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Local Government Energy Program Final Energy Audit Report

For

Borough of Spring Lake Department of Public Works 501 Atlantic Ave Spring Lake, NJ 07762

**Project Number: LGE29** 



Mechanic Garage & Office



Main Garage



Water Department

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### **INTRODUCTION**

On October 23<sup>rd</sup>, 26<sup>th</sup> and 28th, Steven Winter Associates, Inc. (SWA) and PMK Group, a business unit of Birdsall Services Group, (BSG-PMK) performed an energy audit and assessment of the Department of Public Works facility (DPW) located in Spring Lake, NJ. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the buildings.

The Mechanic Garage and Office building structure was built in 1970 and houses two repair garage bays, a mechanics office and parts storage, an office for the Superintendent of Public Works and a vehicular storage garage. The building consists of 7,700 square feet with some attic storage space. There are 2 employees that work specifically in the Mechanic Garage and Office building. The building is open 40 hours a week with some emergency weekends through the course of the year.

The Main Garage building structure was built in 1990 and houses one repair garage bay and a vehicular storage garage. The building consists of 8,400 square feet on one floor. There are 16 employees that work specifically in the Main Garage building. The building is open 40 hours a week with some emergency weekends through the course of the year.

The Water Department building structure was built circa 1950 and houses a pump room, an office, and a parts or storage area that extends into the attic. The building consists of 5,400 square feet on one floor and partial attic. There are 2 employees that work specifically in the Water Department building. The building is open 40 hours a week.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of each building. Using spreadsheet-based calculation methods, SWA and BSG-PMK estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

The goal of this energy audit is to provide sufficient information to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

- Section 1 and section 2 of the report cover a description and analysis of the building existing conditions.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 7 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

### **EXECUTIVE SUMMARY**

This document contains the energy audit report for the DPW facility located at 501 Atlantic Ave, Spring Lake, NJ 07762.

Based on the field visit performed by Steven Winter Associates (SWA) and BSG-PMK Group, on October 23rd and 28<sup>th</sup>, and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

#### **Current conditions**

The DPW facility has three separate electric meters, one for each of the buildings in this report, and only one gas meter for the entire facility.

In the most recent full year of data collected (10/1/08-9/30/09), the Mechanic Garage and Office building consumed 30,944kWh or \$5,469 worth of electricity with an average aggregated cost of electricity that was calculated to be \$0.18/kWh. In the most recent full year of data collected (10/1/08-9/30/09), the Main Garage building consumed 91,120kWh or \$15,589.60 worth of electricity with an average aggregated cost of electricity that was calculated to be \$0.17/kWh. In the most recent full year of data collected (10/1/08-9/30/09), the Water Department building consumed 3,925kWh or \$798.23 worth of electricity with an average aggregated cost of electricity that was calculated to be \$0.20/Kwh. In the most recent full year of data collected (9/12/08-8/25/09), the DPW facility consumed 3950 therms or \$5952.90 worth of natural gas and the average aggregated cost of natural gas was calculated to be \$1.51/therm With electricity and fossil fuel combined, the entire DPW facility consumed 824.841MMBtus of energy at a total cost of \$27,809.73.

BSG-PMK has entered energy information about the DPW facility in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building was not able to receive an Energy Star performance rating since the building is classified as a DPW building, which is currently ineligible for a performance score through the Benchmarking tool.

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). BSG-PMK encourages the Borough of Spring Lake to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity could not be calculated for the Water Department. The Mechanic Garage and Office building was calculated to be 103.6 kBtu/ft<sup>2</sup>yr and 42 kBtu/ft<sup>2</sup>yr for the Main Garage. There is no national average data for a Public Works facility. Implementing this report's recommendations will reduce use by approximately 70.8 kBtu/ft<sup>2</sup>yr for all facilities combined, which when implemented would make the building energy consumption even lower.

#### Recommendations

Category I Recommendations: Capital Improvements.

1) Water Department- BSG-PMK and SWA recommend that the cracks be repaired and special attention be paid to probable further cracking or degradation of structural integrity.

