proposed	75,092	8,600	$22,437	35.9	57	1,116
Savings	481	26	$232	0.1	0	4
% Savings	0.64%	0.30%	1.02%	0.38%	0.00%	0.34%
*Includes operation and maintenance savings; *						

SWA has entered energy information about Grenloch Terrace into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The building is not eligible for an Energy Performance Rating (EPR) based on its classification as an "Other – Other" space type.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Initial Investment ($)	Simple Payback Period	CO2 Savings (lbs/yr)
Replace gas DHW heater in Old Building	$90	$1,568	17.5	289
Replace electric DHW heater in New Building	$142	$1,352	9.5	861
Total	**$232**	**$2,920**	**12.6**	**1,149**

In addition to these ECMs, SWA recommends:

- Capital Improvement opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
  - CI #1 – Replace 6 AHUs and condensing units in Old Building - $65,136
  - CI #2 – Replace 2 smaller ventilating units in Old Building - $1,106
  - CI #3 – Replace window air conditioning unit in Old Building - $180
  - CI #4 – Replace existing non-insulated windows - $98,383
  - CI #5 – Replace existing non-insulated doors - $41,312
  - CI #6 – Replace existing shingled roofs - $50,758

- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low cost – no cost

  - Inspect and replace cracked/ineffective caulk.
  - Inspect and maintain sealants at all windows for airtight performance.
  - Inspect and maintain weather-stripping around all exterior doors and roof hatches.
  - Provide water-efficient fixtures and controls
  - SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced.
  - Use smart power electric strips
  - Create an energy educational program

There may be energy procurement opportunities for the Washington Township Public School District to reduce annual utility costs, which are $1,587 higher, when compared to the average estimated NJ commercial utility rates. SWA recommends further evaluation with energy suppliers, listed in Appendix C.

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent of planting 3 trees to absorb CO_2 from the atmosphere.

Energy Conservation Measure Implementation

SWA recommends that Washington Township implement the following Energy Conservation Measures using an appropriate Incentive Program for reduced capital cost:

Recommended ECMs	Incentive Program (APPENDIX G for details)
Replace gas DHW heater in the Old Building	SmartStart, Direct Install
Replace electric DHW heater in the New Building	SmartStart, Direct Install

Appendix G contains an Energy Conservation Measures table which ranks each ECM by Simple Payback.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 39-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Grenloch Terrace facility at 251 Woodbury-Turnersville Rd, Sewell, NJ. The process of the audit included a facility visit on January 10^{th} and 11th, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Washington Township Public School District to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Grenloch Terrace facility.

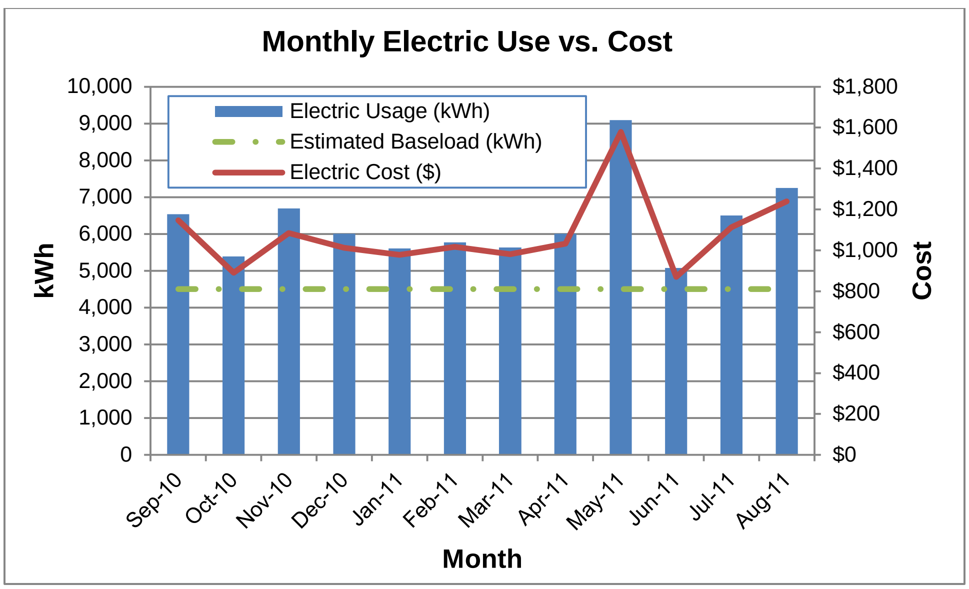
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from September 2009 through September 2011 that were received from the utility companies supplying Grenloch Terrace with electricity and natural gas. A 12 month period of analysis from September 2010 through September 2011 was used for all calculations and for purposes of benchmarking the building.

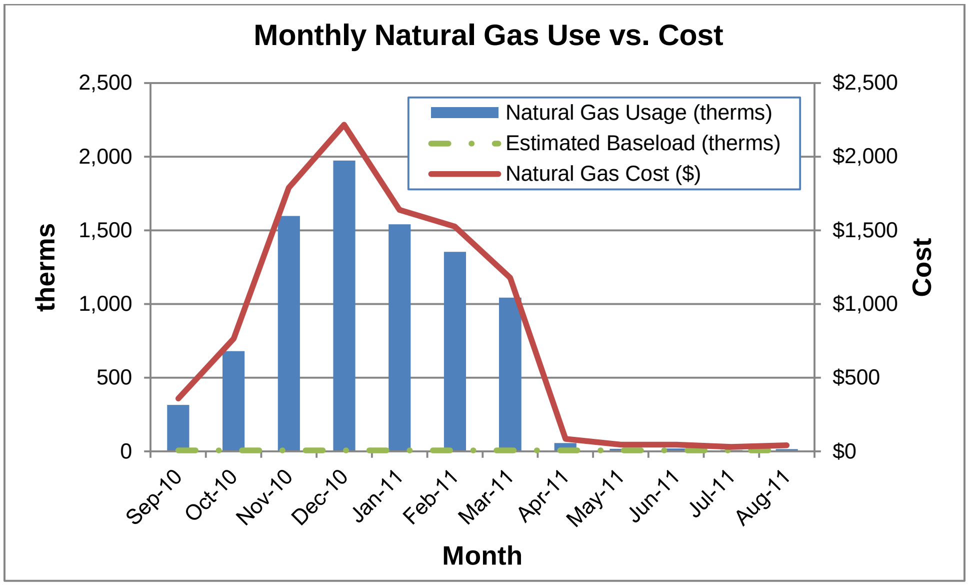
Electricity – Grenloch Terrace is currently served by one electric meter that serves both schools. The school currently purchases electricity from Atlantic City Electric with Pepco acting as a 3rd party supplier. Prior to June 2010, the school used Hess as a 3rd party supplier before switching to Pepco. In the current 12 month period, electricity was purchased at an average aggregated rate of $0.171/kWh and the school consumed approximately 75,573 kWh, or $12,944 worth of electricity. The average monthly demand was 34.9 kW and the monthly peak demand was 54.9 kW. Peak demand occurred in May 2011.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Grenloch Early Childhood Center. The baseline usage for the school is approximately 4,500 kWh, regardless of season. As expected, electric usage increases during the summer months when cooling systems are used the most. A slight peak also occurs in winter months, when the newer building uses electric heat. There appears to be an anomaly in May 2011 with a large electric peak. This anomaly is most likely the result of an over-billing by the utility company and appears to be corrected in the following month of June 2011.

