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Local Government Energy Program
Energy Audit Final Report

Borough of Freehold

Police Headquarters
36-38 Jackson Street
Freehold, NJ 07728

Project Number: LGEA55

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EXECUTIVE SUMMARY

The Freehold Police Headquarters is comprised of a total conditioned floor area of 15,660 square feet and occupies the first floor of an eight-story mixed use building. The headquarters began to occupy the structure in 2003, and there have been no major renovations or additions since then. The following chart provides an overview of current energy usage in the building based on the analysis period of January 2009 through December 2009:

Table 1: State of Building—Energy Usage

	Electric Usage, kWh/yr	Current Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	281,600	47,021	61.4	961
Proposed	233,891	38,099	51.0	798
Savings	47,709	8,922	10.4	163
% Savings	17	19	17	17

There may be energy procurement opportunities for the Police Headquarters to reduce annual utility costs, which are $4,787 higher, when compared to the average estimated NJ commercial utility rates.

SWA has entered energy information about the complex into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The headquarters is categorized as a non-eligible ("Other") space type. Since it is an "Other" space type, there is no rating available. Consequently, it is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 61.0 $\frac{kBtu}{ft^2-yr}$ compared to the national average of a commercial office building consuming 104.0 $\frac{kBtu}{ft^2-yr}$. The Site Energy Use Intensity is low for this building and can be attributed to the Police Headquarters being situated within a larger building, with domestic hot water use supplied by the building and the ceiling acting as an adiabatic barrier. See ECM section for guidance on how to improve the building's rating.

Based on the current state of the building and its energy use, SWA recommends implementing various energy conservation measures from the savings detailed in Table 1. The measures are categorized by payback period in Table 2 below:

Table 2: Energy Conservation Measure Recommendations

ECMs	Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	8,765	3.9	33,831	83,731
5-10 Year	158	7.3	1,154	1,692
Total	123,592	3.9	34,895	85,423

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 12 cars from the roads each year or avoiding the need of 263 trees to absorb the annual CO_2 generated.

Other recommendations to increase building efficiency pertaining to operations and maintenance and capital improvements are listed below:

Further Recommendations:

SWA recommends that the Police Headquarters further explore the following:

- Capital Improvements
    - Add insulation to wall separating break room and bike storage
    - Repair all damaged, warped and exposed window frames
    - Insulate and seal all exposed conduits
    - Slope existing surfaces away from exterior walls to prevent water damage
    - Repair shifted brick masonry units

- Operations and Maintenance
    - Maintain roofs
    - Provide weather-stripping/air-sealing
    - Repair/seal wall cracks and penetrations
    - Provide water efficient fixtures and controls
    - Purchase Energy Star equipment as needed
    - Use smart power electric strips
    - Create an energy educational program

Financial Incentives and Other Program Opportunities

There are various incentive programs that the Borough of Freehold could apply for that could also help lower the cost of installing the ECMs. Please refer to Appendix F for details.

The Borough of Freehold Police Headquarters forms only a small piece of a larger multi-use building. The Police Headquarters is situated on the first floor of an eight story building, which allows less heated air to escape through the ceiling. Typically, buildings lose a large amount of heated air through the roof of a building, however directly above the Police Headquarters are 7 more floors of conditioned space. Since the Police Headquarters was retro-fitted into a larger building in 2003, much of the equipment still has a majority of its remaining useful life. The Police Headquarters also does not pay for domestic hot water since it is provided by the multi-use building. SWA recommends that the recommended measures are undertaken in order to reduce the electric load of the building. The recommended measures address primarily lighting and appliances, which account for the largest portion of energy use within the building.

INTRODUCTION

Launched in 2008, the 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 Solutions to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 37-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 Police Headquarters at 28 East Main Street. The process of the audit included facility visits on February 17, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, 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.

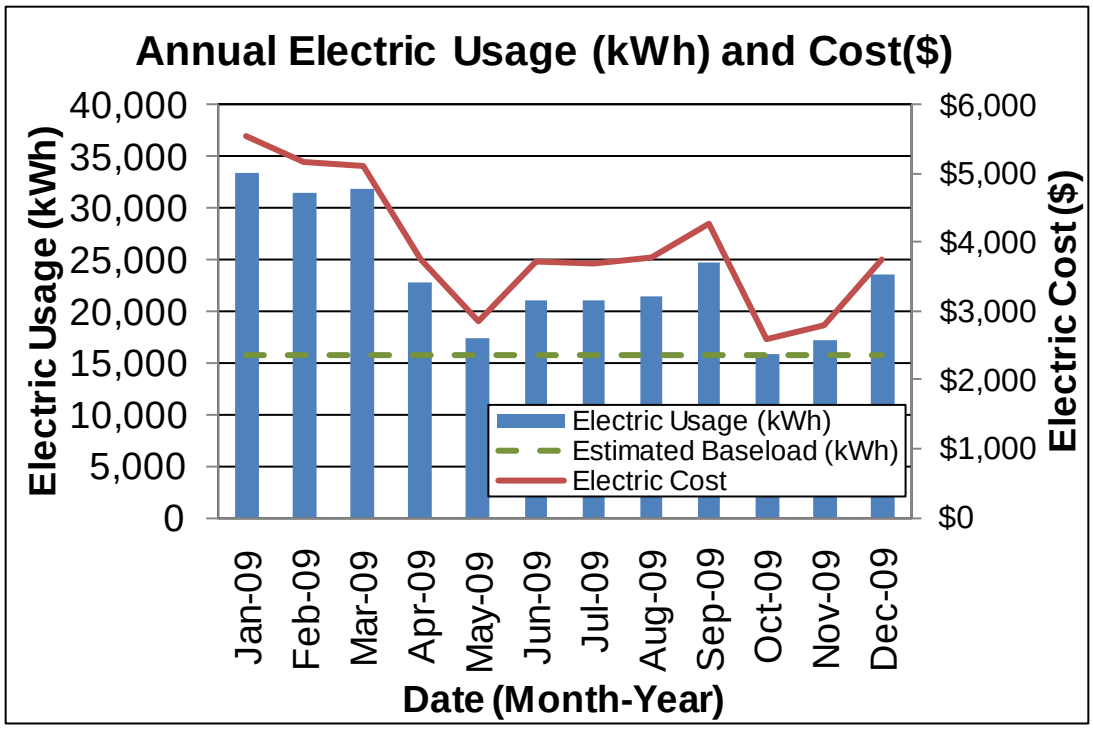
The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Freehold to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the headquarters.

HISTORICAL ENERGY CONSUMPTION

1.1 Energy usage, load profile and cost analysis

SWA reviewed utility bills from January 2008 through December 2009 that were received from the utility companies supplying the police headquarters with electricity. A 12 month period of analysis from January 2009 through December 2009 was used for all calculations and for purposes of benchmarking the building.

