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Local Government Energy Program
Energy Audit Final Report

Borough of Freehold

Municipal Building/Fire Headquarters
51/49 West Main Street
Freehold, NJ 07728

Project Number: LGEA55

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EXECUTIVE SUMMARY

The Freehold Municipal building and Fire Headquarters building are separate structures located adjacent to one another. Since the two buildings share one common electric meter, one report has been created for both buildings. The Municipal building is a two-story building with a basement comprising a total conditioned floor area of 3,072 square feet. The Fire Headquarters building is a two-story building with a basement comprising a total conditioned floor area of 7,200 square feet. The original Municipal building structure was built in 1916, and there have been no additions since then. The following chart provides an overview of current energy usage in the buildings based on the analysis period of December 2008 through November 2009:

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	Joint Energy Consumption, MMBtu/yr
Current	91,360	2,120	19,567	51.5	524
Proposed	57,842	1,908	5,308	17.1	388
Savings	33,518*	212	14,259*	34.4	136
% Savings	37	10	73	67	26

*Revenue generated from producing electricity and collecting Solar Renewable Energy Credits (SRECs) has been factored into the electrical usage and cost savings.

There may be energy procurement opportunities for the Municipal Building and Fire Headquarters to reduce annual utility costs, which are $2,119 higher, when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Municipal Building and Fire Headquarters into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. Both buildings are categorized as a non-eligible ("Other") space type. Because 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 51.5 $\frac{kBtu}{ft^2-yr}$ compared to the national average of a building consuming 104.0 $\frac{kBtu}{ft^2-yr}$. 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	3,908	1.9	7,478	26,783
5-10 Year	9,523	7.1	67,554	27,352
>10 year	828	11.3	9,319	8,216
Total	14,259	5.9	84,351	62,351

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 9 cars from the roads each year or avoiding the need of 192 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 Municipal building and Fire Headquarters further explore the following:

- Capital Improvements
  - Muni. – Replace electric baseboard heaters with hot water baseboard system
  - Fire – Replace two electric baseboard heaters in basement of Fire Headquarters
  - Muni. – Replace existing roof and increase insulation levels
- Operations and Maintenance
  - Both – Install pipe insulation on copper pipes used for Domestic Hot Water supply
  - Fire – Create schedule for heating of Fire Headquarters second floor
  - Fire – Replace or repair damaged window frames and window sills
  - Fire – Replace damaged shingles on upper roof of Fire Headquarters
  - Muni. – Replace or repair missing gutters and downspouts
  - Both – Perform routine maintenance inspections of roof surfaces
  - Both – Perform routine maintenance inspections of exterior shell of building
  - Fire – Adjust overhead doors to close completely and weather-strip
  - Both – Provide water-efficient fixtures and controls
  - Both – Always purchase the most energy-efficient equipment
  - Both – Use smart power electric strips
  - Both – 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.

SWA recommends that the Borough of Freehold first address all maintenance concerns with the building envelope. Both the Municipal building and Fire Headquarters showed areas of the building envelope that could be improved. The Municipal building relies on electric baseboard heaters for the majority of the heating load. Replacing these electric baseboard heaters with a hydronic baseboard system would not be cost-effective and would require a substantial amount of capital

planning; however SWA recommends that this option is considered. Addressing the electric baseboard heaters now would reduce operating costs over the life of the building as well as increase occupant comfort. Aside from replacing the entire Municipal building heating system, SWA recommends that all recommended measures are addressed. A majority of the recommended measures would reduce the electrical load of both buildings by addressing inefficient lighting and appliances. In general, both buildings show excess energy usage through the HVAC systems primarily due to lack of controls. SWA recommends that all recommended HVAC units are replaced and programmable controls are installed and calibrated. Additionally, there is an opportunity to install a 10 kW Solar Photovoltaic system that would help offset the use of electricity as well as generate revenue for the Borough of Freehold.

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 can 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 Municipal Building/Fire Headquarters at 51/49 West Main Street, Freehold, NJ. 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.

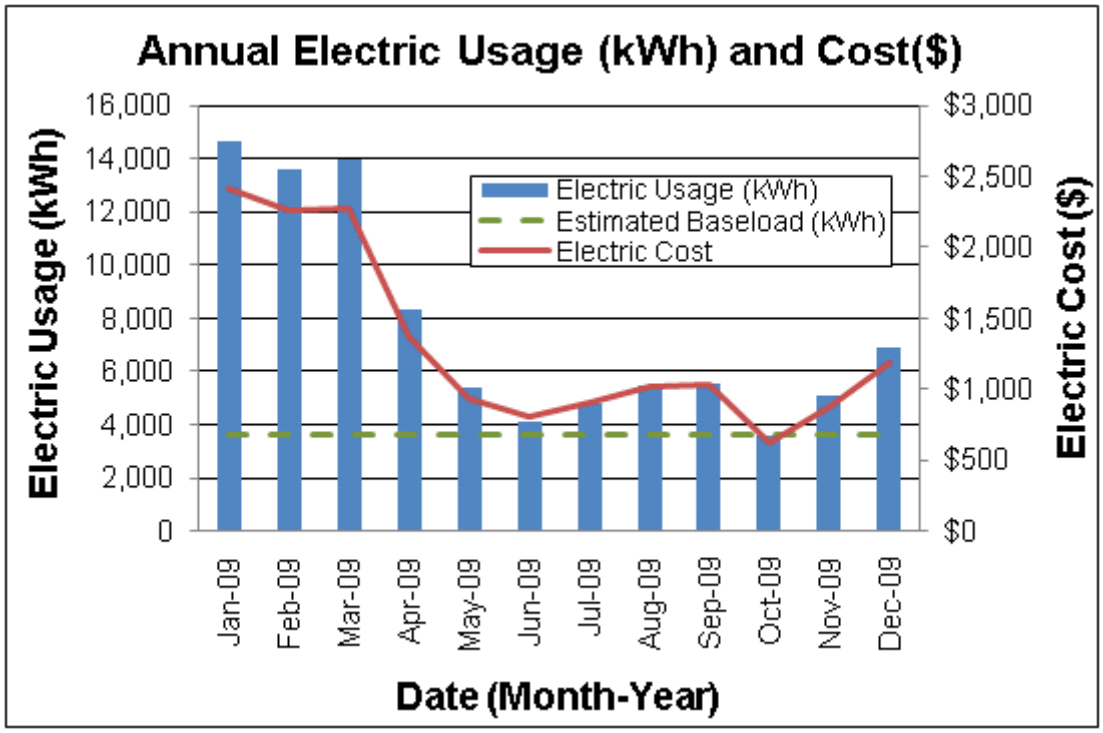
The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Freehold to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Municipal Building/Fire Headquarters.

HISTORICAL ENERGY CONSUMPTION

1.1 Energy usage, load profile and cost analysis

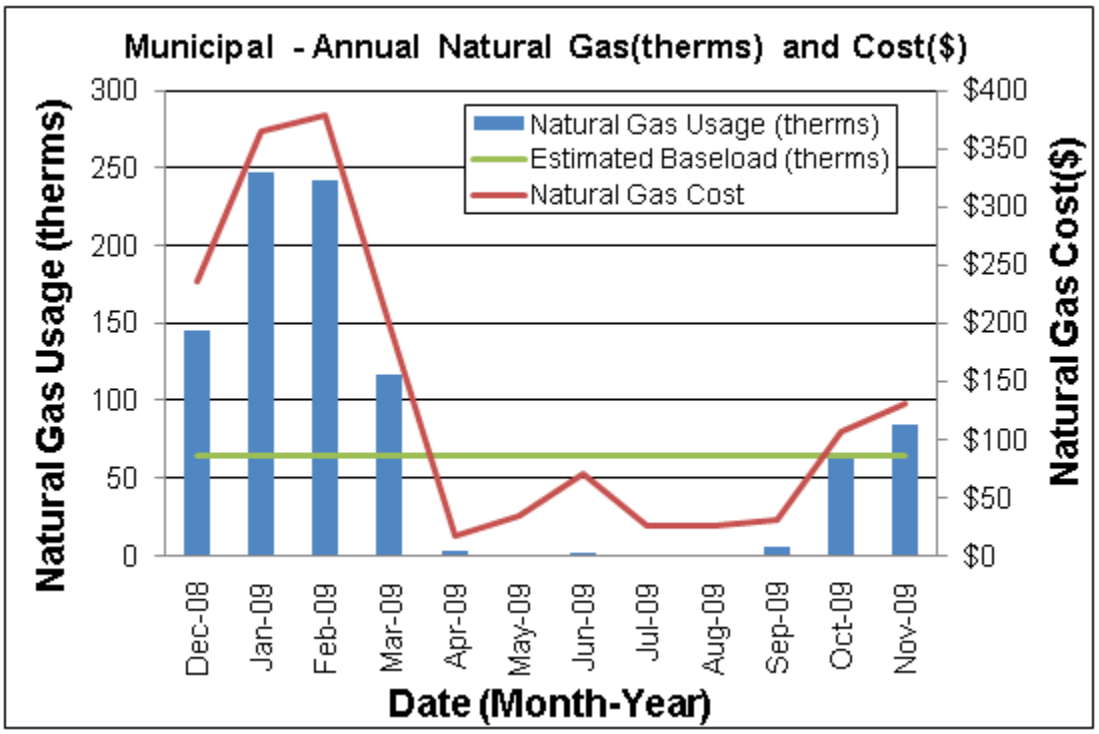
SWA reviewed utility bills from January 2008 through December 2009 that were received from the utility companies supplying both buildings with electric and natural gas. A 12 month period of analysis from January 2009 through December 2009 was used for all calculations and for purposes of benchmarking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

Electricity - The Municipal building and Fire Headquarters are currently served by one electric meter. The Borough of Freehold currently buys electricity from JCP&L at **an average aggregated rate of $0.172/kWh**. They purchased **approximately 91,360 kWh, or $15,692 worth of electricity,** in the previous year. The average monthly demand was 30.4 kW and the annual peak demand was 46.2 kW.

