BOROUGH OF SOMERDALE
MUNICIPAL BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

CHA PROJECT NO. 22424

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1.0 INTRODUCTION & BACKGROUND

The Borough of Somerdale Municipal Building is an 8,500 square foot building located at 105 Kennedy Boulevard. The facility contains offices for tax collection, mayor, clerk, chief financial officer, construction, and court administration. The building also houses the Somerdale Police Department and a courtroom.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

2.0 EXECUTIVE SUMMARY

This report details the results of the Borough of Somerdale Municipal Building. The 8,500 square foot building contains offices for tax collection, mayor, clerk, chief financial officer, construction, and court administration. The building also houses the Somerdale Police Department and a courtroom. Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of $5,850 for the recommended ECMs may be realized with a payback of 4.3 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey SmartStart Buildings Program and/or Direct Install Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

Summary of Energy Conservation Measures

Energy Conservation Measure		Approx. Cost ($)	Approx. Annual Savings ($)	Payback w/o Incentive	Potential Incentive* ($)	Payback w/ Incentive	Recommended for Implementation (X)
ECM-1	Lighting Replacements	2,600	1,200	2.2	1,600	0.8	
ECM-2	Install Lighting Controls	5,000	1,500	3.3	3,000	1.3	
ECM-3	Combined Lighting Replacement with Lighting Controls	7,800	2,700	2.9	4,700	1.1	X
ECM-4	Replace Electric DHW Heater with On Demand Gas	4,200	1,100	3.8	300	3.5	X
ECM-5	Temperature Setback	500	1,400	0.4	300	0.1	X
ECM-6	Dual Flush Toilets	3,900	300	13.0	-	-	
ECM-7	Install Storm Windows in Courtroom	1,500	150	10.0	-	-	X
ECM-8	Increase Wall Insulation in Courtroom	3,900	200	19.5	-	-	
ECM-9	Replace Court Office RTU with More Efficient Unit	11,300	500	22.5	6,800	9.0	X

* Incentive shown is the maximum amount potentially available per the NJ SmartStart or Pay For Performance Programs.

3.0 EXISTING CONDITIONS

3.1 Building General

The Somerdale Municipal Building was constructed in 1978. The original building was about 3,500 square feet; with a 5,000 square foot addition in 2004. The expansion added office space and increased the size of the police department.

The northeast part of the building contains offices for the mayor, tax collector, deputy clerk, tax assessor, and chief financial officer. This area also contains a small meeting room and storage closets. The northwest side of the building contains the offices for the fire marshal, construction, and court violations. This area also has a conference room which is used 2-3 times per week, and employee breakroom.

The majority of the southern part of the building contains the police department. This area includes offices for the sergeants and chief, and also a locker room area for the officers. There are two prisoner cells and prisoner processing area. The southwest corner contains the courtroom which has a capacity of 150 people.

Normal operating hours for the building are Monday through Friday from 8:30 AM to 4:30 PM, except the police department which is a 24 hour operation. Meetings and gatherings occur in the evenings about two times per week for about 3-4 hours each. According to building personnel, about 15 employees occupy the building during normal operations.

The building walls are constructed with filled concrete block and concrete masonry exterior. In the section of the building constructed in 2004, the walls contain polyisocyanurate insulation. In the original section, there is no added insulation. The roof was replaced with a new rubber membrane in 2006 according to building personnel. Windows are double pane and in good condition, except the windows in the courtroom which are single pane and original to the building's construction. All the doors seal appropriately and are in good condition.

3.2 Utility Usage

Utilities include electricity, natural gas, and potable water. Electricity is supplied and delivered by Public Service Electric & Gas Company (PSE&G) and natural gas is supplied and delivered by South Jersey Gas. Potable water is provided by New Jersey American Water.

From November 2009 through October 2010, electric usage was approximately 117,820 kWh at a cost of about $20,500. Analyzing electricity bills during this period showed that the building was charged a supply unit cost of $0.125 per kWh, demand unit cost of $12.99 per kW, and blended unit cost of $0.174 per kWh. Electricity usage was generally higher in the summer months due to air conditioning.

From January 2010 through December 2010, natural gas usage was about 2,900 therms. Based on the annual cost of about $3,900, the blended price for natural gas was $1.36 per therm. Natural gas consumption is highest in winter months when the building is in heating mode.

Review of potable water utility bills from December 2009 through November 2010 determined the facility used a total of 58,000 gallons of water. There was a large spike in water usage in September 2009 for unknown reasons. At a total cost of about $600, the unit cost for water was found to be $10.44 per kGal. Utility data can be found in Appendix A.

Electricity supply and delivery are presently purchased from PSE&G, and natural gas supply and delivery from South Jersey Gas. The delivery component will always be the responsibility of the utility that connects the facility to the power grid or gas line; however, the supply can be purchased from a third party. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

According to the Department of Energy, the state average cost per kWh for commercial buildings in 2010 was $.141/kWh. The average cost for natural gas was $.99/therm in 2009 (the most recent data available). If the borough paid average costs for kWh and therms of natural gas for the municipal building, about $5,000 could be saved per year.

3.3 HVAC Systems

HVAC is divided into four sections; mayor's office wing, police department, tax and construction office, and courtroom. These areas are heated and cooled by five constant volume roof top units (RTUs); one per section, except the police department which has two. Each unit has a thermostat located in the space for temperature control.

The area that contains the offices of the mayor and chief financial officer is heated by an 80% efficient Trane natural gas heater. The RTU has an input rating of 200 MBtu and output rating of 160 MBtu. The RTU has a cooling capacity of 7.5 tons. This unit is located on the northern section of the roof and is about six years' old.

The police department is heated and cooled by two RTUs. One unit, manufactured by Trane, which is about six years old, has a natural gas input of 120 MBtu and output of 96 MBtu. This unit, with a standard 80% efficiency and cooling capacity of four tons, is located on the eastern side of the roof. The second RTU, manufactured by Carrier, for the police department is located on the south side of the roof and has an input capacity of 115 MBtu and output of 92 MBtu. The unit has a standard heating efficiency of 80% and cooling capacity of four tons.

The courtroom Carrier RTU is located on the southwest side of the roof, and according to building maintenance personnel, is slightly over a year old. The heating portion is 82% efficient with an input rating of 224 MBtu and output rating of 184 MBtu. The RTU has a cooling capacity of 9.5 tons and an Energy Efficiency Ratio of 11.1.

The fifth RTU, estimated to be about 12 years' old, heats and cools the offices of court administration, construction, and fire marshal, as well as breakroom and conference room. The unit, manufactured by Carrier, has a standard heating efficiency of 80%, and input heating rating of 180 MBtu and output rating of 144 MBtu. The cooling portion is rated to ten tons.

Six small exhaust fans ventilate the five restrooms; janitorial closet; and server closet in the mayor's wing. All fans are controlled by switches.

3.4 Lighting/Electrical Systems

Most main areas of the building, including the hallways, offices, and common areas are lit primarily with 2-lamp, 3-lamp, or 4-lamp T8 troffer fixtures containing electronic ballasts. The courtroom is lit with 4 lamp T12 fixtures containing magnetic ballasts. Some areas, including the conference room, main hallway, and courtroom, have incandescent bulbs. The restrooms are also primarily lit with T12 lamps.

All lighting is controlled by switches. During the site visit, a thorough lighting survey was conducted analyzing the lighting types and lighting controls. A full list of existing lighting can be viewed in Appendix R.
Outside lighting consists of 100 W metal halide fixtures and emergency wall packs.

There is a 100 kW emergency generator located on the southern part of the building. This unit runs on natural gas and is tested once a month.

3.5 Control Systems

The five HVAC units noted above have dedicated thermostats; all are programmable except one manual thermostat in the police area. This area is on a 24/7 schedule; therefore, setback is not possible. During the site visit, the temperature of the space was about 72°F; a police officer noted that the air conditioning remained around 70°F in the summer.

The programmable thermostat in the mayor's section is set to about 74°F year round. There is setback capability with this unit; however during the site visit, this option had been manually overridden. Because of the overridden setpoint and building load calculations, it was assumed that the space is kept cooler than 74°F in the summer. A conservative estimate of 72°F was used for calculations based on building load. The court office area on the west side of the building has an outdated programmable thermostat. The thermostat was manually overridden to hold the space temperature at 74°F with no setback. An employee in that area noted that it was cool in the summer; therefore, a conservative estimate of 72°F was used as the cooling setpoint. The courtroom is also controlled with an outdated programmable thermostat set to 65°F when unoccupied, and 74°F when occupied in heating mode. In the summer, the courtroom was set to 73°F in occupied mode. This thermostat was manually overridden; therefore, an estimate of 70°F occupied, and 75°F unoccupied was used to determine building load requirements in the summer. The thermostats are not being properly utilized for setback.

3.6 Plumbing System

The building has five restrooms, two main restrooms located in the main hallway, two in the police area, and one employee restroom in the office area on the west side of the building. There is also a single janitorial closet next to the employee restroom that has a mop sink.

The main men's restroom has a 1.6 gallon per flush (gpf) toilet and a 1 gpf urinal. The flush valve on the toilet is not working correctly and the toilet flushes for about 10 seconds. During this time, water flows through unnecessarily. The men's restroom also has two low flow faucets. The main women's restroom has two high flow toilets (about 2.5 gpf) and two low flow faucets. The employee restroom has a low flow toilet (1.6 gpf) and low flow faucet.

One restroom in the police area is located in the officer locker room and has a 1.6 gpf toilet and low flow sink at about 1.0 gallons per minute (gpm). There is also a small restroom in the prisoner processing area with a 1.6 gpf toilet and a high flow sink at about 2.5 gpm.

Domestic hot water (DHW) is produced by a single 40 gallon Bradford White electric hot water heater that uses 4.5 kW. A small 1/12 HP circulation pump manufactured by Sid Harvey provides restroom hot water, and all supply piping is insulated. During the site visit, building staff noted that the hot water in the restrooms takes considerable time to become warm. This was confirmed when the hot water was tested at the restroom sinks.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Lighting Replacements

A lighting survey was performed during the site visit, which consisted of an overall lighting count, analysis of current lighting types, and potential replacement options for increased energy efficiency. Most of the building lighting is primarily T8 troffer fixtures with electronic ballasts. These fixtures are energy efficient by today's standards and were not considered for replacement. Some lighting fixtures that are not efficient by today's standards were evaluated for replacement.

In the police area where prisoners enter, there are five 2-lamp T12 fluorescent fixtures with magnetic ballasts which could be replaced with T8 fixtures containing electronic ballasts. There is also an incandescent lit exit sign in this area that could be replaced with an LED exit sign. The maintenance closet which contains the electric panels for the building has a single 2 lamp T12 fixture that could also be replaced with T8. Additionally, the area near the police attendant contains three 60 W incandescent bulbs that could be replaced with compact fluorescents lightbulbs (CFLs).

The men's and women's restrooms have a single 2-lamp T12 fixture, and the courtroom has nine 4-lamp T12 fixtures. There are also incandescent of various sizes located in the courtroom, main hallway, and conference room in the west office area. All incandescents were evaluated for replacement with CFLs.

To calculate the potential savings by switching out these lights, the existing wattages were compared with the proposed wattages, and multiplied by the hourly usage to determine kWh savings. This calculation can be seen in Appendix B. By replacing all old lighting technologies in the building, the borough could save about 2.1 kW and 7,300 kWh annually.

Lighting and electrical equipment have an expected life of 15 years, according to the manufacturers, and total energy savings over the life of the project are estimated at 109,500 kWh and $18,000.

The implementation cost and savings related to this ECM are presented in Appendix B and summarized below:

ECM-1 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
2,600	2.0	7,300	0	1,200	6.5	1,600	2.2	0.8

* Incentive shown is per the 2010 Direct Install Program. See Section 5.0 for other incentive opportunities.

This measure is not recommended in lieu of ECM 3.

4.2 ECM-2 Install Lighting Controls

As part of the lighting survey conducted for ECM-1, opportunities for lighting controls were evaluated. Areas where there is frequent intermittent use such as restrooms and offices are good candidates for occupancy sensors, and one outdoor light was considered for photocell control. The following were identified as viable areas for occupancy sensors, where not specifically called out as ceiling mounted, the sensor would be wall mounted:

Area Description	No. of Fixtures	Fixture Type	No. of Sensors Required
Maint. Closet with DHW Heater	1	2 lamp T12	1
Police General Restroom	1	20 W T12 2' fixture	1
Police Locker Room	1	2 lamp T8	1 Ceiling Mounted
Police Perimeter Office	1	4 lamp T8	1
Police Gun Cabinet	1	2 lamp T12	1
Interrogation Room	1	2 lamp T8	1
Sergeant Office 1	2	4 lamp T8	1
Sergeant Office 2	2	4 lamp T8	1
Sergeant Office 3	2	4 lamp T8	1
Chief's Office	2	4 lamp T8	1
Storage/Server Room	2	4 lamp T8	1
Mayor's Office	2	4 lamp T8	1
Deputy Treasurer's Office	2	2 lamp T8	1
Server Room Near Copy Machine	1	4 lamp T8	1
Conference Room	2	4 lamp T8	1
Supply Room 1	2	4 lamp T8	1
Supply Room 2	2	4 lamp T8	1
CFO Office	2	4 lamp T8	1
Municipal Clerk Office	2	4 lamp T8	1
Tax Office	4	4 lamp T8	1
Tax Office Closet	1	4 lamp T8	1
Clerk Office	2	4 lamp T8	1
Main Men's Restroom	1	2 lamp T12	2
Main Women's Restroom	1	2 lamp T12	2
Office in Hall Near Police Window	1	2 lamp T8	1
Breakroom	4	3 lamp T8	1 Ceiling Mounted
Restroom off Breakroom	1	4 lamp T8	1
Court Office	6	4 lamp T8	2 Ceiling Mounted
Court Office Storage	1	2 lamp T8	1
Janitor Closet	1	4 lamp T8	1
Conference Room	6	3 lamp T8	1 Ceiling Mounted
Construction Office	3	4 lamp T8	1 Ceiling Mounted
Fire Marshall Office	2	4 lamp T8	1
Tax Assessor Office	2	4 Lamp T8, 2 lamp T8	1
Outdoor Light	1	100 W Metal Halide	1

To calculate the energy saving potential with occupancy sensors, the existing lighting usage was compared to the approximate usage with occupancy sensors and photocells. With occupancy sensors, lights generally remain on for about 10 to 15 minutes after occupancy. Photocells sense daylight; therefore, the outdoor light will only turn on at night. By installing lighting controls in the municipal building, the borough could save about 12,290 kWh per year.

Lighting controls have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 184,350 kWh and $22,500.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-2 Install Lighting Controls

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
5,000	0	12,290	0	1,500	3.5	3,000	3.3	1.3

* Incentive shown is per the 2010 Direct Install Program

This measure is not recommended in lieu of ECM 3.

4.3 ECM-3 Combined Lighting Replacements with Lighting Controls

Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative. This measure is a combination of ECMs-1 and 2 to allow for maximum energy and demand reduction.

Lighting and lighting controls have an expected life of 15 years, according to the manufacturers, and total energy savings over the life of the project are estimated at 288,300 kWh and $40,500.

The implementation cost and savings related to this ECM are presented in Appendix D and summarized below:

ECM-3 Combined Lighting Replacements with Lighting Controls

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
7,800	2.0	19,220	0	2,700	4.2	4,700	2.9	1.1

* Incentive shown is per the 2010 Direct Install Program. See Section 5.0 for other incentive opportunities.

This measure is recommended.

4.4 ECM-4 Replace Electric DHW Heater with On Demand Gas

Domestic hot water for the building is produced by a 40 gallon, 4.5 kW A.O. Smith electric hot water heater located in the storage room near the police section.

This ECM analyzed replacing the existing heater with an on-demand natural gas fired unit. The existing unit has to constantly maintain the 40 gallon tank heated to 120°F regardless if hot water is being used. The gas fired unit turns on when there is a hot water demand in the building. On-demand heaters do not have a reservoir tank, and, therefore, eliminate tank standby losses. Standby losses of about 2.5% occur with DHW tanks, and additional heating energy is required to maintain setpoint temperature.

The existing unit uses electricity to heat the water and overcome standby losses from the tank, and also to replenish the tank when hot water is needed. To calculate the savings of replacing the DHW heater, the existing energy usage was determined from hot water usage information obtained from discussions with

building personnel. Based on building usage of the restrooms and janitorial sink, an accurate representation of hot water use was calculated.

Electricity usage, including the 4.5 kW demand, would be eliminated with the new on-demand unit. The new heater would use natural gas which must be accounted for in the savings calculations. Installing an on-demand gas hot water heater could save 4,200 kWh per year. Based on existing usage, the new unit would use about 100 therms of natural gas annually.

Hot water heaters have a life expectancy of about 13 years according to manufacturers. The total energy savings over the life of the project would be 54,600 kWh. The new gas fired water heater would use an additional 1,300 therms of natural gas, which would correspond to a savings of about $14,300 over the lifetime of the equipment.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized below:

ECM-4 Replace Electric DHW Heater with On Demand Gas

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,200	4.5	4,200	(100)	1,100	2.4	300	3.8	3.5

* Incentive shown is per the 2010 New Jersey Smart Start Program's Gas Hot Water Heating Application, See Section 5.0 for other incentive opportunities.

This measure is recommended.

4.5 ECM-5 Temperature Setback

As previously noted, the building is divided into four primary HVAC sections. Each RTU manages a single section, with the exception of the police department which has two RTUs. Each RTU in the building has a thermostat in the space that regulates temperature. The thermostats are programmable, with the exception of the manual thermostat in the prisoner processing room of the police department. The programmable thermostats have setback capabilities and schedules; however, as noted during the site visit, all were manually overridden to maintain a single space temperature setpoint. Building personnel explained that the building was maintained at about 74°F during all occupied hours. However, by reviewing the programming of the thermostats and energy usage trends throughout the year, it was determined that this was not always adhered to, particularly in the summer. The following chart shows actual heating and cooling temperature setpoints:

	Setpoints			
	Heating °F		Cooling °F	
	Occupied	Unoccupied	Occupied	Unoccupied
Police Area	72	72	70	70
Mayor's Office Wing	74	74	72	72
Courtroom	74	65	70	75
Court Office Area	74	74	72	72

This ECM analyzed setting back the temperature during unoccupied times, with the exception of the police area which operates 24/7. In the summer, the temperature would be set back to 80°F during unoccupied times. In the winter, the temperature would be set to 70°F during occupied times and 60°F during unoccupied times. The current 74°F is considered a high setpoint for occupied heating; 70°F was used as a setpoint to maintain occupancy comfort, and save energy.

To calculate the savings for temperature setback, a block load model of all four main spaces of the building was created to establish the existing energy load. The block load considered window, wall, door areas, building infiltration loads, thermal resistances of building materials, occupancy, and usage. This load was then reconciled to the yearly utility data using outdoor air temperature bins from Newark, NJ. The block load was then modified to represent the energy usage of the building with all set back in place. The difference between energy usages represents the potential savings from setting back the temperature. If implemented, this ECM could save about 850 therms of natural gas and 1,120 kWh per year. The block load can be seen in appendix Q.

Two new thermostats would be required since the mayor's wing already has a newer programmable thermostat, and none is considered for the police section.

Programmable thermostats have an estimated life expectancy of about 15 years according to ASHRAE. The total savings over the life of this project would be about 12,750 therms, 16,800 kWh, and $21,000.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized below:

ECM-5 Temperature Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
500	0	1,120	850	1,400	41.0	300	0.4	0.1

* Incentive shown is per the 2011 New Jersey Direct Install Program. See Section 5.0 for other incentive opportunities.

This measure is recommended.

4.6 ECM-6 Dual Flush Toilets

The building has five restrooms with a total of six toilets. The toilets vary in the amount of water used per flush. The toilet in the police locker room and employee restroom use about 1.6 gpf. The general police toilet, and the two toilets in the women's restrooms use about 2.5 gpf, and the one toilet in the men's room has a broken flush valve; therefore, uses about 4 gpf. This ECM calculated water savings from replacing, or retrofitting, the toilets with dual flush valves. Dual flush valves save water by using 1.6 gpf for solids, and 0.8 gpf for liquids; standard toilets use 1.6 gpf regardless. All toilets would need to be completely replaced, except the toilet in the police locker room and employee restroom, which can be retrofitted.

To calculate the savings of installing a dual flush retrofit kit, and dual flush, low flow toilets, the existing water usage, which was estimated based on discussions with building personnel, was compared to the proposed water usage using replacement toilets and retrofit kits. An approximate number of occupants and types of usage were able to be determined. The savings was calculated based on the amount of liquid

flushes since the retrofits only save water when flushing liquids. By installing new toilets and dual flush retrofit kits, about 32,000 gallons of water, and $300 could be saved.

Dual flush valves have an approximate lifespan of about 15 years according to manufacturers. The total energy savings over the life of the project would be 480,000 gallons of water and $4,500.

The implementation cost and savings related to this ECM are presented in Appendix G and summarized below:

ECM-6 Dual Flush Toilets

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		kgals	Total				
$	kW	kWh	Water	$		$	Years	Years
3,900	0	0	32	300	0.2	NA	13.0	NA

*There are no incentives available through the New Jersey Pay For Performance or Direct Install Programs for this ECM. See Section 5.0 for other incentive opportunities.

This measure is not recommended.

4.7 ECM-7 Install Storm Windows in Courtroom

Most of the windows in the building are newer, and double paned. They are in good condition with good seals, and minimal infiltration. The windows in the courtroom are original to the building's construction, are single pane, and have ineffective seals. Replacing the deteriorated windows is an option, but it is very expensive and typically yields a payback between 20 and 30 years. This ECM assesses installing storms on the courtroom windows.

To calculate the savings of adding storm windows in the courtroom, the existing window conditions were evaluated. There are eight, 2'x5' windows that could benefit from storms. Based on the condition of the courtroom windows, it was estimated they have a thermal resistance of about R-0.95 and an air infiltration rate of about 0.4 cfm per linear foot. The storm windows would add a half inch of air to serve as an insulator, and also decrease infiltration. This is expected to result in a thermal resistance of about R-2 and infiltration rate of 0.2 cfm per linear foot. The difference is a saving of about 110 therms, 10 kWh, and $150.

Storm windows have an expected life of 25 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 2,750 therms, 250 kWh and $3,750.

The implementation cost and savings related to this ECM are presented in Appendix H and summarized as follows:

ECM-7 Install Storm Windows in Courtroom

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
1,500	0	10	110	150	1.5	NA	10.0	NA

*There are no incentives available through the New Jersey Pay For Performance or Direct Install Programs for this ECM. See Section 5.0 for other incentive opportunities.

This measure is recommended.

4.8 ECM-8 Increase Wall Insulation in Courtroom

The courtroom walls are constructed of brick fascia, an air space, and filled concrete block. The thermal resistance of the wall can be calculated by summing all thermal resistances of each wall component. The R-value of the courtroom wall was calculated at about R-6.2. This ECM evaluated the addition of 3.5" thick craft faced insulation in the walls, and construction of a new wall along the inside of the old wall, which would increase the thermal resistance to about R-19.8.

To calculate the savings, the existing and proposed conditions were compared with outdoor air temperature bin data from Newark, NJ. The efficiency of the heating and cooling equipment was used to determine the amount of energy required to heat and cool the space, and the area of the exterior walls was calculated to determine the amount of heat transfer that occurs through the building envelope. The difference between the existing and proposed conditions resulted in a savings of about 150 therms of natural gas, and 60 kWh per year.

This ECM would require metal studs installed, then drywall, and paint over the drywall. This work was accounted for in the budgetary cost.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 3,600 therms, 1,440 kWh, and $4,800.

The implementation cost and savings related to this ECM are presented in Appendix I and summarized below:

ECM-8 Increase Wall Insulation in Courtroom

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,900	0	60	150	200	0.2	0	19.5	NA

*There are no incentives available through the New Jersey Pay For Performance or Direct Install Programs for this ECM. See Section 5.0 for other incentive opportunities.

This measure is not recommended.

4.9 ECM-9 Replace Court Office RTU with More Efficient Unit

The Carrier RTU that serves the court office has a standard heating efficiency of about 80%; cooling capacity of 10 tons and cooling efficiency of about 1.48 kW/ton. This efficiency was calculated based on known amperage, voltage, and estimated power factor. The unit is approximately 12 years' old and is nearing the end of its useful life. This ECM assessed replacing the unit with a higher efficiency model.