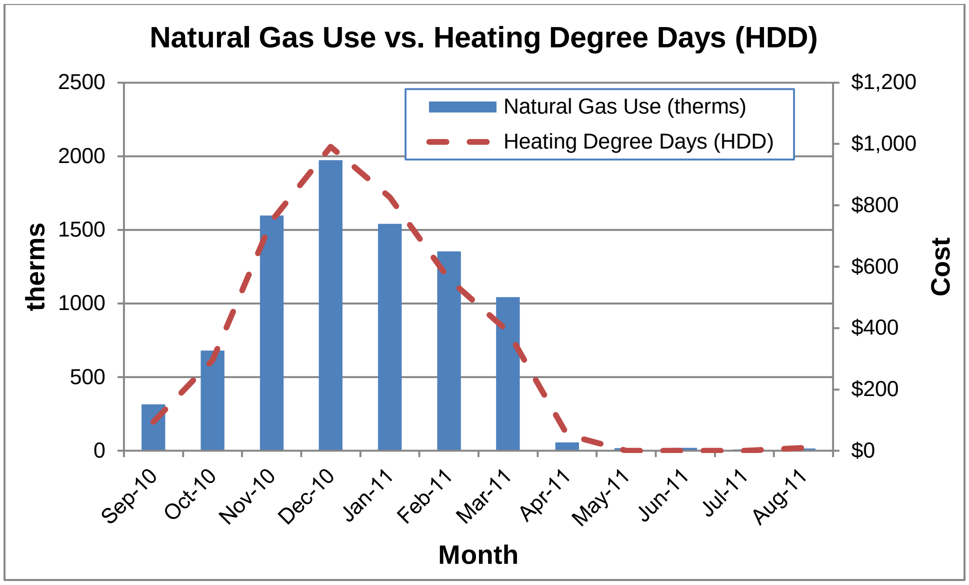


Natural gas – Grenloch Terrace Early Childhood Center is currently served by one natural gas meter at the older building only. The newer, L-shaped building is 100% electric service. The school currently purchases electricity from South Jersey Gas with Pepco acting as a 3rd party supplier. Prior to June 2010, the school used Hess as a 3rd party supplier before switching to Pepco. In the current 12 month period, natural gas was purchase at an average aggregated rate of $1.127/therm and the school consumed approximately 8,626 therms, or $9,725 worth of natural gas.

The chart below shows the monthly natural gas usage and costs. The dashed green line represents the approximate baseload or minimum natural gas usage required to operate the older building. The baseline represents domestic hot water usage for the school and represents 8 therms per month. Natural gas is used for heating and domestic hot water only. Natural gas usage increases during the winter months based on the heating requirements of the old building.

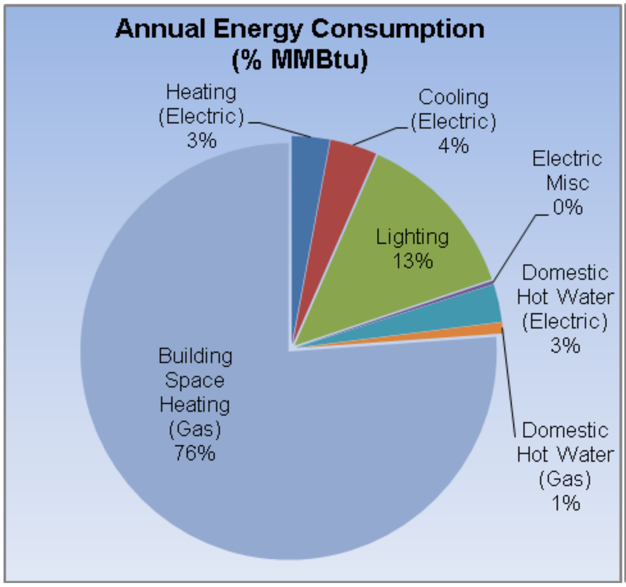


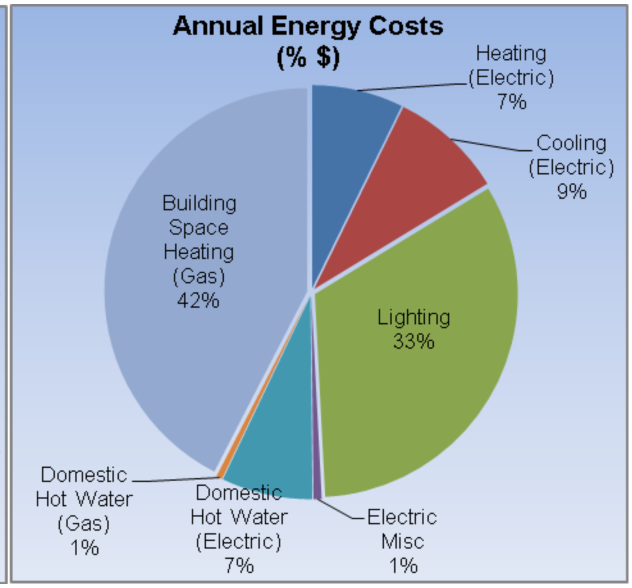
The chart below shows the monthly natural gas usage plotted with Heating Degree Days (HDD). Heating degree days are the difference of the average daily temperature and a base temperature (60°F for this building), on any particular day. A base temperature of 60°F was used since the boiler has an outside air cutoff temperature of 60°F. For a given time period, HDD are summed in order to give an indication of the heating load required to heat a building based on outside air temperature. HDD are zero for the days when the average temperature exceeds the base temperature. Natural gas at the Grenloch Terrace older building fluctuates by a proper amount according to HDD.



The following graphs, pie charts, and table show energy use for Grenloch Terrace based on utility bills for the 12 month period. Note: electrical cost at $50/MMBtu of energy is more than four times as expensive as natural gas at $11/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	% MMBTu	$	% $	$/MMBtu
Heating (Electric)	33	3%	$1,647	7%	$50
Cooling (Electric)	41	4%	$2,048	9%	$50
Lighting	149	13%	$7,456	33%	$50
Electric Misc	3	0%	$147	1%	$50
Domestic Hot Water (Electric)	33	3%	$1,646	7%	$50
Domestic Hot Water (Gas)	10	1%	$108	0%	$11
Building Space Heating (Gas)	853	76%	$9,616	42%	$11
Totals	1,120	100%	$22,669	100%	$274
Total Electric Usage	258	23%	$12,944	57%	$50
Total Gas Usage	863	77%	$9,725	43%	$11
Totals	1,120	100%	$22,669	100%	-



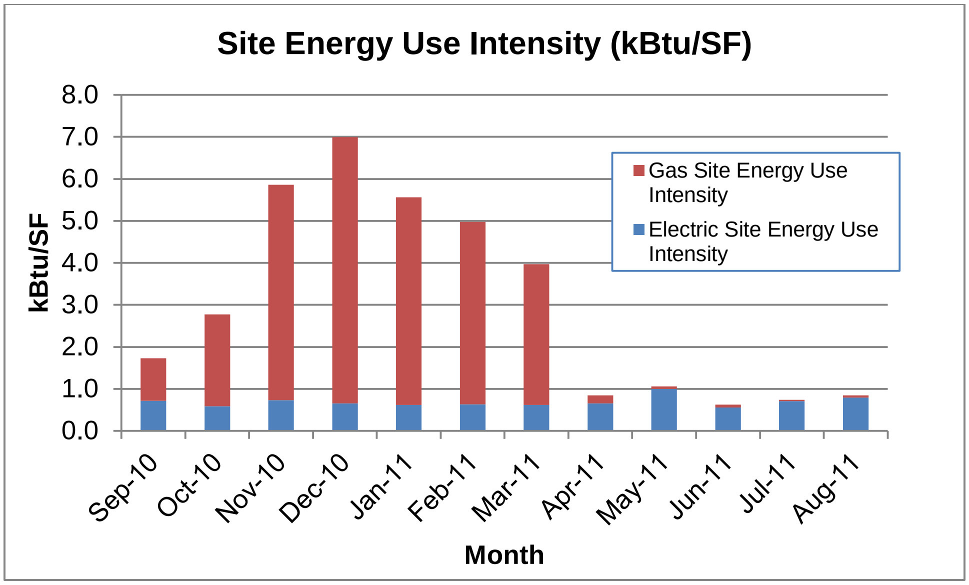


Energy benchmarking

SWA has entered energy information about the Washington Township Bells Elementary School in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "Other - Other" space type. Based on the data entered into the Portfolio Manager software, the building is not eligible for an Energy Performance Rating (EPR) due to its categorization as an "Other – Other" space type. Grenloch Terrace Early Education Center is categorized as an "Other – Other" space type as opposed to a "K – 12" school since its energy use is not realistic of a typical K-12 school.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a Energy Performance Rating from 1-100 by comparing it to similar building types. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.