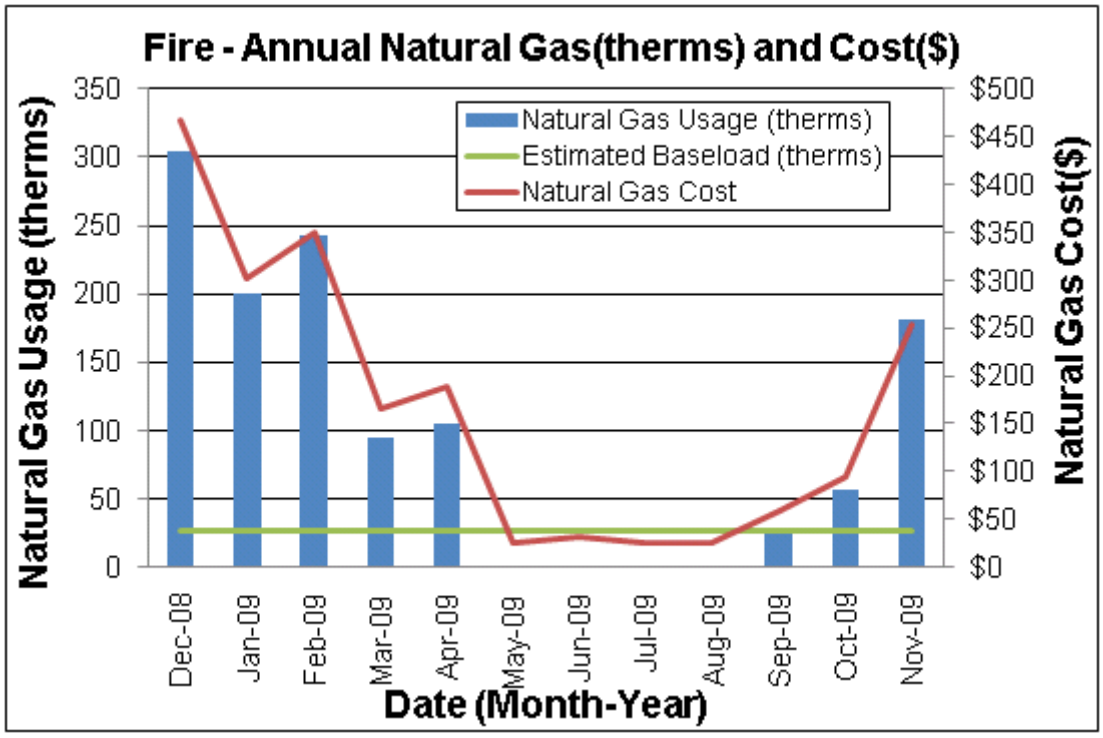


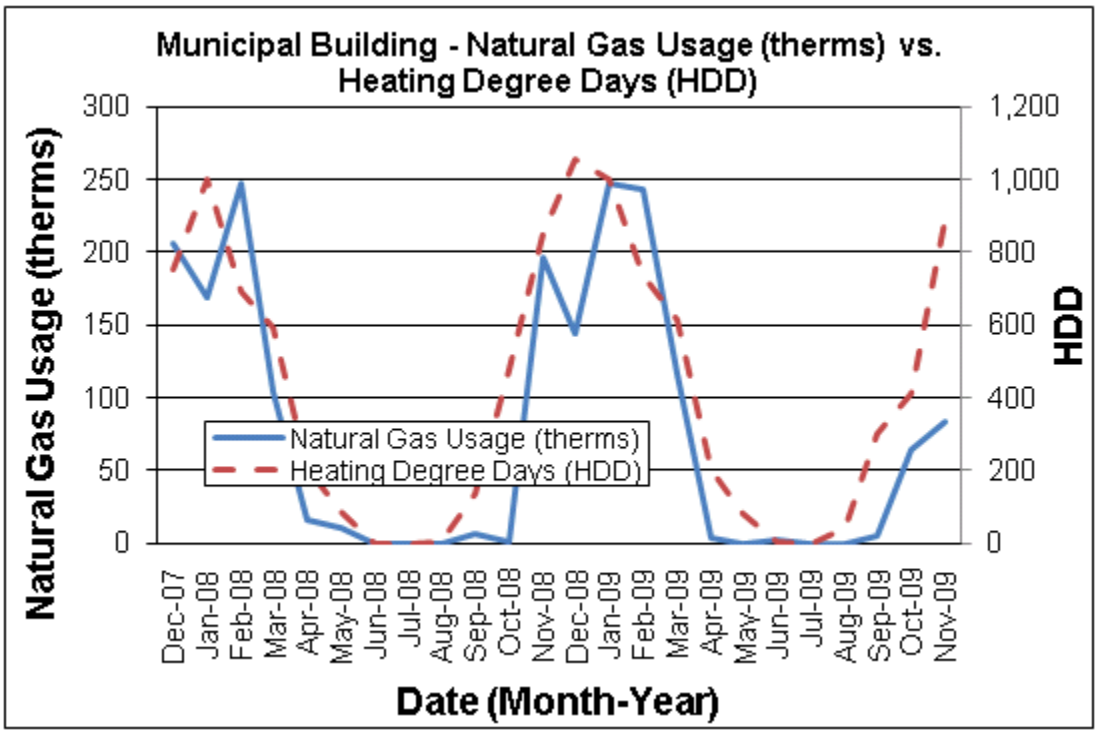
The above chart shows annual electric usage (kWh) for both buildings versus electricity cost ($). Electricity usage follows a trend as expected, with electricity increasing greatly during the winter months when electricity is used for heating and peaking slightly during the summer when electricity is used for air conditioning. Electricity cost follows electricity usage as expected, with no major anomalies.

Natural gas – Both the Municipal building and Fire Headquarters are each currently served by one meter for natural gas. The Municipal building currently buys natural gas from New Jersey Natural Gas at **an average aggregated rate of $1.781/therm**. The Fire Headquarters currently buys natural gas from New Jersey Natural Gas at **an average aggregated rate of $1.642/therm**. The Municipal building purchased **approximately 909 therms or $1,618 worth of natural gas,** in the previous year**,** while the Fire Headquarters purchased **approximately 1,211 therms or $1,989 worth of natural gas**.

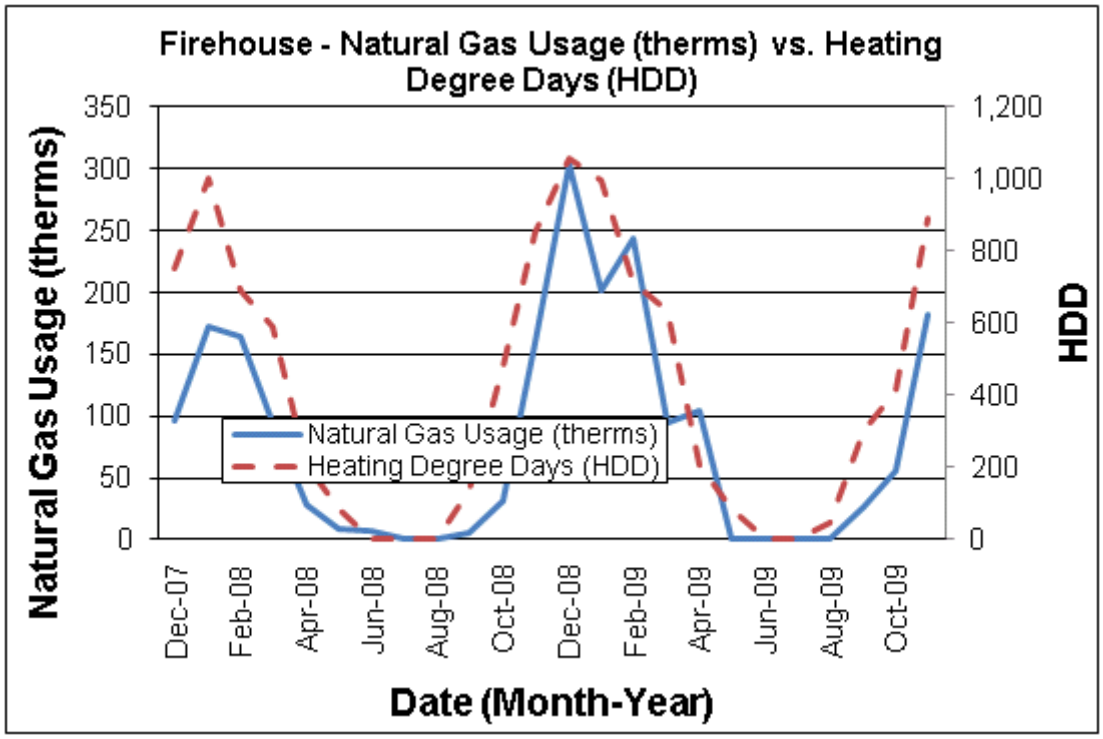


The above chart shows natural gas usage (therms) for the Municipal building versus natural gas cost ($). Natural gas is used only for heating during the winter season and therefore has minimal usage during the warmer months. Natural gas cost follows natural gas usage closely, as expected.





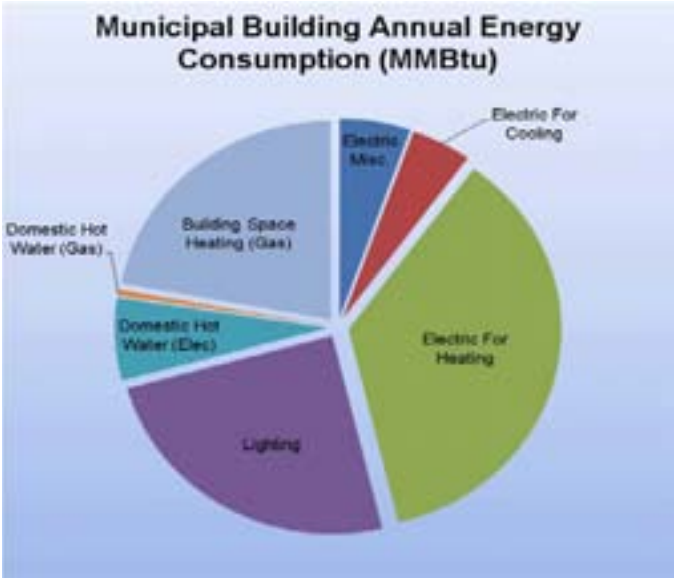
The above chart confirms that natural gas is used for only building heating. Natural gas usage is comparable to assumed heating load based on outside temperatures. Heating Degree Days (HDD) are used to assume a heating load based on average outdoor temperatures.

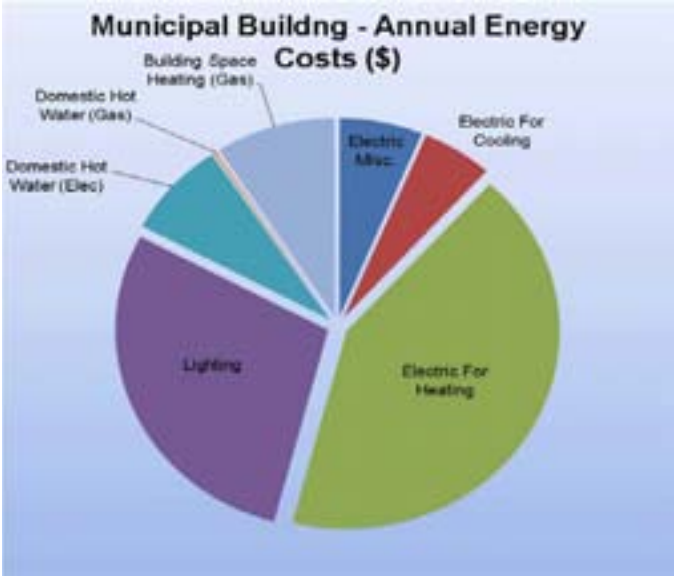


The above chart shows natural gas usage for the Fire Headquarters compared to Heating Degree Days. Natural gas usage follows the Heating Degree Days closely, showing that there are no major concerns of the building using heating outside of the heating season.

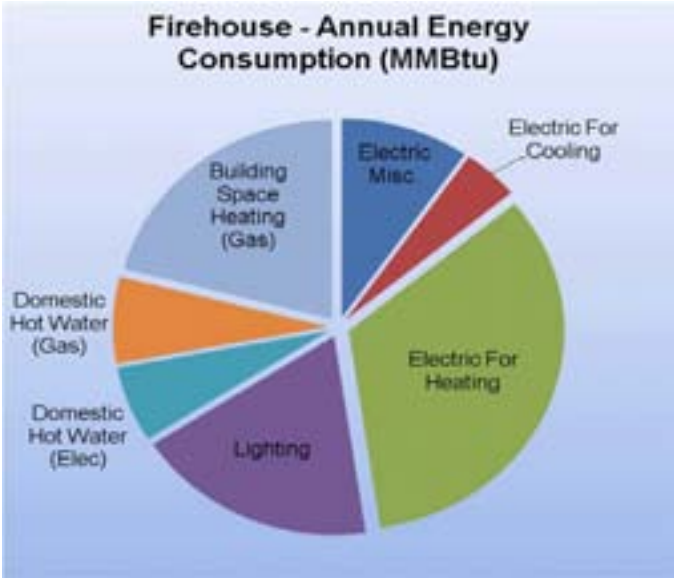
The following graphs, pie charts, and table show energy use for the buildings based on utility bills for the 12 month period. Note: for the Municipal building the electrical cost at $50/MMBtu of energy is almost 3 times as expensive as natural gas at $18/MMBtu and at the Fire Headquarters, the electrical cost at $50/MMBtu of energy is more then 3 times as expensive as natural gas at $16/MMBtu