Water Department-The wood garage door is in disrepair and should be replaced.

5) Replace all old, single-pane windows with thermal pane windows. All DPW buildings combined for approximately 950 ft.<sup>2</sup> of old windows; replacing these windows would yield \$1,700 in natural gas savings. Reducing infiltration through the windows, by reducing the amount of cold air entering the building, will also make the temperature more comfortable for the workers.

Category II Recommendations: Operations & Maintenance

- All sink faucets and toilets should be converted to low-flow unit. Low-flow toilets use 1.6 gallons per flush, compared to 3.5 for standard units. Water consumptions for different types of faucets vary. These units are inexpensive, but due to the fact that public buildings in Spring Lake are not billed for water, the payback would be infinitely long, and therefore, this cannot be recommended as an ECM.
- 2) Water Department BSG-PMK and SWA recommend monitoring the condition of the roof regularly.
- Repair or Replace all loose or deteriorated weather stripping at all insulated door frames and insulated roll up doors. (Window and Door replacements are listed as ECM's under each respective building.)

Category III Recommendations: Energy Conservation Measures

At this time, SWA/PMK highly recommends a total of 7 Energy Conservation Measures (ECMs) for the Spring Lake Department of Public Works buildings that are summarized in the following Table 1. The total investment cost for these ECMs with incentives is 335,682. SWA/PMK estimates a first year savings of 43,536 with a simple payback of 7.7 years. SWA/PMK estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Department of Public Works buildings by 146,760 lbs of CO<sub>2</sub>, which is equivalent to removing approximately 12 cars from the roads each year. SWA also recommends that the Borough of Spring Lake contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to 0.03/kWh, which would have equated to 3,780 for the past 12 months

There are various incentives that the Borough of Spring Lake could apply for that could also help lower the cost of installing the ECMs. SWA/PMK recommends that the Borough of Spring Lake apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover close to 80% of the capital investment. In order to qualify, the facility being upgraded must not have had a peak demand that exceeded 200 kW in any of the

preceding 12 months; the highest peak demand for the Department of Public Works in the previous year was 51.8 kW, for all buildings combined.

## **SCOPE OF WORK – SUMMARY TABLE**

| ROI: Return on Investment (%) |                            |                       |          |   |
|-------------------------------|----------------------------|-----------------------|----------|---|
| Amainprise                    |                            |                       |          | and the second se |
| Discontante                   | 3 Ph per DOL FEMF andelure | Electricity rate      | \$0.19   | \$4Wh (cooling season only);  |
| Energy price escalation rate  | 0% per DOE FEMP pudeline   | 1                     | \$0.17   | STWA  |
|                               |                            |                       | \$0.20   | \$%Wh (water dept.)   |
|                               |                            | Gas rate              | - \$1.51 | \$ them.  |
| Avg Annual Demand:            | 0.005 (Mech. & Office)     |                       |          |   |
|                               | 0.004 (Mani Garage)        | Area of Building (SF) | 5,400    | (wates)   |
|                               | 0.005 (Water Dept.)        | COMPANY STREET        | 8.400    |   |

|        | a – 2                                  | a - 3               |                       |                  | 56 B                                  | s - 5                | 748                    |                             | phile Rady               | essendói à                             | ##Ymr#x                  | THERE IS NOT           | R:   |                  | 5 ÷                              | 5              |                            | -                       |                                   |
|--------|--|---------------------|-----------------------|------------------|---------------------------------------|----------------------|------------------------|-----------------------------|--------------------------|--|--------------------------|------------------------|--|------------------|----------------------------------|----------------|----------------------------|-------------------------|-----------------------------------|
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| ţ      | Lighmug<br>Upgrada<br>(Water<br>Dept.) | Similar<br>Projecti | \$3,264               | 5440             | \$2,824                               | 15,119               | \$67                   | 0                           | 9.55                     | 50                                     | \$3.074                  | -45                    | \$36,172                                   | 0.92             | 7872%                            | - 525N         | 109%                       | \$33.873                | 20,705                            |
| (44)   | Lighting<br>Upgaide<br>(DPW<br>Main)   | Similia<br>Projecti | \$30.783              | 1875             | \$10,408                              | 18,437               | 8.44                   | õ                           | 72.21                    | \$0                                    | \$3,322                  | 15                     | \$39,097                                   | 318              | 183794                           | 122%           | 31%                        | \$29,253                | 26,602                            |
|        | TOTA                                   | 4                   | \$14,047              | 1815             | \$13,232                              | 34,530               | 15.11                  | Ő.                          | 21.82                    | \$0.00                                 | \$6,395                  | - +                    | \$75,265                                   | 2.07             |                                  | - <del>1</del> |                            | \$63.126                | 47,206                            |