The Site Energy Use Intensity is 36 kBtu/sqft/yr compared to the national average of an "Other - Other" building consuming 70 kBtu/sqft/yr. This is a 55% difference between the buildings intensity and the national average. This low Site Energy Use Intensity is due to the fact that the school operates as an Early Childcare Center with low energy use. See ECM section for guidance on how to improve the building's rating.



Per the LGEA program requirements, SWA has assisted the Washington Township Public School District to create an ENERGY STAR® Portfolio Manager account and share the Grenloch Terrace Early Childcare facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Washington Township Public School District (user name of “washingtontownship” with a password of “washingtontownship”) and TRC Energy Services (user name of “TRC-LGEA”).

Tariff analysis

Tariff analysis can help determine if the Washington Township is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

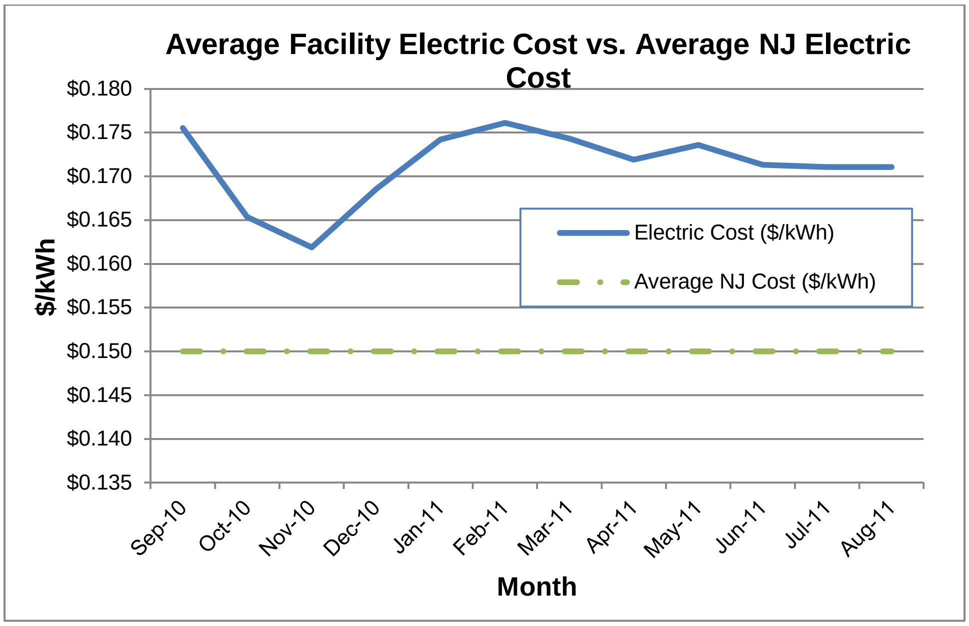
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Township of Washington. Grenloch Terrace is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

Energy Procurement strategies

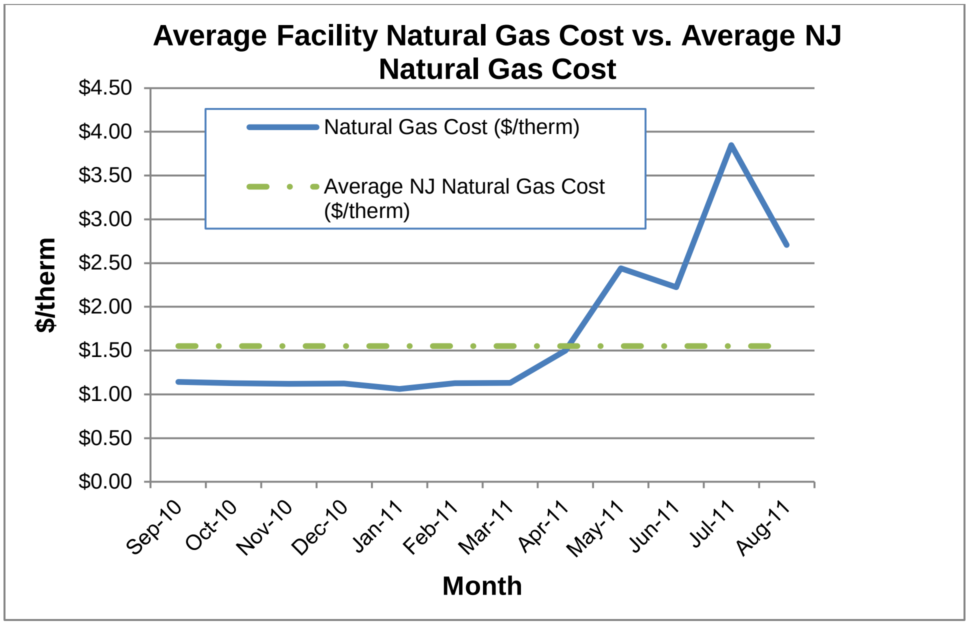
Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

It is important to note that Grenloch Terrace uses Pepco as a 3rd party supplier for both electricity and natural gas service.

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while Grenloch Terrace pays a rate of $0.171/kWh. The Grenloch Terrace annual electric utility costs are $1,587 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 9% over the most recent 12 month period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges and market rate changes and the rate increase in July are most likely due to a combination of low usage and the assessment of fixed fees and charges. Electric demand information was not available.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Grenloch Terrace pays a rate of $1.127/therm. Natural gas bill analysis shows fluctuations up to 41% during the heating season of the most recent 12 month period. Utility rate fluctuations in the spring and summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs.



The facility already uses a 3rd party supplier for both electricity and natural gas. While the facility pays a competitive rate for natural gas, the facility pays higher than the average NJ utility rate for electricity. SWA recommends negotiating for a lower electricity rate with the current 3rd party supplier; however, it is important to note that Grenloch Terrace is a small building with limited electric use due to its size and operation and opportunities for negotiation might be limited. Appendix C contains a complete list of third-party energy suppliers for the Township of Washington service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on visits from SWA on January 11th and 12th, 2012, the following data was collected and analyzed.

Building Characteristics

The Washington Township Grenloch Terrace Early Childhood Center (Grenloch Terrace) consists of two independent buildings, built at separate times, which account for a total floor area of 31,140 SF. The original building was built in 1936, and comprises of 2 stories and a partial below grade basement level. This building houses 6 classrooms, faculty offices, a multi-purpose room and storage. The other building is an "L" shaped, single-story, slab-on-grade structure built between 1990 and 1991. The original section of this building is made up of two pod-like sections, connected by a vestibule. An additional pod or extension was added in 1992. This building houses several classrooms and administrative offices.

North West Façade (Old Building)

South Façade (Old Building)

South East Façade (Old Building)

North East Façade (Old Building)


Partial North West Façade (New Building)


North East Façade (New Building)


Partial East Façade (New Building)


Rear North East Façade (New Building

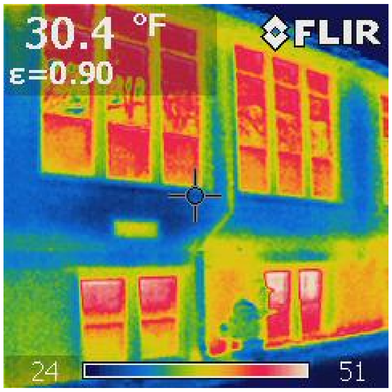
Building Occupancy Profiles

Its occupancy is approximately 523 students and staff from 9:20 AM to 3:30 PM Monday through Friday. Building operations personnel are present from 6:30 AM to 4:00 PM Monday through Friday and during the nighttime cleaning hours of 4:00 PM to 11:00 PM Monday through Friday.

Building Envelope

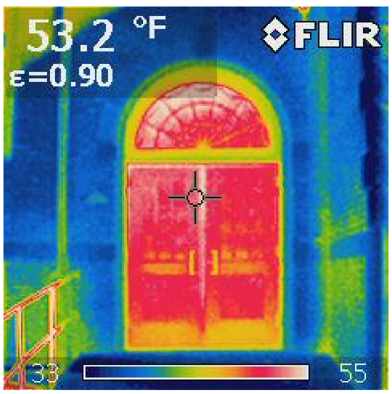
Due to favorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), exterior envelope infrared (IR) images were taken during the field audit. The images are used to find potential areas with deficiencies.