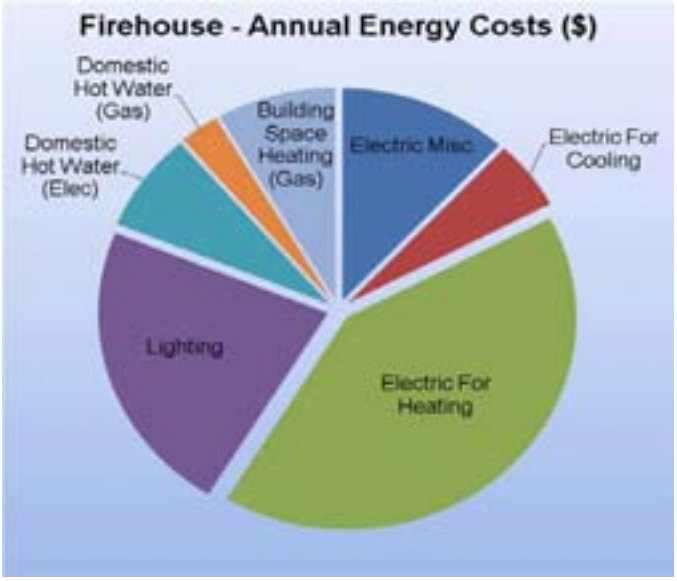
Municipal Building Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	22	5%	$1,095	6%	50
Electric For Cooling	19	5%	$934	5%	50
Electric For Heating	146	36%	$7,338	42%	50
Lighting	99	25%	$4,966	29%	50
Domestic Hot Water (Elec)	27	7%	$1,359	8%	50
Domestic Hot Water (Gas)	2	0%	$35	0%	18
Building Space Heating	89	22%	$1,584	9%	18
Totals	403	100%	$17,310	100%	
Total Electric Usage	312	77%	$15,692	91%	50
Total Gas Usage	91	23%	$1,618	9%	18
Totals	403	100%	$17,310	100%	





Firehouse - Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	42	10%	$2,110	12%	50
Electric For Cooling	19	4%	$934	5%	50
Electric For Heating	146	34%	$7,338	42%	50
Lighting	79	18%	$3,971	22%	50
Domestic Hot Water (Elec)	27	6%	$1,339	8%	50
Domestic Hot Water (Gas)	30	7%	$500	3%	16
Building Space Heating	91	21%	$1,489	8%	16
Totals	433	100%	$17,681	100%	
Total Electric Usage	312	72%	$15,692	89%	50
Total Gas Usage	121	28%	$1,989	11%	16
Totals	433	100%	$17,681	100%	

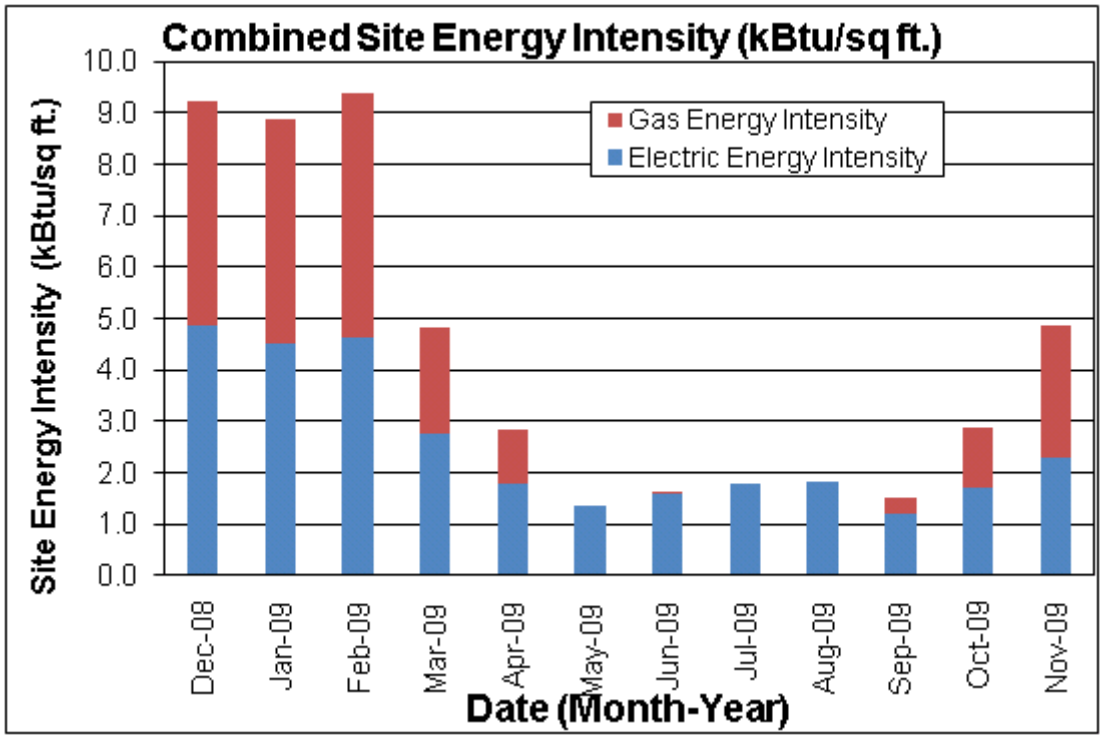




1.2. Energy benchmarking

SWA has also entered energy information about the Municipal building/Fire Headquarters in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. Both buildings are categorized as a non-eligible ("Other") space type. Because 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 51.5 $\frac{kBtu}{ft^2-yr}$ compared to the national average of a building consuming 104.0 $\frac{kBtu}{ft^2-yr}$. 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. Additionally, should the Municipality desire to reach this average there are other large scale and financially less advantageous improvements that can be made, such as envelope window, door and insulation upgrades that would help the building reach this goal.



Per the LGEA program requirements, SWA has assisted Freehold to create an *Energy Star Portfolio Manager* account and share the Municipal building and Fire Headquarters 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 Municipality (user name of "borough of freehold" with a password of "*freehold")* and with TRC Solutions.

1.2.1. Tariff Analysis

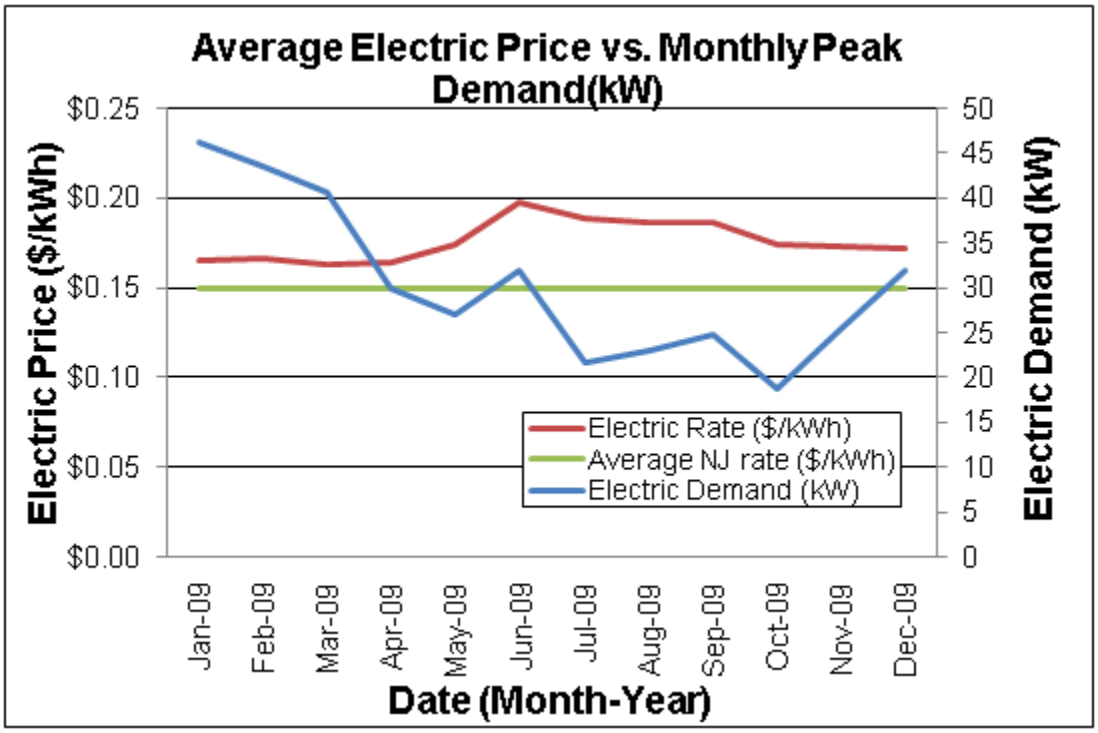
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

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 electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used by the HVAC condensing units, air handlers and window air conditioning units.

Currently, the Borough of Freehold is paying a general service rate for electricity. The building is direct metered for electricity. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year The general service rate charges a market-rate price based on usage and demand. The billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the Borough of Freehold is paying a general service rate for natural gas. Demand is not broken out in the bill. Thus the building pays for fixed costs such as meter reading charges during the summer months.

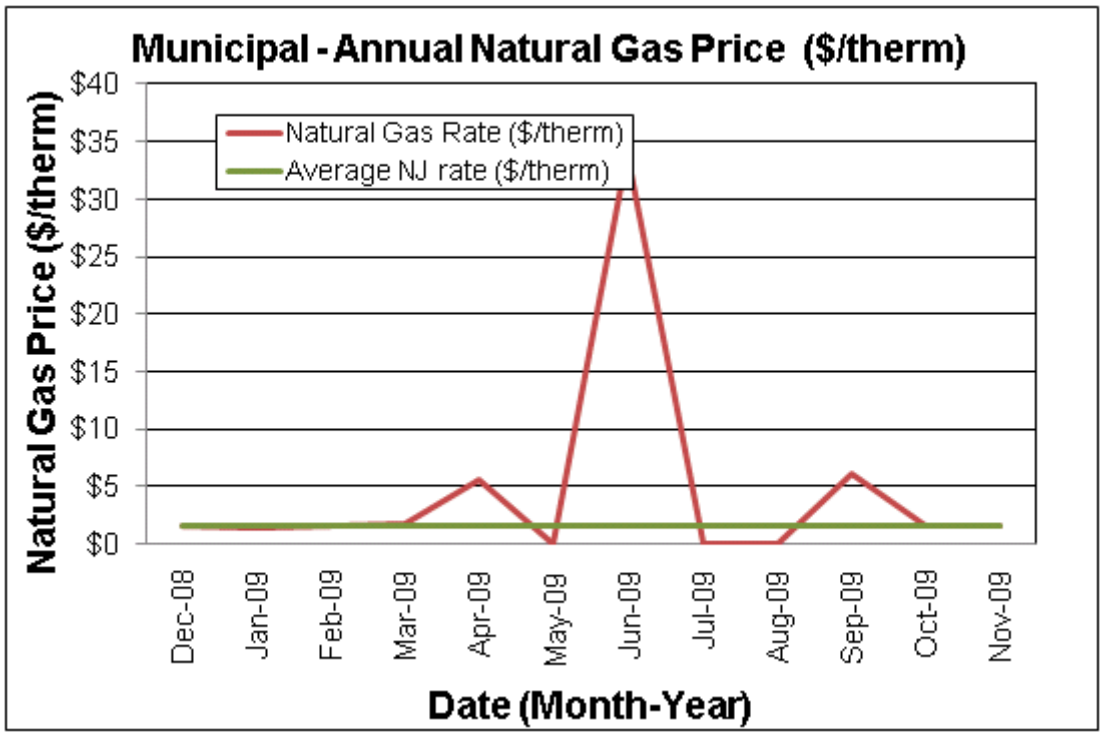
1.2.2. Energy Procurement strategies

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while the Municipal building and Fire Headquarters pay an average rate of $0.172/kWh. The buildings' annual electric utility costs are $2,010 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 18% over the most recent 12 month period.