To calculate the savings of a new unit, the existing and new unit efficiencies were compared. A comparable new system would achieve an efficiency of 82% in heating and 1.04 kW/ton in cooling. A block load was created for the space and evaluated with temperature bin data from Newark, NJ to determine heating and cooling loads. Installing a new unit could save about 30 therms of natural gas and 1,850 kWh in cooling energy. Additionally, there would be a fan efficiency savings of about 720 kWh, based on the existing standard efficiency motor, and replacement premium efficiency motor. In total, this amounts to about $500 in annual savings.

Packaged rooftop units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 600 therms, 38,850 kWh and $7,500.

The implementation cost and savings related to this ECM are presented in Appendix I and summarized below:

ECM-9 Replace Court Office RTU with More Efficient Unit

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
11,300	0	2,570	30	500	(0.3)	6,800	22.5	9.0

* Incentive shown is per the 2011 New Jersey Direct Install Program. See Section 5.0 for other incentive opportunities.

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The building will be eligible for incentives from the New Jersey Office of Clean Energy. Particularly, significant incentives will be available from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. However, the 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. American Recovery and Reinvestment Act (ARRA) funding, when available, may allow oil, propane and municipal electric customers to be eligible for the P4P Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP). The standard incentive pays $0.10 per square foot, up to a maximum of $50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional $0.05 per square foot, up to a maximum of $25,000, rather than the standard incentive noted above.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy saving and designed to pay approximately 60% of the total performance-based incentive. Base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost.

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool. Incentive #3 base incentives deliver $0.07/kWh and $0.70/therm not to exceed 20% of total project cost.

Combining incentives #2 and #3 will provide a total of $0.18/ kWh and $1.80/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% of total project cost.

5.1.2 New Jersey Smart Start Program

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2010 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices.

If the building qualifies and enters into the New Jersey Pay for Performance Program, all energy savings will be included in the total building energy reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

5.1.3 Energy Efficient and Conservation Block Grant

The following is a brief summary of the Energy Efficient and Conservation Block Grant (EECBG) program. The Energy Efficiency and Conservation Block Grant Complete Program Application Package should be consulted for rules and regulations.

Additional funding is available to local government entities through the EECBG, a part of New Jersey's Clean Energy program (NJCEP). The grant is for local government entities only, and can offset the cost of energy reduction implementation to a maximum of $50,000 per entity.

This program is provided in conjunction with NJCEP funding and any utility incentive programs; the total amount of the three incentives combined cannot exceed 100% of project cost. Funds shall first be provided by NJCEP, followed by the EECBG and any utility incentives available to the customer. The total amount of the incentive shall be determined by TRC Solutions, a third party technical consulting firm for the NJCEP.

In order to receive EECBG incentives, local governments must not have received a Direct Block Grant from the US Department of Energy. A list of the 512 qualifying municipalities and counties is provided on the NJCEP website. Qualifying municipalities must participate in at least one eligible Commercial & Industrial component of the NJCEP, utility incentive programs, or install building shell measures recommended by the Local Government Energy Audit Program. Eligible conservation programs through NJCEP include:

- Direct Install
- Pay for Performance
- NJ SmartStart Buildings for measures recommended by a Local Government Energy Audit (LGEA) or an equivalent audit completed within the last 12 months
- Applicants may propose to independently install building shell measures recommended by a LGEA or an equivalent audit. The audit must have been completed within the past 12 months.
- Any eligible utility energy efficiency incentive program

Most facilities owned or leased by an eligible local government within the State of New Jersey are eligible for this grant. Ineligible facilities include casinos or other gambling establishments, aquariums, zoos, golf courses, swimming pools, and any building owned or leased by the United States Federal Government. New construction is also ineligible.

5.1.4 ARRA Initiative "Energy Efficiency Programs through the Clean Energy Program"

The American Recovery and Reinvestment Act (ARRA) Initiative is available to New Jersey oil, propane, cooperative and municipal electric customers who do not pay the Societal Benefits Charge. This charge can be seen on any electric bill as the line item "SBC Charge." Applicants can participate in this program in conjunction with other New Jersey Clean Energy Program initiatives including Pay for Performance, Local Government Energy Audits, and Direct Install programs.

Funding for this program is dispersed on a first come, first serve basis until all funds are exhausted. The program does not limit the municipality to a minimum or maximum incentive, and the availability of funding cannot be determined prior to application. If the municipality meets all qualifications, the application must be submitted to TRC Energy Solutions for review. TRC will then determine the amount

of the incentive based on projected energy savings of the project. It is important to note that all applications for this incentive must be submitted before implementation of energy conservation measures.

Additional information is available on New Jersey's Clean Energy Program website.

5.1.5 Direct Install Program

The Direct Install Program targets small and medium sized facilities where the peak electrical demand does not exceed 200 kW in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. On a case-by-case basis, the program manager may accept a project for a customer that is within 10% of the 200 kW peak demand threshold.

The 200 kW peak demand threshold has been waived for local government entities that receive and utilize their Energy Efficiency and Conservation Block Grant as discussed in section 5.1.3 in conjunction with Direct Install.

Direct Install is funded through New Jersey's Clean Energy Program and is designed to provide capital for building energy upgrade projects to fast track implementation. The program will pay up to 60% of the costs for lighting, HVAC, motors, natural gas, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can significantly reduce the implementation cost of energy conservation projects.

The program pays a maximum amount of $50,000 per building, and up to $250,000 per customer per year. Installations must be completed by a Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website at http://www.njcleanenergy.com. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this document.

5.2 Somerdale Building Incentives

5.2.1 New Jersey Pay For Performance Program

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint, which equates to about $400. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15% which qualifies it for both incentives #2 and #3. Based on a 27% savings, combining incentives #2 and #3 will provide maximum savings of $0.24/ kWh and $2.40/ therm not to exceed 50% of the total project cost. The building is projected to save about 24,180 kWh which amounts to about $5,300 in incentives. The building is also projected to save about 1,140 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $2,600 in incentive money. Combining all incentives in the P4P program would amount to approximately $8,400, reducing the overall payback of the project from 5.2 years to 3.9 years. See Appendix K for calculations.

5.2.2 New Jersey Smart Start Program

The Somerdale Municipal Building is eligible for incentives from the New Jersey Smart Start Program. However, incentives cannot be obtained for the same ECMs under both the Smart Start and Direct Install Programs. It will be up to the borough to decide which incentive should be applied for with respect to each measure. In most cases, the direct install program provides more funding than Smart Start Program.

Only ECM 4, Replacing the Electric Domestic Hot Water heater is recommended to be applied for under the Smart Start Program. This ECM is not covered in the Direct Install Program. The Smart Start incentive would provide $300 towards a new on-demand natural gas unit.

5.2.3 Energy Efficient and Conservation Block Grant

The Somerdale Municipal Building is owned by local government which makes it eligible for this incentive. The incentive amount is determined by TRC Solutions and is not calculable at this time. Further information about this incentive, including the application, can be found at: http://www.njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants

5.2.4 ARRA Initiative "Energy Efficiency Programs through the Clean Energy Program"

The Borough does pay the Societal Benefits Charge and is therefore not able to receive this incentive.

5.2.5 Direct Install Program

Municipal Building will be eligible to receive funding from the Direct Install Program. This money will be in conjunction with the Energy Efficiency and Conservation Block Grant. Certain ECMs will be eligible for this incentive. The program would pay 60% of the implementation cost for approved incentives. The approved incentives for the Municipal Building would be Lighting Replacements with Controls, Temperature Setback, and the Replacement of the Court Office RTU. These ECMs have a combined implementation cost of about $19,600. The Direct Install Program would pay about $11,800 of this cost bringing the combined payback of these measures from about 4.3 years to 2.6 years.

In order to apply for this program the borough must contact the Direct Install contractor for Camden County, Hutchinson Mechanical Services. Contact information is available on the New Jersey Clean Energy Website.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50s°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

The building uses gas-fired packaged rooftop units to meet its HVAC needs. These are not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be removed; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended due to the extent of HVAC system renovation needed for implementation.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The Municipal Building was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a solar cell array above the library and courtroom but it would need to be angled south for maximum efficiency. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Power Estimator provided by the New Jersey Clean Energy Program is presently being updated; therefore, the site recommended use of the PVWATT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in appendix L.

The State of New Jersey incentives for non-residential PV applications is $0.75/watt up to 30 kW of installed PV array. Projects up to 50 kW are eligible to apply. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes and would not be able to utilize the federal tax credit incentive.

Installation of (PV) arrays in the state of New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero

emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for periods of 15 years from the date of installation. The cost of the ACP penalty for 2010 was $700; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2011 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

The building had a maximum electricity demand of 41.7 kW and a minimum of 16.8kW, over the previous 24 months. The monthly average over the observed 12 month period was 29.2 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array. Instead, a 30 kW was used for the calculations. Based on Contractor pricing obtained from The Solar Center in Rockaway, NJ, a 30 kW system would cost about $5.50/Watt, or $5,500/kW.

Space considerations must be taken into account before installation and other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

The implementation cost and savings related to this ECM are presented in Appendix L and summarized below:

Photovoltaic (PV) Rooftop Solar Power Generation – 30 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
165,000	0	37,510	0	6,500	6,500	22,500	18,300	>25	5.7

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of $0.75 per Watt of installed capacity
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at $487/1000 kWh

The Somerdale Municipal Building does have space on the roof for a PV system; however there are lots of tall trees that could potentially cast shadows over the solar cells.

While the payback period is within the parameters for recommended measures, further investigation of possible installation locations, required system maintenance, and local installation costs are suggested prior to consideration for implementation.

6.2.2 Solar Thermal Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, other fluids, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later

utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, a heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by an electric water heater and a solar DHW system would save site electricity.

Currently, an incentive is not available for installation of thermal solar systems. A federal tax credit of 30% of installation cost for the thermal applications is available; however, Somerdale does not pay federal taxes and, therefore, would not benefit from this program.

The implementation cost and savings related to this ECM are presented in appendix M and summarized as follows:

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
12,200	0	1110	0	200	200	NA	>25	NA

* No incentive is available in New Jersey at this time.

This measure is not recommended.

6.3 Wind

Small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the needed strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is the mainframe, and includes the slip-rings that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and are not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Somerdale Borough area, the map shown in the appendices indicates a mean annual wind speed of about 10.5 miles per hour. For the building, there are site restrictions, such as parking lots, trees and surrounding structures that would greatly affect a tower location.

A wind speed map and aerial site photo are included in Appendix N.

Due to the low annual wind speed, and surrounding trees and structures, a wind turbine is not recommended.

6.4 Combined Heat and Power Generation (CHP)

Combined heat and power, cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The building does not have an excessively large electricity demand, and it does not have a heating load to use the thermal byproduct in the summer. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

* From NJOCE Website

This measure is not recommended due to the extent of HVAC system renovation needed for implementation.

6.6 Demand Response Curtailment

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PSE&G offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The Somerdale Municipal building had a monthly average electricity demand of 29.2 kW and a maximum demand of 41.6 kW from October 2008 through October 2010.

This measure is not recommended because the facility does not have adequate load to meet the required minimum load reduction.

7.0 EPA PORTFOLIO MANAGER

The United State Environmental Protection Agency (EPA) is a federal agency in charge of regulating environment waste and policy in the United States. The EPA has released the EPA Portfolio Manager for public use. The program is designed to allow property owners and managers to share, compare and improve upon their facility's energy consumption. Inputting such parameters as electricity, heating fuel, building characteristics and location into the website based program generates a naturalized energy rating score out of 100. Once an account is registered, monthly utility data can be entered to track the savings progress and retrieve an updated energy rating score on a monthly basis.

The Municipal Building is considered a high energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 82 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, but not limited to, wasted energy from poor insulation, lack of heating controls, and inefficient lighting. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 59 kBTU/ft^2/year; the national average for this building type is 68 kBTU/ft^2/year. The EPA Portfolio Manager generated an energy rating score for the building at 32. This number represents how energy efficient a building is on a scale from 1 to 100 with 100 being the best. In order for a building to receive and energy star label, this energy benchmark rating must be at least 75. As energy use decreases from the implementation of the proposed ECMs, this rating will increase.

A full EPA Energy Star Portfolio Manager Report is located in Appendix O.

The user name and password for the EPA Portfolio Manager Account has been provided to Victor Cantillo, the Somerdale Borough CFO.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Borough of Somerdale Municipal Building in Somerdale, New Jersey identified potential ECMs for lighting replacements and controls, electric DHW heater replacement, temperature setback, and RTU replacement. Potential annual savings of $5,700 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-3 Combined Lighting Replacements with Lighting Controls

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
7,800	2.0	19,220	0	2,700	4.2	4,700	2.9	1.1

* Incentive shown is per the 2010 Direct Install Program. See Section 5.0 for other incentive opportunities.

ECM-4 Replace Electric DHW Heater with On Demand Gas

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
4,200	4.5	4,200	(100)	1,100	2.4	300	3.8	3.5

* Incentive shown is per the 2010 New Jersey Smart Start Program's Gas Hot Water Heating Application, See Section 5.0 for other incentive opportunities.

ECM-5 Temperature Setback

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
500	0	1,120	850	1,400	41.0	300	0.4	0.1

* Incentive shown is per the 2011 New Jersey Direct Install Program. See Section 5.0 for other incentive opportunities.

ECM-7 Install Storm Windows in Courtroom

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
1,500	0	10	110	150	1.5	NA	10.0	NA

*There are no incentives available through the New Jersey Pay For Performance or Direct Install Programs for this ECM. See Section 5.0 for other incentive opportunities.

ECM-9 Replace Court Office RTU with More Efficient Unit

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
11,300	0	720	30	500	(0.3)	6,800	22.5	9.0

* Incentive shown is per the 2011 New Jersey Direct Install Program. See Section 5.0 for other incentive opportunities.

APPENDICES

A	Utility Usage Analysis
B	ECM-1 Lighting Replacements
C	ECM-2 Install Lighting Controls
D	ECM-3 Lighting Replacements with Controls
E	ECM-4 Replace Electric DHW with On Demand Gas
F	ECM-5 Temperature Setback
G	ECM-6 Dual Flush Toilets
H	ECM-7 Install Storm Windows in Courtroom
I	ECM-8 Increase Wall Insulation in Courtroom
J	ECM-9 Replace Court Office RTU with More Efficient Unit
K	New Jersey Pay For Performance Incentive Program
L	Photovoltaic (PV) Rooftop Solar Power Generation
M	Solar Thermal Domestic Hot Water Plant
N	Wind
O	EPA Portfolio Manager
P	Building Summaries and ROI Calculation
Q	Building Block Loads
R	Equipment Inventory and Lighting

APPENDIX A

Utility Usage Analysis

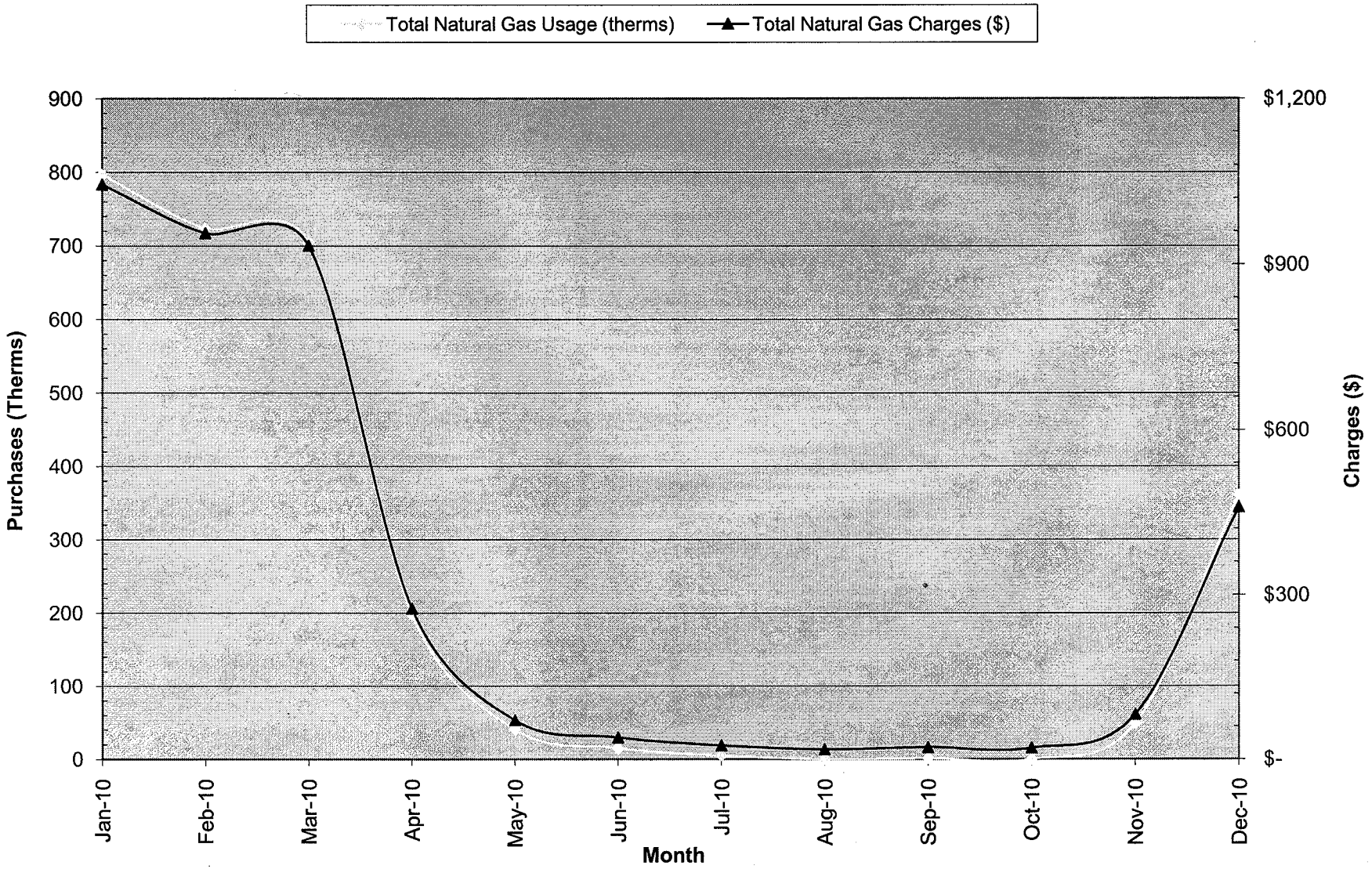
New Jersey BPU Energy Audit Program
CHA Project Number: 22424
Somerdale Municipal Building
South Jersey Gas

Borough of Somerdale - Natural Gas
Account Number: 20341003307

Month	Therms	Charges ($)	($/therm)
January-10	797	$ 1,044.65	$ 1.31
February-10	724	$ 956.52	$ 1.32
March-10	705	$ 933.91	$ 1.32
April-10	198	$ 274.87	$ 1.39
May-10	41	$ 71.35	$ 1.74
June-10	15	$ 39.98	$ 2.59
July-10	5	$ 25.42	$ 4.93
August-10	0	$ 18.10	$ -
September-10	1	$ 21.91	$ 21.48
October-10	0	$ 20.70	$ -
November-10	49	$ 81.92	$ 1.67
December-10	361	$ 459.00	$ 1.27

Total	2,896	$ 3,948	$ 1.36
Most Recent Yr	2,896	$ 3,948	$ 1.36

Natural Gas Usage - Somerdale Municipal Building



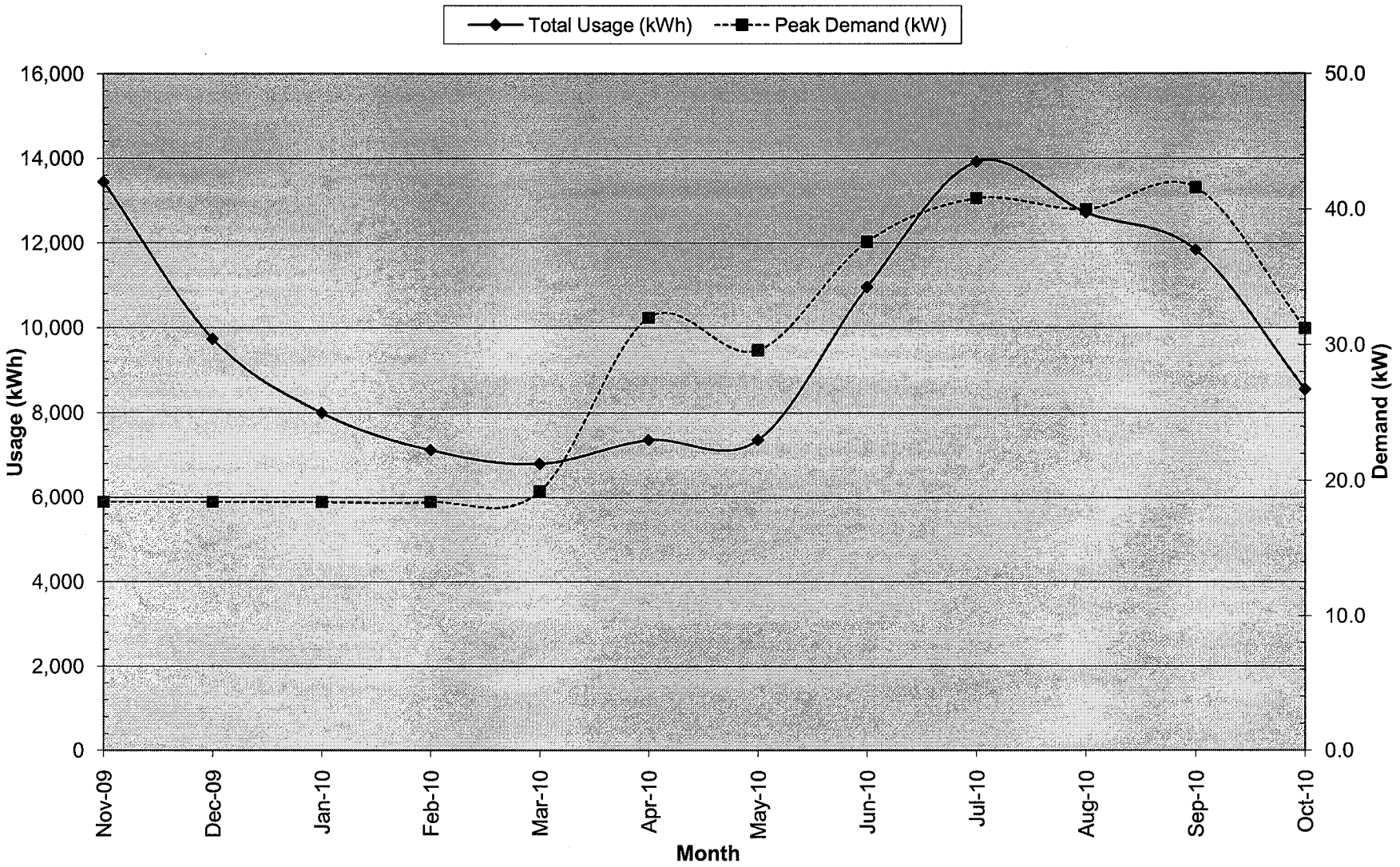
Utility Data - Somerdale.xlsx
Natural Gas Chart

New Jersey BPU Energy Audit Program
CHA Project Number: 22424
Somerdale Municipal Building
PSE&G