The following specific envelope problem spots and areas were identified:



Non-insulated windows allow heat loss

Partial West Façade



Non-insulated door and windows allow heat loss

Partial Courtyard Façade

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over concrete block with an unconfirmed level of detectable insulation. The interior is mostly painted CMU (Concrete Masonry Units).

Note: Wall insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:

Signs of moisture in the brick façade and ground vegetation growing on wall (moisture in the wall)

Roof

The old building's roof is predominantly open gable over a wood structure, with an asphalt shingle finish. It was constructed in 1936. Approximately four inches of fiberglass batt attic insulation was detected. The new building's roof is predominantly hipped over a wood structure, also with an asphalt finish. The attic is assumed to have some insulation; however the space was not accessed at the time of the visit.

Note: Roof insulation levels for the old building could visually be verified in the field by non-destructive methods.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall fair condition, with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues on any roof areas; however maintenance staff feel it is due for a replacement.

Base

The old building's base is composed of a below-grade basement with a slab floor, a perimeter footing with poured concrete foundation walls, and no detectable slab edge/perimeter insulation. The new building's base is composed of a slab-on-grade floor, a perimeter foundation, and no detectable slab edge/perimeter insulation.

Slab and perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

Windows

The buildings contain several different types of windows:

1. Single-hung type windows with a non-insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located in the old building's boiler room, faculty break room, multi-purpose room.

2. Single-hung type windows with a non-insulated aluminum frame, clear double glazing and interior roller shades. The windows are located throughout the classrooms, faculty offices, and throughout the new building.

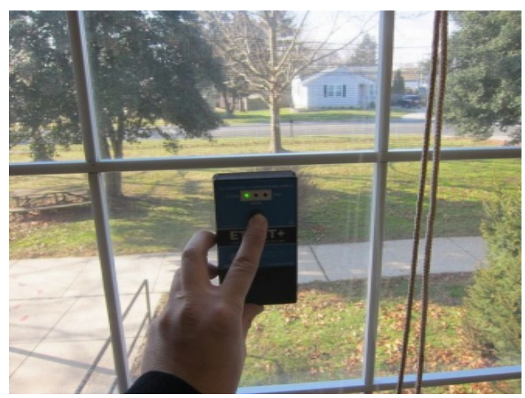
3. Fixed type windows with a painted wood frame, clear single glazing and no interior or exterior shades. The windows are located on the old building, above the street side entrance doors.

4. Fixed type windows with a non-insulated aluminum frame, low-E double glazing and no interior or exterior shading devices. The windows are located in the vestibules between the three pod sections, in the new building.

5. Single-hung type windows with an insulated aluminum frame, low-E double glazing and internal blinds were also found in the 1992 section of the new building.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in fair age appropriate condition, with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spots were identified:



Typical single-hung type windows with clear double glazing and a non-insulated frame. Note: the green light on the low-E detector indicates clear glazing. (Old Building)

Exterior doors

The buildings contain several different types of exterior doors:

1. Aluminum type exterior doors with single-pane glass panels. They are located at both street side entrances of the old building, and in each classroom in the new building.

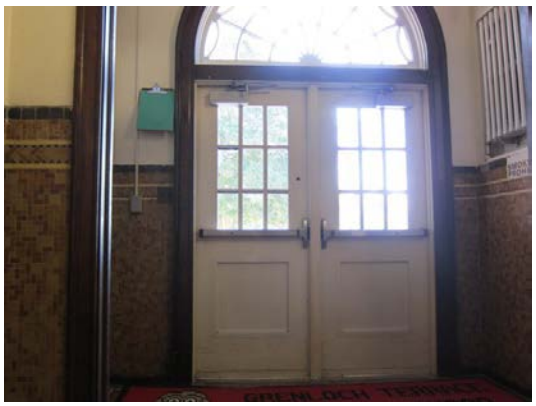
2. Wood type exterior access door. One is located on the rear or North East side of the old building, as well as another on the North West façade.

3. Solid metal type exterior door with wired mesh glass panels. They are located on the rear side of the old building.

4. Single-pane glass doors with aluminum frames. They are located in the vestibules between the pod sections and at the end exist at the end of each hallway.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in good condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:



Typical exterior doors are non-insulated aluminum with single-pane glass panels

Building air-tightness

Overall the field auditors found the building to be reasonably air-tight, considering the building's use and occupancy, as described in more detail earlier in this chapter.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating Ventilation Air Conditioning

The Grenloch Terrace Early Education facility provides heating, cooling and ventilation for all occupied spaces. During the field visit there were no major comfort issues reported. The facility consists of two independent buildings that area heated, cooled and ventilated by different systems.

Equipment

The older building consists of a two story building plus basement that is heated entirely by steam provided by a central natural gas boiler system. The single Weil-McLain boiler has a total input of 2,049 MBH and 1,632 MBH input; giving it a nominal efficiency of 79.6%. The boiler was installed in 1989 and still has approximately 8% of its useful lifetime remaining. The boiler provides steam that is sent to radiators throughout the entire building. The heating plant is not connected to the central Washington Township Building Automation System but is controlled by a local control panel with no digital interface. HVAC technicians are capable of hooking up a laptop computer and reading local setpoints. In general, when the boiler is turned on for the heating season, a outdoor temperature cutoff point of 60°F is set to allow the system to turn on and run in standby mode under the specified temperature. Steam is sent to radiators, where temperature is controlled via Thermostatic Radiator Valves (TRVs). Condensate from the steam system returns to the boiler room where it is mixed with incoming city water before being fed back into the boiler.

In addition to steam heating, ventilation is provided by 6 air handling units (AHU) located in the attic that each serves an individual classroom. These 6 AHUs are each connected to a condenser located on the ground in front of the building. Several small ventilation units and window AC units are located in 1st floor spaces to provide additional conditioning to small office and storage areas. Each AHU is controlled by a local manual, non-programmable thermostat. Time clocks located in the attic near the AHUs allow AHU temperatures to be controlled only during occupied hours.

Weil-McLain boiler (L); Typical Steam Radiator (R)

Air Handling Unit in Attic (L); Time Clock for AHU in Attic (R)

The newer building consists of a single level building that forms an “L” shape. Unlike the older building, the newer building does not have natural gas service and uses electricity only. Each unique space in the building contains a local unit ventilator with separate outside condenser to heat and cool the spaces. The school is conditioned entirely by unit ventilators with the exception of 6 Packaged Terminal Units (PTUs); 2 in the Nurse’s Office, 1 in the Child Study Team Room, 1 in the Main Office, 1 in the Guidance Office and 1 in the Principal’s Office. Both unit ventilators and PTUs are controlled by local non-programmable thermostats set for 68°F - 72°F. Thermostats are locked at a specific temperature and occupants have a +/- 2°F control of temperature. In general, thermostats were found to be controlled within the acceptable temperature range and automatically shut off at night.

Typical Unit Ventilator (L); Typical PTU (R)

Ventilation

The older building is ventilated with fresh air by the AHUs that serve each classroom and ventilating units that serve small office and storage areas. Stale air is removed from the building via small exhaust fans located in each bathroom.

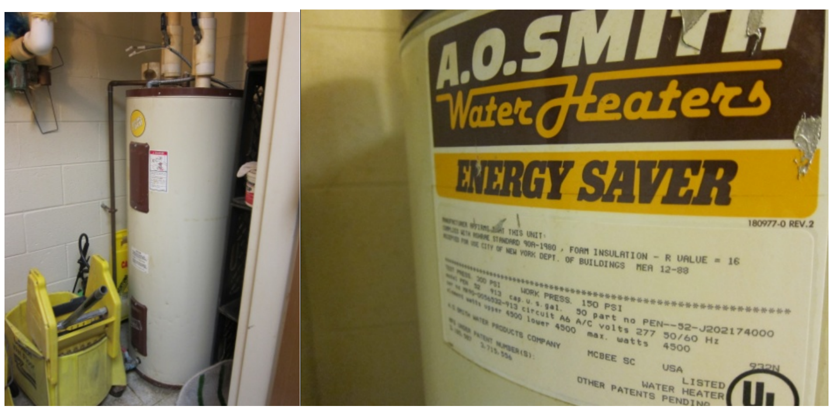
The newer building is ventilated with fresh air directly to each space by the unit ventilators and PTUs. Small exhaust fans located in each bathroom help to remove stale air.