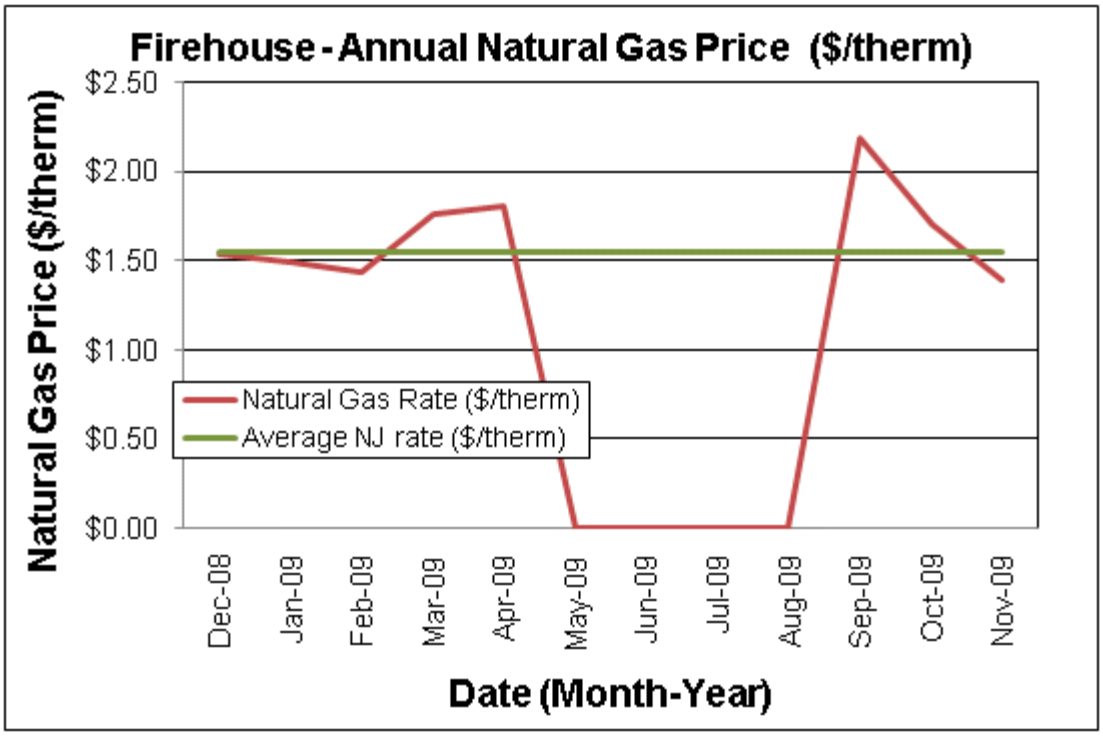
The above chart shows that the average electric cost ($/kWh) is always higher than the average New Jersey electric cost for each month during the year.

The average estimated NJ commercial utility rates for gas are $1.550/therm, while the Municipal building pays a rate of $1.781/therm. Natural gas bill analysis shows fluctuations up to 95% over the most recent 12 month period.



In the above chart, the average natural gas cost per month ($/therm) is much higher when compared to the average NJ cost. The summer months are outliers in this case, showing an exaggerated spike during June, when non-use charges such as meter reading, taxes and low use caps artificially inflate the cost per unit of energy.

The average estimated NJ commercial utility rates for gas are $1.550/therm; while the Fire Headquarters pays a rate of $1.642/therm. Natural gas bill analysis shows fluctuations up to 74% over the most recent 12 month period.



The above chart shows that the monthly average natural gas cost ($/therm) for the Fire Headquarters is lower than the New Jersey average cost, however; on an annual basis, the average cost is higher than the New Jersey average cost.

Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs.

SWA recommends that the Borough of Freehold further explore opportunities of purchasing both natural gas and electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Municipal building and Firehouse. Appendix C contains a complete list of third-party energy suppliers for the JCP&L and NJN 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 February 17th, 2010, the following data was collected and analyzed.

Municipal Building

Building Characteristics

- The Municipal building is a two-story slab below-grade building with a basement.
- Constructed in 1968, it has undergone no major renovation or additions since.
- The building contains 3,072 square feet of conditioned space
- This building is home to various municipal offices, a vault, mechanical room, and a Council meeting room.

Building occupancy profiles

- The building is open to the public and for business use on Monday through Friday from 8:30 AM to 4:30 PM. It is closed on the weekends and on observed holidays.
- There are 20 full time employees working in the building as well as a varying amount of constituents visiting for business

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.

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer, over concrete block with no assumed insulation. The interior is mostly painted gypsum wallboard.

Note: Wall insulation levels could visually be verified in the field by non-destructive methods.

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 sides of the building.

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

Water damage from uncontrolled roof water run-off due to missing gutters and downspouts (L).
Exposed CMU block with no insulation installed (R).

Roof

The building's roof is predominantly a flat, parapet type roof over steel decking, with a built-up asphalt finish. It is not known when the last roof replacement occurred. Two and a half inches of assumed roof insulation were observed.

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

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good condition, with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all roof areas.

The following specific roof system was identified:

Typical roof installation

Base

The building's base is composed of a below-grade basement with a slab floor and a perimeter footing with concrete block foundation walls and no observed slab edge/perimeter insulation.

Slab/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 building contains basically two different types of windows.

1. Fixed type windows with an insulated aluminum frame, tinted double glazing and no interior or exterior shading devices. The windows are located on the southeast façade.

2. Double-hung type windows with a vinyl frame and clear double glazing and interior mini blinds. The windows are located throughout the building and are installed with storm doors and screens.

3. Transom and sidelight units installed with exterior door systems.

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 age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and other energy-compromising issues.

The following specific window problem spots and typical window installations were identified:

Front of Municipal building, glass entrance area (L). Missing window sill and drip-edge detail (R).

Exterior Doors

The building contains three different types of exterior doors:

1. Glass with aluminum frame type exterior doors. They are located on the southeast façade.

2. Solid metal type exterior doors. They are located on the northwest facade.

3. Aluminum type exterior doors with glass panels. They are located on the northwest façade.

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/ age appropriate condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following typical doors were identified:

Typical door installations

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

Due to the limited amount of control over the heating and cooling systems, the Municipal building is currently operating much of their equipment inefficiently. Electric baseboard heaters are used for a majority of the heating. Each electric baseboard is heated by a non-programmable thermostat and is often left on 24 hours per day.

Equipment

The Municipal building is mostly heated using electric baseboards located on the perimeter of both stories. The building is cooled by eight thru-wall window air conditioners located in various windows throughout the building. The Council meeting area located on the 2nd floor is also heated and cooled by a packaged rooftop unit manufactured by Bryant. The Bryant unit was installed in 1998 and has approximately 30% of its useful lifetime left. A comprehensive Equipment List can be found in Appendix A.

The packaged unit is used to condition the Council room only and it contains a condenser as well as a natural gas-fired furnace which conditions warm air that is directly distributed through ducting to the council room through diffusers. When in cooling mode the packaged unit uses the built in condenser and R-22 refrigerant to condition the air and distribute it through the same duct as the heating.

Bryant packaged rooftop unit

The eight window air conditioners are located in various offices throughout the building as are the electric baseboards which are controlled by nonprogrammable thermostats.

Typical electrical baseboard unit

There is also a Maytag plug-in ENERGY STAR® rated humidifier installed in the basement vault.

Maytag humidifier

The Municipal building is naturally ventilated except for air delivered from the ducted, package rooftop unit and toilet exhaust fans.

The domestic hot water (DHW) heater for the Municipal building is located in the mechanical room of the basement. DHW is provided by an electric AO Smith water heater with Model #PEN-30 with 30 gallons of storage capacity. This heater has exceeded its estimated useful lifetime and should be replaced.

Municipal Building DHW heater

Distribution Systems

In the Municipal building, conditioned air from the packaged rooftop unit is distributed through insulated ductwork with diffusers. The electric baseboard heating and window air conditioning units have no associated ductwork. Domestic Hot Water is delivered through the building using mostly un-insulated copper piping.

Example of un-insulated copper piping in the Municipal building

Controls

The Municipal building does not have a central building management system. The electric baseboard heaters are controlled by non-programmable thermostats. The packaged rooftop unit is also controlled by a wall-mounted non-programmable dial thermostat.

Typical thermostat for electric baseboard units

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 Municipal building currently contains mostly T8 fixtures, as well as chandeliers and wall sconces with incandescent lighting. Most of the lighting is already controlled by occupancy sensors. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

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 lamp and halogen fixtures. Exterior lighting is controlled by timers.

Appliances and Processes

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.

At the Municipal building four compact refrigerators were installed. The Haier and Avanti units are new and energy efficient models that should remain. The Goldstar and Sanyo units are older and inefficient models that should be replaced with ENERGY STAR® units.

Existing Sanyo and GoldStar refrigerators to be replaced

Elevators

The Municipal building has a handicap accessibility lift that is rated for travel at 9 fpm with a loaded capacity of 750 lbs and was installed in 1996. This unit was observed to be in age-appropriate condition with no major signs of deterioration.

Accessibility lift and nameplate

Other Electrical systems

There are no other electrical systems present with a significant impact on energy usage.

Fire Headquarters

Building Characteristics

- The Fire Headquarters building is a two story slab below-grade building with a basement.
- Constructed in 1933, it has undergone numerous major renovations and additions since.
- The building contains 7,200 square feet of conditioned space
- This building is home to a garage bay, control room, offices, meeting room, kitchen, lunch room and lounge.

Building occupancy profiles

- The Fire Headquarters is always open as the control center is always staffed by a dispatcher, however, the fire crews are volunteers and use the building only as emergency and training situations arise.

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.

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over concrete block with 1/4 inch of assumed insulation. Other areas are constructed of stucco, over poured-in-place concrete with no assumed insulation. The interior is mostly painted gypsum wallboard and unfinished.

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 sides of the building.

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

Efflorescence on brick and masonry walls indicate moisture presence within the wall cavity, cracked/aged caulk and damaged exterior wall finishes

Roof

The building's roof is predominantly a medium-pitch gable-type roof over a wood structure, with an asphalt shingle finish. It is not known when the last roof replacement occurred. There was no roof insulation observed. Other parts of the building are also covered by a flat and parapet type over steel decking with a built-up asphalt finish. Two and a half inches of assumed roof insulation, were recorded. It is not known when the last roof replacement occurred.

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

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall acceptable, age-appropriate condition, with some minor signs of uncontrolled moisture, air-leakage and other energy-compromising issues on all roof areas.

The following specific roof problem spots were identified:

View of lower roof (L). Missing / ineffective flashing and damaged roof shingles on upper roof (R).

Base

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

Slab-edge/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 building contains basically two different types of windows:

1. Double-hung type windows with an insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located throughout the building and were installed with screens.

2. Hopper type windows with a wood frame and clear double glazing and no interior or exterior shading devices. The windows are located throughout the 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 acceptable/ 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 double-hung window (L). Damaged/aged window frame and damaged window sill (R).

Exterior Doors

The building contains four different types of exterior doors:

1. Overhead type exterior doors. They are located in the front of the building.

2. Solid metal type exterior doors. They are located on the northwest façade.

3. Solid metal type exterior doors with glass panels. They are located on the northeast façade.

4. Aluminum type exterior doors with glass panels. They are located on the northeast façade.

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 acceptable/ age appropriate 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:

Missing/worn weather-stripping, damaged/warped/aged door frame and exterior mold/water damage signs on areas around doors

Building Air Tightness

Overall, the field auditors found the building to be reasonably air-tight with only a few areas of suggested improvements, 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

Most of the Fire Headquarters heating equipment (including garage unit heaters as well as furnaces for the interior spaces) were replaced in 2005 and has much of the remaining useful lifetime left. There were no major comfort complaints with any of the HVAC systems, however it was noted that the furnace is operating extremely loud and becomes a distraction to occupants in the meeting areas. Based on visual observations, there were no obvious problems with the Nordyne/Gibson furnace. The Fire Headquarters uses non-programmable thermostats, which do not allow any automated control over the heating or cooling system.

Equipment

The Fire Headquarters is heated and cooled by two air handler units manufactured by Nordyne/Gibson, cooled by three split system and three through the window air conditioners and heated by two unit heaters, a natural gas fired furnace and two electric baseboard units. Two of the window AC units have been de-commissioned however; they are left installed in the windows as a backup cooling system. The two remaining electric baseboard heaters are located in the basement and are rarely used. These units should remain since it would not be cost-effective to replace them based on the minimal operation. A comprehensive Equipment List can be found in Appendix A.

The two air handler units are located in the ceiling plenum of the second floor and are used to condition the second floor and first floor meeting areas. They contain gas-fired furnaces with cooling coils, connected to condensers located on the roof of first floor.

Air handler unit in ceiling plenum

The lounge in the basement is cooled by a GE through the window air conditioner. There are also two other through the window air conditioning units installed in the second floor, however, they are no longer used due to the installation of the split system cooling units.

Basement air conditioner

There are two split system cooling units installed on the roof of the first floor, near the exterior wall of the 2nd floor. They are both condensing units manufactured by Nordyne and are each connected to the air handlers in the attic above the second floor. There is a third split systems manufactured by Carrier that serves the first floor meeting area through a ceiling hung evaporator and condenser located outside of the building on the backside.

In the basement there are two electric baseboard units used to heat the lounge. There are also two convective, natural gas fired, unit heaters manufactured by Gibson in the ceiling of the garage that serve the garage area. In the first floor mechanical closet there is a Nordyne/Gibson furnace that is used to heat the first floor meeting areas. This single zone unit is very loud when in operation.