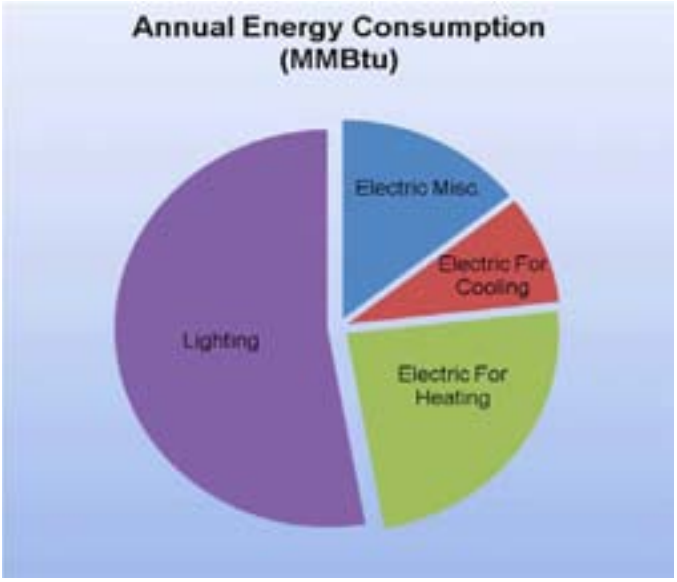
Electricity - The Police Headquarters is currently served by one electric meter. The Headquarters currently buys electricity from JCP&L at **an average aggregated rate of $0.167/kWh**. The Headquarters purchased **approximately 281,600 kWh, or $47,021 worth of electricity,** in the previous year. The average monthly demand was 96.5 kW and the annual peak demand was 111.8 kW.

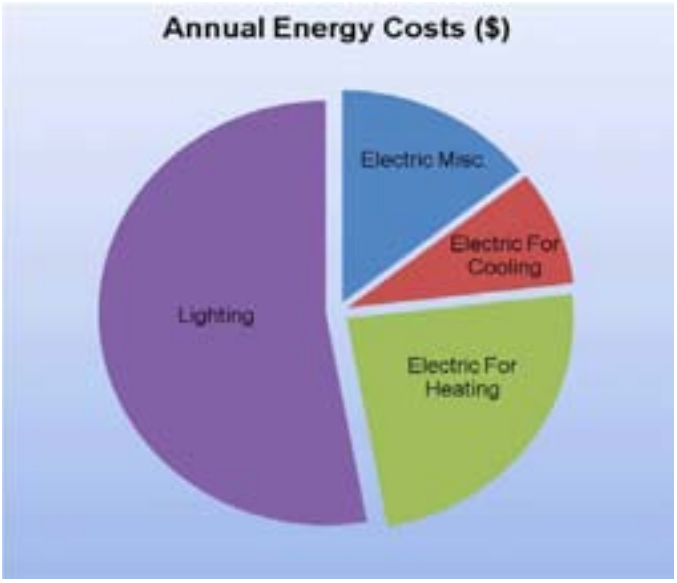


In the above chart, electric usage increases during the summer when air conditioning is used and during the winter when electric heating equipment is used. The estimated baseload is formed primarily by electric lighting and appliances within the building, since domestic hot water is provided by the mixed-use building that the Police Headquarters is located within.

The following graphs, pie charts, and table show energy use for the Police Headquarters based on utility bills for the 12 month period.

2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	138	14%	$6,745	14%	49
Electric For Cooling	85	9%	$4,148	9%	49
Electric For Heating	230	24%	$11,253	24%	49
Lighting	508	53%	$24,875	53%	49
Totals	961	100%	$47,021	100%	49



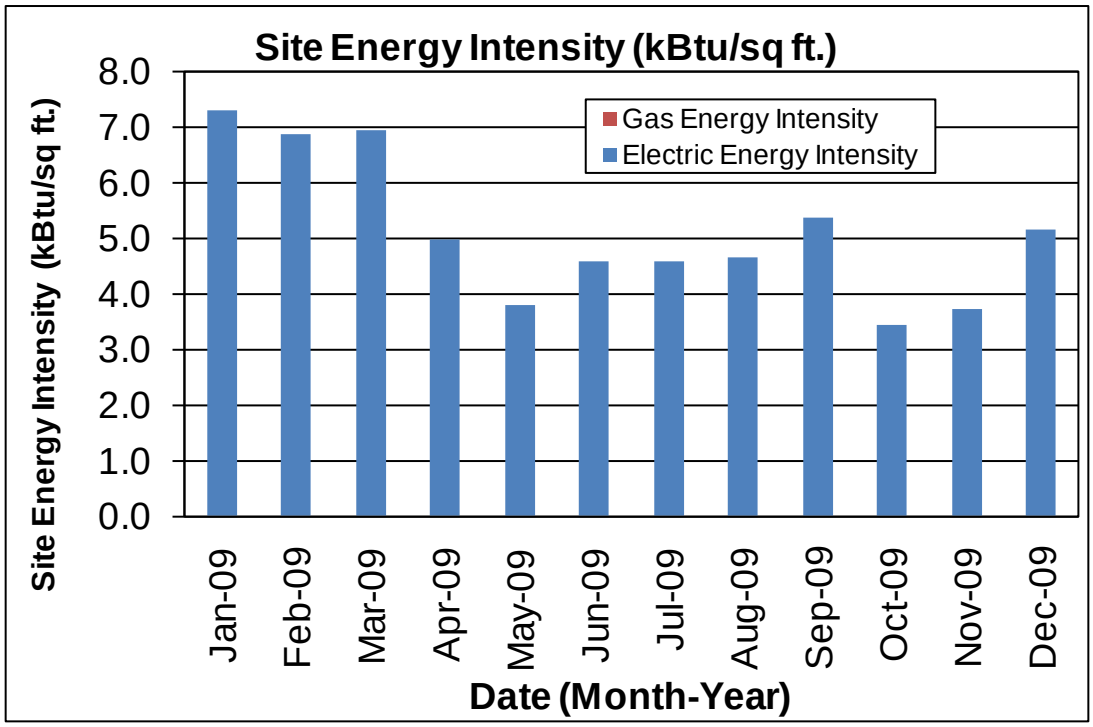


1.2. Energy benchmarking

SWA has entered energy information about the headquarters in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The

Police Headquarters is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the headquarters is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 61.0 $\frac{kBtu}{ft^2-yr}$ compared to the national average of a building consuming 104.0$\frac{kBtu}{ft^2-yr}$. The Site Energy Use Intensity for this building is relatively low compared to other similar buildings. This number is low since the Police Department is provided domestic hot water from the multi-use building that it is located within. In addition, the building has a reduced cooling load due how it is situated within a multi-use building, which allows the building to use efficient heat pumps for both heating and cooling. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for "Other" space types is very subjective, and is not an absolute bellwether for gauging performance.



The above chart shows Site Energy Use Intensity for the Police Headquarters building. Site Energy Use Intensity is used as a metric to measure the density of energy use across the floor are of the building. This chart indicates that energy is used most during the winter months when the heat pumps are used for heating. There is also a peak during the summer months when the heat pumps are operated for cooling purposes.

Per the LGEA program requirements, SWA has assisted the Borough of Freehold to create an *Energy Star Portfolio Manager* account and share the Police Headquarters' information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager Account information with the Municipality (user name of "boroughoffreehold" with a password of "*freehold")* and TRC Solutions.