Borough of Somerdale- Electricity
Account Number: 6510183102

			Charges				Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Summer Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
October-08	10,320	41.6	$1,671.63	$398.06	$0.00	$1,273.57	0.1620	0.1234	9.57
November-08	14,880	32.0	$2,494.88	$721.97	$0.00	$1,772.91	0.1677	0.1191	22.56
December-08	7,760	19.2	$1,181.00	$311.50	$0.00	$869.50	0.1522	0.1120	16.22
January-09	6,720	19.2	$1,079.74	$311.81	$0.00	$767.93	0.1607	0.1143	16.24
February-09	6,560	21.6	$1,100.10	$321.44	$0.00	$778.66	0.1677	0.1187	14.88
March-09	6,720	20.8	$1,135.24	$318.33	$0.00	$816.91	0.1689	0.1216	15.30
April-09	7,680	16.8	$1,209.15	$302.75	$0.00	$906.40	0.1574	0.1180	18.02
May-09	7,360	36.0	$1,238.62	$377.96	$0.00	$860.66	0.1683	0.1169	10.50
June-09	10,240	31.2	$1,951.31	$374.96	$227.00	$1,349.35	0.1906	0.1318	19.29
July-09	11,120	32.8	$2,237.00	$397.52	$238.64	$1,600.84	0.2012	0.1440	19.40
August-09	13,680	40.0	$2,701.76	$425.75	$291.02	$1,984.99	0.1975	0.1451	17.92
September-09	11,520	40.8	$2,376.08	$429.77	$296.84	$1,649.47	0.2063	0.1432	17.81
October-09	1,600	31.2	$597.55	$394.65	$0.00	$202.90	0.3735	0.1268	12.65
November-09	13,440	18.4	$1,908.38	$345.92	$0.00	$1,562.46	0.1420	0.1163	18.80
December-09	9,740	18.4	$1,658.72	$345.92	$0.00	$1,312.80	0.1703	0.1348	18.80
January-10	8,000	18.4	$1,256.55	$345.17	$0.00	$911.38	0.1571	0.1139	18.76
February-10	7,120	18.4	$1,183.24	$344.62	$0.00	$838.62	0.1662	0.1178	18.73
March-10	6,800	19.2	$1,148.48	$347.85	$0.00	$800.63	0.1689	0.1177	18.12
April-10	7,360	32.0	$1,265.30	$399.48	$0.00	$865.82	0.1719	0.1176	12.48
May-10	7,360	29.6	$1,242.50	$389.79	$0.00	$852.71	0.1688	0.1159	13.17
June-10	10,960	37.6	$2,081.33	$400.89	$285.01	$1,395.43	0.1899	0.1273	18.24
July-10	13,920	40.8	$2,574.24	$401.68	$315.04	$1,857.52	0.1849	0.1334	17.57
August-10	12,720	40.0	$2,410.51	$398.36	$308.86	$1,703.29	0.1895	0.1339	17.68
September-10	11,840	41.6	$2,343.43	$406.05	$321.21	$1,616.17	0.1979	0.1365	17.48
October-10	8,560	31.2	$1,420.76	$363.22	$0.00	$1,057.54	0.1660	0.1235	11.64
Total	233,980	41.6	$41,467.50	$9,575.42	$2,283.62	$29,608.46	0.1772	0.1265	13.14
Most Recent Yr	117,820	41.6	$20,493.44	$4,488.95	$1,230.12	$14,774.37	0.1739	0.1254	12.99

Electric Usage - Somerdale Municipal Building



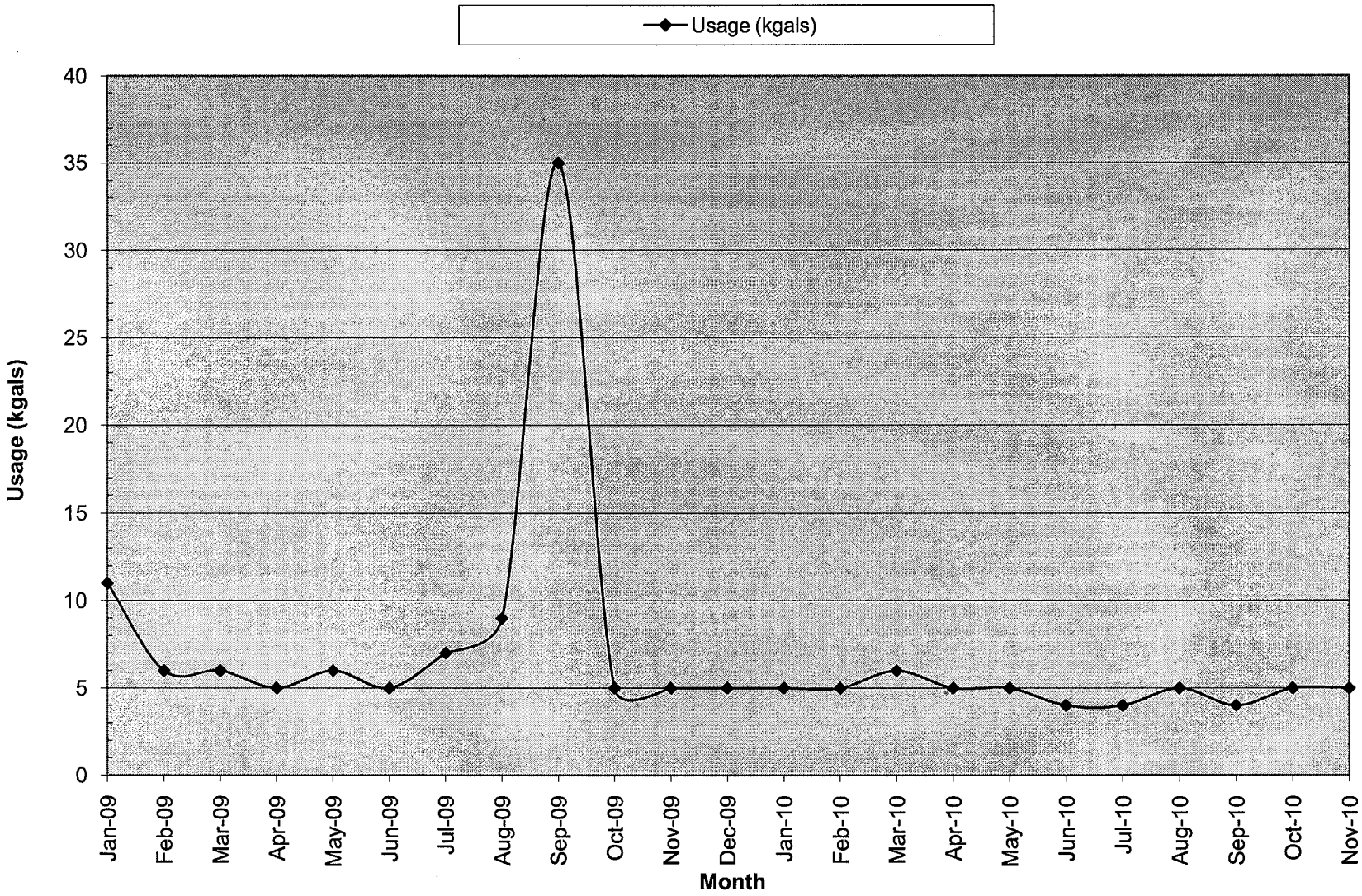
Utility Data - Somerdale.xlsx
Electricity Chart

New Jersey BPU Energy Audit Program
CHA Project Number: 22424
Somerdale Municipal Building

105 Kennedy BLVD Account 20341003307			
Date	**Usage (kgals)**	**Cost ($)**	**Cost($)/kgal**
January-09	11	$ 85.75	$ 7.80
February-09	6	$ 57.01	$ 9.50
March-09	6	$ 57.01	$ 9.50
April-09	5	$ 51.25	$ 10.25
May-09	6	$ 57.01	$ 9.50
June-09	5	$ 51.25	$ 10.25
July-09	7	$ 62.75	$ 8.96
August-09	9	$ 74.25	$ 8.25
September-09	35	$ 225.05	$ 6.43
October-09	5	$ 51.45	$ 10.29
November-09	5	$ 51.45	$ 10.29
December-09	5	$ 51.45	$ 10.29
January-10	5	$ 51.45	$ 10.29
February-10	5	$ 51.45	$ 10.29
March-10	6	$ 57.25	$ 9.54
April-10	5	$ 51.45	$ 10.29
May-10	5	$ 51.45	$ 10.29
June-10	4	$ 45.66	$ 11.42
July-10	4	$ 45.66	$ 11.42
August-10	5	$ 51.44	$ 10.29
September-10	4	$ 45.65	$ 11.41
October-10	5	$ 51.43	$ 10.29
November-10	5	$ 51.43	$ 10.29
Total	158	$ 1,430.00	$ 9.05
Most Recent Year	58	$ 605.77	$ 10.44

* Estimated based on Previous Usage

Water Usage- Somerdale Municipal Building



Utility Data - Somerdale.xlsx
Water Usage Chart

ELECTRIC MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell electricity to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

American Powernet Management
867 Berkshire Blvd, Suite 101
Wyomissing, PA 19610
www.americanpowernet.com

BOC Energy Services
575 Mountain Avenue
Murray Hill, NJ 07974
www.boc-gases.com

Commerce Energy Inc.
535 Route 38, Suite 138
Cherry Hill, NJ 08002
(888) 817-8572 or
(858) 910-8099
www.commerceenergy.com

ConEdison Solutions
701 Westchester Avenue
Suite 201 West
White Plains, NY 10604
(800) 316-8011
www.ConEdSolutions.com

Constellation NewEnergy, Inc.
1199 Route 22 East
Mountainside, NJ 07092
908 228-5100
www.newenergy.com

Credit Suisse (USA), Inc.
700 College Road East
Princeton, NJ 08450
www.creditsuisse.com

Direct Energy Services, LLC
One Gateway Center, Suite 2600
Newark, NJ 07102
(973) 799-8568
www.directenergy.com

FirstEnergy Solutions
395 Ghent Road Suite 407
Akron, OH 44333
(800) 977-0500
www.fes.com

Gerdau Ameristeel Energy Co.
North Crossman Road
Sayreville, NJ 08872

Gexa Energy LLC New Jersey
20 Greenway Plaza, Suite 600
Houston, TX 77046
(866) 304-GEXA
Beth.miller@gexaenergy.com

Glacial Energy of New Jersey
2602 McKinney Avenue, Suite 220
Dallas, TX 75204
www.glacialenergy.com

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
www.hess.com

Integrys Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrysenergy.com

Liberty Power Delaware, LLC
1901 W Cypress Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Liberty Power Holdings, LLC
1901 W Cypress Creek Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Pepco Energy Services, Inc.
d/b/a Power Choice
23 S. Kinderkamack Rd Ste D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
http://www.pplenergyplus.com/

Sempra Energy Solutions
The Mac-Cali Building
581 Main Street, 8th Floor
Woodbridge, NJ 07095
(877) 273-6772
www.SempraSolutions.com

South Jersey Energy Company
1 South Jersey Plaza, Route 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com

Strategic Energy, LLC
6 East Main Street, Suite 6E
Ramsey, NJ 07446
(888) 925-9115
www.sel.com

Suez Energy Resources NA
333 Thornall Street FL6
Edison, NJ 08818
866.999.8374(toll free)
www.suezenergyresources.com

UGI Energy Services, Inc.
d/b/a POWERMARK
1 Meridian Blvd. Suite 2C01
Wyomissing, PA 19610
(800) 427-8545
www.ugienergyservices.com

Jan 14, 2009

GAS MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell natural gas to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

Gateway Energy Services
44 Whispering Pines Lane
Lakewood, NJ 08701
(800) 805-8586
www.gesc.com

Metro Energy Group, LLC
14 Washington Place
Hackensack, NJ 07601
www.metroenergy.com

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

Great Eastern Energy
3044 Coney Island Ave. PH
Brooklyn, NY 11235
888-651-4121
www.greateasterngas.com

Metromedia Energy, Inc.
6 Industrial Way
Eatontown, NJ 07724
(800) 828-9427
www.metromediaenergy.com

South Jersey Energy Company
One South Jersey Plaza, Rte 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com/sje.htm

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
(800) 437-7872
www.hess.com

Mitchell- Supreme Fuel
(NATGASCO)
532 Freeman Street
Orange, NJ 07050
(800) 840-4GAS
www.mitchellsupreme.com

Sprague Energy Corp.
Two International Drive, Ste 200
Portsmouth, NH 03801
800-225-1560
www.spragueenergy.com

Hudson Energy Services, LLC
545 Route 17 South
Ridgewood, NJ 07450
(201) 251-2400
www.hudsonenergyservices.com

MxEnergy Inc.
P.O. Box 177
Annapolis Junction, MD 20701
800-375-1277
www.mxenergy.com

Stuyvesant Energy LLC
642 Southern Boulevard
Bronx, NY 10455
(718) 665-5700
www.stuyfuel.com

Intelligent Energy
7001 SW 24th Avenue
Gainesville, FL 32607
Sales: 1 877 I've Got Gas
(1 877 483-4684)
Customer Service:
1 800 927-9794
www.intelligentenergy.org

Pepco Energy Services, Inc.
23 S Kinderkamack Rd, Suite D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

Tiger Natural Gas, Inc.
1422 E. 71st Street, Suite J.
Tulsa, OK 74136
1-888-875-6122
www.tigernaturalgas.com

Systrum Energy
877-SYSTRUM
(877-797-8786)
www.systrumenergy.com

Plymouth Rock Energy, LLC
165 Remsen Street
Brooklyn, NJ 11201
866-539-6450
www.plymouthrockenergy.com

UGI Energy Services, Inc.
d/b/a GASMARK
704 E. Main Street, Suite I
Moorestown, NJ 08057
856-273-9995
www.ugienergyservices.com

Macquarie Cook Energy, LLC
10100 Santa Monica Blvd, 18th
Fl
Los Angeles, CA 90067

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
www.pplenergyplus.com/natural+gas/

Woodruff Energy
73 Water Street
P.O. Box 777
Bridgeton, NJ 08302
(856) 455-1111
www.woodruffenergy.com

APPENDIX B

ECM-1 Lighting Replacements

Somerdale Municipal Building
CHA Project No. 22424
ECM-1 Lighting Replacements

Cost of Electricity: **$0.125 $/kWh**
$12.99 $/kW

		EXISTING CONDITIONS							RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
11	Maintenance Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2920	210	1	C 28 P F 2	F42SSILL	48	0.0	SW	2,920	140	70	0.0	$ 12.53	$ 106.25	$15	8.5	7.3
246	Police Bathroom	1	1 Lamp T12	F21SE	26	0.0	SW	2920	76	1	1 Lamp T12	F21SE	26	0.0	SW	2,920	76	-	0.0	$ -	$ -	$0		
13	Police Locker Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	263	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4,380	263	-	0.0	$ -	$ -	$0		
163	Prisoner Processing Room	5	1B 40 R F 2 (MAG)	F42SS	94	0.5	SW	8760	4,117	5	1B 28 R F 2	F42SSILL	48	0.2	SW	8,760	2,102	2,015	0.2	$ 288.50	$ 573.75	$150	2.0	1.5
101	Prisoner Processing Room	1	I 40	I40/1	40	0.0	SW	8760	350	1	CF 13	CFQ13/1-L	15	0.0	SW	8,760	131	219	0.0	$ 31.36	$ 6.75	$0	0.2	0.2
164	Prisoner Processing Room	1	X 7.0 W I 2	EI10/2	20	0.0	Breaker	8760	175	1	X 1.5C LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	162	0.0	$ 23.21	$ 128.25	$10	5.5	5.1
18	Perimeter Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2,190	245	-	0.0	$ -	$ -	$0		
87	Gun Cabinet	1	W 32 W F 2 (MAG)	F42LE	71	0.1	SW	2190	155	1	W 32 W F 2 (MAG)	F42LE	71	0.1	SW	2,190	155	-	0.0	$ -	$ -	$0		
13	Interrogation Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2600	156	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2,600	156	-	0.0	$ -	$ -	$0		
18	Main Police Hallway	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2600	1,747	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2,600	1,747	-	0.0	$ -	$ -	$0		
71	Main Police Hallway	3	I 60	I60/1	60	0.2	SW	2600	468	3	CF 26	CFQ26/1-L	27	0.1	SW	2,600	211	257	0.1	$ 47.71	$ 20.25	$0	0.4	0.4
18	Sergeant Office 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
18	Sergeant Office 2	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
18	Sergeant Office 3	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
18	Chief's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
18	Storage/ Server Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
18	Mayor's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1460	327	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1,460	327	-	0.0	$ -	$ -	$0		
13	Deputy Treasurer Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	263	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2,190	263	-	0.0	$ -	$ -	$0		
13	East Offices Hallway	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	4380	1,314	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	4,380	1,314	-	0.0	$ -	$ -	$0		
18	East Offices Hallway	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4,380	981	-	0.0	$ -	$ -	$0		
X1	East Offices Hallway	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	39	-	0.0	$ -	$ -	$0		
18	Server/Storage Room	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2,190	245	-	0.0	$ -	$ -	$0		
18	Conference Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
18	Supply Room 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
18	CFO's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
18	Municipal Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
13	Supply Room 2	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	263	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2,190	263	-	0.0	$ -	$ -	$0		
18	Tax Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2190	981	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2,190	981	-	0.0	$ -	$ -	$0		
18	Tax Office Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2,190	245	-	0.0	$ -	$ -	$0		
18	Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
11	Men's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576	1	C 28 P F 2	F42SSILL	48	0.0	SW	8,000	384	192	0.0	$ 27.82	$ 106.25	$15	3.8	3.3
11	Women's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576	1	C 28 P F 2	F42SSILL	48	0.0	SW	8,000	384	192	0.0	$ 27.82	$ 106.25	$15	3.8	3.3
13	Main Hallway	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	8760	4,205	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	8,760	4,205	-	0.0	$ -	$ -	$0		
78	Main Hallway	2	EP I 100	I100/1	100	0.2	SW	2080	416	2	CF 26	CFQ26/1-L	27	0.1	SW	2,080	112	304	0.1	$ 60.84	$ 40.50	$0	0.7	0.7
13	Bathrooms	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	263	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4,380	263	-	0.0	$ -	$ -	$0		
185	Courtroom	9	DC 40 W F 4	F44SE	172	1.5	SW	4380	6,780	9	DC 28 W F 4	F44SSILL	96	0.9	SW	4,380	3,784	2,996	0.7	$ 482.29	$ 1,275.75	$270	2.6	2.1
71	Courtroom	3	I 60	I60/1	60	0.2	SW	4380	788	3	CF 26	CFQ26/1-L	27	0.1	SW	4,380	355	434	0.1	$ 69.81	$ 20.25	$0	0.3	0.3
35	West Offices Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8760	3,154	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8,760	3,154	-	0.0	$ -	$ -	$0		
35	Breakroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	5000	1,800	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	5,000	1,800	-	0.0	$ -	$ -	$0		
18	Bathroom off Breakroom	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8,760	981	-	0.0	$ -	$ -	$0		
18	Court Office	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2190	1,472	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2,190	1,472	-	0.0	$ -	$ -	$0		
18	Court Office Storage	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8,760	981	-	0.0	$ -	$ -	$0		
18	Janitor Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	4380	491	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	4,380	491	-	0.0	$ -	$ -	$0		
35	Conference Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	2190	1,183	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	2,190	1,183	-	0.0	$ -	$ -	$0		
78	Conference Room	10	EP I 100	I100/1	100	1.0	SW	624	624	10	CF 26	CFQ26/1-L	27	0.3	SW	624	168	456	0.7	$ 170.90	$ 202.50	$0	1.2	1.2
18	Construction Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2190	736	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2,190	736	-	0.0	$ -	$ -	$0		
18	Fire Marshall Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2,190	491	-	0.0	$ -	$ -	$0		
18	Tax Assessor Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2,190	245	-	0.0	$ -	$ -	$0		
13	Tax Assessor Office	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	131	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2,190	131	-	0.0	$ -	$ -	$0		
142	Outdoor Lights	3	MH 100	MH100/1	128	0.4	Photo	4380	1,682	3	MH 100	MH100/1	128	0.4	Photo	4,380	1,682	-	0.0	$ -	$ -	$0		
142	Outdoor Light	1	MH 100	MH100/1	128	0.1	None	8760	1,121	1	MH 100	MH100/1	128	0.1	None	8,760	1,121	-	0.0	$ -	$ -	$0		
	Total	**133**				**12.8**			**48,676**	**133**			**4,205**	**10.7**				**41,380**	**7,296**	**2.1**	**$1,243**	**$2,587**	**$475**		
																		Demand Savings			**2.1**	**$328**			
																		kWh Savings			**7,296**	**$915**			
																		Total savings				**$1,243**		**2.1**	**1.7**

APPENDIX C

ECM-2 Install Lighting Controls

Somerdale Municipal Building
CHA Project No. 22424
ECM-2 Install Lighting Controls

Cost of Electricity: **$0.125 $/kWh**
$12.99 $/kW

		EXISTING CONDITIONS							RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
11	Maintenance Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2920	210.2	1	S 34 P F 2 (MAG)	F42EE	72	0.1	OCC	730	52.6	157.7	0.0	$19.77	$118.75	$20.00	6.0	5.0
246	Police Bathroom	1	1 Lamp T12	F21SE	26	0.0	SW	2920	75.9	1	1 Lamp T12	F21SE	26	0.0	OCC	1095	28.5	47.5	0.0	$5.95	$118.75	$20.00	20.0	16.6
13	Police Locker Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	262.8	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1460	87.6	175.2	0.0	$21.97	$202.50	$35.00	9.2	7.6
163	Prisoner Processing Room	5	1B 40 R F 2 (MAG)	F42SS	94	0.5	SW	8760	4,117.2	5	1B 40 R F 2 (MAG)	F42SS	94	0.5	None	8760	4,117.2	0.0	0.0	$0.00	$0.00	$0.00		
101	Prisoner Processing Room	1	I 40	I40/1	40	0.0	SW	8760	350.4	1	I 40	I40/1	40	0.0	None	8760	350.4	0.0	0.0	$0.00	$0.00	$0.00		
164	Prisoner Processing Room	1	X 7.0 W I 2	EI10/2	20	0.0	Breaker	8760	175.2	1	X 7.0 W I 2	EI10/2	20	0.0	None	8760	175.2	0.0	0.0	$0.00	$0.00	$0.00		
18	Perimeter Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245.3	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1460	163.5	81.8	0.0	$10.25	$118.75	$20.00	11.6	9.6
87	Gun Cabinet	1	W 32 W F 2 (MAG)	F42LE	71	0.1	SW	2190	155.5	1	W 32 W F 2 (MAG)	F42LE	71	0.1	OCC	1460	103.7	51.8	0.0	$6.50	$118.75	$20.00	18.3	15.2
13	Interrogation Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2600	156.0	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1460	87.6	68.4	0.0	$8.58	$118.75	$20.00	13.8	11.5
18	Main Police Hallway	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2600	1,747.2	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	None	2600	1,747.2	0.0	0.0	$0.00	$0.00	$0.00		
71	Main Police Hallway	3	I 60	I60/1	60	0.2	SW	2600	468.0	3	I 60	I60/1	60	0.2	None	2600	468.0	0.0	0.0	$0.00	$0.00	$0.00		
18	Sergeant Office 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1460	327.0	654.1	0.0	$82.02	$118.75	$20.00	1.4	1.2
18	Sergeant Office 2	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1460	327.0	654.1	0.0	$82.02	$118.75	$20.00	1.4	1.2
18	Sergeant Office 3	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1460	327.0	654.1	0.0	$82.02	$118.75	$20.00	1.4	1.2
18	Chief's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1460	327.0	654.1	0.0	$82.02	$118.75	$20.00	1.4	1.2
18	Storage/ Server Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	163.5	817.6	0.0	$102.53	$118.75	$20.00	1.2	1.0
18	Mayor's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1460	327.0	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	163.5	163.5	0.0	$20.51	$118.75	$20.00	5.8	4.8
13	Deputy Treasurer Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	262.8	2	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1460	175.2	87.6	0.0	$10.98	$118.75	$20.00	10.8	9.0
13	East Offices Hallway	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	4380	1,314.0	5	S 32 P F 2 (ELE)	F42LL	60	0.3	None	4380	1,314.0	0.0	0.0	$0.00	$0.00	$0.00		
18	East Offices Hallway	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981.1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	None	4380	981.1	0.0	0.0	$0.00	$0.00	$0.00		
X1	East Offices Hallway	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39.4	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	39.4	0.0	0.0	$0.00	$0.00	$0.00		
18	Server/Storage Room	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245.3	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	81.8	163.5	0.0	$20.51	$118.75	$20.00	5.8	4.8
18	Conference Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	C-OCC	1095	245.3	245.3	0.0	$30.76	$202.50	$35.00	6.6	5.4
18	Supply Room 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	163.5	327.0	0.0	$41.01	$118.75	$20.00	2.9	2.4
18	CFO's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1645	368.5	122.1	0.0	$15.31	$118.75	$20.00	7.8	6.5
18	Municipal Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1645	368.5	122.1	0.0	$15.31	$118.75	$20.00	7.8	6.5
13	Supply Room 2	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	262.8	2	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	730	87.6	175.2	0.0	$21.97	$118.75	$20.00	5.4	4.5
18	Tax Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2190	981.1	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	C-OCC	1645	737.0	244.2	0.0	$30.62	$202.50	$35.00	6.6	5.5
18	Tax Office Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245.3	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	365	40.9	204.4	0.0	$25.63	$118.75	$20.00	4.6	3.9
18	Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1645	368.5	122.1	0.0	$15.31	$118.75	$20.00	7.8	6.5
11	Men's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576.0	1	S 34 P F 2 (MAG)	F42EE	72	0.1	C-OCC	1460	105.1	470.9	0.0	$59.05	$202.50	$35.00	3.4	2.8
11	Women's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576.0	1	S 34 P F 2 (MAG)	F42EE	72	0.1	C-OCC	1460	105.1	470.9	0.0	$59.05	$202.50	$35.00	3.4	2.8
13	Main Hallway	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	8760	4,204.8	8	S 32 P F 2 (ELE)	F42LL	60	0.5	None	8760	4,204.8	0.0	0.0	$0.00	$0.00	$0.00		
78	Main Hallway	2	EP I 100	I100/1	100	0.2	SW	2080	416.0	2	EP I 100	I100/1	100	0.2	None	2080	416.0	0.0	0.0	$0.00	$0.00	$0.00		
13	Small Office to the left of Bathrooms	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	262.8	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	2190	131.4	131.4	0.0	$16.48	$118.75	$20.00	7.2	6.0
185	Courtroom	9	DC 40 W F 4	F44SE	172	1.5	SW	4380	6,780.2	9	DC 40 W F 4	F44SE	172	1.5	None	4380	6,780.2	0.0	0.0	$0.00	$0.00	$0.00		
71	Courtroom	3	I 60	I60/1	60	0.2	SW	4380	788.4	3	I 60	I60/1	60	0.2	None	4380	788.4	0.0	0.0	$0.00	$0.00	$0.00		
35	West Offices Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8760	3,153.6	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	None	8760	3,153.6	0.0	0.0	$0.00	$0.00	$0.00		
35	Breakroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	5000	1,800.0	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	2190	788.4	1,011.6	0.0	$126.85	$202.50	$35.00	1.6	1.3
18	Bathroom off Breakroom	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981.1	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	2190	245.3	735.8	0.0	$92.27	$118.75	$20.00	1.3	1.1
18	Court Office	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2190	1,471.7	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	C-OCC	1645	1,105.4	366.2	0.0	$45.93	$405.00	$70.00	8.8	7.3
18	Court Office Storage	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981.1	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	81.8	899.4	0.0	$112.78	$118.75	$20.00	1.1	0.9
18	Janitor Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	4380	490.6	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	81.8	408.8	0.0	$51.26	$118.75	$20.00	2.3	1.9
35	Conference Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	2190	1,182.6	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	C-OCC	624	337.0	845.6	0.0	$106.04	$202.50	$35.00	1.9	1.6
78	Conference Room	10	EP I 100	I100/1	100	1.0	SW	624	624.0	10	EP I 100	I100/1	100	1.0	None	624	624.0	0.0	0.0	$0.00	$0.00	$0.00		
18	Construction Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2190	735.8	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	OCC	1645	552.7	183.1	0.0	$22.96	$118.75	$20.00	5.2	4.3
18	Fire Marshall Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	490.6	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1645	368.5	122.1	0.0	$15.31	$118.75	$20.00	7.8	6.5
18	Tax Assessor Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245.3	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1645	184.2	61.0	0.0	$7.65	$118.75	$20.00	15.5	12.9
13	Tax Assessor Office	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	131.4	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1645	98.7	32.7	0.0	$4.10	$118.75	$20.00	29.0	24.1
142	Outdoor Lights	3	MH 100	MH100/1	128	0.4	Photo	4380	1,681.9	3	MH 100	MH100/1	128	0.4	None	4380	1,681.9	0.0	0.0	$0.00	$0.00	$0.00		
142	Outdoor Light	1	MH 100	MH100/1	128	0.1	None	8760	1,121.3	1	MH 100	MH100/1	128	0.1	Photo	4380	560.6	560.6	0.0	$70.30	$0.00	$0.00	0.0	0.0
	Total	**133**				**12.8**			**48,676**	**133**				**13**			**36,383**	**12,293**	**0**	**1,542**	**$5,029**	**855**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**12,293**	**$1,542**			
																	Total Savings				**$1,542**		**3.3**	**2.7**