The Fire Headquarters is naturally ventilated except for air delivered from the ducted air handling units and toilet exhaust units.

Picture of first floor furnace and nameplate

Distribution Systems

The Fire Headquarters conditioned air is distributed through insulated ductwork with diffusers. Hot water is distributed by un-insulated copper piping.

Controls

The Fire Headquarters building contains a Carrier split system that is controlled by a programmable thermostat in the first floor meeting room. The Nordyne split systems are controlled by programmable thermostats on the second floor set to 71°F and 68°F. The two electric baseboard units in the basement are controlled by a nonprogrammable thermostat set to 80°F. The garage unit heaters are controlled by programmable thermostats set to 60°F and the Nordyne/Gibson furnace is controlled by a Honeywell non-programmable thermostat.

Honeywell thermostat

Domestic Hot Water

The domestic hot water (DHW) heater for the Fire Headquarters is located in the basement mechanical room. DHW is provided by an AO Smith, Model #PGX 40 216 atmospheric water heater, with a 40 gallon storage capacity. This heater has exceeded its estimated useful operating life.

Fire Headquarters DHW heater

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 Fire Headquarters currently contains mostly T12 fixtures, as well as some incandescent and CFL lighting. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

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, high pressure sodium, incandescent, CFL and neon fixtures. Exterior lighting is controlled by timers.

Appliances and Processes

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.

At the Fire Headquarters there are two ice machines installed, two commercial style refrigerators that are new efficient models that should remain, and an older inefficient model snack vending machine and older inefficient model refrigerated vending machine that should be retrofitted with SnackMiser™ and VendingMiser™ devices respectively.

Existing vending machines to be replaced

Elevators

There are no elevators installed at the Fire Headquarters building.

Other Electrical systems

There are no other electrical systems present with a significant impact on energy usage.

2. 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.

Existing systems

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

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 Municipal building and Firehouse roofs would be good candidates for a Solar Panel installation. There is sufficient roof space for panels to reasonably supplement the power consumption of the buildings. Based on the age of the buildings, an in-depth structural analysis would need to be completed in order to determine if the roof is capable of supporting solar panels.

Solar Thermal Collectors

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

Geothermal

The Municipal building and Fire Headquarters are not good candidates for a geothermal installation since it would require replacement of the entire existing HVAC system, and would not be cost effective.

Combined Heat and Power

The Municipal building and Fire Headquarters are not good candidates 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 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.

Recommendations: Energy Conservation Measures

ECM#	Description of ECMs with 0-5 Year Payback
1	Muni. – Install (8) new CFL lamps
2	Fire – Install (25) new CFL lamps
3	Fire – Retrofit (1) non-refrig. Vending machine with Vending Miser
4	Muni. – Install (9) Programmable thermostats
5	Fire – Install (3) Programmable Thermostats
6	Fire – Retrofit (1) refrig. Vending machine with Vending Miser
7	Fire – Install (5) new Occupancy Sensors
8	Fire – Install (4) new Pulse Start Metal Halide fixtures
9	Muni. – Install (5) new Pulse Start Metal Halide fixtures
	Description of ECMs with 5-10 Year Payback
10	Muni. – Install 10kW Solar Photovoltaic system
11	Muni. – Replace (2) existing smaller refrigerators with Energy Star models
12	Fire – Install (48) new T8 fluorescent fixtures
13	Muni. – Install (9) new T8 fluorescent fixtures
	Description of ECMs with >10 Year Payback
14	Fire – Replace GE window AC unit with Energy Star model
15	Muni. – Replace (8) window AC units with Energy Star models
16	Fire – Replace DHW heater
17	Muni. – Replace electric DHW heater with gas-fired unit

ECM#1: Muni. - Install (8) new CFL lamps

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Municipal building (see Appendix B). The existing lighting inventory contained 8 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: $120 (includes $40 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
1	120	1,140	0.2	0	1.3	186	382	5	1,910	0.3	15	3	3	1,620	2,041

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: Fire - Install (25) new CFL lamps

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Fire Headquarters (see Appendix B). The existing lighting inventory contained 25 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: $375 (includes $125 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
2	375	1,469	0.3	0	0.7	432	685	5	3,423	0.5	8	2	2	2,743	2,630

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#3: Fire - *Retrofit (1) Vending Miser device on non-refrigerated vending machine*

On the days of the site visits, SWA observed that the Fire Headquarters building 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
3	99	466	0.1	0	0.2	0	80	5	401	1.2	3	1	1	266	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#4: *Muni. – Install (9) programmable thermostats*

On the day of the site visit, SWA observed that none of the approximately 8 offices or Council room are controlled by programmable thermostats. SWA recommends installing a programmable thermostat in each area to reduce the heat output at nights and on weekends when the Municipal building is not occupied.

Installation cost:

Estimated installed cost: $1,125 (includes $270 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	1,125	4,279	4.0	56	6.6	0	836	15	12,536	1.3	10	1	1	8,709	8,279

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed that temperatures would be setback based on the operation schedule of the building.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#5: *Fire – Install (3) programmable thermostats*

On the day of the site visit, SWA observed 3 areas within the Fire Headquarters building that could benefit from being controlled by programmable thermostats. SWA recommends installing a programmable thermostat in each area to reduce the heat output at nights and on weekends when the building has a minimal occupancy.

Installation cost:

Estimated installed cost: $1,125 (includes $270 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
5	375	423	0.1	112	1.8	0	257	10	2,567	1.5	6	1	1	1,792	1,992

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed that temperatures would be setback based on the operation schedule of the building.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#6: Fire - *Retrofit (1) VendingMiser device on refrigerated vending machine*

On the days of the site visits, SWA observed that the Fire Headquarters building 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
6	199	485	0.1	0	0.2	0	83	5	417	2.4	1	0	0	181	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#7: *Fire – Install (5) new Occupancy Sensors*

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

Installation cost:

Estimated installed cost: $2,070 (includes $300 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
7	1,000	2,386	0.5	0	1.1	0	410	15	6,156	2.4	5	0	0	3,829	4,272

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 ($20 per sensor).*

Please see Appendix F for more information on Incentive Programs.

ECM#8: *Fire - Install (4) new Pulse Start Metal Halide fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Municipal Building (see Appendix B). The existing lighting inventory contained 4 inefficient Probe Start Metal Halide fixtures located 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: $2,070 (includes $240 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
8	2,070	1,699	0.4	0	0.8	344	636	15	9,543	3.3	4	0	0	5,417	3,042

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#9: *Muni. - Install (5) 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 five inefficient Probe Start Metal Halide fixtures located 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: $2,115 (includes $300 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
9	2,115	1,577	0.3	0	1.8	267	538	15	8,074	3.9	3	0	0	4,219	2,824

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#10: *Install a 10 kW Solar Photovoltaic system*

Description:

Currently, the Municipal building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc. being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. The Municipal building is not eligible for a 30% federal tax credit, available only to residential buildings. Instead, the Borough of Freehold may consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. JCP&L provides the ability to buy SRECs at $600 / MWh or best market offer. There are several possible locations for a 10 kW PV installation on the building roofs and away from shade.

Installation cost:

Estimated installed cost: $60,000 (Includes $24,000 in labor cost)
Source of cost estimate: *Similar Projects*

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
10	60,000	11,804	10.0	0	13.1	0	8,630	25	215,757	7.0	3	0	0	52,241	21,135

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. SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (230 Watts, model #ND-U230C1). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft). A commercial multi-crystalline 230 Watts panel (37.0 volts, 8.24 amps) has 17.5 square feet of surface area (13. 1 Watts per square foot). A 10 kW system needs approximately 44 panels, which would take up 770 square feet. The installation of a renewable Solar Photovoltaic power generating system could also serve as a good educational tool and exhibit for the community.

Rebates/financial incentives:

- *NJ Clean Energy – Renewable Energy Incentive Program (REIP) (based on $1 per Watt installed for systems under 50kW)*
- *NJ Clean Energy – Solar Renewable Energy Certificate (SREC) program. Each time a system generates 1,000 kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The building must also become net-metered in order to earn SREC's as well as sell power back to the electric grid. A total of $6,600/year has been incorporated into the above costs for a period of 15 years, however it requires proof of performance, application approval and negotiations with the utility.*

Please see Appendix F for more information on Incentive Programs.

ECM#11: Muni. – Replace (2) existing smaller refrigerators with Energy Star models

Description:

On the day of the site visit, SWA observed that there were two older and inefficient 2.7 cu. ft. refrigerator models in the building which were 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 units with 2.7 cf. ft. ENERGY STAR® models 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: $258 (Includes $50 in labor cost)
Source of cost estimate: *Manufacturer and Store established 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
11	258	190	0.0	0	0.2	0	33	15	490	7.9	1	0	0	127	340

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:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#12: *Fire – Install (48) new T8 Fluorescent Fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Fire 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: $6,135 (includes $1,440 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
12	6,135	2,882	0.6	0	1.4	240	736	15	11,036	8.3	1	0	0	2,522	5,160

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#13: *Muni. – Install (9) new T8 Fluorescent Fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Municipal building (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: $1,161 (includes $270 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
13	1,161	400	0.1	0	0.4	56	125	15	1,872	9.3	1	0	0	308	716

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#14: *Fire – Replace GE window AC unit with Energy Star Model*

On the day of the site visit, SWA completed an appliance inventory of the Borough of Freehold Fire Headquarters building which included window air conditioning units. The building contained one GE window AC unit in the basement that was old and operating inefficiently. SWA recommends replacing this unit with a new, Energy Star model in order to help reduce the amount of electricity needed to meet the cooling load of the building.

Installation cost:

Estimated installed cost: $739 (includes $116 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
14	739	423	0.0	0	0.2	0	73	15	1,091	10.2	0	0	0	117	757

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 – Electric Unitary HVAC (up to $92 per ton)*

Please see Appendix F for more information on Incentive Programs.

ECM#15: *Muni. – Replace (8) window AC units with Energy Star Models*

On the day of the site visit, SWA completed an appliance inventory of the Borough of Freehold Municipal building which included window air conditioning units. The building contained eight different window AC units throughout the building that were observed to be old and operating inefficiently. SWA recommends replacing these units with new, Energy Star models in order to help reduce the amount of electricity needed to meet the cooling load of the building.

Installation cost:

Estimated installed cost: $5,912 (includes $928 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
15	5,912	3,384	0.1	0	3.8	0	582	15	8,731	10.2	0	0	0	937	6,059

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 – Electric Unitary HVAC (up to $92 per ton)*

Please see Appendix F for more information on Incentive Programs.

ECM#16: *Fire – Replace DHW heater*

On the day of the site visit, SWA observed that the domestic hot water (DHW) loads of the building were met by an atmospheric, gas-fired, 40 gallon DHW heater. This unit was observed to be beyond its useful lifetime and no longer operating at its designed efficiency. SWA recommends that this unit is replaced with a new, sealed combustion, gas-fired unit with a thermal efficiency of 85% or better. In addition to replacing the unit, all DHW supply piping that leaves from the heater to the building, should be well-insulated in order to minimize losses in the distribution system.

Installation cost:

Estimated installed cost: $1,330 (includes $392 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
16	1,330	0	0.0	61	0.8	0	100	15	1,502	13.3	0	0	0	-151	672

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed cost savings based on average utility costs calculated for the Fire Headquarters.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Gas Water Heaters <50 gallons ($50 per heater).*

Please see Appendix F for more information on Incentive Programs.

ECM#17: *Muni. – Replace electric DHW heater with gas-fired unit*

On the day of the site visit, SWA observed that the domestic hot water (DHW) loads of the building were met by an electric 30 gallon DHW heater. Electric DHW heaters consume electricity constantly in order to keep stored hot water at a set temperature. SWA recommends that this unit is replaced with a sealed combustion, gas-fired unit. Upgrading this unit will not result in energy savings but will result in cost savings by switching to a less expensive fuel. In addition to replacing the unit, all DHW supply piping that leaves from the heater to the building, should be well-insulated in order to minimize losses in the distribution system.

Installation cost:

Estimated installed cost: $1,338 (includes $467 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
17	1,338	511	0.1	-17	0.0	15	73	15	1,089	18.4	0	0	0	-484	728

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed cost savings based on average utility costs calculated for the Municipal building.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Gas Water Heaters <50 gallons ($50 per heater).*

Please see Appendix F for more information on Incentive Programs.