1.2.1. Tariff analysis

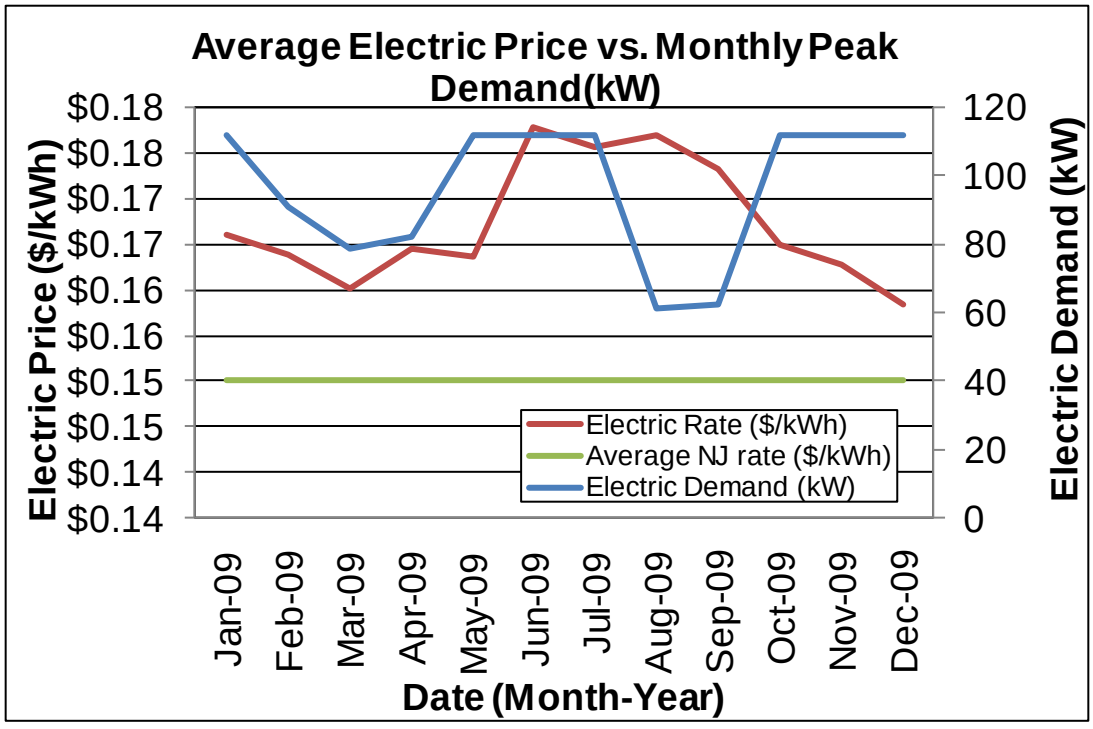
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

Tariff analysis is performed to determine if the rate that a municipality is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electricity. Typically, electricity prices also increase during the cooling months when electricity is used by the air conditioning units.

The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. The building is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. There general service rate for electric charges are market-rate based on use. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

1.2.2. Energy Procurement strategies

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while the Headquarters pays an average rate of $0.167/kWh. The average rate was determined by dividing the total annual cost by the total annual consumption for the building. Buildings with a small floor area (typically 5,000 or less) will exhibit a higher average rate since the energy usage density will be slightly higher with a smaller building. The Police Headquarters annual electric utility costs are $4,787 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 11% over the most recent 12 month period.



The above chart shows that the average annual electric rate ($/kWh) is much higher than NJ

state averages. In addition, increases in the average electric cost ($/kWh) are concurrent with spikes in electric demand (kW).

SWA recommends that the police Headquarters further explore opportunities of purchasing electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the building. Appendix C contains a complete list of third-party energy suppliers for the Borough of Freehold 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 dates, the following data was collected and analyzed.

2.1. Building Characteristics

- Free-standing, eight-story, slab-on-grade building.
- Constructed in 2003 with no additions or architectural alterations.
- Approximately 15,660 square feet of conditioned space
- The building houses a municipal court, holding cells, police station, offices, armory, locker rooms, dispatch room and fitness center.

2.2. Building occupancy profiles

- Typical occupancy of 168 hours per week.
- The police portions and public areas of the building are always open while the court and related offices are only open on weekdays when the court is in session.
- The headquarters is occupied by 50 full time employees and a fluctuating amount of visitors.

2.3. Building envelope

This is an overview of the current state of the building. SWA has included recommendations to improve the efficiency and sustainability of the building. Implementing the suggestions will reduce the energy demand.

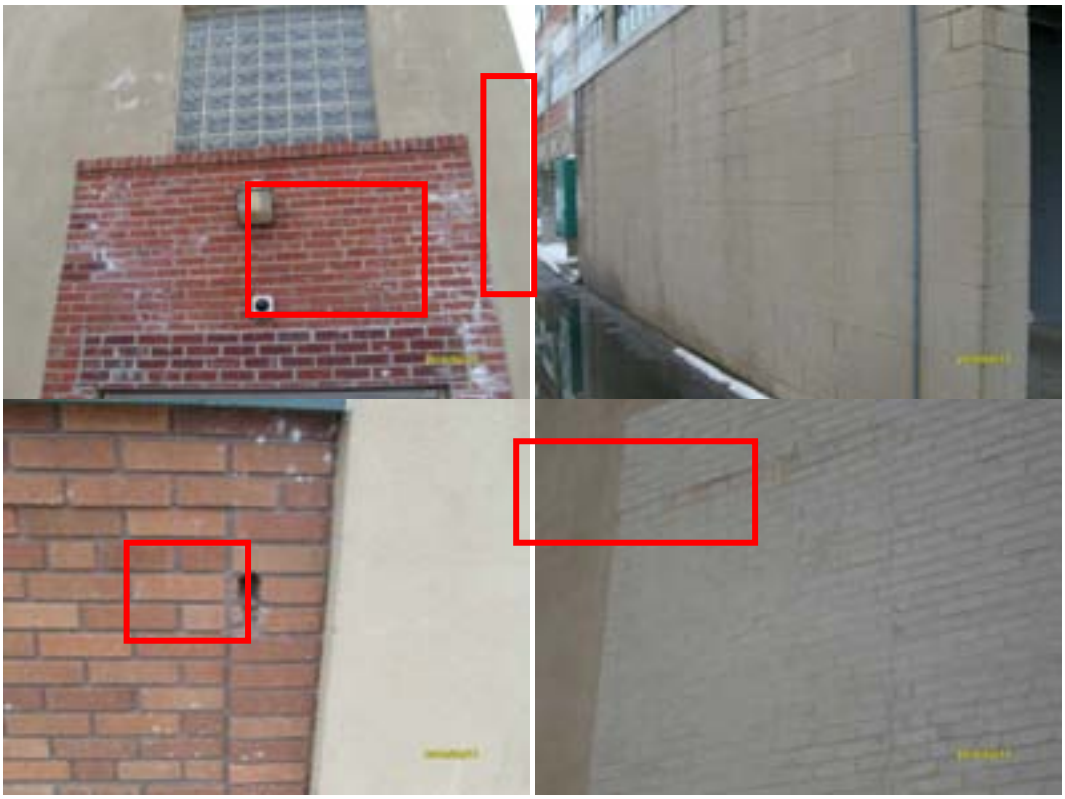
2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of stucco or brick masonry units over concrete block with 1-1/2 inches of assumed insulation. The interior is mostly painted gypsum wallboard.