| _    |   |   |                   |              |  |             | 1                        | abla 2 -                  | Recount                      | unaded 5-10                            | Your Puplo                | ak ECM              |   |                 |  |                                    |                         |                         |                      |
|------|---|---|-------------------|--------------|--|-------------|--------------------------|---------------------------|------------------------------|--|---------------------------|---------------------|---|-----------------|--|------------------------------------|-------------------------|-------------------------|----------------------|
| ECM# | ECM<br>description                          | Secure  | En. Isselber Con. | Extimution 1 | Not Let ECM<br>Cost with<br>Lecentries, \$ | MMs, Ial W. | kW_Dom/d<br>Bodistion/Mi | Thatesa the Yr<br>Six man | (fluing ff, lig Ye<br>Second | Est Opening<br>Conc. 19: Ya<br>Samga S | Total Tay Yo<br>Annings S | Life of Memme, Vol. | Est Lignico<br>Thirty Coli<br>Savings S | Sounde Paylood. | Artistical Reports<br>of Investment, % | Aprimit Roturn on<br>Investment, % | Runne Russ of Runne, Ny | Not Piercen Value.<br>S | CO, Roheot,<br>Enjor |
| Ĭ,   | Convert<br>Wenn<br>Heater to<br>Natural Gay | Contractor -<br>Souble<br>Mechanicaj<br>Autorialej<br>Facefald NI | \$3,500           | \$30         | \$3,450                                    | 4,768       | 211                      | -191                      | 0.72                         | 50                                     | \$742                     | 11                  | \$7,793                                 | 465             | 968%                                   | 74%                                | 19%                     | \$4,40                  | 2,762                |
| 4    | 45.2 kW<br>PV Systems<br>(DPW<br>moint)     | Sionifer<br>Projecti  | \$302,400         | \$43,200     | \$259,200                                  | 49,937      | 16.32                    | ¢                         | 20.28                        | \$3.544                                | \$\$3,013                 | 30                  | \$392,664                               | -385            | 472%                                   | 1996 :                             | 30%0                    | \$206,343               | 68,414               |
|      | 101/  | u.  | \$305,900         | \$43,250     | \$262,650                                  | 34,965      | 8.6.1                    | -151                      | 20,30                        | \$5,544.22                             | \$13,755                  | - 40                | \$400,456                               | 1.58            | - 4                                    | -141-                              |                         | \$210,785               | 73,178               |