APPENDIX D

ECM-3 Lighting Replacements with Controls

Somerdale Municipal Building
CHA Project No. 22424
ECM-3 Combined Lighting Replacements with Lighting Controls

Cost of Electricity: **$0.125 $/kWh**
$12.99 $/kW

		EXISTING CONDITIONS							RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
11	Maintenance Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2920	210	1	C 28 P F 2	F42SSILL	48	0.0	OCC	730	35	175	0.0	$ 25.71	$ 225.00	$ 35	8.8	7.4
246	Police Bathroom	1	1 Lamp T12	F21SE	26	0.0	SW	2920	76	1	1 Lamp T12	F21SE	26	0.0	OCC	1,095	28	47	0.0	$ 5.95	$ 118.75	$ 20	20.0	16.6
13	Police Locker Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	263	1	S 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	1,460	88	175	0.0	$ 21.97	$ 202.50	$ 35	9.2	7.6
163	Prisoner Processing Room	5	1B 40 R F 2 (MAG)	F42SS	94	0.5	SW	8760	4,117	5	1B 28 R F 2	F42SSILL	48	0.2	None	8,760	2,102	2,015	0.2	$ 288.50	$ 573.75	$ 150	2.0	1.5
101	Prisoner Processing Room	1	I 40	I40/1	40	0.0	SW	8760	350	1	CF 13	CFQ13/1-L	15	0.0	None	8,760	131	219	0.0	$ 31.36	$ 6.75	$ -	0.2	0.2
164	Prisoner Processing Room	1	X 7.0 W I 2	EI10/2	20	0.0	Breaker	8760	175	1	X 1.5C LED	ELED1.5/1	1.5	0.0	None	8,760	13	162	0.0	$ 23.21	$ 128.25	$ 10	5.5	5.1
18	Perimeter Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1,460	164	82	0.0	$ 10.25	$ 118.75	$ 20	11.6	9.6
87	Gun Cabinet	1	W 32 W F 2 (MAG)	F42LE	71	0.1	SW	2190	155	1	W 32 W F 2 (MAG)	F42LE	71	0.1	OCC	1,460	104	52	0.0	$ 6.50	$ 118.75	$ 20	18.3	15.2
13	Interrogation Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2600	156	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1,460	88	68	0.0	$ 8.58	$ 118.75	$ 20	13.8	11.5
18	Main Police Hallway	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2600	1,747	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	None	2,600	1,747	-	0.0	$ -	$ 118.75	$ 20		
71	Main Police Hallway	3	I 60	I60/1	60	0.2	SW	2600	468	3	CF 26	CFQ26/1-L	27	0.1	None	2,600	211	257	0.1	$ 47.71	$ 20.25	$ -	0.4	0.4
18	Sergeant Office 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,460	327	654	0.0	$ 82.02	$ 118.75	$ 20	1.4	1.2
18	Sergeant Office 2	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,460	327	654	0.0	$ 82.02	$ 118.75	$ 20	1.4	1.2
18	Sergeant Office 3	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,460	327	654	0.0	$ 82.02	$ 118.75	$ 20	1.4	1.2
18	Chief's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,460	327	654	0.0	$ 82.02	$ 118.75	$ 20	1.4	1.2
18	Storage/ Server Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	164	818	0.0	$ 102.53	$ 118.75	$ 20	1.2	1.0
18	Mayor's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1460	327	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	164	164	0.0	$ 20.51	$ 118.75	$ 20	5.8	4.8
13	Deputy Treasurer Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	263	2	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1,460	175	88	0.0	$ 10.98	$ 118.75	$ 20	10.8	9.0
13	East Offices Hallway	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	4380	1,314	5	S 32 P F 2 (ELE)	F42LL	60	0.3	None	4,380	1,314	-	0.0	$ -	$ -	$ -		
18	East Offices Hallway	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	981	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	None	4,380	981	-	0.0	$ -	$ 118.75	$ 20		
X1	East Offices Hallway	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	39	-	0.0	$ -	$ -	$ -		
18	Server/Storage Room	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	82	164	0.0	$ 20.51	$ 118.75	$ 20	5.8	4.8
18	Conference Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	C-OCC	1,095	245	245	0.0	$ 30.76	$ 202.50	$ 35	6.6	5.4
18	Supply Room 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	730	164	327	0.0	$ 41.01	$ 118.75	$ 20	2.9	2.4
18	CFO's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,645	368	122	0.0	$ 15.31	$ 118.75	$ 20	7.8	6.5
18	Municipal Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,645	368	122	0.0	$ 15.31	$ 118.75	$ 20	7.8	6.5
13	Supply Room 2	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	263	2	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	730	88	175	0.0	$ 21.97	$ 118.75	$ 20	5.4	4.5
18	Tax Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2190	981	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	C-OCC	1,645	737	244	0.0	$ 30.62	$ 202.50	$ 35	6.6	5.5
18	Tax Office Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	385	41	204	0.0	$ 25.63	$ 118.75	$ 20	4.6	3.9
18	Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,645	368	122	0.0	$ 15.31	$ 118.75	$ 20	7.8	6.5
11	Men's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576	1	C 28 P F 2	F42SSILL	48	0.0	C-OCC	1,460	70	506	0.0	$ 67.18	$ 118.75	$ 20	1.8	1.5
11	Women's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	576	1	C 28 P F 2	F42SSILL	48	0.0	C-OCC	1,460	70	506	0.0	$ 67.18	$ 118.75	$ 20	1.8	1.5
13	Main Hallway	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	8760	4,205	8	S 32 P F 2 (ELE)	F42LL	60	0.5	None	8,760	4,205	-	0.0	$ -	$ -	$ -		
78	Main Hallway	2	EP I 100	I100/1	100	0.2	SW	2080	416	2	CF 26	CFQ26/1-L	27	0.1	None	2,080	112	304	0.1	$ 60.84	$ 40.50	$ -	0.7	0.7
13	Small Office to the left of Bathrooms	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	263	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	2,190	131	131	0.0	$ 16.48	$ 118.75	$ 20	7.2	6.0
185	Courtroom	9	DC 40 W F 4	F44SE	172	1.5	SW	4380	6,780	9	DC 28 W F 4	F44SSILL	96	0.9	None	4,380	3,784	2,996	0.7	$ 482.29	$ 1,275.75	$ 270	2.6	2.1
71	Courtroom	3	I 60	I60/1	60	0.2	SW	4380	788	3	CF 26	CFQ26/1-L	27	0.1	None	4,380	355	434	0.1	$ 69.81	$ 20.25	$ -	0.3	0.3
35	West Offices Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8760	3,154	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	None	8,760	3,154	-	0.0	$ -	$ -	$ -		
35	Breakroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	5000	1,800	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	C-OCC	2,190	788	1,012	0.0	$ 126.85	$ 202.50	$ 35	1.6	1.3
18	Bathroom off Breakroom	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	2,190	245	736	0.0	$ 92.27	$ 118.75	$ 20	1.3	1.1
18	Court Office	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2190	1,472	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	C-OCC	1,645	1,105	366	0.0	$ 45.93	$ 405.00	$ 70	8.8	7.3
18	Court Office Storage	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	981	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	82	899	0.0	$ 112.78	$ 118.75	$ 20	1.1	0.9
18	Janitor Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	4380	491	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	730	82	409	0.0	$ 51.26	$ 405.00	$ 70	7.9	6.5
35	Conference Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	2190	1,183	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	C-OCC	824	337	846	0.0	$ 106.04	$ 202.50	$ 35	1.9	1.6
78	Conference Room	10	EP I 100	I100/1	100	1.0	SW	624	624	10	CF 26	CFQ26/1-L	27	0.3	None	624	168	456	0.7	$ 170.90	$ 202.50	$ -	1.2	1.2
18	Construction Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2190	736	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	OCC	1,645	553	183	0.0	$ 22.96	$ 118.75	$ 20	5.2	4.3
18	Fire Marshall Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	491	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1,645	368	122	0.0	$ 15.31	$ 118.75	$ 20	7.8	6.5
18	Tax Assessor Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	245	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	OCC	1,645	184	61	0.0	$ 7.65	$ 118.75	$ 20	15.5	12.9
13	Tax Assessor Office	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	131	1	S 32 P F 2 (ELE)	F42LL	60	0.1	OCC	1,645	99	33	0.0	$ 4.10	$ 118.75	$ 20	29.0	24.1
142	Outdoor Lights	3	MH 100	MH100/1	128	0.4	Photo	4380	1,682	3	MH 100	MH100/1	128	0.4	None	4,380	1,682	-	0.0	$ -	$ -	$ -	-	-
142	Outdoor Light	1	MH 100	MH100/1	128	0.1	None	8760	1,121	1	MH 100	MH100/1	128	0.1	Photo	4,380	561	561	0.0	$ 70.30	$ -	$ -	0.0	0.0
	Total	**133**				**12.8**			**48,676**	**133**				**10.7**			**29,453**		**2.1**	**2,738**	**7,759**	**1,360**		
																		Demand Savings		**2.1**	**$328**			
																		kWh Savings		**19,223**	**$2,411**			
																		Total Savings			**$2,738**		**2.8**	**2.3**

APPENDIX E

ECM-4 Replace Electric DHW with On Demand Gas

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 4: Replace Electric DHW Heater with On Demand Gas

Summary

* Replace Electric DHW Heater w/ Instantaneous, Condensing, Gas-Fired DHW Heater

Item	Value	Units	Formula/Comments
Occupied days per week	7	days/wk	
Water supply Temperature	50	°F	Termperature of water coming into building
Hot Water Temperature	120	°F	
Hot Water Usage per day	41	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	8,755	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	°F	Per building personnel
Average Room Temperature	60	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.5	MBH	
Annual Standby Hot Water Load	4,380	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	13,135	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	92%		Per Manufacturer
Total Annual Energy Required	14,277	Mbtu/yr	
Total Annual Electric Required	4,183	**kWh/yr**	**Electrical Savings**
Average Annual Electric Demand	0.48	kW	
Peak Electric Demand	4.50	**kW**	**Per Manufacturer's Nameplate (Demand Savings)**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	°F	
Average Room Temperature	60	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	8,755	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Bosch GWH C 920 ESC
Proposed Total Annual Energy Required	9,517	MBTU/yr	
Proposed Fuel Use	95	Therms/yr	Standby Losses and inefficient DHW heater eliminated
Elec Utility Demand Unit Cost	$12.99	$/kW	
Elec Utility Supply Unit Cost	$0.13	$/kWh	
NG Utility Unit Cost	$1.36	$/Therm	
Existing Operating Cost of DHW	$1,226	$/yr	
Proposed Operating Cost of DHW	$130	$/yr	
Annual Utility Cost Savings	**$1,096**	**$/yr**	

Daily Hot Water Demand

FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	#USES PER DAY MALE	#USES PER DAY FEMALE	FULL TIME OCCUPANTS** MALE	FULL TIME OCCUPANTS** FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 G	2.5	0.25	3	3	20	20	75	50%	38
MOP SINK	2.5	2	1	1	1	0	5	75%	4
						TOTAL	80		41

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 4: Replace Electric DHW Heater with On Demand Gas

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Condensing Gas Hot Water Heater	1	EA	$ 2,062	$ 300		$ 2,041	$ 369	$ -	$ 2,410	Bosch GWH C 920 ESC
Hot Water Heater Removal	1	EA		$ 150		$ -	$ 185	$ -	$ 185	
Venting	10	LF	$ 5.50	$ 6.70		$ 54	$ 82	$ -	$ 137	
Miscellaneous Piping and Valves	1	LS	$ 500	$ 200		$ 495	$ 246	$ -	$ 741	Natural Gas Line

$ 3,473	Subtotal
$ 347.27	10% Contingency
$ 382.00	10% Contractor O&P
$ -	Engineering
$ 4,202	**Total**

APPENDIX F

ECM-5 Temperature Setback

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 5 Temperature Setback - Mayor

Building Footprint	2,000 SF	Ex Occupied Clng Temp.	72 °F	Ex Occupied Htg Temp.	72 °F	**Heating Energy Savings**	358 **therms**
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	72 °F	Ex Unoccupied Htg Temp.	72 °F	**Cooling Energy Savings**	532 **kWh**
Cooling Efficiency	1.45 kW/ton	Prop Occupied Clng Temp.	72 °F	Prop Occupied Htg Temp.	70 °F		
Building Balance Temp.	55 °F	Prop Unoccupied Clng Temp.	80 °F	Prop Unoccupied Htg Temp.	60 °F		
Internal Gains	21,980 btu/h	Occupied Cooling UA	622 btu/hr/°F	Occupied Heating UA	247 btu/hr/°F		
Unoc Internal Gain factor	0.1	Unoccupied Cooling UA	178 btu/hr/°F	Unoccupied Heating UA	248 btu/hr/°F		
Ave Occ Internal Gain Factor	0.5	Cooling Occ Enthalpy Setpoint	28 Btu/lb				
		Cooling Unocc Enthalpy Setpoint	28 Btu/lb				

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-18,906	-34,515	-10,990	-14,431	-34,515	-2,198	-18,906	-34,515	-10,990	-10,646	-34,515	-2,198	0	0	0	0
97.5	42.5	3	1	2	-15,807	-24,653	-10,990	-12,065	-24,653	-2,198	-15,807	-24,653	-10,990	-8,280	-24,653	-2,198	15	14	0	0
92.5	39.5	34	9	25	-12,707	-20,171	-10,990	-9,699	-20,171	-2,198	-12,707	-20,171	-10,990	-5,914	-20,171	-2,198	145	134	0	0
87.5	36.6	131	36	95	-9,608	-15,838	-10,990	-7,334	-15,838	-2,198	-9,608	-15,838	-10,990	-3,549	-15,838	-2,198	450	406	0	0
82.5	34	500	137	363	-6,509	-11,953	-10,990	-4,968	-11,953	-2,198	-6,509	-11,953	-10,990	-1,183	-11,953	-2,198	1,326	1,160	0	0
77.5	31.6	620	170	450	-3,409	-8,367	-10,990	-2,602	-8,367	-2,198	-3,409	-8,367	-10,990	0	0	-2,198	1,183	587	0	0
72.5	29.2	664	182	482	-310	-4,781	-10,990	-237	-4,781	-2,198	-310	-4,781	-10,990	0	0	-2,198	774	481	0	0
67.5	27	854	234	620	1,571	2,331	-10,990	1,571	2,331	-2,198	604	896	-10,990	0	0	-2,198	200	433	0	0
62.5	24.5	927	254	673	2,780	4,124	-10,990	2,780	4,124	-2,198	1,813	2,689	-10,990	0	0	-2,198	125	378	0	0
57.5	21.4	600	164	436	3,989	5,917	-10,990	3,989	5,917	-2,198	3,022	4,482	-10,990	604	896	-2,198	22	106	0	0
52.5	18.7	610	167	443	5,197	7,710	-10,990	5,197	7,710	-2,198	4,230	6,275	-10,990	1,813	2,689	-2,198	0	10	63	0
47.5	16.2	611	167	444	6,406	9,503	-10,990	6,406	9,503	-2,198	5,439	8,068	-10,990	3,022	4,482	-2,198	0	0	86	35
42.5	14.4	656	180	476	7,615	11,296	-10,990	7,615	11,296	-2,198	6,648	9,861	-10,990	4,230	6,275	-2,198	0	0	117	62
37.5	12.6	1,023	280	743	8,823	13,089	-10,990	8,823	13,089	-2,198	7,856	11,654	-10,990	5,439	8,068	-2,198	0	0	221	135
32.5	10.7	734	201	533	10,032	14,882	-10,990	10,032	14,882	-2,198	9,065	13,447	-10,990	6,648	9,861	-2,198	0	0	186	124
27.5	8.6	334	91	243	11,241	16,675	-10,990	11,241	16,675	-2,198	10,274	15,240	-10,990	7,856	11,654	-2,198	0	0	97	69
22.5	6.8	252	69	183	12,449	18,468	-10,990	12,449	18,468	-2,198	11,482	17,033	-10,990	9,065	13,447	-2,198	0	0	83	62
17.5	5.5	125	34	91	13,658	20,260	-10,990	13,658	20,260	-2,198	12,691	18,826	-10,990	10,274	15,240	-2,198	0	0	46	35
12.5	4.1	47	13	34	14,867	22,053	-10,990	14,867	22,053	-2,198	13,900	20,619	-10,990	11,482	17,033	-2,198	0	0	19	15
7.5	2.6	22	6	16	16,075	23,846	-10,990	16,075	23,846	-2,198	15,108	22,412	-10,990	12,691	18,826	-2,198	0	0	10	8
2.5	1	13	4	9	17,284	25,639	-10,990	17,284	25,639	-2,198	16,317	24,205	-10,990	13,900	20,619	-2,198	0	0	6	5
-2.5	0	0	0	0	18,493	27,432	-10,990	18,493	27,432	-2,198	17,526	25,998	-10,990	15,108	22,412	-2,198	0	0	0	0
-7.5	-1.5	0	0	0	19,701	29,225	-10,990	19,701	29,225	-2,198	18,734	27,791	-10,990	16,317	24,205	-2,198	0	0	0	0
TOTALS		8,760	2,399	6,361													4,240	3,708	935	550

Existing Building Ventilation & Infiltration (occ) 332 cfm
Overheat Ventilation Factor 1.00
Additional ventilation to offset overheat 0 cfm
Existing Building Ventilation & Infiltration (unocc) 332 cfm

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 5 Temperature Setback - Court Office

Building Footprint	1,920 SF	Ex Occupied Clng Temp.	75 °F	Ex Occupied Htg Temp.	71 °F	**Heating Energy Savings**	366 **therms**
Heating Efficiency	0.78	Ex Unoccupied Clng Temp.	78 °F	Ex Unoccupied Htg Temp.	68 °F	**Cooling Energy Savings**	224 **kWh**
Cooling Efficiency	1.48 kW/ton	Prop Occupied Clng Temp.	75 °F	Prop Occupied Htg Temp.	70 °F		
Building Balance Temp.	55 °F	Prop Unoccupied Clng Temp.	80 °F	Prop Unoccupied Htg Temp.	60 °F		
Internal Gains	18,023 btu/h	Occupied Cooling UA	592 btu/hr/°F	Occupied Heating UA	245 btu/hr/°F		
Unoc Internal Gain factor	0.2	Unoccupied Cooling UA	451 btu/hr/°F	Unoccupied Heating UA	245 btu/hr/°F		
Ave Occ Internal Gain Factor	0.9	Cooling Occ Enthalpy Setpoint	28 Btu/lb				
		Cooling Unocc Enthalpy Setpoint	28 Btu/lb				

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-17,150	-30,629	-16,219	-13,749	-30,629	-3,604	-15,463	-30,629	-16,219	-10,143	-30,629	-3,604	0	0	0	0
97.5	42.5	3	1	2	-14,339	-21,878	-16,219	-11,495	-21,878	-3,604	-12,652	-21,878	-16,219	-7,889	-21,878	-3,604	15	14	0	0
92.5	39.5	34	9	25	-11,527	-17,900	-16,219	-9,241	-17,900	-3,604	-9,840	-17,900	-16,219	-5,635	-17,900	-3,604	146	133	0	0
87.5	36.6	131	36	95	-8,716	-14,055	-16,219	-6,987	-14,055	-3,604	-7,029	-14,055	-16,219	-3,381	-14,055	-3,604	462	412	0	0
82.5	34	500	137	363	-5,904	-10,607	-16,219	-4,733	-10,607	-3,604	-4,217	-10,607	-16,219	-1,127	-10,607	-3,604	1,401	1,211	0	0
77.5	31.6	620	170	450	-3,093	-7,425	-16,219	-2,479	-7,425	-3,604	-1,406	-7,425	-16,219	0	0	-3,604	1,310	725	0	0
72.5	29.2	664	182	482	-281	-4,243	-16,219	-225	-4,243	-3,604	0	0	-16,219	0	0	-3,604	945	578	0	0
67.5	27	854	234	620	1,619	2,068	-16,219	1,619	2,068	-3,604	623	796	-16,219	0	0	-3,604	361	703	0	0
62.5	24.5	927	254	673	2,865	3,660	-16,219	2,865	3,660	-3,604	1,869	2,387	-16,219	0	0	-3,604	303	674	0	0
57.5	21.4	600	164	436	4,111	5,251	-16,219	4,111	5,251	-3,604	3,114	3,978	-16,219	623	796	-3,604	139	302	0	0
52.5	18.7	610	167	443	5,357	6,842	-16,219	5,357	6,842	-3,604	4,360	5,569	-16,219	1,869	2,387	-3,604	83	130	0	0
47.5	16.2	611	167	444	6,602	8,433	-16,219	6,602	8,433	-3,604	5,606	7,160	-16,219	3,114	3,978	-3,604	24	71	0	0
42.5	14.4	656	180	476	7,848	10,024	-16,219	7,848	10,024	-3,604	6,852	8,751	-16,219	4,360	5,569	-3,604	0	14	91	0
37.5	12.6	1,023	280	743	9,094	11,615	-16,219	9,094	11,615	-3,604	8,097	10,342	-16,219	5,606	7,160	-3,604	0	0	179	95
32.5	10.7	734	201	533	10,340	13,206	-16,219	10,340	13,206	-3,604	9,343	11,933	-16,219	6,852	8,751	-3,604	0	0	155	95
27.5	8.6	334	91	243	11,585	14,797	-16,219	11,585	14,797	-3,604	10,589	13,524	-16,219	8,097	10,342	-3,604	0	0	83	55
22.5	6.8	252	69	183	12,831	16,388	-16,219	12,831	16,388	-3,604	11,835	15,116	-16,219	9,343	11,933	-3,604	0	0	72	51
17.5	5.5	125	34	91	14,077	17,980	-16,219	14,077	17,980	-3,604	13,080	16,707	-16,219	10,589	13,524	-3,604	0	0	40	30
12.5	4.1	47	13	34	15,323	19,571	-16,219	15,323	19,571	-3,604	14,326	18,298	-16,219	11,835	15,116	-3,604	0	0	17	13
7.5	2.6	22	6	16	16,568	21,162	-16,219	16,568	21,162	-3,604	15,572	19,889	-16,219	13,080	16,707	-3,604	0	0	9	7
2.5	1	13	4	9	17,814	22,753	-16,219	17,814	22,753	-3,604	16,817	21,480	-16,219	14,326	18,298	-3,604	0	0	6	5
-2.5	0	0	0	0	19,060	24,344	-16,219	19,060	24,344	-3,604	18,063	23,071	-16,219	15,572	19,889	-3,604	0	0	0	0
-7.5	-1.5	0	0	0	20,306	25,935	-16,219	20,306	25,935	-3,604	19,309	24,662	-16,219	16,817	21,480	-3,604	0	0	0	0
TOTALS		8,760	2,399	6,361													5,190	4,966	651	351