Note: Wall insulation levels *could not be verified in the field and are based on reports from building management.*

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 located mostly at the side(s) of the building.

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



Cracked/aged caulk, efflorescence on brick and masonry walls indicate moisture presence within the wall cavity, un-caulked/un-sealed exterior wall penetrations, signs of water damage at perimeter walls due to missing/ineffective site drainage and shifted bricks.

In addition to exterior wall penetrations, there is also one area of concern for thermal bridging at one wall in the Police Headquarters lunch/break room. SWA observed that the bike storage area, which is an unconditioned area, was situated adjacent to the lunch/break room with no thermal barrier. This is specifically a significant problem since there is an un-sealed electrical outlet that allows a noticeable amount air to escape to the outside.

Electrical outlet allowing heated air to be lost to bike storage area

2.3.2. Roof

The Police Headquarters is situated on the first floor of an eight-story building. The roof of this building has no affect on the Police Headquarters. Since a condition space is located directly above the Police Headquarters, the ceiling is considered adiabatic and does not have an affect on energy savings.

2.3.3. Base

The building's base is a concrete slab-on grade with a perimeter footing and concrete block walls. No moisture or water-related issues were reported or detected.

2.3.4. Windows

The building contains basically one type of window.:

1. Fixed type windows with an aluminum clad frame, tinted double glazing and interior roller blinds at some installations. The windows are located throughout the building and are original/have never been replaced

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 acceptable condition with some signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

Damaged and exposed window frames that form thermal bridges, warped frames that lead to infiltration, un-insulated conduits that run through windows and a window installation.

2.3.5. Exterior doors

The building contains five different types of exterior doors:

1. Glass with aluminum frame type exterior doors that are integrated with the window systems. They are located throughout the building and are original/have never been replaced.

2. Glass with aluminum frame type exterior doors. They are located throughout the building and are original/have never been replaced.

3. Solid metal type exterior doors. They are located throughout the building and are original/have never been replaced.

4. Aluminum type exterior doors. They are located throughout the building and are original/have never been replaced.

5. Paneled aluminum with hidden overhead storage type exterior doors. They are located throughout the building and are original/have never been replaced.

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:

Examples of typical doors with damaged frames, and missing weather-stripping.

2.3.6. 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.

2.4. Mechanical Systems

The Police Headquarters was built as part of an existing space in an older building. The structure occupies the first floor of an eight-story multi-use building. The heating and cooling systems of the Police Headquarters are independent of the larger building structure, however domestic hot water is provided by the building. Due to the minimal load of

domestic hot water compared to the multi-use building that also contains apartments, the Police Headquarters is not charged for domestic hot water and has no control over the domestic hot water supply equipment.

Equipment

The Freehold Police Headquarters is both heated and cooled using 6 heat pumps located along the exterior perimeter of the building. These heat pumps were installed in 2003 when the Police Headquarters was retro-fitted into the building and each unit has approximately 72% of its remaining life left. The front entrance area contains leaky, store-front windows that allow cold air into the building during the heating season. For this reason, 5 small electric baseboard heaters were added to this perimeter area to provide additional comfort. These electric units were installed since there is no hot water heating system in place.

Two of the six heat pumps located on the exterior of the building

Distribution Systems

The heat pumps for the building are ducted directly to the various spaces of the building, allowing each space to receive warm air during the winter and cool air during the summer. The ductwork including supply diffusers were observed to be in good condition, with no obvious deficiencies.

Controls

The Police Headquarters is divided up into 6 zones; one zone per heat pump. For each of these zones, there is a programmable thermostat installed to control the temperature setpoint of the heat pump. Since the building is used as a Police Headquarters, each thermostat is encased in a clear plastic lock box, so that the Policed Department has control over who is allowed to adjust the temperature. SWA observed that the temperature settings were reasonable and did not allow excessive heating or cooling to occur.

2.4.1. Domestic Hot Water

The Police Headquarters is situated on the first floor of an eight-story mixed-use building. This building is primarily used as a multi-family dwelling that has a high, constant domestic hot water load. In comparison, the Police Headquarters domestic hot water load is minimal and therefore the building supplies the Police Headquarters with domestic hot water. The Police Headquarters does not have control of the domestic hot water supply and therefore has been excluded from the energy audit. The Police Headquarters does however have control over domestic hot water usage such as faucets and shower heads.

2.5. Electrical systems

2.5.1. 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 Police Headquarters currently contains mostly inefficient T12 magnetically ballasted fluorescent fixture. However there is a small amount of electronically ballasted T5 and T8 fixtures and incandescent fixtures. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas. SWA recommends installing 15 occupancy sensors to reduce lighting usage.

Exit Lights - Exit signs were found to be LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide and incandescent fixtures. Exterior lighting is controlled by a combination of photocells and timers.

2.5.2. 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, printers, etc. 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.
The building contained 2 larger older model refrigerators, 1 smaller older model refrigerator, 1 older snack-type vending machine and 1 older drink-type vending machine.

2.5.3. Elevators

The police headquarters does not have an installed elevator.

2.5.4. Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Headquarters.

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 state and federal 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. Technology such as photovoltaic panels or wind turbines, use natural resources to generate electricity on the site. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Solar thermal collectors heat a specified volume of water, reducing the amount of energy required to heat water using building equipment. Cogeneration or CHP allows you to generate electricity locally, while also taking advantage of heat wasted during the generation process.

3.1. Existing systems

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

3.2. Evaluated Systems

SWA evaluated the following renewable and distributed energy measure possibilities: wind, solar photovoltaic, solar thermal collectors, combined heat and power, and geothermal.

Solar Photovoltaic

Based on utility analysis and a study of roof conditions, the Police Headquarters is not a good candidate for a Solar Panel installation. The Police Headquarters is situated on the first floor of an eight-story building and does not contain access to the roof. Solar Photovoltaic panels would only benefit the multi-use building that encompasses the Police Headquarters.

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. In addition, the Police Headquarters is situated in a larger building with no ownership to the roof.

Geothermal

The Police Headquarters is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system and would also require a significant investment by the larger multi-use building that it is situated within.

Combined Heat and Power

The Police Headquarters is not a good candidate for CHP installation since there is currently no gas service to the building and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a high electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Typical applications include buildings with an absorption chiller, where waste heat would be used efficiently.