Domestic Hot Water

Domestic Hot Water (DHW) is provided to the older building by an AO Smith gas-fired DHW heater with 40 gallons of storage located in the boiler room. This atmospheric AO Smith water heater was installed in 1988 and is currently operating beyond its expected useful lifetime. The DHW heater is controlled a single dial located on the DHW heater. DHW temperatures were found to be 120°F.

DHW Heater (L); DHW Heater Controls (R)

DHW is provided to the new school by an electric AO Smith DHW heater with 50 gallons of storage located in a mechanical closet near the Nurse's office. This unit uses a maximum of 4,500W and was installed in 1988. This unit is currently operating beyond its expected useful lifetime.



*D*HW Heater (L); DHW Heater Label (R)

Electrical systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

Interior Lighting - The primary interior lighting at the Washington Township Grenloch Terrace Early Childhood Center is electronically ballasted T8 lamped fixtures. Also installed are pulse start metal halides, compact fluorescent and LED fixtures on the exterior. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Typical interior T8 lighting in the old building (L.) classroom T8 lighting in the new building (R.)

Exit Lights - Exit signs were found to be LED type

Typical LED exit sign

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of pulse start metal halide, mercury vapor, CFL, and LED lamped fixtures. Exterior lighting is controlled by both photocells and timers.

Typical metal halide and LED exterior fixtures

Typical CFL bollard and pole mounted mercury vapor fixtures

Appliances and process

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines and printers all create an electrical load on the building that is hard to separate out from the rest of the building’s energy usage based on utility analysis.

Installed at Washington Township Grenloch Terrace facility are two refrigerators, and one refrigerated vending machine.

Typical refrigerators and vending machine

Elevators

No elevators are installed at the Grenloch Terrace facilities.

Other electrical systems

There are currently no other significant energy-impacting electrical systems installed at the Washington Township Grenloch Terrace facility.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

Currently there are no renewable energy systems installed in the building.

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

Based on utility analysis and a study of roof conditions, the Grenloch Terrace facility is not a good candidate for Solar Panel installation. Asphalt-shingled roofs on both buildings at the facility are in need of replacement and there is concern that complaints may arise from a local neighbor that operates a HAM radio and other antennas nearby.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The Grenloch Terrace facility is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The Grenloch Terrace facility is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system and based on the limited HVAC used due to the size of the school.

Combined Heat and Power

The Grenloch Terrace facility is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a constant electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Additionally, the seasonal occupancy schedule of the facility is not well suited for a CHP installation.

ENERGY CONSERVATION MEASURES AND CAPITAL IMPROVEMENTS

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions and shows an opportunity to reduce total building energy use. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital Improvements may also constitute equipment that is currently being operated beyond its expected useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the Washington Township Grenloch Terrace facility:

#	Energy Conservation Measures
ECM 1	Replace gas DHW heater in Old Building
ECM 2	Replaced electric DHW heater in New Building
	Capital Improvement Measures
CI 1	Replace 6 AHUs and condensing units in Old Building
CI 2	Replace 2 smaller ventilating units in Old Building
CI 3	Replace window air conditioning unit in Old Building
CI 4	Replace existing non-insulated windows with ENERGY STAR® windows, with low-E glazing and with two or more panes
CI 5	Replace existing non-insulated doors with fire rated insulated models, with low-E double glazing for the window panels
CI 6	Replace existing shingled roofs on both New and Old Buildings

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling.

ECM#1: Replace gas DHW heater in Old Building

The Old Building contains an AO Smith gas-fired DHW heater with 40 gallons of storage located in the boiler room. This domestic water heater was installed in 1988 and is currently operating beyond its expected useful lifetime. It was determined that this older water heater is operating at a thermal efficiency of 78%, while a newer seal-combustion water heater will have a minimum efficiency of 84%.

Based on similar replacements of water heaters by the Washington Township Board of Education, it is recommended that the school install a Lochinvar condensing water heater or similar. Condensing water heaters are capable of a minimum thermal efficiency of 84% with efficiencies possible of up to 94% when in condensing mode.

Installation cost:

Estimated installed cost: $1,618
Source of cost estimate: RS Means Cost Works software; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Replace gas DHW heater in Old School	$1,618	$50	$1,568	0	0.0	26	0.1	$60	$90	10	$895	17.5	-43%	-4%	-9%	$28	289

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The existing DHW is assumed to have a thermal efficiency of 78%, while a new condensing water heater will have a minimum thermal efficiency of 84% at all times.

Rebates/financial incentives:

- NJ Clean Energy – NJ SmartStart Program
    - Incentive available for gas hot water heaters - $50 per unit

Please see APPENDIX G for more information on Incentive Programs.

ECM#2: Replaced electric DHW heater in New School

The New Building contains an AO Smith electric DHW heater with 50 gallons of storage located in a mechanical closet near the Nurse's office. This unit has an upper element (4,500W) and a lower element (4,500W) with a maximum output of 4,500W. This unit was installed in 1988 and is operating beyond its expected useful lifetime.

This measure will consists of an in-kind replacement for the current electric water heater. Since electric heaters are 100% efficient by nature, there will not be a significant energy savings. Based on the age of the equipment, it is assumed that the tank liner and other components of the water heater have failed and are causing a 5% decrease in operating efficiency.

Installation cost:

Estimated installed cost: $1,352
Source of cost estimate: RS Means Cost Works software; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Replace electric DHW heater in New School	$1,352	$0	$1,352	481	3.2	0	0.1	$60	$142	10	$1,422	9.5	5%	1%	1%	$44	861

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The existing DHW is assumed to have a 5% decrease in efficiency due to failed components based on the age of the equipment. A new electric DHW heater will not have a higher nameplate efficiency; however, savings will occur based on removing the outdated equipment.

Rebates/financial incentives:

- No incentives available for an electric DHW heater

Please see APPENDIX G for more information on Incentive Programs.

CI #1: Replace 6 AHUs and condensing units in Old Building

The old building contains 6 AHUs located in the attic that are attached to 6 condensing units to provide ventilation and cooling to the 6 main classrooms in the building. Currently, these units are operating and show no sign of failure. These units were installed in 1994 and are operating beyond their expected useful lifetime. Replacing these units will not result in a substantial energy savings opportunity.

This measure is recommended as a Capital Improvement for several reasons: the units are still operating without major concern but have reached the end of its useful lifetime, the measure will have a long payback period based on minimal savings and a high installed cost and reasonable payback calculations are not possible without a more in-depth study.

This Capital Improvement consists of replacing both the AHUs and Condensing units. Based on failure of the equipment and available funds, this equipment may be replaced at the same time or condensing units may be replaced prior to replacement of the AHUs. Implementation costs are presented below:

Replacement Component	Installed Cost
Replacement of six 5 ton condensing units	$29,726
Replacement of six 5 ton, 1,780 CFM AHUs	$35,410
Total Replacement Costs	**$65,136**

CI #2: Replace 2 smaller ventilating units in Old Building

The old building contains two heating only ventilating units in small offices and storage spaces on the 1st floor. These units were installed in 1994 and are currently operating beyond their useful lifetime. These units contain a steam coil to provide heating for the spaces that they serve.

This measure is recommended as a Capital improvement since replacing these units will not have a significant impact on energy savings but may significantly impact occupant comfort.

This measure is estimated to cost $1,106.

CI #3: Replace window air conditioning unit in Old Building

The old building contains one window air conditioning unit in a small office area on the first floor. This unit is inefficient with a nameplate cooling efficiency of only 9.4 SEER; however, this unit is used infrequently and would not present significant energy savings.

This measure is recommended as a Capital Improvement due to its non-existent payback. The unit is rarely used; however, it is noted as being old and inefficient.

This measure is estimated to cost $180.

CI #4: Replace existing non-insulated windows with ENERGY STAR® windows, with low-E glazing and with two or more panes

Throughout both buildings the existing windows have poor thermal properties that allow heat loss in the winter and solar heat gain in the summer. Due to the high capital costs, it is recommended that these units are replaced based on available funds or upon failure. SWA recommends replacing the windows with ENERGY STAR® certified models, which would provide better insulating properties, and potentially reduce cooling and heating loads.