Existing Building Ventilation & Infiltration (occ)	**295 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**295 cfm**

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 5 Temperature Setback - Courtroom

Building Footprint	1,480	SF	Ex Occupied Clng Temp.	70	°F	Ex Occupied Htg Temp.	70	°F	**Heating Energy Savings**	162	**therms**
Heating Efficiency	0.80		Ex Unoccupied Clng Temp.	75	°F	Ex Unoccupied Htg Temp.	60	°F	**Cooling Energy Savings**	366	**kWh**
Cooling Efficiency	1.40	kW/ton	Prop Occupied Clng Temp.	70	°F	Prop Occupied Htg Temp.	70	°F			
Building Balance Temp.	55	°F	Prop Unoccupied Clng Temp.	80	°F	Prop Unoccupied Htg Temp.	60	°F			
Internal Gains	13,140	btu/h	Occupied Cooling UA	532	btu/hr/°F	Occupied Heating UA	336	btu/hr/°F			
Unocc Internal Gain factor	0.2		Unoccupied Cooling UA	443	btu/hr/°F	Unoccupied Heating UA	306	btu/hr/°F			
Ave Occ Internal Gain Factor	0.8		Cooling Occ Enthalpy Setpoint	28	Btu/lb						
			Cooling Unocc Enthalpy Setpoint	28	Btu/lb						

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-20,343	-30,012	-10,512	-12,313	-30,012	-2,628	-20,343	-30,012	-10,512	-10,074	-30,012	-2,628	0	0	0	0
97.5	42.5	3	0	3	-17,214	-21,437	-10,512	-10,074	-21,437	-2,628	-17,214	-21,437	-10,512	-7,835	-21,437	-2,628	10	9	0	0
92.5	39.5	34	2	32	-14,084	-17,539	-10,512	-7,835	-17,539	-2,628	-14,084	-17,539	-10,512	-5,597	-17,539	-2,628	90	83	0	0
87.5	36.6	131	8	123	-10,954	-13,772	-10,512	-5,597	-13,772	-2,628	-10,954	-13,772	-10,512	-3,358	-13,772	-2,628	274	248	0	0
82.5	34	500	30	470	-7,824	-10,394	-10,512	-3,358	-10,394	-2,628	-7,824	-10,394	-10,512	-1,119	-10,394	-2,628	784	688	0	0
77.5	31.6	620	37	583	-4,695	-7,276	-10,512	-1,119	-7,276	-2,628	-4,695	-7,276	-10,512	0	0	-2,628	665	217	0	0
72.5	29.2	664	40	624	-1,565	-4,157	-10,512	0	0	-2,628	-1,565	-4,157	-10,512	0	0	-2,628	209	209	0	0
67.5	27	854	51	803	1,984	2,027	-10,512	0	0	-2,628	763	780	-10,512	0	0	-2,628	224	235	0	0
62.5	24.5	927	55	872	3,509	3,586	-10,512	763	780	-2,628	2,289	2,339	-10,512	0	0	-2,628	104	240	0	0
57.5	21.4	600	36	564	5,035	5,145	-10,512	2,289	2,339	-2,628	3,815	3,898	-10,512	763	780	-2,628	1	65	0	0
52.5	18.7	610	36	574	6,561	6,704	-10,512	3,815	3,898	-2,628	5,340	5,457	-10,512	2,289	2,339	-2,628	0	0	37	14
47.5	16.2	611	36	575	8,087	8,263	-10,512	5,340	5,457	-2,628	6,866	7,016	-10,512	3,815	3,898	-2,628	0	0	60	37
42.5	14.4	656	39	617	9,613	9,822	-10,512	6,866	7,016	-2,628	8,392	8,575	-10,512	5,340	5,457	-2,628	0	0	89	65
37.5	12.6	1,023	61	962	11,138	11,381	-10,512	8,392	8,575	-2,628	9,918	10,134	-10,512	6,866	7,016	-2,628	0	0	177	139
32.5	10.7	734	44	690	12,664	12,940	-10,512	9,918	10,134	-2,628	11,444	11,693	-10,512	8,392	8,575	-2,628	0	0	155	127
27.5	8.6	334	20	314	14,190	14,499	-10,512	11,444	11,693	-2,628	12,969	13,252	-10,512	9,918	10,134	-2,628	0	0	83	71
22.5	6.8	252	15	237	15,716	16,058	-10,512	12,969	13,252	-2,628	14,495	14,811	-10,512	11,444	11,693	-2,628	0	0	72	63
17.5	5.5	125	7	118	17,242	17,617	-10,512	14,495	14,811	-2,628	16,021	16,370	-10,512	12,969	13,252	-2,628	0	0	40	36
12.5	4.1	47	3	44	18,767	19,176	-10,512	16,021	16,370	-2,628	17,547	17,929	-10,512	14,495	14,811	-2,628	0	0	17	15
7.5	2.6	22	1	21	20,293	20,735	-10,512	17,547	17,929	-2,628	19,073	19,488	-10,512	16,021	16,370	-2,628	0	0	9	8
2.5	1	13	1	12	21,819	22,294	-10,512	19,073	19,488	-2,628	20,598	21,047	-10,512	17,547	17,929	-2,628	0	0	6	5
-2.5	0	0	0	0	23,345	23,853	-10,512	20,598	21,047	-2,628	22,124	22,606	-10,512	19,073	19,488	-2,628	0	0	0	0
-7.5	-1.5	0	0	0	24,871	25,412	-10,512	22,124	22,606	-2,628	23,650	24,165	-10,512	20,598	21,047	-2,628	0	0	0	0
TOTALS		8,760	521	8,239													2,361	1,995	744	580

Existing Building Ventilation & Infiltration (occ)	**289 cfm**
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**289 cfm**

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 5 - Temperature Setback

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Programmable T-Stats	2	EA	$ 85	$ 50		$ 168	$ 123	$ -	$ 291	Replace Old Units in Courtroom and Western Office Areas
Program Thermostats	3	EA		$ 25		$ -	$ 92	$ -	$ 92	

$	384	Subtotal
$	58	15% Contingency
$	66	15% Contractor O&P
$	-	Engineering
$	**507**	**Total**

APPENDIX G

ECM-6 Dual Flush Toilets

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 6 Dual Flush Toilets

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$10.44	$ / kGal
Number of Toilets in Building	6	

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	6	
Proposed Gallons / Flush Solids	1.6	Gal
Proposed Gallons / Flush Liquids	0.8	Gal
Total Installation Cost	$3,961	

SAVINGS		
Current Toilet Water Use	68	kGal / year
Proposed Toilet Water Use	36	kGal / year
Water Savings	32	kGal / year
Cost Savings	$ 335	/ year
Simple Payback	11.8	years

	Toilets	Uses/day/toilet	Liquid/Day	Solid/Day	Gal/Flush	Total Usage (gals)	Proposed Usage (gals)	Toilet Replacement?
Mens	1	15	0	15	4	60	24	yes
Womens	2	15	5	10	2.5	37.5	20	yes
General/PoliceToilet	1	7	5	2	2.5	17.5	7.2	yes
Police Toilet	1	25	15	10	1.6	40	28	no
Employee Toilet	1	20	15	5	1.6	32	20	no
						187	99.2	

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 6 Dual Flush Toilets

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Dual Flush Toilets	4	ea	$ 320	$ 139		$ 1,267	$ 684	$ -	$ 1,951	Kohler Units
Misc Plumbing fixtures, etc..	5	ea	$ 100	$ 100		$ 495	$ 615	$ -	$ 1,110	
Old Valve Removal	5	ea		$ 10		$ -	$ 62	$ -	$ 62	
Dual Flush Retrofit	2	ea	$ 28	$ 50		$ 55	$ 123	$ -	$ 178	

$ 3,301		Subtotal
$ 330	10%	Contingency
$ 330	10%	Contractor O&P
$ -	0%	Engineering
$ 3,961	**Total**	

APPENDIX H

ECM-7 Install Storm Windows in Courtroom

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

*Change U-value and air infiltration rates based on new windows or storm windows
See block load spreadsheet for U-values

ECM 7 Install Storm Windows in Courtroom

Description Windows can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss. Adding storm windows to single pained glass can more than double the window's thermal resistance and decrease infiltration.

Given

Occupied Cooling Hours per Week	10	Hours		
Occupied Heating Hours per Week	10	Hours		
Heating Energy Cost	$1.36	$/therm		
Cooling Cost	60.174	$/kWh		
Occupied Cooling Setpoint Temperature	20.0	Degrees F		(Assumption)
Occupied Cooling Avg Space Air Enthalpy	26.0	btu/# air		(Assumption)
Occupied Heatng Setpoint Temperature	74.0	Degrees F	Occupied	(Assumption)
Unoccupied Heating Setpoint Temperature	65.0	Degrees F	Unoccupied	(Assumption)
Window Area	80	sq.ft.		(From window survey)
Window Perimeter	112	ft		(From window survey)
Proposed U factor	0.50	Btu/(h*sqft*degf)		(From window vendor)
Proposed Air Infiltration	0.20	cfm/ft		(From window vendor)
Cooling Conversion	12,000	Btu/ton		
Heating Btu Conversion	1,000,000	Btu/MMBtu		

Assumptions

Existing U factor	1.06	Btu/(h*sqft*degf)	(From ASHRAE Fundamentals)
Existing Air Infiltration	0.40	cfm/ft	(From ASHRAE Fundamentals)
Heating System Efficiency	82%		
Cooling System Efficiency	1.10	kW/ton	

Formula

Cooling Energy Conduction = (Existing U x Area x (OA Temp - RA Temp) x Op Hours)

Heating Energy Conduction = (Existing U x Area x (RA Temp - OA Temp) x Op Hours)
Cooling Energy Infiltration = (4.5 x Leakage x Perimeter x (OA Enthalpy - RA Enthalpy) x Op Hours)
Heating Energy Infiltration = 1.08 x Leakage x Perimeter x (RA temp - OA temp) x Op Hours)
Load = (Conduction) + (Infiltration)
Cooling Energy = (Cooling Load) / (12,000 Btu/Ton) x (kw/Ton)
Heating Energy = (Heating Load) / (1,000,000 Btu/MMBtu) / (Boiler Efficiency)
Energy Cost = (Energy) x (Cost/Unit)

Existing Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	37	2.2	0.0	0.0	4,163	0	0	5,461	0	0
Cooling	36.6	87.5	131	7.8	0.0	0.0	11,463	0	0	16,663	0	0
Cooling	33.5	82.5	500	29.8	0.0	0.0	31,250	0	0	45,000	0	0
Cooling	31.6	77.5	620	36.9	0.0	0.0	23,250	0	0	41,664	0	0
Cooling	30.3	72.5	664	39.5	39.5	0.0	8,300	4,980	0	34,262	2,868	0
Heating	27.9	67.5	854	0.0	50.8	0.0	0	27,755	0	0	15,987	0
Heating	24.6	62.5	927	0.0	55.2	871.8	0	53,303	183,083	0	30,702	105,456
Heating	21.6	57.5	600	0.0	35.7	564.3	0	49,500	355,500	0	28,512	204,768
Heating	18.7	52.5	610	0.0	36.3	573.7	0	65,575	602,375	0	37,771	346,968
Heating	16.2	47.5	611	0.0	36.4	574.6	0	80,958	844,708	0	46,632	486,552
Heating	14.3	42.5	656	0.0	39.0	617.0	0	103,320	1,166,040	0	59,512	671,639
Heating	12.4	37.5	1,023	0.0	60.9	962.1	0	186,698	2,222,468	0	107,538	1,280,141
Heating	10.4	32.5	734	0.0	43.7	690.3	0	152,305	1,884,545	0	87,728	1,085,498
Heating	8.7	27.5	334	0.0	19.9	314.1	0	77,655	989,475	0	44,729	569,938
Heating	7	22.5	252	0.0	15.0	237.0	0	64,890	846,090	0	37,377	487,348
Heating	5.4	17.5	125	0.0	7.4	117.6	0	35,313	469,063	0	20,340	270,180
Heating	3.9	12.5	47	0.0	2.8	44.2	0	14,453	194,933	0	8,325	112,281
Heating	2.5	7.5	22	0.0	1.3	20.7	0	7,315	99,935	0	4,213	57,563
Heating	1.2	2.5	13	0.0	0.8	12.2	0	4,648	64,188	0	2,677	36,972
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	116	445	5,600	78,425	928,665	9,922,400 btu	143,051	534,911	5,715,302 btu

	Conduction + Infiltration		
Cooling Load =	(78425) + (143051) =		221,476 btu
	Cooling Load / Cooling Energy * 1.10		
Cooling Energy =	(221476)/(12000) * (1.10) =		20 kWh
	Cooling Energy x Cooling Cost		
Cooling Energy Cost =	(20.30) x ($0.174) =	$	3.53
	Conduction + Infiltration		
Heating Load =	(10851065) + (6250213) =		17,101,278 btu
	Heating Load / Heat Content		
Heating Energy =	(17101278)/(82%)/(100000) =		209 therms
	Heating Energy x Heating Cost		
Heating Energy Cost =	(208.55) x ($1.363) =	$	284

Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	37	2.2	0.0	0.0	1,982	0	0	2,731	0	0
Cooling	36.6	87.5	131	7.8	0.0	0.0	5,458	0	0	8,332	0	0
Cooling	33.5	82.5	500	29.8	0.0	0.0	14,881	0	0	22,500	0	0
Cooling	31.6	77.5	620	36.9	0.0	0.0	11,071	0	0	20,832	0	0
Cooling	30.3	72.5	664	39.5	39.5	0.0	3,952	2,371	0	17,131	1,434	0
Heating	27.9	67.5	854	0.0	50.8	0.0	0	13,217	0	0	7,993	0
Heating	24.6	62.5	927	0.0	55.2	871.8	0	25,382	87,182	0	15,351	52,728
Heating	21.6	57.5	600	0.0	35.7	564.3	0	23,571	169,286	0	14,256	102,384
Heating	18.7	52.5	610	0.0	36.3	573.7	0	31,226	286,845	0	18,886	173,484
Heating	16.2	47.5	611	0.0	36.4	574.6	0	38,551	402,242	0	23,316	243,276
Heating	14.3	42.5	656	0.0	39.0	617.0	0	49,200	555,257	0	29,756	335,820
Heating	12.4	37.5	1,023	0.0	60.9	962.1	0	88,904	1,058,318	0	53,769	640,071
Heating	10.4	32.5	734	0.0	43.7	690.3	0	72,526	897,402	0	43,864	542,749
Heating	8.7	27.5	334	0.0	19.9	314.1	0	36,979	471,179	0	22,365	284,969
Heating	7	22.5	252	0.0	15.0	237.0	0	30,900	402,900	0	18,688	243,674
Heating	5.4	17.5	125	0.0	7.4	117.6	0	16,815	223,363	0	10,170	135,090
Heating	3.9	12.5	47	0.0	2.8	44.2	0	6,882	92,825	0	4,162	56,141
Heating	2.5	7.5	22	0.0	1.3	20.7	0	3,483	47,588	0	2,107	28,781
Heating	1.2	2.5	13	0.0	0.8	12.2	0	2,213	30,565	0	1,338	18,486
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	116	445	5,600	37,345	442,221	4,724,952 btu	71,525	267,456	2,857,651 btu

Cooling Load =	(37345 Conduction) + (71525 Infiltration) =	108,871 btu
Cooling Energy =	(108871 Cooling Load)/(12000 Cooling Energy) * (1.10 Cooling Cost) =	10 kWh
Cooling Energy Cost =	(9.98 Cooling Energy) x ($0.174 Cooling Cost) =	$ 1.74
Heating Load =	(5167174 Conduction) + (3125107 Infiltration) =	8,292,281 btu
Heating Energy =	(8292281 Heating Load)/(82% Heat Content) / (100000) =	101 therms
Heating Energy Cost =	(101.13 Heating Energy) x ($1.363 Heating Cost) =	$ 138

Summary

EXISTING COOLING ENERGY	20.30	kWh	$	3.53
EXISTING HEATING ENERGY	208.55	therms	$	284.31
EXISTING ENERGY COST			$	287.84
PROPOSED COOLING ENERGY	9.98	kWh	$	1.74
PROPOSED HEATING ENERGY	101.13	therms	$	137.86
PROPOSED ENERGY COST			$	139.60
COOLING ENERGY SAVINGS	10.32	kWh	$	1.80
HEATING ENERGY SAVINGS	107.43	therms	$	146.45
ENERGY COST SAVINGS			$	148.25

50.8% of existing
51.5% of existing
51.5% of existing

Comments

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 7 Install Storm Windows in Courtroom

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
2'x5' storm windows	8	EA	$ 98	$ 21		$ 776	$ 207	$ -	$ 983	Cost Estimated from Means
						$ -	$ -	$ -	$ -	

$	983	Subtotal
$	295	30% Contingency
$	192	15% Contractor O&P
$	-	0% Engineering
$	**1,469**	**Total**

APPENDIX I

ECM-8 Increase Wall Insulation in Courtroom

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 8 Increase Wall Insulation in Courtroom

Total Existing Exterior Wall Area	818	sf
Existing U-value	0.16	Btu/hr/(sf*F)
Existing R-value	6.2	
Proposed U-value	0.05	Btu/hr/(sf*F)
Proposed R-value	19.78	
Heating Efficiency	82%	
Cooling Efficiency	1.19	kW/ton

Proposed Wall Section	R Value
Exterior Surface R	0.17
Concrete Masonry	0.8
1.5" Air Space	1.48
Filled Concrete Block	3.1
Insulation	13
Drywall	0.45
Interior Paint	0.1
Interior Surface Resistance	0.68
Total	**19.78**

Existing Cooling

Max. North Wall Cooling Load	0	Btu/hr
Max. East Wall Cooling Load	144	Btu/hr
Max. South Wall Cooling Load	867	Btu/hr
Max. West Wall Cooling Load	1,158	Btu/hr

Existing Heating

Existing Heating Load Temp Diff.	64	F
Existing Max. Wall Heating Load	6,760	Btu/hr
Heating On Point	60	F

Proposed Cooling

Max. North Wall Cooling Load	-	Btu/hr
Max. East Wall Cooling Load	45	Btu/hr
Max. South Wall Cooling Load	273	Btu/hr
Max. West Wall Cooling Load	365	Btu/hr

Proposed Heating

Proposed Max. Heating Load	2,759	Btu/hr

Occupied Cooling Setpoint	70	F
Unoccupied Cooling Setpoint	75	F

Occupied Heating Setpoint	74	F
Unoccupied Heating Setpoint	65	F

Existing Cooling Total	80	kWh/yr
Proposed Cooling Total	25	kWh/yr
Savings	55	kWh/yr

Existing Heating Total	17,748,223	Btu/yr
Proposed Heating Total	5,590,062	Btu/yr
Savings	12,158,161	Btu/yr
Input	148	therms

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	1	2	2,169	683	-	-	2,169	683	-	-	1	-	0	-
92.5	34	9	25	1,775	559	-	-	1,687	531	-	-	5	-	2	-
87.5	131	36	95	1,380	435	-	-	1,205	380	-	-	15	-	5	-
82.5	500	137	363	986	311	-	-	723	228	-	-	36	-	11	-
77.5	620	170	450	592	186	-	-	241	76	-	-	19	-	6	-
72.5	664	182	482	197	62	-	-	-	-	-	-	3	-	1	-
67.5	854	234	620	-	-	-	-	-	-	-	-	-	-	-	-
62.5	927	254	673	-	-	-	-	-	-	-	-	-	-	-	-
57.5	600	164	436	-	-	2,159	680	-	-	981	309	-	782,108	-	246,336
52.5	610	167	443	-	-	2,813	886	-	-	1,635	515	-	1,194,140	-	376,112
47.5	611	167	444	-	-	3,467	1,092	-	-	2,289	721	-	1,595,749	-	502,604
42.5	656	180	476	-	-	4,121	1,298	-	-	2,943	927	-	2,142,360	-	674,768
37.5	1,023	280	743	-	-	4,775	1,504	-	-	3,598	1,133	-	4,010,044	-	1,263,022
32.5	734	201	533	-	-	5,429	1,710	-	-	4,252	1,339	-	3,357,301	-	1,057,431
27.5	334	91	243	-	-	6,083	1,916	-	-	4,906	1,545	-	1,746,176	-	549,984
22.5	252	69	183	-	-	6,737	2,122	-	-	5,560	1,751	-	1,482,306	-	466,874
17.5	125	34	91	-	-	7,391	2,328	-	-	6,214	1,957	-	817,032	-	257,336
12.5	47	13	34	-	-	8,045	2,534	-	-	6,868	2,163	-	337,947	-	106,441
7.5	22	6	16	-	-	8,699	2,740	-	-	7,522	2,369	-	172,578	-	54,356
2.5	13	4	9	-	-	9,354	2,946	-	-	8,176	2,575	-	110,481	-	34,798
-2.5	0	0	0	-	-	10,008	3,152	-	-	8,830	2,781	-	-	-	-
-7.5	0	0	0	-	-	10,662	3,358	-	-	9,484	2,987	-	-	-	-
TOTALS	**8,760**	**2,399**	**6,361**									**80**	**17,748,223**	**25**	**5,590,062**

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM 8 Increase Wall Insulation in Courtroom

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Kraft Faced Fiberglass Insulation	815	SF	$ 0.28	$ 0.21		$ 226	$ 211	$ -	$ 436	R-13, 3.5" thick, 23" wide
Metal Framing	38	EA	$ 15.00	$ 5.00		$ 564	$ 234	$ -	$ 798	Metal Studs
1/2" Gypsum Board, without finish	815	SF	$ 0.24	$ 0.33		$ 194	$ 331	$ -	$ 524	From Means
Drywall Finishing	815	SF	$ 0.12	$ 0.30		$ 97	$ 301	$ -	$ 398	From Means
Painting	815	SF	$ 0.19	$ 0.29		$ 153	$ 291	$ -	$ 444	From Means
Miscellaneous electrical and plumbing costs	815	SF	$ 0.10	$ 0.10		$ 81	$ 100	$ -	$ 181	Estimated
Miscellaneous Trim Work	815	SF	$ 0.25	$ 0.25		$ 202	$ 251	$ -	$ 452	Estimated

$ 3,234	Subtotal
$ 323	10% Contingency
$ 356	10% Contractor O&P
$ -	Engineering
$ 3,913	**Total**

APPENDIX J

ECM-9 Replace Court Office RTU with More Efficient Unit

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM-9 Replace Court Office RTU with more Efficient Unit

Building Footprint	1,900	SF	Ex Occupied Clng Temp.	72	°F	Ex Occupied Htg Temp.	74	°F	**Heating Energy Savings**	32	therms
Building Balance Temp.	55	°F	Ex Unoccupied Clng Temp.	72	°F	Ex Unoccupied Htg Temp.	74	°F	**Cooling Energy Savings**	1854	kWh
Internal Gains	18,021	btu/h	Occupied Cooling UA	562	btu/hr/°F	Occupied Heating UA	249	btu/hr/°F	**Fan Savings**	717	kWh
Unoc Internal Gain factor	0.2		Unoccupied Cooling UA	451	btu/hr/°F	Unoccupied Heating UA	249	btu/hr/°F			
Ave Occ Internal Gain Factor	0.9		Cooling Occ Enthalpy Setpoint	26	Btu/lb						
Economizer available (Y/N)	Yes		Cooling Unocc Enthalpy Setpoint	26	Btu/lb						
Proposed Economizer (Y/N)	Yes										
Existing Heating Efficiency	78%										
Existing Cooling Efficiency	1.48	kW/ton									
Proposed Heating Efficiency	82%										
Proposed Cooling Efficiency	1.04	kW/ton									