|       |   |  |                |                |  |            | ÷.                            |                      | Se alla                    | naded to see                             | underfeiten be          | 100110-001       |  |                       |                                      |                                  |                             |            |                     |
|-------|---|--|----------------|----------------|--|------------|-------------------------------|----------------------|----------------------------|--|-------------------------|------------------|--|-----------------------|--------------------------------------|----------------------------------|-----------------------------|------------|---------------------|
| ECM # | ECM<br>description                                | Searce   | Field Internet | En lauration S | Dest Est. EC.M.<br>Cost with<br>Inconducts. 3. | MML 140 YS | V.V. Denord<br>Richertron Mo- | Borne 14/Yr<br>Samps | Oburba B, Far Yr<br>Saenge | Eat Operating<br>Cost 14 Ye<br>Swrings 5 | Total IA YE<br>Smirga S | Life of Mession. | Est Lithure<br>Inerge Cost<br>Arrays S | Somes Product.<br>Vox | Millione Rotum<br>on his currect, 75 | Annual Benno on<br>Investment, % | Internal Rate of Return, %. | Net Promit | CO, Rohuett<br>Boly |
| i i i | Replace<br>Unit<br>Remers and<br>Remove<br>Bodler | Coursens<br>Stuble<br>Mechanical<br>Anaeianys<br>Factbold, NJ    | \$23,000       | 26.5           | \$23,000                                       | 6          | 0.00                          | 1050                 | 1231                       | so.                                      | 11.561                  | 20               | \$23,123                               | 14:91                 | 594                                  | œ.                               | 108%                        | <u>846</u> | 12,290              |
| #     | Upprede<br>Firmatie                               | Connector<br>Satuble<br>Mechanical<br>Accession,<br>Factbald, NJ | \$7,508        | \$400          | \$7,300  | (0)        | 3.65                          | 161.8                | 4.91                       | \$4                                      | \$40î                   | 24               | \$1,810                                | 17.73                 | -58%                                 | -44                              | 15                          | -\$1,141   | 5,109               |
| 1     | Uppade<br>Beiler                                  | Courterno<br>Studio<br>Mechanical<br>Anostatus<br>Feinfald Ni    | \$30,000       | \$308          | \$29,708                                       | (#)        | 8.00                          | 929.8                | 11.07                      | м  | \$1,401                 | 2                | \$27,864                               | 21:29                 | 1996                                 | 3%                               | 16                          | 35,995     | 10.376              |
|       | 1014  | u.   | \$60,500       | \$700.         | \$59,600                                       | - 10       | 0.00                          | 2.246                | 28.49                      | \$0.00                                   | \$1,185                 | - 40             | \$52,834                               | 17.6                  | 14                                   | -141-                            |                             | 一時。他们      | 26,276              |

### 1. HISTORIC ENERGY CONSUMPTION

### 1.1. Energy usage and cost analysis

SWA and BSG-PMK analyzed utility bills from October 2007 through September 2009 that were received f rom t he utility c ompanies s upplying the DPW buildings and f acility with electric and natural gas.

Electricity - The DPW facility is currently served by three electric meters. The Mechanic Garage and Office building currently buys electricity from Jersey Central Power & Light at **an average rate of \$0.18/kWh** based on 12 months of utility bills from October 2008 to September 2009. The Mechanic Garage and Office building purchased **approximately 30,944 kWh or \$5,469 worth of electricity** in the previous year. The average monthly demand was 13.45 kW.

The Main Garage building currently buys electricity from Jersey Central Power & Light at an average r ate of \$0.17/kWh based on 12 m onths of ut ility bi lls f rom O ctober 20 08 t o September 2009. The Mechanic G arage and Office building purchased approximately 91,120 kWh or \$15,589.60 worth of electricity in the previous year. The average monthly de mand was 30.1 kW.

The Water Department building currently buys electricity from Jersey Central Power & Light at an ave rage r ate of \$0.20/kWh based on 12 m onths of ut ility bills from O ctober 2008 to September 2009. The Wat er D epartment building purchased approximately 3,925 k Wh o r \$798.23 worth of electricity in the previous year. The average monthly demand was 1.7 kW.

Natural gas - The DPW facility is currently served by one meter for natural gas. The DPW facility currently buys natural gas from New Jersey Natural Gas at **an average aggregated rate of \$1.51/therm** based on 12 months of utility bills for September 2008 to August 2009. The DPW facility purchased **approximately 3,949.913 therms or \$5,952.90 worth of natural gas** in the previous year.



The following chart shows electricity usage for the Building based on ut ility bills for the 2008 - 2009 billing period.

The Mechanic Garage and Office Building







The Water Department Building

The following chart shows the natural gas usage for the Building based on utility bills for the 2008-2009 billing year



The DPW facility

## 1.2. Utility rate

The Mechanic Garage and Office building currently buys electricity from Jersey Central Power & Light at an average rate of \$0.18/kWh based on 12 months of utility bills from October 2008 to September 2009.