This measure is recommended as a Capital Improvement due to its high installed cost relative to a poor payback period and requires a feasibility study including a detailed energy model in order to reasonably calculate energy savings.

An estimated project cost to replace 125 windows is $98,383.

CI #5: Replace existing non-insulated doors with fire rated insulated models, with low-E double glazing for the window panels

Throughout both buildings the existing doors have poor thermal properties that allow heat loss in the winter and heat gain in the summer. Due to the high capital costs, it is recommended that these units are replaced based on available funds or upon failure. SWA recommends replacing the doors with better insulating properties and new weather-stripping. Better insulated doors would potentially reduce cooling and heating loads, and save energy in the long-term.

This measure is recommended as a Capital Improvement due to its high installed cost relative to a poor payback period and requires a feasibility study including a detailed energy model in order to reasonably calculate energy savings.

An estimated project cost to replace the 20 single doors and 8 double doors is $41,312.

CI #6: Replace existing shingled roofs on both New and Old Buildings

Both buildings contain asphalt shingled roofs that are showing signs of wear. Based on facility maintenance records, both roofs have lasted beyond their manufacturer's warrant and recommended useful lifetime.

This measure is recommended as a Capital Improvement due to its high installed cost relative to a poor payback period and requires a feasibility study including a detailed energy model in order to reasonably calculate energy savings.

SWA estimates the roof replacements at a total cost of $50,758 based on the total footprint of the buildings.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Inspect and replace cracked/ineffective caulk.

- Inspect and maintain sealants at all windows for airtight performance.

- Inspect and maintain weather-stripping around all exterior doors and roof hatches.

- Provide water-efficient fixtures and controls - Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. More information can be found in the "Products" section of the ENERGY STAR® website at: http://www.energystar.gov.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches how to minimize energy use. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

APPENDIX A: EQUIPMENT LIST

Building System	Description	Model #	Fuel	Location	Space Served	Date Installed	Expected Useful Lifetime (Years)	Estimated Remaining Useful Life %
Domestic Hot Water	DHW-1; A.O Smith Domestic Hot Water Heater, 50 gallon capacity, 4500W upper element, 4500W lower element, 4500W max, Foam insulation R value 16, 110°F setpoint	AO Smith Energy Saver, Model #PEN 52 9213, Serial #MK90-0056532-913	Electricity	L shaped; Mechanical Closet near Nurses office	Entire School	1988	10	0%
Cooling	CU-1; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABS342 A600, Serial #3008E1526 3	Electricity	L shaped; Exterior outside of Room 12 - Library	Room 12 - Library	2008	15	73%
Cooling	CU-2; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABR342 A0060010, Serial #2006E3120 1	Electricity	L shaped; Exterior outside of Room 13	Room 13	2008	15	73%
Cooling	CU-3; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABR342 A600, Serial #1606E2295 6	Electricity	L shaped; Exterior outside of Room 14	Room 14	2008	15	73%
Cooling	CU-4/HP-1; York heat pump, R-22 refrigerant, 1 compressor	York, Model #E1FB04B5 25A, Serial #EGAM2983 07	Electricity	L shaped; Exterior outside of Room 24	Entranc e/ Atrium	1992	15	0%
Cooling	CU-5; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABS342 A300, Serial #3808E2013 3	Electricity	L shaped; Exterior outside of Room 24	Room 24	2008	15	73%
Cooling	CU-6; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABR342 A310, Serial #1708E1214 0	Electricity	L shaped; Exterior outside of Room 25	Room 25	2008	15	73%
Cooling	CU-7; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABB342 A600, Serial #3809E0700 0	Electricity	L shaped; Exterior outside of Room 26	Room 26	2009	15	80%

Cooling	CU-8; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABB342 A600, Serial #3809E0699 6	Electricity	L shaped; Exterior outside of Room 27	Room 27	2009	15	80%
Cooling	CU-9; York condensing unit, R-106 refrigerant, 1 compressor	York Stellar Plus, Model #E4FH018S 06A, Serial #WCLM001 668	Electricity	L shaped; Exterior outside of Room 27	Room 27/28	2009	15	80%
Cooling	CU-10; Carrier condensing unit, R-410a, 1 compressor	Carrier, Model #24ABB324 W310, Serial #4610E0794 7	Electricity	L shaped; Exterior outside of Room 28	Room 28	2010	15	87%
Cooling	CU-11; York condensing unit, R-22 refrigerant, 1 compressor	York, Model #E1FB018S 06A, Serial #EABM0017 40	Electricity	L shaped; Exterior outside of Facility Work Room	Facility Work Room/ Confere nce Room	1992	15	0%
Cooling	CU-12; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABB324 W310, Serial #4610E0795 8	Electricity	L shaped; Exterior outside of Facility Work Room	Facility Work Room/ ITN Facility Office	2009	15	80%
Cooling	CU-13; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 620, Serial #2905E1172 2	Electricity	L shaped; Exterior outside of Room 15	Room 15	2008	15	73%
Cooling	CU-14; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #24ABS342 A600, Serial #3008E1527 2	Electricity	L shaped; Exterior outside of Room 14	Room 14	2008	15	73%
Cooling	CU-15; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 620, Serial #3804E1359 8	Electricity	L shaped; Exterior outside of Room 17	Room 17	2008	15	73%
Cooling	CU-16; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 620, Serial #3603E0422 0	Electricity	L shaped; Exterior outside of Room 18	Room 18	2008	15	73%
Cooling	CU-17; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 610, Serial #0303E0492 6	Electricity	L shaped; Exterior outside of Room 19	Room 19	2008	15	73%

Cooling	CU-18; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 610, Serial #1901E1080 1	Electricity	L shaped; Exterior outside of Room 20	Room 20	2008	15	73%
Cooling	CU-19; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CK0426 10, Serial #1901E1080 7	Electricity	L shaped; Exterior outside of Room 21	Room 21	2008	15	73%
Cooling	CU-20; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CKC042 620, Serial #3603E0424 7	Electricity	L shaped; Exterior outside of Room 22	Room 22	2008	15	73%
Cooling	CU-21; Carrier condensing unit, R-22 refrigerant, 1 compressor	Carrier, Model #38CK0426 10, Serial #0303E0491 7	Electricity	L shaped; Exteriour outside of Room 23	Room 23	2008	15	73%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L shaped; Nurse's Office	Nurse's Office	1991	25	16%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L shaped; Nurse's Office	Nurse's Office	1991	25	16%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L shaped; Child Study Team	Child Study Team	1991	25	16%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L shaped; Main Office	Main Office	1991	25	16%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L shaped; Guidance Office	Guidanc e Office	1991	25	16%
Heating/ Cooling	PTAC-1; PTAC unit; model info not available	Model NA	Electricity	L Shaped; Principal's Office	Principa l's Office	1991	25	16%
Heating	B-1; Weil-McLain boiler, 15 PSI, 1,632 MBH output, 2,049 MBH input, 79.6% nominal efficiency with thermal tank to mix condensate with domestic cold water before re-introduced to boiler	Weil-McLain, 88 series, Model #788	Natural Gas	Older building; Boiler Room	All areas	1989	25	8%
Heating	Power Flame burner attached to B-1; 2,200 MBH max input	Power Flame, Invoice #73427, Model #WCR2-C-15, Serial	Natural Gas	Older building; Boiler Room	All areas	1989	25	8%