					EXISTING LOADS											
					Occupied			Unoccupied								
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Available Economizer Cooling kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	L	L	M	N
102.5	49.1	0	0	0	-17,150	-30,629	-16,219	-13,749	-30,629	-3,604	0	0	0	0	0	0
97.5	42.5	3	1	2	-14,339	-21,878	-16,219	-11,495	-21,878	-3,604	15	11	0	11	0	0
92.5	39.5	34	9	25	-11,527	-17,900	-16,219	-9,241	-17,900	-3,604	146	103	0	103	0	0
87.5	36.6	131	36	95	-8,716	-14,055	-16,219	-6,987	-14,055	-3,604	462	324	0	324	0	0
82.5	34	500	137	363	-5,904	-10,607	-16,219	-4,733	-10,607	-3,604	1401	985	0	985	0	0
77.5	31.6	620	170	450	-3,093	-7,425	-16,219	-2,479	-7,425	-3,604	1310	920	0	920	0	0
72.5	29.2	664	182	482	-281	-4,243	-16,219	-225	-4,243	-3,604	945	664	0	664	0	0
67.5	27	854	234	620	1,619	2,068	-16,219	1,619	2,068	-3,604	361	254	0	254	0	0
62.5	24.5	927	254	673	2,865	3,660	-16,219	2,865	3,660	-3,604	303	213	423	0	0	0
57.5	21.4	600	164	436	4,111	5,251	-16,219	4,111	5,251	-3,604	139	98	840	0	0	0
52.5	18.7	610	167	443	5,357	6,842	-16,219	5,357	6,842	-3,604	83	58	0	58	0	0
47.5	16.2	611	167	444	6,602	8,433	-16,219	6,602	8,433	-3,604	24	17	0	17	0	0
42.5	14.4	656	180	476	7,848	10,024	-16,219	7,848	10,024	-3,604	0	0	0	0	91	87
37.5	12.6	1,023	280	743	9,094	11,615	-16,219	9,094	11,615	-3,604	0	0	0	0	179	170
32.5	10.7	734	201	533	10,340	13,206	-16,219	10,340	13,206	-3,604	0	0	0	0	155	148
27.5	8.6	334	91	243	11,585	14,797	-16,219	11,585	14,797	-3,604	0	0	0	0	83	79
22.5	6.8	252	69	183	12,831	16,388	-16,219	12,831	16,388	-3,604	0	0	0	0	72	68
17.5	5.5	125	34	91	14,077	17,980	-16,219	14,077	17,980	-3,604	0	0	0	0	40	38
12.5	4.1	47	13	34	15,323	19,571	-16,219	15,323	19,571	-3,604	0	0	0	0	17	16
7.5	2.6	22	6	16	16,568	21,162	-16,219	16,568	21,162	-3,604	0	0	0	0	9	8
2.5	1	13	4	9	17,814	22,753	-16,219	17,814	22,753	-3,604	0	0	0	0	6	5
-2.5	0	0	0	0	19,060	24,344	-16,219	19,060	24,344	-3,604	0	0	0	0	0	0
-7.5	-1.5	0	0	0	20,306	25,935	-16,219	20306	25,935	-3,604	0	0	0	0	0	0
TOTALS		8,760	2,399	6,361							5190	3,647	1,263	3,336	651	619

Existing Building Ventilation & Infiltration (occ)	295	cfm
Overheat Ventilation Factor	1	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	295	cfm
Economizer Ventilation	2,850	cfm

Fan Savings

Existing Fan							
Volts	Phase	Current	kW	HP	Efficiency	Run Hours/year	Usage kWh
208	3	7.5	2.4	3.3	82.4%	3,066	9,038

Proposed Fan (premium efficiency)							
Volts	Phase	Current	kW	HP	Efficiency	Run Hours/year	Usage kWh
208	3	7.5	2.4	3.3	89.5%	3,066	8,321

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

ECM-9 Replace Court Office RTU with more Efficient Unit

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.00

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS	
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.			
						$ -	$ -	$ -	$ -		
RTU Removal	1	EA		$ 600		$ -	$ 738	$ -	$ 738		
						$ -	$ -	$ -	$ -		
10 Ton cooling /200MBH heating RTU (11.5 EER)*	1	EA	$ 5,900	$ 1,750		$ 5,841	$ 2,153	$ -	$ 7,994	From Contractor	
Roof Curb Adapter	1	EA	$ 225	$ 125		$ 223	$ 154	$ -	$ 377		
Miscellaneous Electrical	1	LS	$ 250			$ 248	$ -	$ -	$ 248		

*RTU pricing is estimated based on Carrier model 48HC12 w/ economizer and gas heat.

$	**9,356**	Subtotal
$	**936**	10% Contingency
$	**1,029**	Contractor 10% O&P
$	**-**	0% Engineering
$	**11,320**	**Total**

APPENDIX K

New Jersey Pay For Performance Incentive Program

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2010.
Building must have a minimum average electric demand of 200 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
The incentive values represented below are applicable through December 31, 2010.

Total Building Area (Square Feet)	8,500
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilites (BPU)

Incentive #1		
Audit not funded by NJ BPU	$0.10	$/sqft
Audit is funded by NJ BPU	$0.05	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$20,493	$3,948
Existing Usage (from utility)	117,820	2,896
Proposed Savings	24,178	1,043
Existing Total MMBtus	692	
Proposed Savings MMBtus	187	
% Energy Reduction	27.0%	
Proposed Annual Savings	$6,328	Does not Include Water Savings

	Min (Savings = 15%)		Increase (Savings > 15%)		Max Incentive		Achieved Incentive	
	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm	$/kWh	$/therm
Incentive #2	$0.11	$1.10	$0.005	$0.05	$0.13	$1.45	$0.13	$1.45
Incentive #3	$0.07	$0.70	$0.005	$0.05	$0.09	$1.05	$0.09	$1.05

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$425
Incentive #2	$3,143	$1,512	$4,655
Incentive #3	$2,176	$1,095	$3,271
Total All Incentives	**$5,319**	**$2,606**	**$8,350**

Total Project Cost	$33,025	Does not include Water Savings implementation costs

		Allowable Incentive
% Incentives #1 of Utility Cost*	1.7%	$425
% Incentives #2 of Project Cost**	14.1%	$4,655
% Incentives #3 of Project Cost**	9.9%	$3,271
Total Eligible Incentives***	$8,350	
Project Cost w/ Incentives	$24,674	

Project Payback (years)	
w/o Incentives	w/ Incentives
5.2	3.9

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.

** Maximum allowable amount of Incentive #2 is 30% of total project cost.
Maximum allowable amount of Incentive #3 is 20% of total project cost.

*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.
Maximum allowable amount of Incentive #2 & #3 is $1 million per gas account and $1 million per electric account

APPENDIX L

Photovoltaic (PV) Rooftop Solar Power Generation

Somerdale
Borough Hall

Cost of Electricity $0.174 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-30 kW System

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$165,000	**0.0**	**37,510**	**0**	**$6,500**	**0**	**$6,500**	**$22,500**	**$18,300**	**25.4**	**5.7**

Note: Budgetary cost is based on $5,500/kW.

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $0.75/W of installed PV system

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

Year	SREC
1	600
2	600
3	600
4	500
5	500
6	500
7	500
8	500
9	500
10	500
11	400
12	400
13	400
14	400
15	400
AVG	**487**

PVWatts AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	30.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	23.1 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	17.4 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.61	2684	466.75
2	4.20	2795	486.05
3	4.78	3373	586.56
4	5.23	3464	602.39
5	5.44	3634	631.95
6	5.48	3399	591.09
7	5.55	3514	611.08
8	5.41	3465	602.56
9	5.23	3318	577.00
10	4.60	3102	539.44
11	3.59	2463	428.32
12	3.17	2299	399.80
Year	4.69	37510	6522.99

Output Hourly Performance Data

About the Hourly Performance Data

Output Results as Text

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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RReDC Return to RReDC home page (*http://rredc.nrel.gov*)

Cautions for Interpreting the Results

The monthly and yearly energy production are modeled using the PV system parameters you selected and weather data that are typical or representative of long-term averages. For reference, or comparison with local information, the solar radiation values modeled for the PV array are included in the performance results.

Because weather patterns vary from year-to-year, the values in the tables are better indicators of long-term performance than performance for a particular month or year. PV performance is largely proportional to the amount of solar radiation received, which may vary from the long-term average by ± 30% for monthly values and ± 10% for yearly values. How the solar radiation might vary for your location may be evaluated by examining the tables in the *Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors* (*http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/*).

For these variations and the uncertainties associated with the weather data and the model used to model the PV performance, future months and years may be encountered where the actual PV performance is less than or greater than the values shown in the table. The variations may be as much as 40% for individual months and up to 20% for individual years. Compared to long-term performance over many years, the values in the table are accurate to within 10% to 12%.

If the default overall DC to AC derate factor is used, the energy values in the table will overestimate the actual energy production if nearby buildings, objects, or other PV modules and array structure shade the PV modules; if tracking mechanisms for one- and two-axis tracking systems do not keep the PV arrays at the optimum orientation with respect to the sun's position; if soiling or snow cover related losses exceed 5%; or if the system performance has degraded from new. (PV performance typically degrades 1% per year.) If any of these situations exist, an overall DC to AC derate factor should be used with PVWATTS that was calculated using system specific component derate factors for *shading*, *sun-tracking*, *soiling*, and *age*.

The PV system size is the nameplate DC power rating. The energy production values in the table are valid only for crystalline silicon PV systems.

The cost savings are determined as the product of the number of kilowatt hours (kWh) and the cost of electricity per kWh. These cost savings occur if the owner uses all the electricity produced by the PV system, or if the owner has a net-metering agreement with the utility. With net-metering, the utility bills the owner for the net electricity consumed. When electricity flows from the utility to the owner, the meter spins forward. When electricity flows from the PV system to the utility, the meter spins backwards.

If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

Besides the cost savings shown in the table, other benefits of PV systems include greater energy independence and a reduction in fossil fuel usage and air pollution. For commercial customers, additional cost savings may come from reducing demand charges. Homeowners can often include the cost of the PV system in their home mortgage as a way of accommodating the PV system's initial cost.

To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to http://www.nrel.gov/stateandlocal for more information.

APPENDIX M

Solar Thermal Domestic Hot Water Plant

NJBPU Energy Audits
CHA #22424
Somerdale
Borough Hall

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	1	EA	$ 2,400	$ 1,200		$ 2,376	$ 1,476	$ -	$ 3,852	
Piping modifications	1	LS	$ 1,500	$ 2,000		$ 1,485	$ 2,460	$ -	$ 3,945	
Electrical modifications	1	LS	$ 400	$ 500		$ 396	$ 615	$ -	$ 1,011	
65 GallonStorage Tank	1	EA	$ 300	$ 200		$ 300	$ 200	$ -	$ 500	
10 Gallon Drip Tank	1	EA	$ 100	$ 80		$ 100	$ 80	$ -	$ 180	
						$ -	$ -	$ -	$ -	

$ 9,488	Subtotal
$ 949	10% Contingency
$ 949	10% Contractor O&P
$ 949	10% Engineering
$12,334	**Total**

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Home Energy

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Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

Our calculators help you understand energy production and consumption in a whole new way. Use them to develop a personal profile of your own energy use.

Carbon Pollution Calculator
Electric Power Pollution Calculator
PV System Economics
Solar Water Heating
What's a Watt?

Solar Water Heating Calculator

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	58
? Capacity (gallons)	40	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	17.79	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	20
Energy Use			
424.2		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0	? Overall Efficiency	0.98
0	? Conversion Efficiency	0.98
NaN BTU/hr	? Power Into Water Heater	432.9 BTU/hr
Cost		
$ 0.40 /Therm	? Utility Rates	$ 0.17 /kWh
$ NaN	? Yearly Water Heating Cost	$ 188.809(
How Does Solar Compare?		
? Solar Water Heater Cost: $ 12300		? Percentage Solar: 70
NaN years for gas	? Payback Time for Solar System	93.0645 years for electric

More information on solar water heating:

Fact sheet - Solar Water Heaters
Fact sheet - Solar Water Heaters for Swimming Pools
Kids fact sheet - Heat from the Sun

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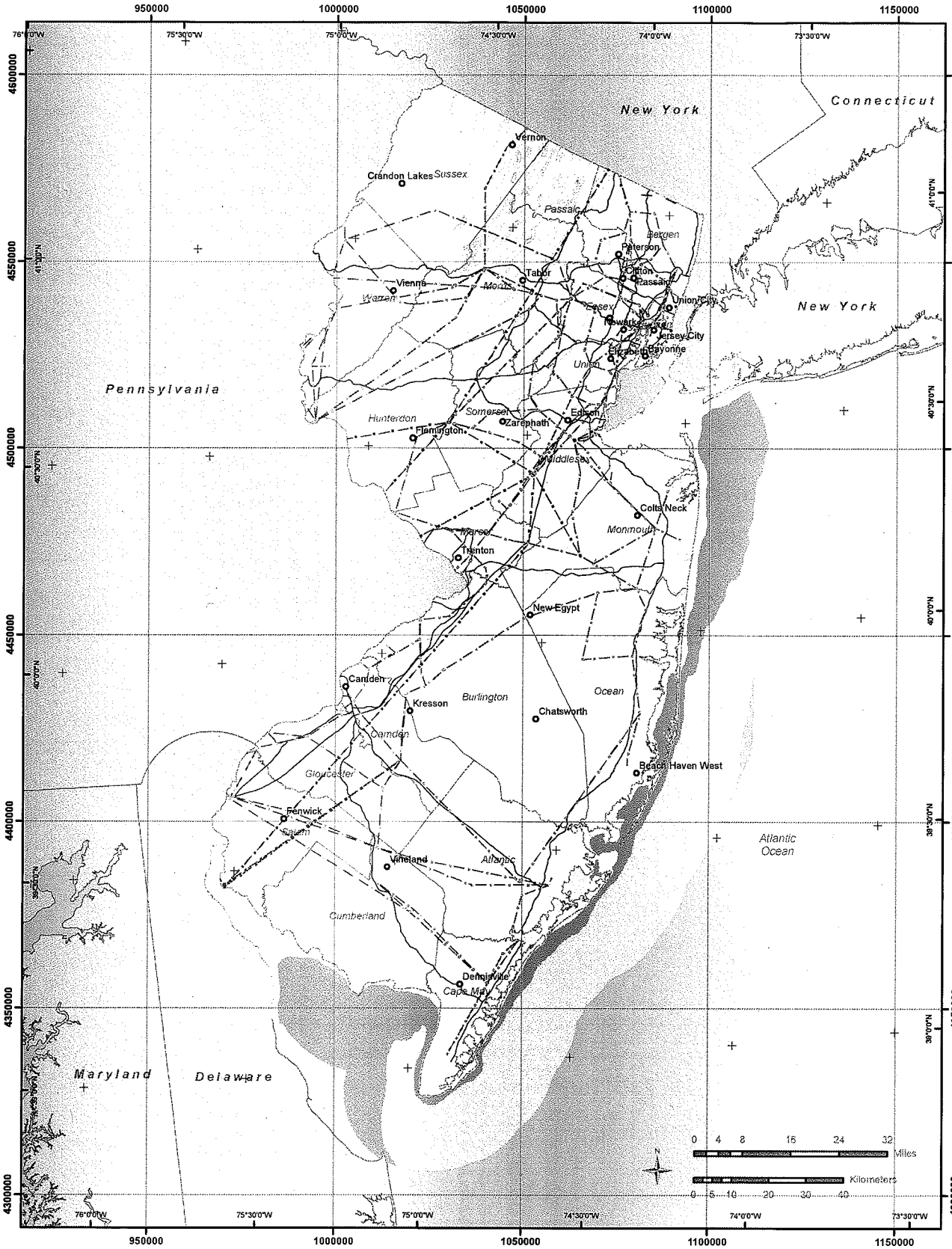
APPENDIX N

Wind


Juniper Ave
Kennedy Blvd
Chestnut Ave
Cedar Ave
Cedar Ave
150 feet
10 m
© 2011 Microsoft Corporation © AND © 2010 NAVTEQ
© 2010 Microsoft Corporation
Pictometry Bird's Eye © 2010 Pictometry International Corp
© 2011 Microsoft | Privacy | Legal | Advertise | About our ads | Help | Tell us what you think



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

- Under 100 kV
- 100 kV-161 kV
- 230 kV-287 kV
- 345 kV
- 500 kV
- 735 kV +
- Step-Up
- DC Line

Mean Speed at 30 m

mph	m/s
< 10.1	< 4.5
10.1 - 11.2	4.5 - 5.0
11.2 - 12.3	5.0 - 5.5
12.3 - 13.4	5.5 - 6.0
13.4 - 14.5	6.0 - 6.5
14.5 - 15.7	6.5 - 7.0
15.7 - 16.8	7.0 - 7.5
16.8 - 17.9	7.5 - 8.0
17.9 - 19.0	8.0 - 8.5
> 19.0	> 8.5

AWS Truewind

Projection: Tranverse Mercator,
UTM Zone 17 WGS84
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.

The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

APPENDIX O

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Somerdale Municipal Building

Building ID: 2562855
For 12-month Period Ending: December 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: January 26, 2011

Facility	**Facility Owner**	**Primary Contact for this Facility**
Somerdale Municipal Building 105 Kennedy Blvd. Somerdale, NJ 08083	Borough of Somerdale 105 Kennedy Blvd. Somerdale, NJ 08083	Victor Cantillo 105 Kennedy Blvd. Somerdale, NJ 08083

Year Built: 1978
Gross Floor Area (ft²): 8,500

Energy Performance Rating[2] (1-100) 32

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	404,800
Natural Gas (kBtu)[4]	289,600
Total Energy (kBtu)	694,400

Energy Intensity[5]	
Site (kBtu/ft²/yr)	82
Source (kBtu/ft²/yr)	195

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	77

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	68
National Average Source EUI	162
% Difference from National Average Source EUI	20%
Building Type	Office

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.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) or a Registered Architect (RA) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE or RA in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Somerdale Municipal Building	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	105 Kennedy Blvd., Somerdale, NJ 08083	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Municipal Building (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	8,500 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	46 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	15	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 5.3 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	20	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity

Meter: Electricity (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2010	12/31/2010	12,000.00
11/01/2010	11/30/2010	12,000.00
10/01/2010	10/31/2010	8,560.00
09/01/2010	09/30/2010	11,840.00
08/01/2010	08/31/2010	12,720.00
07/01/2010	07/31/2010	13,920.00
06/01/2010	06/30/2010	10,960.00
05/01/2010	05/31/2010	7,360.00
04/01/2010	04/30/2010	7,360.00
03/01/2010	03/31/2010	6,800.00
02/01/2010	02/28/2010	7,120.00
01/01/2010	01/31/2010	8,000.00
Electricity Consumption (kWh (thousand Watt-hours))		**118,640.00**
Electricity Consumption (kBtu (thousand Btu))		**404,799.68**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**404,799.68**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2010	12/31/2010	361.00
11/01/2010	11/30/2010	49.00
10/01/2010	10/31/2010	0.00
09/01/2010	09/30/2010	1.00
08/01/2010	08/31/2010	0.00
07/01/2010	07/31/2010	5.00
06/01/2010	06/30/2010	15.00
05/01/2010	05/31/2010	41.00
04/01/2010	04/30/2010	198.00
03/01/2010	03/31/2010	705.00

02/01/2010	02/28/2010	724.00
01/01/2010	01/31/2010	797.00
Natural Gas Consumption (therms)		**2,896.00**
Natural Gas Consumption (kBtu (thousand Btu))		**289,600.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**289,600.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same PE or RA that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Somerdale Municipal Building
105 Kennedy Blvd.
Somerdale, NJ 08083

Facility Owner
Borough of Somerdale
105 Kennedy Blvd.
Somerdale, NJ 08083

Primary Contact for this Facility
Victor Cantillo
105 Kennedy Blvd.
Somerdale, NJ 08083

General Information

Somerdale Municipal Building	
Gross Floor Area Excluding Parking: (ft^2)	8,500
Year Built	1978
For 12-month Evaluation Period Ending Date:	December 31, 2010

Facility Space Use Summary

Municipal Building	
Space Type	Office
Gross Floor Area(ft^2)	8,500
Weekly operating hours	46
Workers on Main Shift	15
Number of PCs	20
Percent Cooled	50% or more
Percent Heated	50% or more

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2010)	**Baseline** (Ending Date 11/30/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	32	34	75	N/A	50
Energy Intensity					
Site (kBtu/ft²)	82	79	50	N/A	68
Source (kBtu/ft²)	195	190	120	N/A	162
Energy Cost					
$/year	$ 20,874.67	$ 22,074.39	$ 12,832.98	N/A	$ 17,350.84
$/ft²/year	$ 2.46	$ 2.60	$ 1.51	N/A	$ 2.04
Greenhouse Gas Emissions					
$MtCO_2e$/year	77	75	47	N/A	64
$kgCO_2e/ft^2$/year	9	9	6	N/A	7

More than 50% of your building is defined as Office. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

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

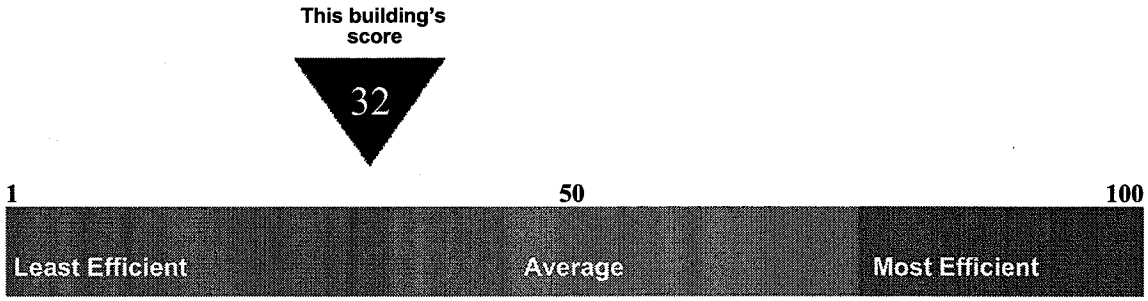
Statement of Energy Performance

2010

Somerdale Municipal Building
105 Kennedy Blvd.
Somerdale, NJ 08083

Portfolio Manager Building ID: 2562855

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 195 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending December 2010

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 01/28/2011

APPENDIX P

Building Summaries and ROI Calculation

Somerdale, NJ Energy Audit
CHA #22424

Engineer: Matt Pittinger

Utility Costs		Yearly Usage	MTCDE
$ 0.174	$/kWh blended		0.00042021
$ 0.125	$/kWh supply	117,820	0.00042021
$ 12.99	$/kW	41.6	0
$ 1.36	$/Therm	2,896	0.00533471
$ 10.44	$/kgals	58	0

Somerdale Municipal Building

	Item	Savings						Cost	Simple Payback	MTCDE	Life Expectancy	Simple Projected Lifetime Savings						ROI
		kW	kWh	therms	cooling kWh	kgal/yr	$					kW	kWh	therms	cooling kWh	kgal/yr	$	
	Mechanical																	
ECM-1	Lighting Replacements	2.1	7296	0.0	0.0	0.0	$ 1,243	$ 2,587	2.1	3.1	15	31.6	109441	0	0	0	$ 18,642	6.2
ECM-2	Install Lighting Controls	0.0	12293	0.0	0.0	0.0	$ 1,542	$ 5,029	3.3	5.2	15	0.0	184401	0	0	0	$ 32,074	5.4
ECM-3	Lighting Replacements with Controls	2.1	19223	0.0	0.0	0.0	$ 2,738	$ 7,759	2.8	8.1	15	31.6	288345	0	0	0	$ 41,076	4.3
ECM-4	Replace Electric DHW Heater with On Demand Gas	4.5	4183	-95.2	0.0	0.0	$ 1,096	$ 4,202	3.8	1.3	13	58.5	54382	-1237	0	0	$ 14,251	2.4
ECM-5	Temperature Setback	0.0	0	850.3	1122	0.0	$ 1,354	$ 507	0.4	5.0	15	0.0	16833	12754	16833	0	$ 23,243	44.8
ECM-6	Dual Flush Toilets	0.0	0	0.0	0.0	32.0	$ 335	$ 3,961	11.8	0.0	15	0.0	0	0	0	481	$ 5,021	0.3
ECM-7	Install Storm Windows in Courtroom	0.0	0	107.4	10.3	0.0	$ 148	$ 1,469	9.9	0.6	25	0.0	0	2686	258	0	$ 3,706	1.5
ECM-8	Increase Wall Insulation in Courtroom	0.0	55	148	0.0	0.0	$ 212	$ 3,913	18.5	0.8	24	0.0	1313	3558	0	0	$ 5,079	0.3
ECM-9	Replace Court Office RTU with More Efficient Unit	0	717	32	1,854	0	$ 490	$ 11,320	23.1	1.2	15	0.0	10754	476	27809	0	$ 7,357	-0.4
	Total	**9**	**24,178**	**1,043**	**2,986**	**32**												
	% of Existing	**21%**	**21%**	**36%**	**3%**	**55%**												

APPENDIX Q

Block Load Models

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

Reconcile Thermal Model - Mayor's Office Wing

Building Footprint	2,000 SF	Ex Occupied Clng Temp.	72 °F	Ex Occupied Htg Temp.	74 °F		
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	72 °F	Ex Unoccupied Htg Temp.	74 °F		
Cooling Efficiency	1.45 kW/ton	Occupied Cooling UA	(620) btu/hr/°F	Occupied Heating UA	242 btu/hr/°F		
Internal Gains	21,980 btu/h	Unoccupied Cooling UA	(473) btu/hr/°F	Unoccupied Heating UA	242 btu/hr/°F		
Unoc Internal Gain factor	0.1	Cooling Occ Enthalpy Setpoint	26 Btu/lb				
Ave Occ Internal Gain Factor	0.5	Cooling Unocc Enthalpy Setpoint	26 Btu/lb				
Economizer available (Y/N)	Yes						

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations.