The Main Garage building currently buys electricity from Jersey Central Power & Light at an average rate of \$0.17/kWh based on 12 months of utility bills from October 2008 to September 2009.

The Water Department building currently buys electricity from Jersey Central Power & Light at an average rate of \$0.20/kWh based on 12 months of utility bills from October 2008 to September 2009. It is important to note that this rate appears higher than the other buildings on the same sight because of the allocation of the fixed customer and demand charge components of the utility tariff being spread over a relatively low Kwh demand.

The DPW facility is currently served by one meter for natural gas. The DPW facility currently buys natural gas from New Jersey Natural Gas at an average aggregated rate of \$1.51/therm based on 12 months of utility bills for September 2008 to August 2009.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.

## **1.3.** Energy benchmarking

The building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. SWA recommends that the Borough of Spring Lake maintain the Portfolio Manager account at the link below. The account username is springlakeboro and the account password is *springlake*. As the account is maintained, SWA can share with the Borough of Spring Lake and allow future data to be added and tracked using the benchmarking tool.

http://www.energystar.gov/index.cfm?c=evaluate\_performance.bus\_portfoliomanager

## 2. FACILITY AND SYSTEMS DESCRIPTION

### **2.1. Building Characteristics**

The Mechanic Garage and Office building structure was built in 1970 and houses two repair garage bays, a mechanics office and parts storage, an office for the Superintendent of Public Works and a vehicular storage garage. The building consists of 7,700 square feet with some attic storage space. There are 2 employees that work specifically in the Mechanic Garage and Office building. The building is open 40 hours a week.

The Main Garage building structure was built in 1990 and houses one repair garage bay and a vehicular storage garage. The building consists of 8,400 square feet on one floor. There are 16 employees that work specifically in the Main Garage building. The building is open 40 hours a week.

The Water Department building structure was built circa 1950 and houses a pump room, an office, and a parts or storage area that extends into the attic. The building consists of 5,400 square feet on one floor and partial attic. There are 2 employees that work specifically in the Water Department building. The building is open 40 hours a week.

### 2.2. Building occupancy profiles

The peak occupancy for the Department of Public Works facility is approximately 20 employees at any given time during weekdays, during summer there may be seasonal employees. The building is typically occupied 40 hours a week.

#### 2.3. Building envelope

#### 2.3.1. Exterior walls

#### Mechanic Garage and Office

The exterior walls of the Mechanic Garage portion of the building are constructed from 8" CMU and mortar. There is no interior finish or insulation because of the use of the building. The exterior walls are not cracked or damaged and were found to be in good condition. The exterior walls of the Office portion of the building are constructed from wood framing and plywood, covered in vinyl siding, finished on the interior with insulation and drywall. There is no evidence of water infiltration or air infiltration and the exterior walls appear to be in good condition.



#### Main Garage

The exterior walls and roofing of the Main Garage are standard Butler type Standing seam construction with an approx. average thickness of 3". The interior of the walls are covered in spray insulation. There are no cracks or water damage reported or found. The exterior walls are in good condition.



#### Water Dept.

The exterior walls consist of  $3\frac{1}{2}$ " brick and mortar with interior walls made of  $3\frac{1}{2}$ " brick and mortar. The total thickness of the outside walls is between 6"-8". Overall, exterior of the envelope was found to be in fair to poor condition. The interior sides of the walls were painted, but it was obvious the bricks were beginning to deteriorate and structural cracks

at the tops of walls were beginning to develop both on the interior and exterior. BSG-PMK and SWA recommend that the cracks be repaired and special attention be paid to probable further cracking or degradation of structural integrity.





#### 2.3.2. Roof

#### Mechanic Garage and Office

The roof over the Mechanic Garage and Office is wood framed with asphalt shingles. There is no insulation between the wood and the attic space, but there is insulation on top of the ceiling (the floor of the attic space). The roof is in good condition; there are no water seepage/drainage issues or any other damage evident.