		#098947060						
Domestic Hot Water	DHW-1; AO Smith atmospheric automatic storage domestic hot water heater, 40 gallon capacity, uses 290 therms ($163 @ $.562/therm) per year according to EnergyGuide label	AO Smith Conservationist '90, Model PQC-40-208, Part #PQC--40-J00N010000	Natural Gas	Older building; Boiler Room	All areas	1988	10	0%
Cooling	AC-1; Airwell-Fedders window AC unit, 24,000 Btuh, 2,550 W, 9.4 EER, R410A refrigerant	Airwell-Fedders, Model #Az7R24E7A	Electricity	Older building; Teacher's Lounge	Teacher's Lounge	2010	10	80%
Ventilation/ Cooling	AHU-1; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons	Trane, Model #TWE060A100BB, Serial #J27178619	Electricity	Older building; Attic	Room 7	1994	15	0%
Ventilation/ Cooling	AHU-2; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons, 1,800 CFM	Trane, Model #TWE060A100BB, Serial #J27178T24	Electricity	Older building; Attic	Room 6	1994	15	0%
Ventilation/ Cooling	AHU-3; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons, 1,800 CFM	Trane, Model #TWE060A100BB, Serial #J27178670	Electricity	Older building; Attic	Room 3	1994	15	0%
Ventilation/ Cooling	AHU-4; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons, 1,800 CFM	Trane, Model #TWE060A100BB, Serial #J27178205	Electricity	Older building; Attic	Room 5	1994	15	0%
Ventilation/ Cooling	AHU-5; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons, 1,800 CFM	Trane, Model #TWE060A100BB, Serial #J27178620	Electricity	Older building; Attic	Room 1	1994	15	0%

Ventilation/ Cooling	AHU-6; Trane split air handling unit with outside condensing unit, R-22 refrigerant, 60 MBH, 5 tons, 1,800 CFM	Trane, Model #TWE060A100BB, Serial #J27178725	Electricity	Older building; Attic	Room 2	1994	15	0%
Ventilation/ Heating	AHU-7; Altru-V small air handling unit with steam heat, max steam 6 PSIG, 115V, 1 ph, 1/4 HP motor, <100 CFM	Altru-V, Model #ABEIAMHAAH4501110, Serial #85L5500	Electricity/ Steam	Older building; Art Supply Room on 1st Floor	Art Supply Room	1994	15	0%
Ventilation/ Heating	AHU-8; Altru-V small air handling unit with steam heat, max steam 6 PSIG, 115V, 1 ph, 1/4 HP motor, <100 CFM	Altru-V, Model #ABEIAMHAAH4501110, Serial #N/A	Electricity/ Steam	Older building; Room 9 on 1st Floor	Room 9	1994	15	0%
Cooling	AC-2; Fedders small AC unit	Fedders, Model NA	Electricity	Older building; Room 9 on 1st Floor	Room 9	1985	15	0%
Cooling	CU-1; Trane condensing unit for AHU-5, R-22, 1 compressor	Trane, Model #TTA060C300A0, Serial #J20231169	Electricity	Older building; Front Exterior	Room 1	1994	15	0%
Cooling	CU-2; Trane condensing unit for AHU-6, R-22, 1 compressor	Trane, Model #TTA060C300A0, Serial #J20231160	Electricity	Older building; Front Exterior	Room 2	1994	15	0%
Cooling	CU-3; Trane condensing unit for AHU-3, R-22, 1 compressor	Trane, Model #TTA060C300A0, Serial #J24292122	Electricity	Older building; Front Exterior	Room 3	1994	15	0%
Cooling	CU-5; Trane condensing unit for AHU-4, R-22, 1 compressor	Trane, Model #TTA060C300A0, Serial #J24292123	Electricity	Older building; Front Exterior	Room 5	1994	15	0%
Cooling	CU-6; Trane condensing unit for AHU-2, R-22, 1 compressor	Trane, Model #TTA048C300A0, Serial #J19217209	Electricity	Older building; Front Exterior	Room 6	1994	15	0%
Cooling	CU-7; Trane condensing unit for AHU-1, R-22, 1 compressor	Trane, Model #TTA048C300A0, Serial #J17289106	Electricity	Older building; Front Exterior	Room 7	1994	15	0%

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

Appendix B: Lighting Study

Location			Existing Fixture Information											
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year
1	1	Hallway (HALL)	Recessed Parabolic	E	4'T8	10	2	32	Sw	9	208	5	690	1,292
2	1	Office (OFFICE)	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	208	5	202	336
3	1	Nurse's Station (NURSE)	Recessed Parabolic	E	4'T8	6	2	32	Sw	7	208	5	414	603
4	1	Nurse's Station (NURSE)	Recessed Parabolic	E	4'T8	1	2	32	Sw	7	208	5	69	100
5	1	Office (OFFICE 2)	Recessed Parabolic	E	4'T8	10	2	32	Sw	8	208	5	690	1,148
6	1	Classroom (18)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
7	1	Bathroom (18)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
8	1	Classroom (19)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
9	1	Bathroom (19)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
10	1	Classroom (20)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
11	1	Bathroom (20)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
12	1	Classroom (21)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
13	1	Bathroom (21)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
14	1	Classroom (22)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
15	1	Bathroom (22)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
16	1	Classroom (23)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
17	1	Bathroom (23)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
18	1	Bathroom Men (BOYS)	Recessed Parabolic	E	4'T8	2	2	32	Sw	6	208	5	138	172
19	1	Bathroom Women (GIRLS)	Recessed Parabolic	E	4'T8	3	2	32	Sw	6	208	5	207	258
20	1	Storage Closet (STORAGE)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	208	5	69	29
21	1	Library (12)	Recessed Parabolic	E	4'T8	8	2	32	Sw	7	208	5	552	804
22	1	Storage Closet (12)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	7	208	5	138	201
23	1	Classroom (14)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
24	1	Bathroom (14)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
25	1	Classroom (15)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
26	1	Bathroom (15)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
27	1	Classroom (16)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
28	1	Bathroom (16)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
29	1	Classroom (17)	Recessed Parabolic	E	4'T8	8	2	32	Sw	6	208	5	552	689
30	1	Bathroom (17)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
31	1	Hallway (NEW HALL)	Recessed Parabolic	E	4'T8	30	1	32	Sw	9	208	5	1,110	2,078
32	1	Classroom (24)	Recessed Parabolic	E	4'T8	13	3	32	Sw	6	208	5	1,313	1,639
33	1	Bathroom (24)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
34	1	Classroom (24)	Recessed Parabolic	E	2'T8	1	2	17	Sw	6	208	2	36	45
35	1	Classroom (25)	Recessed Parabolic	E	4'T8	13	3	32	Sw	6	208	5	1,313	1,639
36	1	Bathroom (25)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
37	1	Classroom (25)	Recessed Parabolic	E	2'T8	1	2	17	Sw	6	208	2	36	45
38	1	Classroom (26)	Recessed Parabolic	E	4'T8	13	3	32	Sw	6	208	5	1,313	1,639
39	1	Bathroom (26)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
40	1	Classroom (26)	Recessed Parabolic	E	2'T8	1	2	17	Sw	6	208	2	36	45
41	1	Classroom (27)	Recessed Parabolic	E	4'T8	13	3	32	Sw	6	208	5	1,313	1,639
42	1	Bathroom (27)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
43	1	Classroom (27)	Recessed Parabolic	E	2'T8	1	2	17	Sw	6	208	2	36	45
44	1	Classroom (28)	Recessed Parabolic	E	4'T8	13	3	32	Sw	6	208	5	1,313	1,639
45	1	Bathroom (28)	Recessed Parabolic	S	Inc	1	1	60	Sw	4	208	0	60	50
46	1	Classroom (28)	Recessed Parabolic	E	2'T8	1	2	17	Sw	6	208	2	36	45
47	1	Electrical Rm (ELEC)	Parabolic Ceiling Suspended	E	4'T8	2	2	32	Sw	2	208	5	138	57
48	1	Lunch Rm (30)	Recessed Parabolic	E	4'T8	4	3	32	Sw	6	208	5	404	504
49	1	Office Area (29)	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	208	5	404	672
50	1	Exterior (EXT)	Wallpack	S	HPS	20	1	70	PC	12	365	14	1,680	7,358
51	1	Multi-Purpose	Ceiling Mounted	E	8'T8	8	2	59	Sw	6	208	7	1,000	1,248
52	1	Multi-Purpose	Exit Sign	S	LED	1	1	25	N	24	365	3	28	241
53	1	Office Area	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48
54	1	Office Area	Ceiling Mounted	E	4'T8	4	2	32	Sw	8	261	5	276	576
55	1	Storage Rm	Ceiling Mounted	E	4'T8	4	2	32	Sw	2	261	5	276	144
56	2	Hallway	Ceiling Mounted	E	4'T8	5	2	32	Sw	11	261	5	345	990
57	2	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96
58	Attic	Attic	Ceiling Mounted	S	Inc	2	1	60	Sw	1	50	0	120	6
59	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
60	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
61	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
62	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
63	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
64	2	Classroom	Ceiling Suspended	E	4'T8	12	2	32	Sw	6	208	5	828	1,033
65	Str	Staircase	Wall Mounted	E	4'T8	3	2	32	Sw	9	208	5	207	388
66	Str	Staircase	Wall Mounted	E	4'T8	3	2	32	Sw	9	208	5	207	388
67	1	Vestibule	Ceiling Suspended	S	CFL	1	1	13	Sw	9	208	0	13	24
68	1	Vestibule	Ceiling Suspended	S	CFL	1	1	13	Sw	9	208	0	13	24
69	1	Vestibule	Exit Sign	S	LED	1	1	25	N	24	208	3	28	137
70	1	Vestibule	Exit Sign	S	LED	1	1	25	N	24	208	3	28	137
71	1	Storage Rm	Ceiling Mounted	E	4'T8	2	2	32	Sw	4	100	5	138	55
72	1	Bathroom	Ceiling Mounted	E	4'T8	1	2	32	Sw	4	208	5	69	57
73	1	Bathroom	Ceiling Mounted	E	4'T8	1	2	32	Sw	4	208	5	69	57
74	1	Faculty Lounge	Ceiling Suspended	E	4'T8	5	2	32	Sw	8	208	5	345	574
75	1	Boiler Rm	Ceiling Mounted	E	4'T8	4	2	32	Sw	4	208	5	276	230
76	1	Storage Rm	Ceiling Mounted	E	4'T8	1	2	32	Sw	1	100	5	69	7
77	2	Bathroom Men	Ceiling Mounted	E	4'T8	2	2	32	Sw	4	208	5	138	115
78	2	Bathroom Women	Ceiling Mounted	E	4'T8	2	2	32	Sw	4	208	5	138	115
Totals:						397	139	2,821				280	28,836	43,528