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-18,906	-34,515	-10,990	-14,431	-34,515	-2,198	0	0	0	0
97.5	42.5	3	1	2	-15,807	-24,653	-10,990	-12,065	-24,653	-2,198	0	15	15	0
92.5	39.5	34	9	25	-12,707	-20,171	-10,990	-9,699	-20,171	-2,198	0	145	145	0
87.5	36.6	131	36	95	-9,608	-15,838	-10,990	-7,334	-15,838	-2,198	0	450	450	0
82.5	34.0	500	137	363	-6,509	-11,953	-10,990	-4,968	-11,953	-2,198	0	1,326	1,326	0
77.5	31.6	620	170	450	-3,409	-8,367	-10,990	-2,602	-8,367	-2,198	0	1,183	1,183	0
72.5	29.2	664	182	482	-310	-4,781	-10,990	-237	-4,781	-2,198	0	774	774	0
67.5	27.0	854	234	620	1,571	2,331	-10,990	1,571	2,331	-2,198	0	200	200	0
62.5	24.5	927	254	673	2,780	4,124	-10,990	2,780	4,124	-2,198	621	125	0	0
57.5	21.4	600	164	436	3,989	5,917	-10,990	3,989	5,917	-2,198	1,233	22	0	0
52.5	18.7	610	167	443	5,197	7,710	-10,990	5,197	7,710	-2,198	0	0	0	63
47.5	16.2	611	167	444	6,406	9,503	-10,990	6,406	9,503	-2,198	0	0	0	86
42.5	14.4	656	180	476	7,615	11,296	-10,990	7,615	11,296	-2,198	0	0	0	117
37.5	12.6	1,023	280	743	8,823	13,089	-10,990	8,823	13,089	-2,198	0	0	0	221
32.5	10.7	734	201	533	10,032	14,882	-10,990	10,032	14,882	-2,198	0	0	0	186
27.5	8.6	334	91	243	11,241	16,675	-10,990	11,241	16,675	-2,198	0	0	0	97
22.5	6.8	252	69	183	12,449	18,468	-10,990	12,449	18,468	-2,198	0	0	0	83
17.5	5.5	125	34	91	13,658	20,260	-10,990	13,658	20,260	-2,198	0	0	0	46
12.5	4.1	47	13	34	14,867	22,053	-10,990	14,867	22,053	-2,198	0	0	0	19
7.5	2.6	22	6	16	16,075	23,846	-10,990	16,075	23,846	-2,198	0	0	0	10
2.5	1.0	13	4	9	17,284	25,639	-10,990	17,284	25,639	-2,198	0	0	0	6
-2.5	0.0	0	0	0	18,493	27,432	-10,990	18,493	27,432	-2,198	0	0	0	0
-7.5	-1.5	0	0	0	19,701	29,225	-10,990	19,701	29,225	-2,198	0	0	0	0
TOTALS		8,760	2,399	6,361								4,240	4,093	935

Existing Building Ventilation & Infiltration (occ)	**332 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**332 cfm**
Economizer Ventilation (from AHU's)	**3,000 cfm**

Energy Use Indices (calculated)

	Base Case
Heating	935

	Base Case
Cooling	4,093

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Mayor's Office Wing

Outdoor Winter Design DB Temperature	10 *F		**Indoor Winter Design DB Temperature**	74 *F	
Outdoor Summer Design DB Temperature	93 *F		**Indoor Summer Design DB Temperature**	72 *F	
Outdoor Summer Design WB Temperature	73 *F		**Indoor Summer Design WB Temperature**	60 *F	
Outdoor Summer Humidity Ratio	0.0121 #/#		**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#	

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	U value calculator	12.5	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	21.6	

Windows (Select One)

		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
X	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=0.4)	0.90
Flat Glass (e=0.2)	0.77
Double Glaze (3/16 in air)	0.63
Double Glaze (1/4 in air)	0.60
Double Glaze (1/2 in air)	0.53
Double Glaze (e=.6)	0.50
Double Glaze (e=0.4)	0.42
Double Glaze (e=0.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS

Roof Area	2,000 SF		
Occupied Area	2,000 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	69 Ft	11.0 Ft	8.0 Ft	48 SF	42 SF	669 SF
East Exposure	29 Ft	11.0 Ft	8.0 Ft	36 SF	21 SF	262 SF
South Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF
West Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF

Occupied Forced Ventilation	158 cfm	9.5 AC/hr
Unoccupied Forced Ventilation	158 cfm	9.5 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	Project No.:	CHA #22424		
Location	Somerdale, NJ	Site Elevation:	80 Feet	Specific Volume	14.00 CF/#
Building Name	Somerdale Municipal Building	Date:	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: Mayor's Office Wing

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	48	38	btu/h/sf	0.8	0.75	Glass Type C	1,094 Btu/hr
East Exposure	36	216	btu/h/sf	0.8	0.31	Glass Type C	1,928 Btu/hr
South Exposure	0	109	btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr
West Exposure	0	216	btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr
							3,023 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	462	0.08	20 °F	1.0	742 Btu/hr
East Exposure	175	0.08	39 °F	1.0	548 Btu/hr
South Exposure	0	0.08	27 °F	1.0	0 Btu/hr
West Exposure	0	0.08	22 °F	1.0	0 Btu/hr
Roof	2,000	0.05	73 °F	1.0	6,750 Btu/hr
Fenestration	84	0.50	21 °F		865 Btu/hr
Doors	63	0.14	27 °F		238 Btu/hr
Ceiling	2,000	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	2,000	0.04	0 °F		0 Btu/hr
					9,142 Btu/h

INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

									Room Heat Gain
Lights	1.53	w/sf x	2,000	Occ Area =	3.1	kW x 3.4x	1.0	RAF =	10,444 Btu/h
Plug Load	0.20	w/sf x	2,000	Occ Area =	0.4	kW x 3.4x	1.0	RAF =	1,365 Btu/h
People	5	people x	255	btu/person x	75%	time in space =			956 Btu/h
Computer Work Stations			10	Units x	120	W/Unit x 3414 =			4,096 Btu/h
Equipment	1.5	kW x 3.413 =							5,120 Btu/h
Misc.									0 Btu/h
									21,980 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	637 SF	0.13	CFM/SF			1.04	21 °F	1,923 Btu/h
Doors	63 SF	0.25	CFM/LF	0.73	LF/SF	1.04	21 °F	267 Btu/h
Windows	84 SF	0.30	CFM/LF	1.67	LF/SF	1.04	21 °F	975 Btu/h
Ventilation	158 cfm					1.04	21 °F	3,658 Btu/h
								6,823 Btu/h
Infiltration	136 cfm	8.2	AC/hr					

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	207	0.08	20	1.0	332 Btu/hr
East Exposure	87	0.08	39	1.0	272 Btu/hr
South Exposure	0	0.08	27	1.0	0 Btu/hr
West Exposure	0	0.08	22	1.0	0 Btu/hr
Roof	2,000	0.05	73	0.0	0 Btu/hr
					605 Btu/h

INTERNAL HEAT GAINS

Lights	1.53 w/sf x	2,000	Occ Area =	3.1	kW x3413x	0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
							0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	3,023
Conduction to Room	9,142
Conduction to Plenum	605
Ventilaton and Infiltration	6,823
Sub Total	19,592

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	21,980
Internal Gains to Plenum	0
Sub Total	21,980

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Mayor's Office Wing

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,294 SF	0.13 CFM/SF	4,629	0.0042 ##/#	5,857 Btu/h
Doors	63 SF	0.25 CFM/LF	4,629	0.0042 ##/#	226 Btu/h
Windows	84 SF	0.30 CFM/LF	4,629	0.0042 ##/#	825 Btu/h
Ventilation	158 cfm		4,629	0.0042 ##/#	3,093 Btu/h
People	5 people	0.75 time in space		250 Btu/hr/person	938 Btu/h
					10,938 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	19,592	10,938	30,530	
Temperature Indep. Gains	21,980		21,980	SHR= 0.79
Total	41,573	10,938	52,511	

Building Cooling Load 4.4 Tons at 457 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is **3,271 CFM** / **1.64 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	669	0.08	64	3,436 Btu/h
East Exposure	262	0.08	64	1,346 Btu/h
South Exposure	0	0.08	64	0 Btu/h
West Exposure	0	0.08	64	0 Btu/h
Fenestration	84	0.50	64	2,688 Btu/h
Roof	2,000	0.05	64	5,918 Btu/h
Doors	63	0.14	64	563 Btu/h
Ceiling	2,000	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,000	0.04	19	1,520 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	931 SF	0.13 CFM/SF	1.04	64	121 cfm	8,085 Btu/h
Doors	63 SF	0.25 CFM/LF	1.04	64	12 cfm	768 Btu/h
Windows	84 SF	0.30 CFM/LF	1.04	64	42 cfm	2,806 Btu/h
Ventilation Load	158 cfm		1.04	64	158 cfm	11,363 Btu/h
Total Ventilation & Infiltration Load					332 cfm	23,023 Btu/h

Building Heating Load	38,493	btu/h
	19.2	btu/sf

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Mayor's Wing

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	6.0	7.0	1	42.0	26.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	42.0	26.0
East	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**63.0**	**46.0**

LF/SF
0.73

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	69.0	11.0	1	759.0	160.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	69.0			759.0	160.0	11.0	Average height wall automatically linked
East	29.0	11.0	1	319.0	80.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	29.0			319.0	80.0	11.0	Average height wall automatically linked
South	0.0	0.0	0	0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
West	0.0	0.0	0	0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	2.0	3.0	8	48.0	80.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	48.0	80.0	
East	2.0	3.0	6	36.0	60.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	36.0	60.0	
South				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
West				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
						LF/SF
			Total	**84.0**	**140.0**	1.67

Building Volume Calculator

Width(ft)	Length (ft)	Height(ft)	Count	Volume (cf)
10	10	10	1	1,000

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building

Reconcile Thermal Model - Court Office

Building Footprint	1,900 SF	Ex Occupied Clng Temp.	72 °F	Ex Occupied Htg Temp.	74 °F
Heating Efficiency	78%	Ex Unoccupied Clng Temp.	72 °F	Ex Unoccupied Htg Temp.	74 °F
Cooling Efficiency	1.43 kW/ton	Occupied Cooling UA	(562) btu/hr/°F	Occupied Heating UA	249 btu/hr/°F
Internal Gains	18,021 btu/h	Unoccupied Cooling UA	(451) btu/hr/°F	Unoccupied Heating UA	249 btu/hr/°F
Unoc Internal Gain factor	0.2	Cooling Occ Enthalpy Setpoint	26 Btu/lb		
Ave Occ Internal Gain Factor	0.9	Cooling Unocc Enthalpy Setpoint	26 Btu/lb		
Economizer available (Y/N)	No				

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-17,150	-30,629	-16,219	-13,749	-30,629	-3,604	0	0	0	0
97.5	42.5	3	1	2	-14,339	-21,878	-16,219	-11,495	-21,878	-3,604	0	15	15	0
92.5	39.5	34	9	25	-11,527	-17,900	-16,219	-9,241	-17,900	-3,604	0	146	146	0
87.5	36.6	131	36	95	-8,716	-14,055	-16,219	-6,987	-14,055	-3,604	0	462	462	0
82.5	34.0	500	137	363	-5,904	-10,607	-16,219	-4,733	-10,607	-3,604	0	1,401	1,401	0
77.5	31.6	620	170	450	-3,093	-7,425	-16,219	-2,479	-7,425	-3,604	0	1,310	1,310	0
72.5	29.2	664	182	482	-281	-4,243	-16,219	-225	-4,243	-3,604	0	945	945	0
67.5	27.0	854	234	620	1,619	2,068	-16,219	1,619	2,068	-3,604	0	361	361	0
62.5	24.5	927	254	673	2,865	3,660	-16,219	2,865	3,660	-3,604	0	303	303	0
57.5	21.4	600	164	436	4,111	5,251	-16,219	4,111	5,251	-3,604	0	139	139	0
52.5	18.7	610	167	443	5,357	6,842	-16,219	5,357	6,842	-3,604	0	83	83	0
47.5	16.2	611	167	444	6,602	8,433	-16,219	6,602	8,433	-3,604	0	24	24	0
42.5	14.4	656	180	476	7,848	10,024	-16,219	7,848	10,024	-3,604	0	0	0	91
37.5	12.6	1,023	280	743	9,094	11,615	-16,219	9,094	11,615	-3,604	0	0	0	179
32.5	10.7	734	201	533	10,340	13,206	-16,219	10,340	13,206	-3,604	0	0	0	155
27.5	8.6	334	91	243	11,585	14,797	-16,219	11,585	14,797	-3,604	0	0	0	83
22.5	6.8	252	69	183	12,831	16,388	-16,219	12,831	16,388	-3,604	0	0	0	72
17.5	5.5	125	34	91	14,077	17,980	-16,219	14,077	17,980	-3,604	0	0	0	40
12.5	4.1	47	13	34	15,323	19,571	-16,219	15,323	19,571	-3,604	0	0	0	17
7.5	2.6	22	6	16	16,568	21,162	-16,219	16,568	21,162	-3,604	0	0	0	9
2.5	1.0	13	4	9	17,814	22,753	-16,219	17,814	22,753	-3,604	0	0	0	6
-2.5	0.0	0	0	0	19,060	24,344	-16,219	19,060	24,344	-3,604	0	0	0	0
-7.5	-1.5	0	0	0	20,306	25,935	-16,219	20,306	25,935	-3,604	0	0	0	0
TOTALS		8,760	2,399	6,361								5,190	5,190	651

Existing Building Ventilation & Infiltration (occ)	**295 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**295 cfm**
Economizer Ventilation (from AHU's)	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	651

	Base Case
Cooling	5,190

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Court Office

Outdoor Winter Design DB Temperature	10 *F	**Indoor Winter Design DB Temperature**	74 *F
Outdoor Summer Design DB Temperature	93 *F	**Indoor Summer Design DB Temperature**	72 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	**Indoor Air (70*F) Humidity Ratio**	0.0079 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	U value calculator	7.8	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	21.6	

Windows (Select One)

		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
X	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=0.4)	0.90
Flat Glass (e=0.2)	0.77
Double Glaze (3/16 in air)	0.63
Double Glaze (1/4 in air)	0.60
Double Glaze (1/2 in air)	0.53
Double Glaze (e=.6)	0.50
Double Glaze (e=0.4)	0.42
Double Glaze (e=0.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS

Roof Area	1,900 SF		
Occupied Area	1,900 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	48 Ft	10.0 Ft	8.0 Ft	48 SF	0 SF	432 SF
East Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	21 SF	-21 SF
South Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF
West Exposure	39 Ft	10.0 Ft	8.0 Ft	24 SF	21 SF	340 SF

Occupied Forced Ventilation	150 cfm	9.0 AC/hr
Unoccupied Forced Ventilation	150 cfm	9.0 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	Project No.:	CHA #22424		
Location	Somerdale, NJ	Site Elevation:	80 Feet	Specific Volume	14.00 CF/#
Building Name	Somerdale Municipal Building	Date:	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: Court Office

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	48	38	btu/h/sf	0.8	0.75	Glass Type C	1,094 Btu/hr
East Exposure	0	216	btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	0	109	btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr
West Exposure	24	216	btu/h/sf	0.8	0.29	Glass Type C	1,203 Btu/hr
							2,297 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	336	0.13	20 °F	1.0	867 Btu/hr
East Exposure	-21	0.13	39 °F	1.0	-106 Btu/hr
South Exposure	0	0.13	27 °F	1.0	0 Btu/hr
West Exposure	263	0.13	22 °F	1.0	746 Btu/hr
Roof	1,900	0.05	73 °F	1.0	6,412 Btu/hr
Fenestration	72	0.50	21 °F		742 Btu/hr
Doors	42	0.14	27 °F		158 Btu/hr
Ceiling	1,900	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	1,900	0.04	0 °F		0 Btu/hr
					8,820 Btu/h

INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

								Room Heat Gain
Lights	1.56	w/sf x	1,900	Occ Area =	3.0 kW x 3.4x		1.0 RAF =	10,116 Btu/h
Plug Load	0.20	w/sf x	1,900	Occ Area =	0.4 kW x 3.4x		1.0 RAF =	1,297 Btu/h
People	5	people x	255	btu/person x	90%	time in space =		1,148 Btu/h
Computer Work Stations			5	Units x	120	W/Unit x 3414 =		2,048 Btu/h
Equipment		1.0	kW x 3.413 =					3,413 Btu/h
Misc.								0 Btu/h
								18,021 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	578 SF	0.15	CFM/SF			1.04	21 °F	2,013 Btu/h
Doors	42 SF	0.20	CFM/LF	0.95	LF/SF	1.04	21 °F	186 Btu/h
Windows	72 SF	0.20	CFM/LF	1.67	LF/SF	1.04	21 °F	557 Btu/h
Ventilation	150 cfm					1.04	21 °F	3,483 Btu/h
								6,240 Btu/h
Infiltration	119 cfm	7.1	AC/hr					

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	96	0.13	20	1.0	248 Btu/hr
East Exposure	0	0.13	39	1.0	0 Btu/hr
South Exposure	0	0.13	27	1.0	0 Btu/hr
West Exposure	77	0.13	22	1.0	219 Btu/hr
Roof	1,900	0.05	73	0.0	0 Btu/hr
					466 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.56	w/sf x	1,900	Occ Area =	3.0 kW x3413x	0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
							0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	2,297	Internal Gains to Room	18,021
Conduction to Room	8,820	Internal Gains to Plenum	0
Conduction to Plenum	466		
Ventilaton and Infiltration	6,240		
Sub Total	17,823	Sub Total	18,021

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	Project No.:	CHA #22424		
Location	Somerdale, NJ	Site Elevation:	80 Feet	Specific Volume	14.00 CF/#
Building Name	Somerdale Municipal Building	Date:	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: Court Office

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain	
Walls	2,073 SF	0.15 CFM/SF	4,629	0.0042 ##/#	6,107	Btu/h
Doors	42 SF	0.20 CFM/LF	4,629	0.0042 ##/#	157	Btu/h
Windows	72 SF	0.20 CFM/LF	4,629	0.0042 ##/#	471	Btu/h
Ventilation	150 cfm		4,629	0.0042 ##/#	2,946	Btu/h
People	5 people	0.90 time in space		250 Btu/hr/person	1,125	Btu/h
						10,806 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	17,823	10,806	28,629		
Temperature Indep. Gains	18,021		18,021	SHR=	0.77
Total	35,845	10,806	46,650		

Building Cooling Load: 3.9 Tons at 489 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 2,824 CFM; 1.49 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain	
North Exposure	432	0.13	64	3,567	Btu/h
East Exposure	-21	0.13	64	-173	Btu/h
South Exposure	0	0.13	64	0	Btu/h
West Exposure	340	0.13	64	2,807	Btu/h
Fenestration	72	0.50	64	2,304	Btu/h
Roof	1,900	0.05	64	5,622	Btu/h
Doors	42	0.14	64	375	Btu/h
Ceiling	1,900	0.14	0	0	Btu/h
Partition	0	0.05	0	0	Btu/h
Floor	1,900	0.04	19	1,444	Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain	
Walls	751 SF	0.15 CFM/SF	1.04	64	113 cfm	7,525	Btu/h
Doors	42 SF	0.20 CFM/LF	1.04	64	8 cfm	534	Btu/h
Windows	72 SF	0.20 CFM/LF	1.04	64	24 cfm	1,603	Btu/h
Ventilation Load	150 cfm		1.04	64	150 cfm	10,822	Btu/h
Total Ventilation & Infiltration Load					295 cfm	20,485	Btu/h

Building Heating Load	36,431	btu/h
	19.2	btu/sf

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Court Office Area

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	0.0	0.0		0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	3.0	7.0	1	21.0	20.0
				0.0	0.0
			Sub-total	21.0	20.0
			Total	**42.0**	**40.0**

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	48.0	10.0	1	480.0	116.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	48.0			480.0	116.0	10.0	Average height wall automatically linked
East	0.0	0.0	0	0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
South	0.0	0.0	0	0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
West	38.5	10.0	1	385.0	97.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	38.5			385.0	97.0	10.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	2.0	3.0	8	48.0	80.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	48.0	80.0
East				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	2.0	3.0	4	24.0	40.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	24.0	40.0
					LF/SF
			Total	72.0	120.0 1.67

Building Volume Calculator

Width(ft)	Length (ft)	Height(ft)	Count	Volume (cf)
10	10	10	1	1,000

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Courtroom

Reconcile Thermal Model

Building Footprint	1,400 SF	Ex Occupied Clng Temp.	70 °F	Ex Occupied Htg Temp.	74 °F
Heating Efficiency	82%	Ex Unoccupied Clng Temp.	75 °F	Ex Unoccupied Htg Temp.	65 °F
Cooling Efficiency	1.10 kW/ton	Occupied Cooling UA	(626) btu/hr/°F	Occupied Heating UA	305 btu/hr/°F
Internal Gains	13,140 btu/h	Unoccupied Cooling UA	(448) btu/hr/°F	Unoccupied Heating UA	305 btu/hr/°F
Unoc Internal Gain factor	0.2	Cooling Occ Enthalpy Setpoint	26 Btu/lb		
Ave Occ Internal Gain Factor	0.8	Cooling Unocc Enthalpy Setpoint	26 Btu/lb		
Economizer available (Y/N)	No				

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-20,343	-30,012	-10,512	-12,313	-30,012	-2,628	0	0	0	0
97.5	42.5	3	0	3	-17,214	-21,437	-10,512	-10,074	-21,437	-2,628	0	10	10	0
92.5	39.5	34	2	32	-14,084	-17,539	-10,512	-7,835	-17,539	-2,628	0	90	90	0
87.5	36.6	131	8	123	-10,954	-13,772	-10,512	-5,597	-13,772	-2,628	0	274	274	0
82.5	34.0	500	30	470	-7,824	-10,394	-10,512	-3,358	-10,394	-2,628	0	784	784	0
77.5	31.6	620	37	583	-4,695	-7,276	-10,512	-1,119	-7,276	-2,628	0	665	665	0
72.5	29.2	664	40	624	-1,565	-4,157	-10,512	0	0	-2,628	0	209	209	0
67.5	27.0	854	51	803	1,984	2,027	-10,512	0	0	-2,628	0	224	224	0
62.5	24.5	927	55	872	3,509	3,586	-10,512	763	780	-2,628	0	104	104	0
57.5	21.4	600	36	564	5,035	5,145	-10,512	2,289	2,339	-2,628	0	1	1	0
52.5	18.7	610	36	574	6,561	6,704	-10,512	3,815	3,898	-2,628	0	0	0	37
47.5	16.2	611	36	575	8,087	8,263	-10,512	5,340	5,457	-2,628	0	0	0	60
42.5	14.4	656	39	617	9,613	9,822	-10,512	6,866	7,016	-2,628	0	0	0	89
37.5	12.6	1,023	61	962	11,138	11,381	-10,512	8,392	8,575	-2,628	0	0	0	177
32.5	10.7	734	44	690	12,664	12,940	-10,512	9,918	10,134	-2,628	0	0	0	155
27.5	8.6	334	20	314	14,190	14,499	-10,512	11,444	11,693	-2,628	0	0	0	83
22.5	6.8	252	15	237	15,716	16,058	-10,512	12,969	13,252	-2,628	0	0	0	72
17.5	5.5	125	7	118	17,242	17,617	-10,512	14,495	14,811	-2,628	0	0	0	40
12.5	4.1	47	3	44	18,767	19,176	-10,512	16,021	16,370	-2,628	0	0	0	17
7.5	2.6	22	1	21	20,293	20,735	-10,512	17,547	17,929	-2,628	0	0	0	9
2.5	1.0	13	1	12	21,819	22,294	-10,512	19,073	19,488	-2,628	0	0	0	6
-2.5	0.0	0	0	0	23,345	23,853	-10,512	20,598	21,047	-2,628	0	0	0	0
-7.5	-1.5	0	0	0	24,871	25,412	-10,512	22,124	22,606	-2,628	0	0	0	0
TOTALS		8,760	521	8,239								2,361	2,361	744