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 Municipal building and Fire Headquarters:

- Muni. – Replace electric baseboard heaters with hot water baseboard system. SWA recommends that the Borough of Freehold investigate the possibility of replacing the entire electric baseboard system with a hot water baseboard system. Using RSMeans, SWA calculated that this would cost more than $15/square foot or more than $46,000 for the entire building. Due to this high costs and the amount of necessary work, replacing the electric baseboard system would not be cost-effective at this point in time. The Borough of Freehold should consider upgrading the entire heating system as part of a Capital Improvement plan.

- Fire – Replace two electric baseboard heaters in basement of Fire Headquarters. SWA recommends that the Borough of Freehold investigate the possibility of replacing the remaining two electric baseboards in the basement area. Based on the limited used of these baseboards, they would not be cost-effective to replace at this time. SWA recommends that the Borough consider adding a small, gas-fired furnace to this room in order to provide the ability for heating. Installing a gas-fired furnace would also help reduce moisture in the basement. This should be considered as a part of a capital improvement plan.

- Muni. – Replace existing roof and increase insulation levels. The roof at the Municipal building was observed to be in age-appropriate condition, however the roof surface was mostly level and did not allow for proper moisture drainage. SWA recommends that the Borough of Freehold consider replacing the roof with a new EPDM surface as well as increase rigid insulation levels to 6 inches in order to form a proper drainage plane. Replacing the roof will not be cost-effective, but can reduce energy consumption and water damage through the roof when incorporated into a larger, capital improvement plan.

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.

- Both – Install pipe insulation on copper pipes used for Domestic Hot Water supply. SWA observed that neither building contained sufficient pipe insulation on DHW supply pipes. SWa recommends adding insulation to ensure that minimal heat loss occurs on the DHW distribution system.

- Fire – Create schedule for heating of Fire Headquarters second floor – Currently, there are two air handling units located in the attic of the Fire Headquarters that are used to heat the entire second floor. SWA observed that these units were controlled by programmable thermostats

that were no programmed and the space was constantly being heated to over 72ºF, even though it is used only 4-6 times per month. SWA recommends that building staff program this thermostat correctly to correspond to actual building usage. This measure requires no costs and could have a significant impact on energy consumption.

- Fire – Replace or repair damaged window frames and window sills on Fire Headquarters. SWA observed one specific window on the Fire Headquarters building that had a severely damaged window sill and frame. This unit could allow excessive heat to transfer around the window as well as the transportation of moisture.

- Fire – Replace damaged shingles on upper roof of Fire Headquarters. SWA observed that there were several shingles either damaged or missing on the upper roof of the Fire Headquarters. SWA recommends replacing this shingles immediately to reduce the risk of moisture damage at the roof level.

- Muni. – Replace or repair missing gutters and downspouts. SWA observed that several of the gutters/downspouts at the Municipal building were missing or in poor condition. These gutters and downspouts are important in order to help divert excess water away from the building.

- Both – Perform routine maintenance inspections of roof surfaces – SWA recommends that the Borough of Freehold perform biannual maintenance inspections to ensure that water is allowed to properly drain off of the roof and away from the building.

- Both - Perform routine maintenance inspections of exterior shell of building – SWA recommends that the Borough of Freehold perform biannual maintenance inspections to reduce unnecessary energy losses through the shell of the building. Inspections should be focused on penetrations in the building shell that allow unwanted heat, air and moisture to be transported across the building envelope. Inspections should include insulation levels, windows, doors, siding, roof surfaces, etc.

- Fire - Adjust overhead doors to close completely and weather-strip – SWA recommends that each overhead door is adjusted in order to ensure that they close properly. In addition to adjusting the door, weather-stripping should be repaired and added as necessary to ensure that the doors form a proper seal with the framed wall and building base.

- Both - 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.

- Both - Always purchase 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.

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

- Both - 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/.

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APPENDIX A: EQUIPMENT LIST

Municipal Inventory

Building System	Description	Location	Make/ Model	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating/ Cooling	Bryant rooftop unit, 180,000 BTUH input, 144,000 BTUH output, 80% thermal efficiency, R-22 cooling	Roof	Bryant, Model #580FPV090180AB--, Serial #1003G20521	Natural Gas/ Electricity	Meeting Room	1998	30%
Heating	Electric baseboards in every office, no nameplate information, controlled by non-programmable thermostats for each room	Offices, Perimeter offices	No nameplate info	Electricity	Office Areas	1969	10%
Cooling	Eight (8) various window AC units	Office windows	No nameplate info	Electricity	Office Areas	2005	66%
Humidifier	Maytag plug-in humidifier, Energy Star rates	Vault, Basement	Maytag, Model #M7DH45B2A*A-R, Serial #BS 819914 039W	Electricity	Vault	2008	80%
Domestic Hot Water	AO Smith electric domestic hot water heater, 30 gallons	Mechanical Room, Baement	AO Smith, Permaglass Electra, Hydrasteel, Model #PEN-30, Serial #J08617	Electricity	All Areas	1970	0%
Lighting	See Appendix A	-	-	-	-	-	-
Accessibilty Lift	Handicap Acessbility Lift - 750 lbs capacity - 9 FPM - Car Weight 155 Lbs. - Suspension and support means screw drive - 220V/60Φ/9Amps -	Front vestibule	Model # PCDE-144 - Serial # 28235 - MFR. The National Wheel-O-Vator Co. Inc. -	Electricity	-	1/26/1996	50%

Fire Headquarters Inventory

Building System	Description	Location	Make/ Model	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating	UH-1; Gibson gas-fired unit heater for garage, convective unit, non-programmable thermostat set to 60F	Hanging from garage bay ceiling, towards Municipal building	Gibson, Model #GL1RC 100D-16B, Serial #GLD050502854	Natural Gas	Garage	2005	66%
Heating	UH-2; Gibson gas-fired unit heater for garage, convective unit, non-programmable thermostat	Hanging from garage bay ceiling, towards front of firehouse	Gibson, Model #GL1RC 100D-16B, Serial #GLD050502932	Natural Gas	Garage	2005	66%
Heating	Nordyne/Gibson Furnace for Meeting Areas, 120,000 BTUH input, 110,000 BTUH output, controlled by Honeywell non-programmable thermostat on wall, 1 zone, unit is extremely loud when operated	Mechanical closet in Firehouse lounge/meeting area, first floor	Gibson, Model #KG6RC 120C-20C, Serial #KGD040708802	Natural Gas	First floor, meeting areas	2005	66%
Heating	Two (2) electric baseboards in basement, non-programmable thermostat set to 80F, no nameplate info	Basement, Billiards room	No nameplate info	Electricity	Basement, Billiards room	1970	10%
Cooling	GE window AC unit in basement, no nameplate info	Basement, Billiards room	No nameplate info	Electricity	Basement, Billiards room	2000	30%
Cooling	CU-1; Nordyne split AC system condensing unit, 4 tons, connects to an AHU located in ceiling plenum of second floor, R-22 refrigerant	Rooftop of first floor, right side unit	Nordyne, Model #JS3BA-048KA, Serial #JSF050505253	Electricity	Second Floor	2005	66%
Cooling	CU-2; Nordyne split AC system condensing unit, 4 tons, connects to an AHU located in ceiling plenum of second floor, R-22 refrigerant	Rooftop of first floor, left side unit	Nordyne, Model #JS3BA-048KA, Serial #JSF050505254	Electricity	Second Floor	2005	66%
Cooling	Two (2) large window AC units installed in second floor windows, these are no longer used since the split AC system was installed in 2005, no nameplate info	Windows of second floor	No nameplate info	Electricity	Second Floor	1990	0%
Heating/ Cooling	AHU-1; Nordyne gas-fired furnace with cooling coil, connected to condenser located on roof of first floor, R-22 refrigerant, connected to non-programmable thermostat on second floor near office entrance and set to 71F	Ceiling plenum of second floor, unit closest to scuttle hole	Nordyne, Model #C3BH-048C-B, Serial #G3D050800138	Natural Gas/ Electricity	Second Floor	2005	66%
Heating/ Cooling	AHU-2; Nordyne gas-fired furnace with cooling coil, connected to condenser located on roof of first floor, R-22 refrigerant, connected to non-programmable thermostat on second floor near stairwell entrance and set to 68F	Ceiling plenum of second floor, unit furthest from scuttle hole	Nordyne, Model #C3BH-048C-B, Serial #NA	Natural Gas/ Electricity	Second Floor	2005	66%
Cooling	CU-3; Carrier condensing unit connected to Carrier evaporator unit in Meeting area of first floor, connected to programmable thermostat in first floor meeting area	Exterior of building, behind firehouse	Carrier, Model #38HDC060321, Serial #1303X54520	Electricity	First floor meeting areas via Carrier evaporator hung from ceiling	1998	20%
Domestic Hot Water	AO Smith, atmospheric, 40 gallons, 32,000 BTUH input	Mechanical/storage room, basement level	AO Smith, Model #PGX 40 216, Serial #NA, Part #PGX--40-J00N010000	Natural Gas	All Areas	1980	0%
Lighting	See Appendix A	-	-	-	-	-	-