#### Main Garage

The roof on the Main Garage, like the rest of building, is constructed with standing seam corrugated steel with spray foam insulation on the inside. There is no evidence of water damage. And the roof is in overall good condition.

#### Water Dept.

The roof at the Water Department building is constructed of wood with asphalt shingles. There is no insulation between the wood roof and the attic space. The roof has been repaired over the years. The gutters and overhang along the building are beginning to deteriorate and fall off. BSG-PMK and SWA recommend monitoring the condition of the roof regularly.

### 2.3.3. Base

The buildings bases are concrete slab-on grade. No water seepage through the slab was detected nor was the slab cracked or damaged. The Water Dept. has pipes below the slab that feed the water tower. The foundations of these buildings are in good condition.

#### 2.3.4. Windows



#### Mechanic Garage and Office

The Mechanic Garage and Office has 10 single pane, wood framed windows that measure 90"x67". A visual inspection of the windows and frames was conducted and it was determined that the windows should be replaced with new vinyl or aluminum frame double pane windows.

#### Main Garage

There are no windows only garage doors on the Main Garage.

#### Water Dept.

There are 14 single pane, wood framed windows of varying measurements at the Water Department building. The windows are old and some are broken and covered in plywood. BSG-PMK and SWA recommend replacing these windows with vinyl or aluminum framed double pane windows.

#### 2.3.5. Exterior doors

## Mechanic Garage and Office

There are 5 garage bay doors and 3 aluminum doors on the Mechanic

Garage and Office building. All doors are in good condition. BSG-PMK and SWA recommend re-weather stripping the garage bay doors as needed, to reduce infiltration.



#### Main Garage

There are 5 garage bay doors and 3 aluminum doors on the Main Garage building. All doors are in good condition. BSG-PMK and SWA recommend re-weather stripping the garage bay doors as needed, to reduce infiltration.

#### Water Dept.

There is one aluminum door, one wooden door, one 9'x8' wooden garage door, and two large wooden front doors. The wooden doors are in fair to poor condition and should have weather stripping added to prevent infiltration around the door. The wood garage door is in disrepair and should be replaced.

#### 2.3.6. Building air tightness

Due to the nature of the use of these buildings the large bay doors are constantly being opened and closed. The Main Garage structure and the Office space are the most air tight when the doors are closed, while the Mechanic Garage and Water Department buildings are in fair to poor condition in relation to air tightness. BSG-PMK and SWA recommends sealing the cracks in the Water Department building as previously stated in an effort to increase the building's air tightness and closing the doors in the Mechanic Garage when the heat is on.

#### 2.4. HVAC systems

#### 2.4.1. Heating

#### Mechanic Garage and Office

Heating in the Mechanic Garage is provided by unit heaters suspended from the ceiling, and fueled by natural gas. There is one Dayton, one Reznor, and one Modine brand heater in this building. All are in good to fair condition.

Heating in the Office is provided by one gravity direct vent wall furnace made by the Louisville Tin and Stove Company and installed in 1997. The unit is in fair condition.



Gravity Direct Vent Wall Furnace

#### Main Garage

The heating in the Main Garage is provided by a Lanair waste oil heater that is in good condition and 4 natural gas powered Dayton radiant heaters positioned throughout the room. As per the interview with the mechanic the radiant heaters are very rarely used. The heat in the break room is provided by a Cozy unit heater, fueled by natural gas, and in good condition. The heat in the equipment storage area is provided by a Dayton hydronic unit heater fed by a Weil-McLain boiler both are in good condition.

Category III Recommendation: ECM #7: Recommend replacing the Weil McLain boiler, which serves the break area, with a high-efficiency condensing boiler, and installing outside air reset control.



Waste Oil Heater

#### Water Dept.

Heating is provided by 4 Roberts Gordon Vantage II infrared radiant heaters and a small York Diamond 80 forced hot air furnace. All units are fueled by natural gas and are in good to fair condition. The York furnace should be replaced with a more efficient unit.