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

ECM#	Description of ECMs with 0-5 Year Payback
1	Install 21 new CFL lamps
2	Retrofit (1) non-refrig. Vending machine with VendingMiser device
3	Retrofit (1) refrig. Vending machine with VendingMiser device
4	Install 15 new Occupancy Sensors
5	Install 12 new Pulse Start Metal Halide fixtures
6	Install 175 new T8 fluorescent fixtures
	Description of ECMs with 5-10 Year Payback
7	Replace 2 existing larger refrigerators with Energy Star models
8	Replace 1 existing smaller refrigerator with Energy Star model

ECM#1: *Install 21 new CFL lamps*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Police Headquarters (see Appendix B). The existing lighting inventory contained 21 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $315 (includes $105 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM #	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 energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, l lbs/yr
1	315	4,387	0.9	0	1.0	133	866	5	4,328	0.4	13	3	3	3,627	7,855

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#2: *Install (1) Vending Miser device on non-refrigerated vending machine*

On the days of the site visits, SWA observed that the Police Headquarters contained one non-refrigerated ("Snack") vending machine. A simple plug and play device both the VendingMiser™ and SnackMiser™ devices are compatible with refrigerated vending machines and non-refrigerated vending machines respectively. They both utilize Passive Infrared Sensors (PIR) to help the unit save power. This unit is to be installed on the existing non-refrigerated vending machine.

Installation cost:

Estimated installed cost: $99 (includes $15 of labor)
Source of cost estimate: Manufacturer Costs

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
2	99	466	0.1	0	0.1	0	78	5	389	1.3	3	1	1	255	834

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Calculations were performed using the VendingMiser savings calculators located online at http://www.usatech.com/energy_management/energy_calculator.php

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#3: *Install (1) Vending Miser device on refrigerated vending machine*

On the days of the site visits, SWA observed that the Police Headquarters contained one refrigerated ("Drink") vending machine. A simple plug and play device both the VendingMiser™ and SnackMiser™ devices are compatible with refrigerated vending machines and non-refrigerated vending machines respectively. They both utilize Passive Infrared Sensors (PIR) to help the unit save power. This unit is to be installed on the existing non-refrigerated vending machine.

Installation cost:

Estimated installed cost: $199 (includes $30 of labor)
Source of cost estimate: Manufacturer Costs

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
3	199	485	0.1	0	0.1	0	81	5	405	2.5	1	0	0	170	868

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Calculations were performed using the VendingMiser savings calculators located online at http://www.usatech.com/energy_management/energy_calculator.php

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#4: *Install (15) new Occupancy Sensors*

On the day of the site visit, SWA observed that the Police Headquarters did not contain any lighting that was operated via occupancy sensors. SWA identified fifteen areas within the Police Headquarters that could benefit from the installation of occupancy sensors. Please see Appendix B for a detailed lighting inventory.

Installation cost:

Estimated installed cost: $3,000 (includes $200 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program, ENERGY STAR®*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
4	3,000	5,537	1.2	0	1.2	0	925	15	13,870	3.2	4	0	1	7,881	9,914

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Wall-mounted occupancy sensors ($80 per sensor).*

Please see Appendix F for more information on Incentive Programs.

ECM#5: *Install (11) new pulse start metal halide fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Police Headquarters (see Appendix B). The existing lighting inventory contained many inefficient Probe Start Metal Halide fixtures located in the garage bays and on the exterior of the building. SWA recommends replacing each existing fixture with more efficient, pulse start metal halide. Pulse start metal halides can be installed at lower wattages than probe start technology since the quality of light does not degrade over time, which is anticipated when sizing a probe start metal halide fixture.

Installation cost:

Estimated installed cost: $8,975 (includes $660 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
5	8,975	12,220	2.5	0	2.7	157	2,198	15	32,966	4.1	3	0	0	16,886	21,880

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Metal Halide with Pulse Start ($25 per fixture)*

Please see Appendix F for more information on Incentive Programs.

ECM#6: *Install (175) new T8 fluorescent fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Police Headquarters (see Appendix B). The existing lighting inventory contained mostly inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each existing fixture with more efficient, T8 fluorescent fixtures with electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to a T12 fixture with magnetic ballast.

Installation cost:

Estimated installed cost: $21,243 (includes $5,250 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
6	21,243	23,669	4.3	0	5.2	665	4,618	15	69,266	4.6	2	0	0	33,094	42,379

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – T8 fixtures with electronic ballasts ($15 per fixture)*

Please see Appendix F for more information on Incentive Programs.

ECM#7: *Replace 2 existing larger refrigerators with Energy Star models*

Description:

On the day of the site visit, SWA observed that there were two 17 cu. ft. model refrigerators in the building which were not Energy Star rated (using approximately 773 kWh/yr each). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerators with a 17 cu. ft. top freezer refrigerator ENERGY STAR®, or equivalent. Besides saving energy, the replacement will also keep their surroundings cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Installation cost:

Estimated installed cost: $1,025 (Includes $50 in labor cost)
Source of cost estimate: *Manufacturer and Store established costs*

Economics:

ECM #	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 energy 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
7	1,025	850	0.2	0	0.2	0	142	15	2,129	7.2	1	0	0	645	1,522

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis aggregate utility rate.

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#8: *Replace 1 existing smaller refrigerator with Energy Star model*

Description:

On the day of the site visit, SWA observed that there was one older 2.7 cu. ft. refrigerator model which was not Energy Star rated (using approximately 254 kWh/yr each). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing unit with a 2.7 cf. ft. ENERGY STAR® model or equivalent. Besides saving energy, the replacement will also keep their surroundings cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Installation cost:

Estimated installed cost: $1125 (Includes $125 in labor cost)
Source of cost estimate: *Manufacturer and Store established costs*

Economics:

ECM #	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 energy 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
8	129	95	0.0	0	0.0	0	16	15	238	8.1	1	0	0	58	170

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis aggregate utility rate.

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

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. 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 Headquarters building:

- Add insulation to wall separating break room and bike storage
- Repair all damaged, warped and exposed windows frames to minimize infiltration and thermal bridging.
- Insulate and seal all exposed conduits.
- Slope existing surfaces away from exterior walls to prevent future water damage due to poor site drainage.
- Repair shifted brick masonry units

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.

- Maintain roofs – SWA recommends regular maintenance to verify water is draining correctly.

- Provide weather-stripping/air-sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate in places. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected, and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Repair/seal wall cracks and penetrations - SWA recommends as part of the maintenance program installing weep holes, installing proper flashing and correct masonry efflorescence, and sealing wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- 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/.