Appendix B: Lighting Study – Municipal Building

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 Wattage	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)
1	Bsmt	Office Area	Recessed	E	4'T8	2	3	32	Sw	8	261	5	202	422	N/A	Recessed	4'T8	E	Sw	2	3	32	8	261	5	202	422	0	0	0
2	Bsmt	Office Area	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
3	Bsmt	Office Area	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
4	Bsmt	Office Area - DPW	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
5	Bsmt	Office Area - Health	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
6	Bsmt	Office Area	Recessed	E	4'T8	3	3	32	OS	8	261	5	303	633	N/A	Recessed	4'T8	E	OS	3	3	32	8	261	5	303	633	0	0	0
7	Bsmt	Office - Borough Administrator	Recessed	E	4'T8	3	3	32	OS	8	261	5	303	633	N/A	Recessed	4'T8	E	OS	3	3	32	8	261	5	303	633	0	0	0
8	Bsmt	Office - Borough Administrator	Recessed	E	4'T8 J-Shaped	2	2	32	OS	8	261	5	138	288	N/A	Recessed	4'T8 U-Shaped	E	OS	2	2	32	8	261	5	138	288	0	0	0
9	Bsmt	Judge Room - Borough Administra	Recessed	M	4'T12	1	4	40	Sw	4	261	12	172	180	T8	Recessed	4'T8	E	Sw	1	4	32	4	261	5	133	139	41	0	41
10	Bsmt	Hallway	Recessed	E	4'T8 J-Shaped	4	2	32	OS	8	261	5	276	576	N/A	Recessed	4'T8 U-Shaped	E	OS	4	2	32	8	261	5	276	576	0	0	0
11	Bsmt	Vault	Ceiling Mounted	M	4'T12	3	2	40	Sw	4	261	12	276	288	T8	Ceiling Mounted	4'T8	E	Sw	3	2	32	4	261	5	207	216	72	0	72
12	Bsmt	Office Storage	Ceiling Mounted	M	8'T12	5	2	80	Sw	4	261	20	900	940	T8	Ceiling Mounted	8'T8	E	Sw	5	2	59	4	261	7	625	653	287	0	287
13	Bsmt	Bathroom Men	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
14	Bsmt	Bathroom Women	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
15	GF	Staircase	Wall Mounted	S	Inc	2	1	20	Sw	8	261	0	40	84	CFL	Wall Mounted	CFL	S	Sw	2	1	5	8	261	0	10	21	63	0	63
16	GF	Office-Assessor	Recessed	E	4'T8	3	3	32	Sw	8	261	5	303	633	N/A	Recessed	4'T8	E	Sw	3	3	32	8	261	5	303	633	0	0	0
17	GF	Office - Building Department	Recessed	E	4'T8	4	3	32	OS	8	261	5	404	844	N/A	Recessed	4'T8	E	OS	4	3	32	8	261	5	404	844	0	0	0
18	GF	Office - Building Department	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
19	GF	Office - Building Department	Recessed	E	4'T8 J-Shaped	1	2	32	OS	8	261	5	69	144	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	8	261	5	69	144	0	0	0
20	GF	Storage Room	Recessed	E	4'T8 J-Shaped	1	2	32	OS	2	261	5	69	36	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	2	261	5	69	36	0	0	0
21	GF	Hallway	Recessed	E	4'T8	1	3	32	Sw	8	261	5	101	211	N/A	Recessed	4'T8	E	Sw	1	3	32	8	261	5	101	211	0	0	0
22	GF	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
23	GF	Bathroom Men	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
24	GF	Bathroom Women	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
25	GF	Bathroom Women	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
26	GF	Lobby	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
27	GF	Lobby	Recessed	E	4'T8 J-Shaped	3	2	32	Sw	24	261	5	207	1,297	N/A	Recessed	4'T8 U-Shaped	E	Sw	3	2	32	24	261	5	207	1297	0	0	0
28	GF	Office - Borough Clerk	Recessed	E	4'T8	3	3	32	OS	8	261	5	303	633	N/A	Recessed	4'T8	E	OS	3	3	32	8	261	5	303	633	0	0	0
29	GF	Office - Borough Clerk	Recessed	E	4'T8 J-Shaped	1	2	32	OS	8	261	5	69	144	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	8	261	5	69	144	0	0	0
30	GF	Office - Tax Clerk	Recessed	E	4'T8	3	3	32	OS	8	261	5	303	633	N/A	Recessed	4'T8	E	OS	3	3	32	8	261	5	303	633	0	0	0
31	GF	Office - Registrar	Recessed	E	4'T8	4	3	32	OS	8	261	5	404	844	N/A	Recessed	4'T8	E	OS	4	3	32	8	261	5	404	844	0	0	0
32	GF	Office - Registrar	Recessed	E	4'T8 J-Shaped	2	2	32	OS	8	261	5	138	288	N/A	Recessed	4'T8 U-Shaped	E	OS	2	2	32	8	261	5	138	288	0	0	0
33	GF	Hallway	Wall Mounted	S	Inc	1	1	20	Sw	8	261	0	20	42	CFL	Wall Mounted	CFL	S	Sw	1	1	5	8	261	0	5	10	31	0	31
34	GF	Office - CFO Secretary	Recessed	E	4'T8 J-Shaped	4	2	32	OS	8	261	5	276	576	N/A	Recessed	4'T8 U-Shaped	E	OS	4	2	32	8	261	5	276	576	0	0	0
35	GF	Office - CFO	Recessed	E	4'T8 J-Shaped	2	2	32	OS	8	261	5	138	288	N/A	Recessed	4'T8 U-Shaped	E	OS	2	2	32	8	261	5	138	288	0	0	0
36	GF	Office - CFO	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
37	1	Staircase	Wall Mounted	S	Inc	2	2	20	Sw	8	261	0	80	167	CFL	Wall Mounted	CFL	S	Sw	2	2	5	8	261	0	20	42	125	0	125
38	1	Staircase - Chandelier	Wall Mounted	S	Inc	1	15	20	Sw	8	261	0	300	626	CFL	Wall Mounted	CFL	S	Sw	1	15	5	8	261	0	75	157	470	0	470
39	1	Hallway	Recessed	E	4'T8 J-Shaped	2	2	32	Sw	8	261	5	138	288	N/A	Recessed	4'T8 U-Shaped	E	Sw	2	2	32	8	261	5	138	288	0	0	0
40	1	Meeting Room	Recessed	E	4'T8	4	3	32	OS	8	261	5	404	844	N/A	Recessed	4'T8	E	OS	4	3	32	8	261	5	404	844	0	0	0
41	1	Council Room	Recessed	E	4'T8	11	3	32	OS	4	261	5	1,111	1,160	N/A	Recessed	4'T8	E	OS	11	3	32	4	261	5	1111	1160	0	0	0
42	1	Council Room	Recessed	E	4'T8 J-Shaped	2	2	32	OS	4	261	5	138	144	N/A	Recessed	4'T8 U-Shaped	E	OS	2	2	32	4	261	5	138	144	0	0	0
43	1	Council Room	Exit Sign	S	LED	3	1	5	N	4	365	1	17	24	N/A	Exit Sign	LED	S	N	3	1	5	4	365	1	17	24	0	0	0
44	1	Storage Room	Wall Mounted	S	Inc	1	1	40	Sw	2	261	0	40	21	CFL	Wall Mounted	CFL	S	Sw	1	1	15	2	261	0	15	8	13	0	13
45	1	Bathroom Men	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
46	1	Bathroom Women	Recessed	E	4'T8 J-Shaped	1	2	32	OS	4	261	5	69	72	N/A	Recessed	4'T8 U-Shaped	E	OS	1	2	32	4	261	5	69	72	0	0	0
47	1	Office - Fire Prevention	Recessed	E	4'T8	2	3	32	OS	8	261	5	202	422	N/A	Recessed	4'T8	E	OS	2	3	32	8	261	5	202	422	0	0	0
48	Ext	Exterior	Wall Mounted	S	Hal	1	3	45	T	12	365	10	145	635	CFL	Wall Mounted	CFL	S	T	1	3	15	12	365	0	45	197	438	0	438
49	Ext	Exterior	Wall Mounted	S	MH	5	1	150	T	12	365	42	960	4,205	PSMH	Wall Mounted	PSMH	S	T	5	1	100	12	365	20	600	2628	1577	0	1577
Totals:						114	123	484				273	10,469	22,043						114	123	1,413			214	9,271	18,927	3,116	0	3,116

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

Lighting Study – Fire Headquarters

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 Wattage	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)
1	GF	Garage bay	Recessed	E	4'T8	1	3	32	Sw	8	365	5	707	2,064	N/A	Recessed	4'T8	E	Sw	1	3	32	8	365	5	707	2,064	0	0	0
2	GF	Garage bay	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	365	5	483	1,410	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	8	365	5	483	1410	0	0	0
3	GF	Garage bay	Parabolic Ceiling Suspended	E	4'T12	1	4	40	Sw	8	365	12	172	502	T8	Parabolic Ceiling Suspended	4'T8	E	Sw	1	4	32	8	365	5	133	388	114	0	114
4	GF	Control Room	Recessed	M	4'T8 U-Shaped	4	2	32	Sw	24	365	5	279	2,419	N/A	Recessed	4'T8 U-Shaped	M	Sw	4	2	32	24	365	5	279	2419	0	0	0
5	GF	Storage Room	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
6	GF	Lunch Room	Ceiling Mounted	M	4'T12	1	2	40	Sw	4	365	12	92	134	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	4	365	5	69	101	34	0	34
7	GF	Lunch Room	Ceiling Mounted	M	4'T12	1	2	40	Sw	4	365	12	92	134	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	4	365	5	69	101	34	0	34
8	GF	Meeting Room	Ceiling Mounted	M	4'T12	8	2	40	Sw	4	365	12	736	1,075	T8	Ceiling Mounted	4'T8	E	Sw	8	2	32	4	365	5	552	806	269	0	269
9	GF	Meeting Room	Ceiling Mounted	M	4'T12	4	1	40	Sw	4	365	12	208	304	T8	Ceiling Mounted	4'T8	E	Sw	4	1	32	4	365	5	148	216	88	0	88
10	GF	Boiler Room	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
11	GF	Boiler Room	Wall Mounted	S	CFL	1	1	23	Sw	2	365	0	23	17	N/A	Wall Mounted	CFL	S	Sw	1	1	23	2	365	0	23	17	0	0	0
12	GF	Mechanical Room	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
13	GF	Bathroom	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
14	GF	Storage Room	Parabolic Ceiling Suspended	M	8'T12	1	4	80	Sw	2	365	20	340	248	T8	Parabolic Ceiling Suspended	8'T8	E	Sw	1	4	59	2	365	7	243	177	71	0	71
15	GF	Staircase	Recessed	M	8'T12 U-Shaped	1	2	40	Sw	8	365	12	92	269	T8	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	8	365	5	69	201	67	0	67
16	Bsmt	Storage Room	Parabolic Ceiling Suspended	M	8'T12	1	2	80	Sw	4	365	20	180	263	T8	Parabolic Ceiling Suspended	8'T8	E	Sw	1	2	59	4	365	7	125	183	80	0	80
17	Bsmt	Meeting Room	Recessed	M	8'T12	9	2	80	Sw	4	365	20	1,620	2,365	T8	Recessed	8'T8	E	OS	9	2	59	3	365	7	1125	1232	723	411	1133
18	Bsmt	Kitchen	Recessed	M	8'T12	5	2	80	Sw	4	365	20	900	1,314	T8	Recessed	8'T8	E	OS	5	2	59	3	365	7	625	684	402	228	630
19	Bsmt	Bathroom Men	Recessed	M	2'T12	1	1	20	Sw	2	365	6	26	19	T8	Recessed	2'T8	E	Sw	1	1	17	2	365	2	19	14	5	0	5
20	Bsmt	Bathroom Women	Recessed	M	2'T12	1	1	20	Sw	2	365	6	26	19	T8	Recessed	2'T8	E	Sw	1	1	17	2	365	2	19	14	5	0	5
21	Bsmt	Bathroom Women	Wall Mounted	M	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	M	Sw	1	1	20	2	365	0	20	15	29	0	29
22	Bsmt	Bathroom Men	Wall Mounted	M	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	M	Sw	1	1	20	2	365	0	20	15	29	0	29
23	Bsmt	Boiler Room	Ceiling Mounted	M	4'T12	1	2	40	Sw	2	365	12	92	67	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	2	365	5	69	50	17	0	17
24	Bsmt	Boiler Room	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
25	GF	Staircase	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
26	GF	Staircase	Ceiling Mounted	S	CFL	4	2	18	Sw	2	365	0	144	105	N/A	Ceiling Mounted	CFL	S	Sw	4	2	18	2	365	0	144	105	0	0	0
27	GF	Staircase	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
28	2	Meeting Room	Recessed	E	4'T8	24	4	32	Sw	4	365	5	3,192	4,660	C	Recessed	4'T8	E	OS	24	4	32	3	365	5	3192	3499	0	1160	1160
29	2	Hallway	Recessed	M	8'T12 U-Shaped	3	2	40	Sw	8	365	12	276	806	T8	Recessed	4'T8 U-Shaped	E	Sw	3	2	32	8	365	5	207	604	201	0	201
30	2	Office-chief	Recessed	E	4'T12	3	4	40	Sw	8	365	12	516	1,507	T8	Recessed	4'T8	E	OS	3	4	32	8	365	5	399	874	342	291	633
31	2	Office-chief2	Recessed	E	4'T12	3	4	40	Sw	8	365	12	516	1,507	T8	Recessed	4'T8	E	OS	3	4	32	8	365	5	399	874	342	291	633
32	2	Meeting Room	Exit Sign	S	LED	2	1	5	N	4	365	1	11	16	N/A	Exit Sign	LED	S	N	2	1	5	4	365	1	11	16	0	0	0
33	2	Bathroom Women	Recessed	M	8'T12 U-Shaped	1	2	40	Sw	2	365	12	92	67	T8	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	2	365	5	69	50	17	0	17
34	2	Bathroom Men	Recessed	E	4'T12	3	4	40	Sw	2	365	12	344	251	T8	Recessed	4'T8	E	Sw	3	4	32	2	365	5	266	194	57	0	57
35	2	Storage Room	Parabolic Ceiling Suspended	M	4'T12	1	2	40	Sw	2	365	12	92	67	T8	Parabolic Ceiling Suspended	4'T8	E	Sw	1	2	32	2	365	5	69	50	17	0	17
36	2	Meeting Room	Recessed	S	Inc	7	1	75	Sw	4	365	0	525	767	CFL	Recessed	CFL	S	Sw	7	1	23	4	365	0	175	256	511	0	511
37	2	Meeting Room	Wall Mounted	S	Inc	4	1	60	Sw	4	365	0	240	350	CFL	Wall Mounted	CFL	S	Sw	4	1	20	4	365	0	80	117	234	0	234
38	Attic	Attic	Ceiling Mounted	S	Inc	3	1	60	Sw	2	365	0	180	96	CFL	Ceiling Mounted	CFL	S	Sw	3	1	20	2	365	0	60	12	24	0	24
39	Ext	Exterior	Wall Mounted	S	CFL	2	1	23	T	12	365	0	46	201	N/A	Wall Mounted	CFL	S	T	2	1	23	12	365	0	46	201	0	0	0
40	Ext	Exterior	Wall Mounted	S	Neon	1	1	250	T	12	365	0	250	1,095	N/A	Wall Mounted	Neon	S	T	1	1	250	12	365	0	250	1095	0	0	0
41	Ext	Exterior	Wall Mounted	E	MH	2	1	175	T	12	365	40	448	1,962	PSMH	Wall Mounted	PSMH	E	T	2	1	100	12	365	20	240	1051	911	0	911
42	Ext	Exterior	Wall Mounted	E	HPS	2	1	175	T	12	365	35	420	1,840	PSMH	Wall Mounted	PSMH	E	T	2	1	100	12	365	20	240	1051	788	0	788
43	Ext	Exterior	Recessed	S	Inc	2	1	75	T	12	365	0	150	657	CFL	Recessed	CFL	S	T	2	1	25	12	365	0	50	219	438	0	438
Totals:						129	77	2,487				353	14,047	28,911						129	77	1,603			158	10,831	20,474	8,051	2,386	8,437

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: VendingMiser and SnackMiser Savings Calculations

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)	.172
Facility Occupied Hours per Week	40
Number of Cold Drink Vending Machines	1
Number of Non-refrigerated Snack Machines	1
Power Requirements of Cold Drink Machine (Watts; 400 typical)	400
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	3494	1276	2219	63%
Cost of Operation	$601.04	$219.43	$381.61	63%

SNACK MACHINES	Current	Projected	Total Savings	% Savings
kWh	699	166	532	76%
Cost of Operation	$120.21	$28.62	$91.59	76%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	4193	1442	2751	66%
Cost of Operation	$721.24	$248.05	$473.20	66%

Total Project Cost	Break Even (Months)
$298	7.56

Estimated Five Year Savings on ALL Machines = $2,365.99

APPENDIX D: 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	(888) 644-1014 www.suezenergyresources.com

Edison, NJ 08837	
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for NJNG 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
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
NJ Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NewJerseyGasElectric.com
Pepco Energy Services, Inc. 112 Main Street 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
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX E: 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.