Category III Recommendation: ECM #6: Recommend upgrading the York furnace with a high-efficiency modulating furnace.



Carpenter's Shop

Heating is provided by a gas-fired Hydrotherm boiler, which feeds two unit heaters that were installed in the 1960's. The boiler is near the end of its useful life, and the unit heaters have surpassed their's.

Category III Recommendation: ECM #5: Recommend replacing the boiler and the unit heaters with two gas-fired unit heaters, rather than replace the whole system.

## 2.4.2. Cooling

## Mechanic Garage and Office

The office portion of the building is cooled by one Maytag window unit, powered by electricity. BSG-PMK and SWA recommend replacing this unit with a higher efficiency unit. The Mechanic Garage portion of the building is cooled by fans and natural ventilation from opening the garage bay doors.

### Main Garage

The Main Garage building is not actively cooled by any mechanical system. The bay doors are often open wide during summer.

### Water Dept.

The Water Department building is not actively cooled by any mechanical system.

### 2.4.3. Ventilation

Ventilation for the Mechanic Garage and Office, Main Garage and Water Department buildings is provided by opening the large doors and windows.

### 2.4.4. Domestic Hot Water

#### Mechanic Garage and Office

There is a 30 gallon hot water heater located in the repair garage that services the bathroom in the office and slop sink. The unit is in good condition and there is no recommendation to upgrade or replace this unit.

#### Main Garage

There is a 66-gallon Rheem hot water heater in the break area that services the washer machine, showers, and sinks in the break area. The unit should be replaced with a more efficient model that is also powered by natural gas.

### Water Dept.

There is a 49-gallon Rheem electric hot water heater that services the two sinks in the building. BSG-PMK and SWA recommends a smaller more efficient hot water heater.

Category III Recommendation: ECM #3: Recommend converting the existing water heating system to natural gas.

## 2.5. Electrical systems

## 2.5.1. Lighting

Category III Recommendation: ECM #1: Recommend upgrading all of the Water Department's T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. Also recommend installing lighting sensors to certain areas where lights typically remain lit when unoccupied for long periods of time.

Category III Recommendation: ECM #2: Recommend upgrading all of the T-12 lighting fixtures in the DPW's main facility with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. Also recommend installing lighting sensors to certain areas where lights typically remain lit when unoccupied for long periods of time.

*Interior Lighting* – See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

*Exit Signs* – See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

*Exterior Lighting* – See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

## 2.5.2. Appliances and process

There are a total of 3 personal computers between all the buildings. Given the nature of the use of these buildings there are a lot of power tools used in the garages.

### 2.5.3. Elevators

There is no elevator at this facility.

### 2.5.4. Kitchen

There are no kitchens in these buildings

# 2.5.5. Other electrical systems

There are no other electrical systems in these buildings.