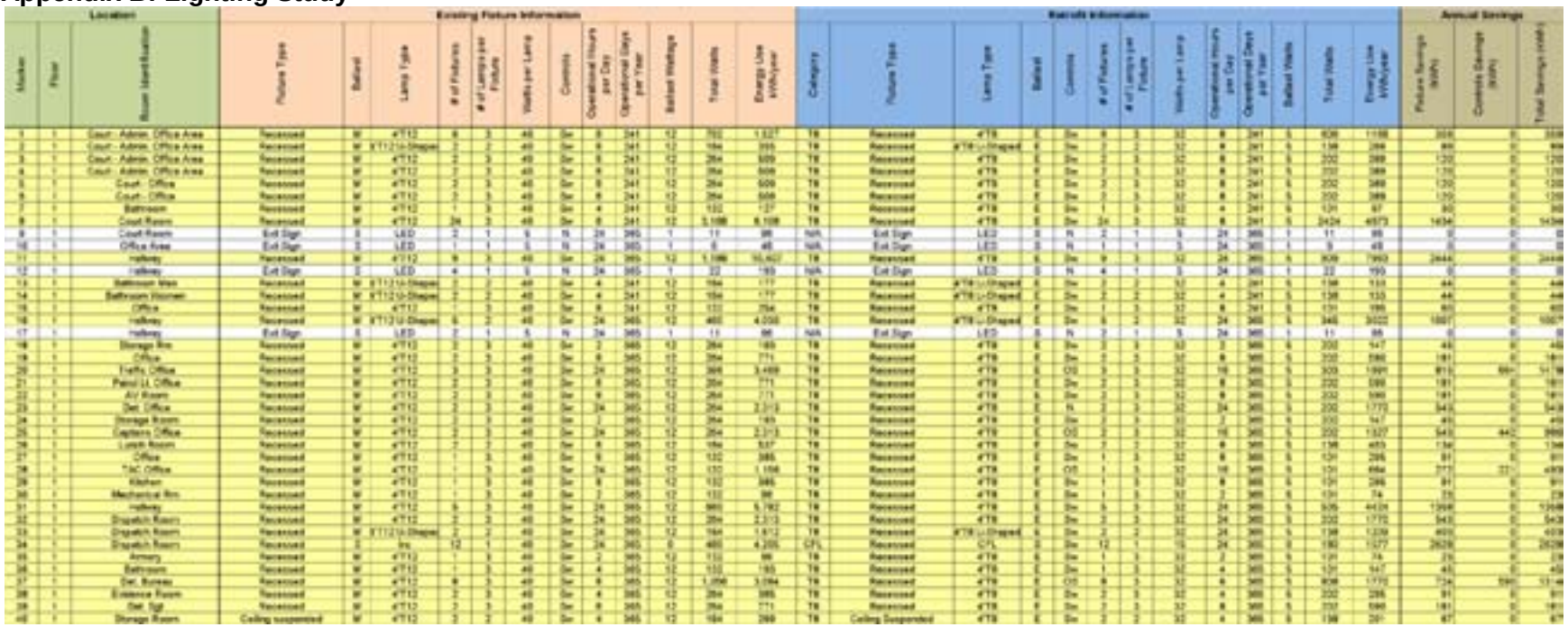
APPENDIX A: EQUIPMENT LIST

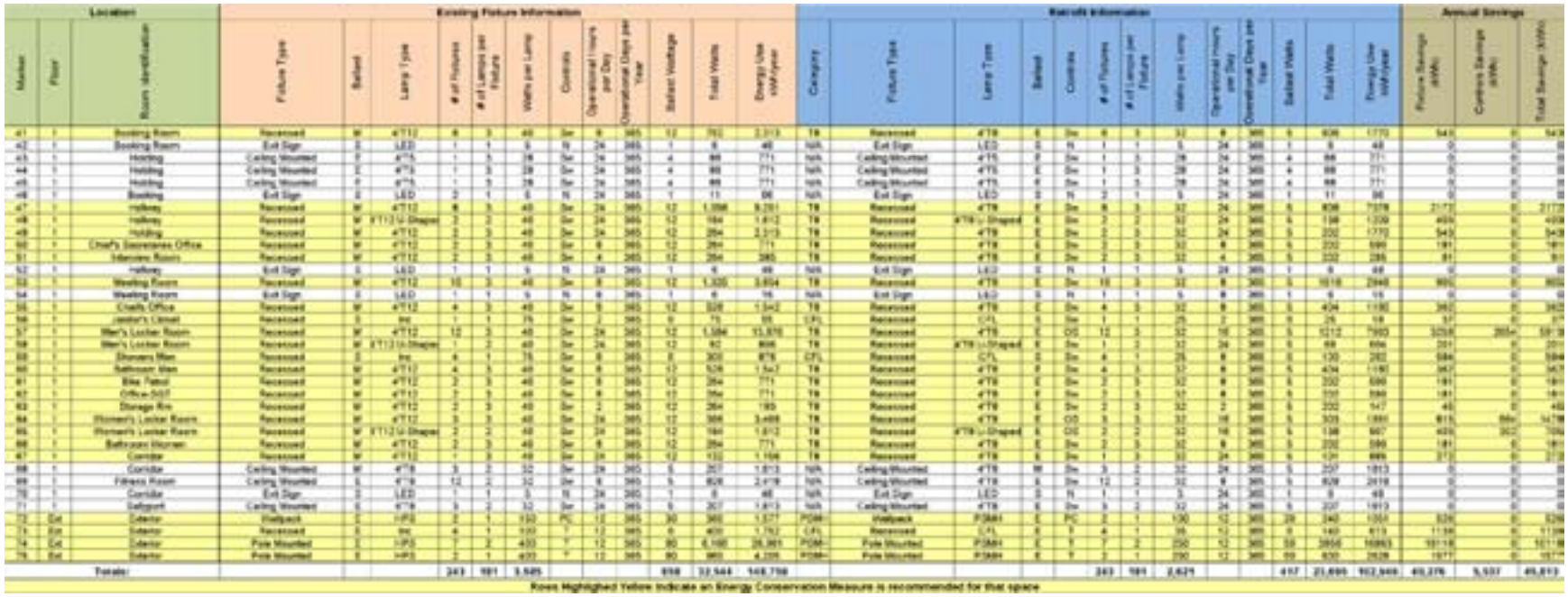
Inventory

Building System	Description	Location	Make/ Model	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, 9.5 SEER	Exterior of building, near Rug Mill Towers apartment entrance	Lennox, Model #HP26-060-9Y, Serial #5801K 44924	Electricity	All areas	2003	72%
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, 9.5 SEER	Exterior of building, near Rug Mill Towers apartment entrance	Lennox, Model #HP29-090-2Y, Serial #5601K 04325	Electricity	All areas	2003	72%
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, 9.5 SEER	Exterior of building, near Rug Mill Towers apartment entrance	Lennox, Model #HP26-060-9Y, Serial #5801K 44929	Electricity	All areas	2003	72%
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, Tag #3, 9.5 SEER	Exterior of building, near front entrance, parking lot side	Lennox, Model #HP26-060-9Y, Serial #5801K 44931	Electricity	All areas	2003	72%
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, Tag #5, 9.5 SEER	Exterior of building, near front entrance, parking lot side	Lennox Model #HP26-060-9Y, Serial #5801K 44922	Electricity	All areas	2003	72%
Heating/ Cooling	Lennox Heat Pump, HCFC-22 refrigerant, Tag #6, 9.5 SEER	Exterior of building, near front entrance, parking lot side	Lennox Model #HP26-042-7Y, Serial #5801G 67505	Electricity	All areas	2003	72%
Heating	Five (5) electric baseboard heaters added to front entrance/waiting area after Police Department was established, no nameplate info	Perimeter, front entrance under windows	No nameplate info	Electricity	All areas	2004	80%
Controls	Programmable thermostats are installed in each area of the Police Department, these thermostats are located inside of locked boxes so that no one can access them or adjust setpoints, maintenance staff confirmed that thermostats are already programmed, no nameplate info	All areas	No nameplate info	Electricity	All areas	2003	72%
Domestic Hot Water	Domestic hot water for this building is delivered via a DHW loop from the apartment building directly above, maintenance staff made it clear that the building does not have separate DHW equipment	Hot water loop is run to sinks and locker rooms	No unit	Hot water loop	All areas	2003	72%
Lighting	See Appendix A	-	-	-	-	-	-