Legend								
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped "G" lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydrochlorofluorocarbons):

- As of **January 1, 2010,** no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company	(800) 756-3749

One South Jersey Plaza, Route 54 Folsom, NJ 08037	www.southjerseyenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for South Jersey Gas Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street	(800) 363-7499 www.pepco-services.com

Lebanon, NJ 08833	
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

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

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

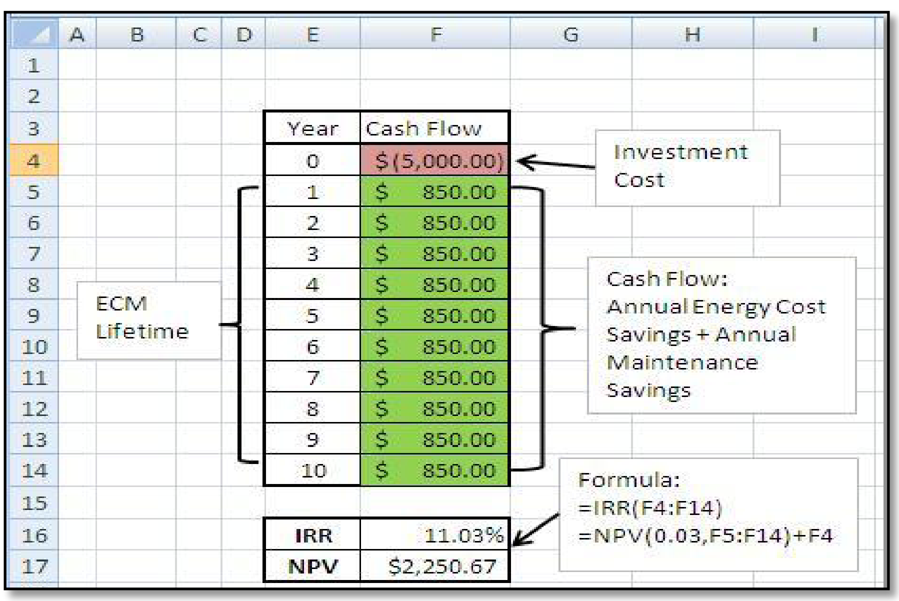
Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV (rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $600/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial Equipment Life Span

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

OMB No. 2060-0347

ENERGY STAR

STATEMENT OF ENERGY PERFORMANCE
Grenloch Early Childhood Center

Building ID: 2845066
For 12-month Period Ending: August 31, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 05, 2012

Facility
Grenloch Early Childhood Center
251 Woodbury-Turnersville Road
Gloucester, NJ 08080

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1936
Gross Floor Area (ft²): 31,139

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	259,157
Natural Gas (kBtu)[4]	862,497
Total Energy (kBtu)	1,121,654

Energy Intensity[4]

Site (kBtu/ft²/yr)	36
Source (kBtu/ft²/yr)	57

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	83

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

National Median Comparison

National Median Site EUI	70
National Median Source EUI	127
% Difference from National Median Source EUI	-55%
Building Type	Other

Stamp of Certifying Professional

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

Meets Industry Standards[5] **for Indoor Environmental Conditions:**

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

Certifying Professional
N/A

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

APPENDIX G: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures, and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15% performance threshold savings has been achieved.

Energy Provider Incentives

- **South Jersey Gas** - Offers financing up to $100,000 on the customer's portion of project cost through private lender. In addition to available financing, it provides matching incentive on gas P4P incentives #2 and #3 up to $100,000 (not to exceed total project cost).

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 60%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 100 kW** within 12 months of applying (the 100 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to $25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.
- **Atlantic City Electric –** Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of $5,000 per customer.

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install or visit the utility web sites.

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

Energy Provider Incentives

- **South Jersey Gas –** Program to finance projects up to $25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
  PSE&G - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program*

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Combined Heat and Power (CHP)

Energy Provider Incentives

- South Jersey Gas - Provides additional incentive of $1.00/watt up to $1,000,000 on top of NJCEP incentive.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG.

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX H: RECOMMENDED MEASURES

#	ECM Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
ECM 1	Replace gas DHW heater in Old School	$1,618	$50	$1,568	0	0.0	26	0.1	$60	$90	10	$895	17.5	-43%	-4%	-9%	$28	289
ECM 2	Replace electric DHW heater in New School	$1,352	$0	$1,352	481	3.2	0	0.1	$60	$142	10	$1,422	9.5	5%	1%	1%	$44	861
CI 1	Replace 6 AHUs and condensing units in Old Building	$65,136	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 2	Replace 2 smaller ventilating units in Old Building	$1,106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 3	Replace window air conditioning unit in Old Building	$180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 4	Replace existing non-insulated windows	$98,383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 5	Replace existing non-insulated doors	$41,312	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 6	Replace existing shingled roofs	$50,758	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals:		**$259,845**	**$50**	**$259,795**	**481**	**3.2**	**26**	**0.1**	**$120**	**$232**	**-**	**$2,317**	**27.0**	**-**	**-**	**-**	**-**	**1,149**

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%

Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

APPENDIX I: COST WORKS COST ESTIMATES

Washington Township
251 Woodbury-Turnersville Rd
Sewell,
NJ, 08080
Year 2011 Quarter 4

Date: 5-Feb-12

Unit Detail Report

Cost Estimate Report
CostWorks
RSMeans

Grenloch Terrace

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 11 Equipment							
113133236950			Water heater, residential appliances, electric, glass lined, 30 gallon, maximum	1.00	Ea.	$1,351.86	$1,351.86
113133237260			Water heater, residential appliances, gas, glass lined, 50 gallon, minimum	1.00	Ea.	$1,617.90	$1,617.90
Division 11 Subtotal							**$2,969.76**
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)							
230505102730			Heating and ventilating unit, selective demolition	2.00	Ea.	$552.98	$1,105.96
236213100500			Condensing unit, air cooled, compressor, 5 Ton, includes standard controls	6.00	Ea.	$4,954.30	$29,725.80
237313100906			Air handling unit, built-up, horizontal/vertical, constant volume, single zone, 2000 CFM, with cooling/heating coil section, filters, mixing box	6.00	Ea.	$5,901.70	$35,410.20
Division 23 Subtotal							**$66,241.96**

APPENDIX J: METHOD OF ANALYSIS

Assumptions and tools

Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.