Existing Building Ventilation & Infiltration (occ)	**289**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**289**	**cfm**
Economizer Ventilation (from AHU's)		**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	744

	Base Case
Cooling	2,361

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Courtroom

Outdoor Winter Design DB Temperature	10 *F	**Indoor Winter Design DB Temperature**	74 *F
Outdoor Summer Design DB Temperature	93 *F	**Indoor Summer Design DB Temperature**	70 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	U value calculator	6.2	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	21.6	

Windows (Select One)

		U Value
x	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=0.4)	0.90
Flat Glass (e=0.2)	0.77
Double Glaze (3/16 in air)	0.63
Double Glaze (1/4 in air)	0.60
Double Glaze (1/2 in air)	0.53
Double Glaze (e=.6)	0.50
Double Glaze (e=0.4)	0.42
Double Glaze (e=0.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS

Roof Area	1,400 SF		
Occupied Area	1,400 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF
East Exposure	6 Ft	14.5 Ft	8.0 Ft	0 SF	21 SF	59 SF
South Exposure	30 Ft	11.5 Ft	8.0 Ft	40 SF	0 SF	305 SF
West Exposure	46 Ft	11.5 Ft	8.0 Ft	40 SF	0 SF	489 SF

Occupied Forced Ventilation	110 cfm	6.6 AC/hr
Unoccupied Forced Ventilation	110 cfm	6.6 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Courtroom

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	0	38	btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	0	216	btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	40	109	btu/h/sf	0.8	0.58	Glass Type C	2,023 Btu/hr
West Exposure	40	216	btu/h/sf	0.8	0.29	Glass Type C	2,004 Btu/hr
							4,028 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.16	20 °F	1.0	0 Btu/hr
East Exposure	23	0.16	39 °F	1.0	144 Btu/hr
South Exposure	200	0.16	27 °F	1.0	867 Btu/hr
West Exposure	328	0.16	22 °F	1.0	1,158 Btu/hr
Roof	1,400	0.05	73 °F	1.0	4,725 Btu/hr
Fenestration	80	1.05	23 °F		1,898 Btu/hr
Doors	21	0.14	27 °F		79 Btu/hr
Ceiling	1,400	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	1,400	0.04	0 °F		0 Btu/hr
					8,872 Btu/h

INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

								Room Heat Gain
Lights	1.23	w/sf x	1,400	Occ Area =	1.7 kW x 3.4x		1.0 RAF =	5,877 Btu/h
Plug Load	0.10	w/sf x	1,400	Occ Area =	0.1 kW x 3.4x		1.0 RAF =	478 Btu/h
People	50	people x	255	btu/person x	50%	time in space =		6,375 Btu/h
Computer Work Stations			1	Units x	120	W/Unit x 3414 =		410 Btu/h
Equipment	0.0	kW x 3.413 =						0 Btu/h
Misc.								0 Btu/h
								13,140 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	551 SF	0.15	CFM/SF			1.04	23 °F	2,106 Btu/h
Doors	21 SF	0.30	CFM/LF	0.95	LF/SF	1.04	23 °F	153 Btu/h
Windows	80 SF	0.40	CFM/LF	1.40	LF/SF	1.04	23 °F	1,141 Btu/h
Ventilation	110 cfm					1.04	23 °F	2,802 Btu/h
								6,202 Btu/h
Infiltration	133 cfm	8.0	AC/hr					

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.16	20	1.0	0 Btu/hr
East Exposure	36	0.16	39	1.0	224 Btu/hr
South Exposure	105	0.16	27	1.0	455 Btu/hr
West Exposure	161	0.16	22	1.0	569 Btu/hr
Roof	1,400	0.05	73	0.0	0 Btu/hr
					1,247 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.23	w/sf x	1,400	Occ Area =	1.7 kW x3413x	0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
							0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	4,028	Internal Gains to Room	13,140
Conduction to Room	8,872	Internal Gains to Plenum	0
Conduction to Plenum	1,247		
Ventilaton and Infiltration	6,202		
Sub Total	20,349	Sub Total	13,140

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Courtroom

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	1,702 SF	0.15 CFM/SF	4,629	0.0042 #/#	5,013 Btu/h
Doors	21 SF	0.30 CFM/LF	4,629	0.0042 #/#	118 Btu/h
Windows	80 SF	0.40 CFM/LF	4,629	0.0042 #/#	880 Btu/h
Ventilation	110 cfm		4,629	0.0042 #/#	2,160 Btu/h
People	50 people	0.50 time in space		250 Btu/hr/person	6,250 Btu/h
					14,421 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	20,349	14,421	34,770	
Temperature Indep. Gains	13,140		13,140	SHR= 0.70
Total	33,488	14,421	47,909	

Building Cooling Load 4.0 Tons at 351 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is **2,574 CFM** / **1.84 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	0	0.16	64	0 Btu/h
East Exposure	59	0.16	64	604 Btu/h
South Exposure	305	0.16	64	3,133 Btu/h
West Exposure	489	0.16	64	5,023 Btu/h
Fenestration	80	1.05	64	5,376 Btu/h
Roof	1,400	0.05	64	4,142 Btu/h
Doors	21	0.14	64	188 Btu/h
Ceiling	1,400	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	1,400	0.04	19	1,064 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	853 SF	0.15 CFM/SF	1.04	64	128 cfm	8,545 Btu/h
Doors	21 SF	0.30 CFM/LF	1.04	64	6 cfm	401 Btu/h
Windows	80 SF	0.40 CFM/LF	1.04	64	45 cfm	2,993 Btu/h
Ventilation Load	110 cfm		1.04	64	110 cfm	7,936 Btu/h
Total Ventilation & Infiltration Load					289 cfm	19,875 Btu/h

Building Heating Load 39,405 btu/h

28.1 btu/sf

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Courtroom

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**21.0**	**20.0**

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North				0.0	0.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
East	5.5	14.5	1	79.8	40.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	5.5			79.8	40.0	14.5	Average height wall automatically linked
South	30.0	11.5	1	345.0	83.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	30.0			345.0	83.0	11.5	Average height wall automatically linked
West	46.0	11.5	1	529.0	115.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	46.0			529.0	115.0	11.5	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
South	2.0	5.0	4	40.0	56.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	40.0	56.0
West	2.0	5.0	4	40.0	56.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	40.0	56.0
			Total	**80.0**	**112.0**

LF/SF
1.40

Building Volume Calculator

Width(ft)	Length (ft)	Height(ft)	Count	Volume (cf)
10	10	10	1	1,000

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Police Area

Reconcile Thermal Model

Building Footprint	2,400	SF	Ex Occupied Clng Temp.	70	°F	Ex Occupied Htg Temp.	72 °F
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	70	°F	Ex Unoccupied Htg Temp.	72 °F
Cooling Efficiency	1.45	kW/ton	Occupied Cooling UA	(795)	btu/hr/°F	Occupied Heating UA	327 btu/hr/°F
Internal Gains	19,310	btu/h	Unoccupied Cooling UA	(600)	btu/hr/°F	Unoccupied Heating UA	327 btu/hr/°F
Unoc Internal Gain factor	0.8		Cooling Occ Enthalpy Setpoint	26	Btu/lb		
Ave Occ Internal Gain Factor	0.8		Cooling Unocc Enthalpy Setpoint	26	Btu/lb		
Economizer available (Y/N)	Yes						

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS										
					Occupied			Unoccupied							
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load	Ventilation BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load	Ventilation BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F		G	H	I		J	K	L	M	M
102.5	49.1	0	0	0	-25,853	-42,126		-15,848	-19,485	-42,126		-15,848	0	0	0	0
97.5	42.5	3	3	0	-21,875	-30,090		-15,848	-16,487	-30,090		-15,848	0	25	25	0
92.5	39.5	34	34	0	-17,898	-24,619		-15,848	-13,490	-24,619		-15,848	0	240	240	0
87.5	36.6	131	131	0	-13,921	-19,330		-15,848	-10,492	-19,330		-15,848	0	777	777	0
82.5	34.0	500	500	0	-9,943	-14,589		-15,848	-7,494	-14,589		-15,848	0	2,440	2,440	0
77.5	31.6	620	620	0	-5,966	-10,212		-15,848	-4,497	-10,212		-15,848	0	2,399	2,399	0
72.5	29.2	664	664	0	-1,989	-5,836		-15,848	-1,499	-5,836		-15,848	0	1,899	1,899	0
67.5	27.0	854	854	0	1,472	1,970		-15,848	1,472	1,970		-15,848	0	1,280	1,280	0
62.5	24.5	927	927	0	3,108	4,158		-15,848	3,108	4,158		-15,848	0	961	961	0
57.5	21.4	600	600	0	4,743	6,346		-15,848	4,743	6,346		-15,848	0	345	345	0
52.5	18.7	610	610	0	6,379	8,535		-15,848	6,379	8,535		-15,848	0	69	69	0
47.5	16.2	611	611	0	8,014	10,723		-15,848	8,014	10,723		-15,848	0	0	0	22
42.5	14.4	656	656	0	9,650	12,911		-15,848	9,650	12,911		-15,848	0	0	0	55
37.5	12.6	1,023	1,023	0	11,285	15,100		-15,848	11,285	15,100		-15,848	0	0	0	135
32.5	10.7	734	734	0	12,921	17,288		-15,848	12,921	17,288		-15,848	0	0	0	132
27.5	8.6	334	334	0	14,557	19,476		-15,848	14,557	19,476		-15,848	0	0	0	76
22.5	6.8	252	252	0	16,192	21,665		-15,848	16,192	21,665		-15,848	0	0	0	69
17.5	5.5	125	125	0	17,828	23,853		-15,848	17,828	23,853		-15,848	0	0	0	40
12.5	4.1	47	47	0	19,463	26,041		-15,848	19,463	26,041		-15,848	0	0	0	17
7.5	2.6	22	22	0	21,099	28,230		-15,848	21,099	28,230		-15,848	0	0	0	9
2.5	1.0	13	13	0	22,734	30,418		-15,848	22,734	30,418		-15,848	0	0	0	6
-2.5	0.0	0	0	0	24,370	32,606		-15,848	24,370	32,606		-15,848	0	0	0	0
-7.5	-1.5	0	0	0	26,006	34,795		-15,848	26,006	34,795		-15,848	0	0	0	0
TOTALS		**8,760**	**8,760**	**0**										**10,435**	**10,435**	**562**

Existing Building Ventilation & Infiltration (occ)	**405**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**405**	**cfm**
Economizer Ventilation (from AHU's)		**cfm**

Total Reconcile		
	Heating	Cooling
Mayor Wing	935	4,093
Court Office	651	5,190
Courtroom	744	2,361
Police	562	10,435
Total	**2,892**	**22,080**
Target --->	2,896	22,840
	100%	97%

Energy Use Indices (calculated)

	Base Case
Heating	562

	Base Case
Cooling	10,435

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	**Project No.:**	CHA #22424		
Location	Somerdale, NJ	**Site Elevation:**	80 Feet	**Specific Volume**	14.00 CF/#
Building Name	Somerdale Municipal Building	**Date:**	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation Police

Outdoor Winter Design DB Temperature	10 *F	**Indoor Winter Design DB Temperature**	72 *F
Outdoor Summer Design DB Temperature	93 *F	**Indoor Summer Design DB Temperature**	70 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	U value calculator	8.6	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	21.6	

Windows (Select One)

		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
X	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=0.4)	0.90
Flat Glass (e=0.2)	0.77
Double Glaze (3/16 in air)	0.63
Double Glaze (1/4 in air)	0.60
Double Glaze (1/2 in air)	0.53
Double Glaze (e=.6)	0.50
Double Glaze (e=0.4)	0.42
Double Glaze (e=0.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS

Roof Area	2,400 SF		
Occupied Area	2,400 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF
East Exposure	49 Ft	9.9 Ft	8.0 Ft	60 SF	0 SF	425 SF
South Exposure	76 Ft	11.0 Ft	8.0 Ft	24 SF	42 SF	770 SF
West Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF

Occupied Forced Ventilation	190 cfm	11.4 AC/hr
Unoccupied Forced Ventilation	190 cfm	11.4 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	Project No.:	CHA #22424		
Location	Somerdale, NJ	Site Elevation:	80 Feet	Specific Volume	14.00 CF/#
Building Name	Somerdale Municipal Building	Date:	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: Police

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	60	216 btu/h/sf	0.8	0.31	Glass Type C	3,214 Btu/hr
South Exposure	24	109 btu/h/sf	0.8	0.58	Glass Type C	1,214 Btu/hr
West Exposure	0	216 btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr
						4,428 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.12	20 °F	1.0	0 Btu/hr
East Exposure	332	0.12	39 °F	1.0	1,505 Btu/hr
South Exposure	542	0.12	27 °F	1.0	1,701 Btu/hr
West Exposure	0	0.12	22 °F	1.0	0 Btu/hr
Roof	2,400	0.05	73 °F	1.0	8,100 Btu/hr
Fenestration	84	0.50	23 °F		949 Btu/hr
Doors	42	0.14	27 °F		158 Btu/hr
Ceiling	2,400	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	2,400	0.04	0 °F		0 Btu/hr
					12,413 Btu/h

INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

								Room Heat Gain
Lights	1.11	w/sf x	2,400	Occ Area =	2.7 kW x 3.4x		1.0 RAF =	9,092 Btu/h
Plug Load	0.10	w/sf x	2,400	Occ Area =	0.2 kW x 3.4x		1.0 RAF =	819 Btu/h
People	5	people x	255	btu/person x	75%	time in space =		956 Btu/h
Computer Work Stations			1	Units x	120	W/Unit x 3414 =		410 Btu/h
Equipment	2.5	kW x 3.413 =						8,533 Btu/h
Misc.								0 Btu/h
								19,810 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	874 SF	0.15	CFM/SF			1.04	23 °F	3,340 Btu/h
Doors	42 SF	0.20	CFM/LF	0.95	LF/SF	1.04	23 °F	204 Btu/h
Windows	84 SF	0.20	CFM/LF	1.67	LF/SF	1.04	23 °F	713 Btu/h
Ventilation	190 cfm					1.04	23 °F	4,841 Btu/h
								9,098 Btu/h
Infiltration	167 cfm	10.0	AC/hr					

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	0	0.12	20	1.0	0 Btu/hr
East Exposure	93	0.12	39	1.0	421 Btu/hr
South Exposure	228	0.12	27	1.0	715 Btu/hr
West Exposure	0	0.12	22	1.0	0 Btu/hr
Roof	2,400	0.05	73	0.0	0 Btu/hr
					1,137 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.11	w/sf x	2,400	Occ Area =	2.7 kW x3413x	0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
							0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	4,428
Conduction to Room	12,413
Conduction to Plenum	1,137
Ventilaton and Infiltration	9,098
Sub Total	27,076

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	19,810
Internal Gains to Plenum	0
Sub Total	19,810

HEAT GAIN/LOSS WORKSHEET

Project Name:	Somerdale, NJ Energy Audit	Project No.:	CHA #22424		
Location	Somerdale, NJ	Site Elevation:	80 Feet	Specific Volume	14.00 CF/#
Building Name	Somerdale Municipal Building	Date:	12/06/10		
Engineer:	Matt Pittinger				

Building/Facility Designation: Police

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,721 SF	0.15 CFM/SF	4,629	0.0042 ##	8,015 Btu/h
Doors	42 SF	0.20 CFM/LF	4,629	0.0042 ##	157 Btu/h
Windows	84 SF	0.20 CFM/LF	4,629	0.0042 ##	550 Btu/h
Ventilation	190 cfm		4,629	0.0042 ##	3,731 Btu/h
People	5 people	0.75 time in space		250 Btu/hr/person	938 Btu/h
					13,391 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	27,076	13,391	40,467	
Temperature Indep. Gains	19,810		19,810	SHR= 0.78
Total	46,885	13,391	60,276	

Building Cooling Load: 5.0 Tons at 478 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 3,652 CFM (1.52 CFM/sf)

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	0	0.12	62	0 Btu/h
East Exposure	425	0.12	62	3,062 Btu/h
South Exposure	770	0.12	62	5,548 Btu/h
West Exposure	0	0.12	62	0 Btu/h
Fenestration	84	0.50	62	2,604 Btu/h
Roof	2,400	0.05	62	6,879 Btu/h
Doors	42	0.14	62	364 Btu/h
Ceiling	2,400	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,400	0.04	19	1,824 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	1,195 SF	0.15 CFM/SF	1.04	62	179 cfm	11,600 Btu/h
Doors	42 SF	0.20 CFM/LF	1.04	62	8 cfm	518 Btu/h
Windows	84 SF	0.20 CFM/LF	1.04	62	28 cfm	1,812 Btu/h
Ventilation Load	190 cfm		1.04	62	190 cfm	13,280 Btu/h
Total Ventilation & Infiltration Load					405 cfm	27,210 Btu/h

Building Heating Load: 47,491 btu/h (19.8 btu/sf)

Somerdale, NJ Energy Audit
CHA #22424
Building: Somerdale Municipal Building
Police Area

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
South	3.0	7.0	2	42.0	40.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	42.0	40.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**42.0**	**40.0**

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North				0.0	0.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
East	27.0	9.0	1	243.0	72.0		
	22.0	11.0	1	242.0	66.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	49.0			485.0	138.0	9.9	Average height wall automatically linked
South	76.0	11.0	1	836.0	174.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	76.0			836.0	174.0	11.0	Average height wall automatically linked
West				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	2.0	3.0	10	60.0	100.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	60.0	100.0
South	2.0	3.0	4	24.0	40.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	24.0	40.0
West				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**84.0**	**140.0**

LF/SF: 1.67

Building Volume Calculator

Width(ft)	Length (ft)	Height(ft)	Count	Volume (cf)
10	10	10	1	1,000

APPENDIX R

Equipment Inventory and Lighting

Borough of Somerdale
CHA #22424
Borough Hall

Description	Qty	Manufacturer Name	Model No.	Serial Number	Equipment Type	Capacity/Size	Operation Hours	Areas Served	Estimated Efficiency	Approximate Age	Useable Life Expectancy (years)
DHW Heater	1	Bradford White	M240S6DS-1NCWW	FF12007812	Electric	40 Gallon, 4.5 kW	As Needed	Restrooms and Janitor Closet	98%	5	13
Emergency Generator	1	Kohler	100 RZG	2024075	Natural Gas	100 kW	Emergency Usage	Entire Building	NA	1	20
RTU	1	Carrier	48TCED12A2GSA0A0A0	4509G40400	Packaged RTU	224 Mbtu Heating, 9.5 tons Cooling	8760	Courtroom	82% gas, 1.1 kW/ton cooling	1.5	15
RTU	1	Carrier	48TME012-A-501	0807G21765	Packaged RTU	180 Mbtu Heating, 10 tons Cooling	8760	Court Offices, Tax Offices, Fire Marshal	80% gas, 1.48 kW/ton	12	15
RTU	1	Trane	YSC090A3RHA1PF1	444100867L	Packaged RTU	200 Mbtu Heating, 7.5 tons Cooling	8760	Mayor's Wing	80% gas, 1.45 kW/ton	7	15
RTU	1	Trane	YSC048A3RHA1FF	444100553L	Packaged RTU	120 Mbtu Heating, 4 tons Cooling	8760	Police Area	80% gas, 1.45 kW/ton	7	15
RTU	1	Carrier	48TFE005-A-511	902040358	Packaged RTU	115 Mbtu Heating, 4 tons Cooling	8760	Police Area	80% gas, 1.45 kW/ton	7	15

Somerdale Municipal Building
CHA Project No. 22424
Existing Lighting

Cost of Electricity: **$0.125 $/kWh**
$12.99 $/kW

		EXISTING CONDITIONS								
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)
11	Maintenance Closet	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	2920	OCC	210
246	Police Bathroom	1	1 Lamp T12	F21SE	26	0.0	SW	2920	OCC	76
13	Police Locker Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	C-OCC	263
163	Prisoner Processing Room	5	1B 40 R F 2 (MAG)	F42SS	94	0.5	SW	8760	None	4,117
101	Prisoner Processing Room	1	I 40	I40/1	40	0.0	SW	8760	None	350
164	Prisoner Processing Room	1	X 7.0 W I 2	EI10/2	20	0.0	Breaker	8760	None	175
18	Perimeter Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	OCC	245
87	Gun Cabinet	1	W 32 W F 2 (MAG)	F42LE	71	0.1	SW	2190	OCC	155
13	Interrogation Room	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	OCC	156
18	Main Police Hallway	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2600	OCC	1,747
71	Main Police Hallway	3	I 60	I60/1	60	0.2	SW	2600	None	468
18	Sergeant Office 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	OCC	981
18	Sergeant Office 2	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	OCC	981
18	Sergeant Office 3	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	OCC	981
18	Chief's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	OCC	981
18	Storage/ Server Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	OCC	981
18	Mayor's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1460	OCC	327
13	Deputy Treasurer Office	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	OCC	263
13	East Offices Hallway	5	S 32 P F 2 (ELE)	F42LL	60	0.3	SW	4380	None	1,314
18	East Offices Hallway	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	4380	None	981
X1	East Offices Hallway	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	None	39
18	Server/Storage Room	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	OCC	245
18	Conference Room	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	C-OCC	491
18	Supply Room 1	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	OCC	491
18	CFO's Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	OCC	491
18	Municipal Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	OCC	491
13	Supply Room 2	2	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	OCC	263
18	Tax Office	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2190	C-OCC	981
18	Tax Office Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	OCC	245
18	Clerk Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	OCC	491
11	Men's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	C-OCC	576
11	Women's Restroom	1	S 34 P F 2 (MAG)	F42EE	72	0.1	SW	8000	C-OCC	576
13	Main Hallway	8	S 32 P F 2 (ELE)	F42LL	60	0.5	SW	8760	None	4,205

Somerdale Municipal Building
CHA Project No. 22424
Existing Lighting

Cost of Electricity: **$0.125 $/kWh**
$12.99 $/kW

		EXISTING CONDITIONS								
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)
78	Main Hallway	2	EP I 100	I100/1	100	0.2	SW	2080	None	416
13	Small Office to the left of Bathrooms	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	4380	OCC	263
185	Courtroom	9	DC 40 W F 4	F44SE	172	1.5	SW	4380	None	6,780
71	Courtroom	3	I 60	I60/1	60	0.2	SW	4380	None	788
35	West Offices Hallway	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	8760	None	3,154
35	Breakroom	4	T 32 R F 3 (ELE)	F43ILL/2	90	0.4	SW	5000	C-OCC	1,800
18	Bathroom off Breakroom	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	OCC	981
18	Court Office	6	T 32 R F 4 (ELE)	F44ILL	112	0.7	SW	2190	C-OCC	1,472
18	Court Office Storage	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	8760	OCC	981
18	Janitor Closet	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	4380	OCC	491
35	Conference Room	6	T 32 R F 3 (ELE)	F43ILL/2	90	0.5	SW	2190	C-OCC	1,183
78	Conference Room	10	EP I 100	I100/1	100	1.0	SW	624	None	624
18	Construction Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2190	OCC	736
18	Fire Marshall Office	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2190	OCC	491
18	Tax Assessor Office	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2190	OCC	245
13	Tax Assossor Office	1	S 32 P F 2 (ELE)	F42LL	60	0.1	SW	2190	OCC	131
142	Outdoor Lights	3	MH 100	MH100/1	128	0.4	Photo	4380	None	1,682
142	Outdoor Light	1	MH 100	MH100/1	128	0.1	None	8760	Photo	1,121
	Total	**133**				**12.8**				**48,676**