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												Retrofit Information												Annual Savings		
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 Voltage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
x1	1	Booking Room	Recessed	M	4'T12	4	3	40	Sw	4	365	12	702	2,313	T8	Recessed	4'T8	E	Sw	4	3	32	4	365	4	636	1170	543	0	543
x2	1	Booking Room	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	E	N	1	1	5	24	365	1	9	48	0	0	0
x3	1	Holding	Ceiling Mounted	E	4'T5	1	3	28	Sw	24	365	4	88	771	N/A	Ceiling Mounted	4'T5	E	Sw	1	3	28	24	365	4	88	771	0	0	0
x4	1	Holding	Ceiling Mounted	E	4'T5	1	3	28	Sw	24	365	4	88	771	N/A	Ceiling Mounted	4'T5	E	Sw	1	3	28	24	365	4	88	771	0	0	0
x5	1	Holding	Ceiling Mounted	E	4'T5	1	3	28	Sw	24	365	4	88	771	N/A	Ceiling Mounted	4'T5	E	Sw	1	3	28	24	365	4	88	771	0	0	0
x6	1	Booking	Exit Sign	E	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	E	N	2	1	5	24	365	1	11	96	0	0	0
x7	1	Hallway	Recessed	M	4'T12	8	3	40	Sw	24	365	12	1,056	9,251	T8	Recessed	4'T8	E	Sw	8	3	32	24	365	8	836	7378	2172	0	2172
x8	1	Hallway	Recessed	M	4'T12 U-Shaped	2	2	40	Sw	24	365	12	184	1,612	T8	Recessed	4'T8 U-Shaped	E	Sw	2	2	32	24	365	8	136	1200	409	0	409
x9	1	Holding	Recessed	M	4'T12	3	3	40	Sw	24	365	12	264	2,313	T8	Recessed	4'T8	E	Sw	3	3	32	24	365	8	232	1770	543	0	543
x10	1	Chief's Secretaries Office	Recessed	M	4'T12	1	3	40	Sw	8	365	12	264	771	T8	Recessed	4'T8	E	Sw	1	3	32	8	365	8	232	590	181	0	181
x11	1	Interview Room	Recessed	M	4'T12	2	3	40	Sw	4	365	12	264	385	T8	Recessed	4'T8	E	Sw	2	3	32	4	365	8	232	295	91	0	91
x12	1	Hallway	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	E	N	1	1	5	24	365	1	9	48	0	0	0
x13	1	Waiting Room	Recessed	M	4'T12	10	3	40	Sw	8	365	12	1,320	3,854	T8	Recessed	4'T8	E	Sw	10	3	32	8	365	8	1010	2948	906	0	906
x14	1	Waiting Room	Exit Sign	E	LED	1	1	5	N	8	365	1	6	16	N/A	Exit Sign	LED	E	N	1	1	5	8	365	1	9	16	0	0	0
x15	1	Chiefs Office	Recessed	M	4'T12	4	3	40	Sw	8	365	12	528	1,542	T8	Recessed	4'T8	E	Sw	4	3	32	8	365	8	404	1180	362	0	362
x16	1	Janitor's Closet	Recessed	E	Inc	1	1	75	Sw	2	365	0	75	55	CFL	Recessed	CFL	E	Sw	1	1	25	2	365	0	25	18	37	0	37
x17	1	Men's Locker Room	Recessed	M	4'T12	12	3	40	Sw	24	365	12	1,584	11,570	T8	Recessed	4'T8	E	OS	12	3	32	16	365	8	1212	7993	3258	265+	3523
x18	1	Men's Locker Room	Recessed	M	4'T12 U-Shaped	1	2	40	Sw	24	365	12	92	806	T8	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	24	365	8	68	604	201	0	201
x19	1	Showers Men	Recessed	E	Inc	4	1	75	Sw	8	365	0	300	876	CFL	Recessed	CFL	E	Sw	4	1	25	8	365	0	100	292	584	0	584
x20	1	Bathroom Men	Recessed	M	4'T12	4	3	40	Sw	8	365	12	528	1,542	T8	Recessed	4'T8	E	Sw	4	3	32	8	365	8	404	1180	362	0	362
x21	1	Bike Patrol	Recessed	M	4'T12	2	3	40	Sw	8	365	12	264	771	T8	Recessed	4'T8	E	Sw	2	3	32	8	365	8	232	590	181	0	181
x22	1	Office-SGT	Recessed	M	4'T12	1	3	40	Sw	8	365	12	264	771	T8	Recessed	4'T8	E	Sw	1	3	32	8	365	8	232	590	181	0	181
x23	1	Storage Rm	Recessed	M	4'T12	2	3	40	Sw	2	365	12	264	193	T8	Recessed	4'T8	E	Sw	2	3	32	2	365	8	232	147	45	0	45
x24	1	Women's Locker Room	Recessed	M	4'T12	3	3	40	Sw	24	365	12	396	3,468	T8	Recessed	4'T8	E	OS	3	3	32	16	365	8	303	1980	815	66+	1479
x25	1	Women's Locker Room	Recessed	M	4'T12 U-Shaped	2	2	40	Sw	24	365	12	184	1,612	T8	Recessed	4'T8 U-Shaped	E	OS	2	2	32	16	365	8	136	967	409	302	709
x26	1	Bathroom Women	Recessed	M	4'T12	2	3	40	Sw	8	365	12	264	771	T8	Recessed	4'T8	E	Sw	2	3	32	8	365	8	232	590	181	0	181
x27	1	Corridor	Recessed	M	4'T12	1	3	40	Sw	24	365	12	132	1,156	T8	Recessed	4'T8	E	Sw	1	3	32	24	365	8	101	885	272	0	272
x28	1	Corridor	Ceiling Mounted	M	4'T8	3	2	32	Sw	24	365	8	207	1,813	N/A	Ceiling Mounted	4'T8	M	Sw	3	2	32	24	365	8	207	1813	0	0	0
x29	1	Fitness Room	Ceiling Mounted	E	4'T8	12	2	32	Sw	8	365	8	828	2,419	N/A	Ceiling Mounted	4'T8	E	Sw	12	2	32	8	365	8	828	2419	0	0	0
x30	1	Corridor	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	E	N	1	1	5	24	365	1	9	48	0	0	0
x31	1	Sallyport	Ceiling Mounted	E	4'T8	3	2	32	Sw	24	365	8	207	1,813	N/A	Ceiling Mounted	4'T8	E	Sw	3	2	32	24	365	8	207	1813	0	0	0
x32	Ext	Exterior	Wallpack	E	HPS	2	1	100	PC	12	365	30	360	1,577	PSMH	Wallpack	PSMH	E	PC	2	1	100	12	365	28	340	1351	226	0	226
x33	Ext	Exterior	Recessed	E	Inc	4	1	100	T	12	365	0	400	1,752	CFL	Recessed	CFL	E	T	4	1	26	12	365	0	140	613	1139	0	1139
x34	Ext	Exterior	Pole Mounted	E	HPS	7	2	400	T	12	365	80	6,160	26,981	PSMH	Pole Mounted	PSMH	E	T	7	2	250	12	365	56	3864	16863	10118	0	10118
x35	Ext	Exterior	Pole Mounted	E	HPS	2	1	400	T	12	365	80	960	4,205	PSMH	Pole Mounted	PSMH	E	T	2	1	250	12	365	69	830	3628	1577	0	1577
Totals:						243	181	5,585				958	32,544	148,758						243	181	2,629			417	21,695	102,949	40,376	5,537	45,913

Rows Highlighted Yellow Indicate an Energy Conservation Measure is recommended for that space

Legend:

Fixture Type	Lamp Type	Control Type	Ballast Type	Retrofit Category
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
HID (High Intensity Discharge)	4'T8			
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	Halogen			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.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
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 One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.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

APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS

Glossary of ECM Terms

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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 measure (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.