Calculation References

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

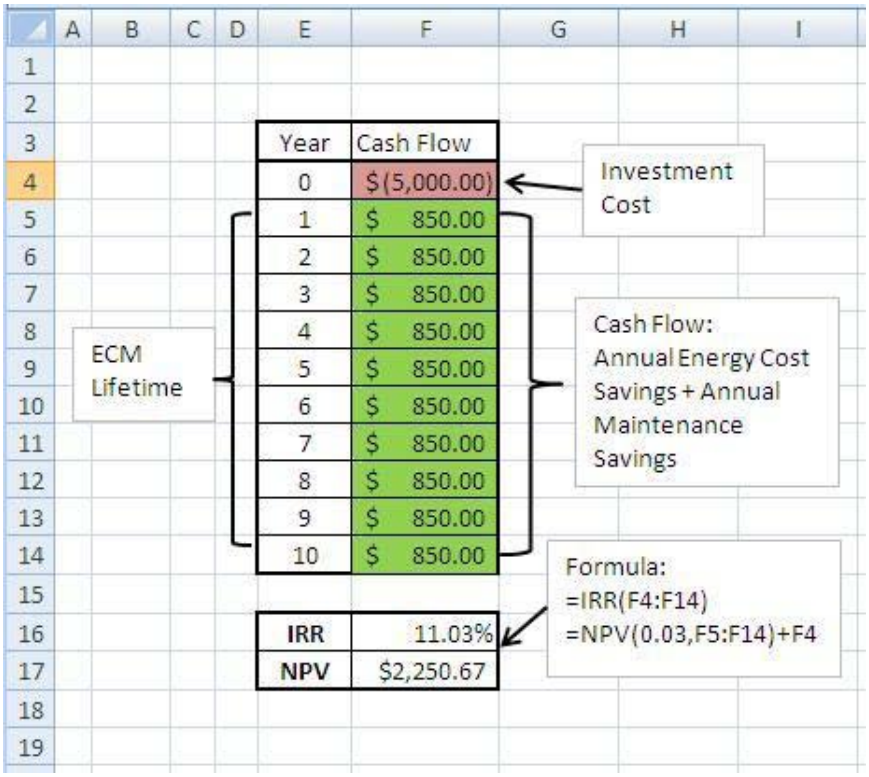
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime
LCS = LOCS+LECS

Note: 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).

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
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

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:



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.

NJCEP C & I Lifetimes

Measure	Measure Life
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 - Fire Headquarters/Municipal Building

Building ID: 2211582
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: April 26, 2010

Facility
Borough of Freehold - Fire Headquarters/Municipal Building
49 West Main Street
Freehold, NJ 07728

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1933
Gross Floor Area (ft²): 10,272

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	318,817
Natural Gas (kBtu)[4]	210,004
Total Energy (kBtu)	528,821
Energy Intensity[5]	
Site (kBtu/ft²/yr)	51
Source (kBtu/ft²/yr)	125
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	60
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	-20%
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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE 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 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. Theincentives 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 here.

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: ENERGY CONSERVATION MEASURES TABLE

Combined – Energy Conservation Measures

Combined - 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/sqft, 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, $	CO2 reduced, lb/year
1	Muni. - Install (6) new CFL lamps	RS Means	120	0	120	1,140	0.2	0	1.3	188	282	5	1,910	0.3	15	3	3	1,620	2,041
2	Fire - Install (25) new CFL lamps	RS Means	375	0	375	1,469	0.3	0	0.7	432	695	5	3,423	0.5	8	2	2	2,743	2,630
3	Fire - Retrofit (1) non-refrig. Vending machine with VendingMiser	Manufacturer	99	0	99	466	0.1	0	0.2	0	80	5	401	1.2	3	1	1	266	834
4	Muni. - Install (9) programmable thermostats	RS Means	1,125	0	1,125	4,279	4.0	56	6.6	0	836	15	12,536	1.3	10	1	1	8,709	8,279
5	Fire - Install (3) programmable thermostats	RS Means	375	0	375	423	0.1	112	1.8	0	257	10	2,567	1.5	6	1	1	1,792	1,992
6	Fire - Retrofit (1) refrig. Vending machine with VendingMiser	Manufacturer	199	0	199	495	0.1	0	0.2	0	83	5	417	2.4	1	0	0	181	866
7	Fire - Install (5) new Occupancy Sensors	RS Means	1,100	100	1,000	2,388	0.5	0	1.1	0	410	15	6,156	2.4	5	0	0	3,629	4,272
8	Fire - Install (4) new Pulse Start Metal Halide fixtures	RS Means	2,170	100	2,070	1,699	0.4	0	0.8	344	636	15	9,543	3.3	4	0	0	5,417	3,042
9	Muni. - Install (5) new Pulse Start Metal Halide fixtures	RS Means	2,240	125	2,115	1,577	0.3	0	1.8	267	539	15	8,074	3.9	3	0	0	4,219	2,824
10	Muni. - Install 10kW Solar Photovoltaic system	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	13.1	0	8,630	25	215,757	7.0	3	0	0	52,241	21,135
11	Muni. - Replace (2) existing smaller refrigerators with Energy Star models	Manufacturer	258	0	258	190	0.0	0	0.2	0	33	15	490	7.9	1	0	0	127	340
12	Fire - Install (48) new T8 fluorescent fixtures	RS Means	6,855	720	6,135	2,882	0.6	0	1.4	240	736	15	11,036	8.3	1	0	0	2,522	5,160
13	Muni. - Install (9) new T8 fluorescent fixtures	RS Means	1,296	135	1,161	400	0.1	0	0.4	56	125	15	1,872	9.3	1	0	0	309	716
14	Fire - Replace GE window AC unit with Energy Star model	RS Means	831	92	739	423	0.0	0	0.2	0	73	15	1,091	10.2	0	0	0	117	757
15	Muni. - Replace (8) window AC units with Energy Star models	RS Means	6,648	736	5,912	3,384	0.1	0	3.8	0	582	15	8,731	10.2	0	0	0	937	6,059
16	Fire - Replace DHW heater	RS Means	1,380	50	1,330	0	0.0	61	0.8	0	100	15	1,502	13.3	0	0	0	-151	672
17	Muni. - Replace electric DHW heater with gas-fired unit	RS Means	1,388	50	1,338	511	0.1	-17	0.0	15	73	15	1,089	18.4	0	0	0	-484	728
	TOTALS		**96,459**	**12,100**	**84,351**	**33,519**	**16.9**	**212**	**34.4**	**1,540**	**14,259**	**-**	**286,596**	**5.9**	**-**	**-**	**-**	**84,391**	**62,351**

Municipal Building – Energy Conservation Measures

Municipal Building - 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, $	COs reduced, lbs/year
1	Muni. - Install (6) new CFL lamps	RS Means	120	0	120	1,140	0.2	0	1.3	188	382	5	1,910	0.3	15	3	3	1,620	2,041
2	Muni. - Install (9) programmable thermostats	RS Means	1,125	0	1,125	4,279	4.0	56	6.6	0	836	15	12,536	1.3	10	1	1	8,709	8,279
3	Muni. - Install (5) new Pulse Start Metal Hal-de fixtures	RS Means	2,240	125	2,115	1,577	0.3	0	1.8	267	538	15	8,074	3.9	3	0	0	4,219	2,824
4	Muni. - Install 10kW Solar Photovoltaic system	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	13.1	0	8,630	25	215,757	7.0	3	0	0	52,241	21,135
5	Muni. - Replace (2) existing smaller refrigerators with Energy Star models	Manufacturer	258	0	258	190	0.0	0	0.2	0	33	15	490	7.9	1	0	0	127	340
6	Muni. - Install (9) new T8 fluorescent fixtures	RS Means	1,296	135	1,161	400	0.1	0	0.4	56	125	15	1,872	9.3	1	0	0	369	716
7	Muni. - Replace (8) window AC units with Energy Star models	RS Means	6,648	736	5,912	3,384	0.1	0	3.8	0	582	15	8,731	10.2	0	0	0	937	6,059
8	Muni. - Replace electric DHW heater with gas-fired unit	RS Means	1,388	50	1,338	511	0.1	-17	0.0	15	73	15	1,089	18.4	0	0	0	-484	728
	TOTALS		**83,075**	**11,046**	**72,029**	**23,295**	**14.8**	**39**	**27.1**	**524**	**11,199**	**-**	**260,459**	**6.4**	**-**	**-**	**-**	**67,676**	**42,122**

Fire Headquarters – Energy Conservation Measures

Fire Headquarters - 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, $	COs reduced, lbs/year
1	Fire - Install (25) new CFL lamps	RS Means	375	0	375	1,469	0.3	0	0.7	432	685	5	3,423	0.5	8	2	2	2,743	2,630
2	Fire - Retrofit (1) non-refrig. Vending machine with VendingMiser	Manufacturer	99	0	99	466	0.1	0	0.2	0	80	5	401	1.2	3	1	1	266	834
3	Fire - Install (3) programmable thermostats	RS Means	375	0	375	423	0.1	112	1.8	0	257	10	2,567	1.5	6	1	1	1,792	1,992
4	Fire - Retrofit (1) refrig. Vending machine with VendingMiser	Manufacturer	199	0	199	485	0.1	0	0.2	0	83	5	417	2.4	1	0	0	181	868
5	Fire - Install (5) new Occupancy Sensors	RS Means	1,100	100	1,000	2,386	0.5	0	1.1	0	410	15	6,156	2.4	5	0	0	3,829	4,272
6	Fire - Install (4) new Pulse Start Metal Halide fixtures	RS Means	2,170	100	2,070	1,699	0.4	0	0.8	344	636	15	9,543	3.3	4	0	0	5,417	3,042
7	Fire - Install (48) new T8 fluorescent fixtures	RS Means	6,855	720	6,135	2,892	0.6	0	1.4	240	736	15	11,036	8.3	1	0	0	2,522	5,160
8	Fire - Replace GE window AC unit with Energy Star model	RS Means	831	92	739	423	0.0	0	0.2	0	73	15	1,091	10.2	0	0	0	117	757
9	Fire - Replace DHW heater	RS Means	1,360	50	1,330	0	0.0	61	0.8	0	100	15	1,502	13.3	0	0	0	-151	672
	TOTALS		**13,384**	**1,062**	**12,322**	**10,233**	**2.1**	**173**	**7.3**	**1,016**	**3,060**	**-**	**36,136**	**4.0**	**-**	**-**	**-**	**16,715**	**20,229**

APPENDIX H: 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.