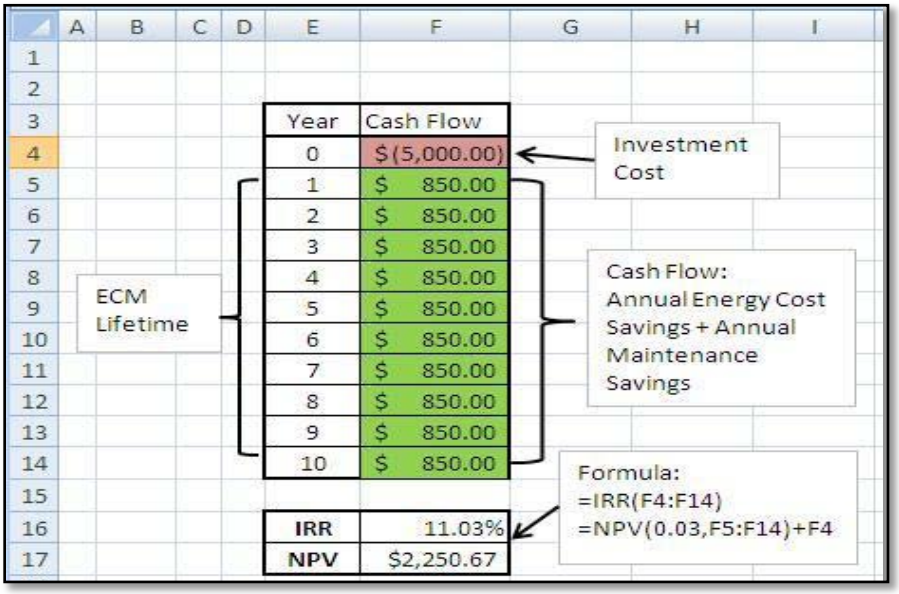
Calculation References

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
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 50kW or less, $1/Watt incentive subtracted from installation cost
Incentive 2:	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 & Industrial Lifetimes

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

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Freehold - Police Headquarters

Building ID: 2211609
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 16, 2010

Facility	Facility Owner	Primary Contact for this Facility
Borough of Freehold - Police Headquarters 38 Jackson Street Freehold, NJ 07728	Borough of Freehold 51 West Main Street Freehold, NJ 07728	Joseph Bellina 51 West Main Street Freehold, NJ 07728

Year Built: 2003
Gross Floor Area (ft²): 15,660

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	960,819
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	960,819
Energy Intensity[5]	
Site (kBtu/ft²/yr)	61
Source (kBtu/ft²/yr)	205
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	146
Electric Distribution Utility	
FirstEnergy - Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	31%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

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

EPA Form 5900-16

APPENDIX F: 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.

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

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs's 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 80%** 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 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

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

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.

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.

Utility Sponsored Programs

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

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/.

APPENDIX G: VendingMiser™ and SnackMiser™ Analysis

EnergyMisers

VendingMiser® CoolerMiser™ SnackMiser™ PlugMiser™ VM2iQ® CM2iQ®

Savings Calculator

Please replace the default values in the table below with your location's unique information and then click on the "calculate savings" button.
Note: To calculate for CoolerMiser, use the equivalent VendingMiser results. To calculate for PlugMiser, use the equivalent SnackMiser results.

Energy Costs ($0.000 per kWh)	.167
Facility Occupied Hours per Week	56
Number of Cold Drink Vending Machines	1
Number of Non-refrigerated Snack Machines	1
Power Requirements of Cold Drink Machine (Watts; 400 typical)	100
Power Requirements of Snack Machine (Watts; 80 typical)	80
VendingMiser® Sale Price (for cold drink machines)	199
SnackMiser™ Sale Price (for snack machines)	99

Calculate Savings!

Results of your location's projected savings with VendingMiser® installed:

COLD DRINK MACHINES	Current	Projected	Total Savings	% Savings
kWh	874	388	485	56%
Cost of Operation	$145.89	$64.84	$81.05	56%

SNACK MACHINES	Current	Projected	Total Savings	% Savings
kWh	699	233	466	67%
Cost of Operation	$116.71	$38.90	$77.81	67%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	1572	621	951	60%
Cost of Operation	$262.60	$103.74	$158.86	60%

Total Project Cost	Break Even (Months)
$298	22.51

Estimated Five Year Savings on ALL Machines = $794.30

APPENDIX H: ENERGY CONSERVATION MEASURES

Energy Conservation Measures																		
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
1	Install 21 new CFL lamps	RS Means	315	0	315	4,387	0.9	0	1.0	133	866	5	4,328	0.4	13	3	3	3,627	7,855
2	Retrofit (1) non-refrig. Vending machine with VendingMiser device	Manufacturer	99	0	99	466	0.1	0	0.1	0	78	5	389	1.3	3	1	1	255	834
3	Retrofit (1) refrig. Vending machine with VendingMiser device	Manufacturer	199	0	199	485	0.1	0	0.1	0	81	5	405	2.5	1	0	0	170	868
4	Install 15 new Occupancy Sensors	RS Means	3,300	300	3,000	5,537	1.2	0	1.2	0	925	15	13,870	3.2	4	0	1	7,881	9,914
5	Install 11 new Pulse Start Metal Halide fixtures	RS Means	9,250	275	8,975	12,220	2.5	0	2.7	157	2,198	15	32,966	4.1	3	0	0	16,886	21,880
6	Install 175 new T8 fluorescent fixtures	RS Means	23,868	2,625	21,243	23,669	4.3	0	5.2	665	4,618	15	69,266	4.6	2	0	0	33,094	42,379
7	Replace 2 existing larger refrigerators with Energy Star models	Manufacturer	1,025	0	1,025	850	0.2	0	0.2	0	142	15	2,129	7.2	1	0	0	645	1,522
8	Replace 1 existing smaller refrigerator with Energy Star model	Manufacturer	129	0	129	95	0.0	0	0.0	0	16	15	238	8.1	1	0	0	58	170
	TOTALS		**38,185**	**3,200**	**34,985**	**47,709**	**9.3**	**0**	**10.4**	**955**	**8,922**	**-**	**123,592**	**3.9**	**-**	**-**	**-**	**62,616**	**85,423**

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: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions, eQUEST
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.