# 3. EQUIPMENT LIST

Mechanic Garage and Office & Main Garage

| Building<br>System | Description  | Physical<br>Location             | Make/model                                       | Fuel               | Space served                                  | Estimated<br>Remaining<br>useful life % |
|--------------------|--|----------------------------------|--|--------------------|---|---|
| Cooling            | Window A/C unit,<br>115V, 60Hz, 7.1 Apms   | Office                           | Maytag/M6X08F2B-<br>G                            | Electric           | Office  | 80%                                     |
| DHW                | 30 Gal Hot water<br>heater, located<br>between Garage<br>Doors, No information<br>could be gathered off<br>of unit     | Auto Repair<br>Garage            | ??   | Electric           | Auto Repair<br>Garage                         | 80%                                     |
| DHW                | Hot Water Heater, 66<br>gal, R-6.7   | Laundry Room<br>in Break Area    | Rheem/21V40S-2/<br>serial no. RHNG<br>0700H06438 | Natural<br>Gas     | Washer<br>Machine and<br>Sinks and<br>showers | 80%                                     |
| Domestic<br>Water  | 3 Toilets  | -                                | -  | -                  | -   | 20%                                     |
| Domestic<br>Water  | 4 Sinks  | -                                | -  | -                  | -   | 20%                                     |
| Domestic<br>Water  | Urinals  | -                                | -  | -                  | -   | 60%                                     |
| Heating            | Unit heater, Suspended from ceiling  | Auto Repair<br>Garage            | Dayton/ 3E2310                                   | Natural<br>Gas     | Auto Repair<br>Garage                         | 80%                                     |
| Heating            | Unit Heater,<br>Suspended from<br>ceiling  | Vehicle Storage                  | Modine/P1145A/<br>Serial No.<br>18011010477      | Natural<br>Gas     | Vehicle<br>Storage                            | 60%                                     |
| Heating            | Unit heater, Suspended from ceiling  | Vehicle Storage                  | Reznor   | Natural<br>Gas     | Vehicle<br>Storage                            | 60%                                     |
| Heating            | 4, Radiant Heaters,<br>Electronic Ignition   | Truck Repair<br>Garage           | Dayton/ 3E133C                                   | Natural<br>Gas     | Truck Repair<br>Garage                        | 0%                                      |
| Heating            | Waste Oil Heater,<br>Fuel Input 2.14 GPH,<br>heats up to 15,00 sq.<br>ft., 12V 60Hz,<br>16.5amps, 585<br>lbs,4,600 CFM | Truck Repair<br>Garage           | Lanair/MX300                                     | Waste<br>Motor Oil | Truck Repair<br>Garage                        | 80%                                     |
| Heating            | Unit Heater,<br>26'X30"X19-1/4", 112<br>lbs  | Break area                       | Cozy/ VC501A                                     | Natural<br>Gas     | Break area                                    | 60%                                     |
| Heating            | CG Boiler, Less than<br>12 Amps, 120 V, 60<br>Hz   | Boiler Room in<br>Break Area     | Weil-McLain/ CG-8-<br>SPDN                       | Natural<br>Gas     | Break Area                                    | 80%                                     |
| Heating            | Hydronic Unit Heater,<br>Hot water 1/3 hp,115<br>V, 1ph, 5.4 amps  | Storage Garage<br>in Break area  | Dayton/1H204/serial<br>no. 05100597-3874         | Electric           | Storage<br>Garage in<br>Break area            | 80%                                     |
| Heating            | Unit heaters (2),<br>Suspended from<br>ceiling, Hot Water,   | Carpenter's shop                 | McCord/4238C                                     | Electric           | Carpenter's shop                              | 0%                                      |
| Heating            | Boiler, Hydrotherm<br>Net Rating 173,900   | In Shed behind<br>Carpenter shop | HydroTherm/ B250                                 | Natural<br>Gas     | Carpenter's shop                              | 4%                                      |
| Heating            | Gravity Direct Vent<br>Wall Furnace  | Office                           | Louisville Tin and<br>Stove company/<br>CDV251A  | Natural<br>Gas     | Office  | 50%                                     |

## The Water Dept.

| Building<br>System | Description   | Physical<br>Location | Make/model                    | Fuel           | Space<br>served     | Estimated<br>Remaining<br>useful life<br>% |
|--------------------|---|----------------------|-------------------------------|----------------|---------------------|--|
| DHW                | Electric Water Heater,<br>49 gals   | Office               | Rheem/ 81V40D C<br>C08640     | Electric       | Sinks<br>throughout | 60%  |
| Domestic<br>Water  | 2 Sinks   | Bathrooms            | no name                       | -              | -                   | 20%  |
| Domestic<br>Water  | 2 Toilets   | Bathrooms            | o name                        | -              | -                   | 20%  |
| Heating            | 2, Infrared Radiant<br>Heaters  | Shop/Storage         | Roberts Gordon/ Vantage<br>II | Natural<br>Gas | Shop/<br>Storage    | 80%  |
| Heating            | Force hot air Furnace,<br>12 Amps   | Office               | York/P2PMPD08N04801G          | Natural<br>Gas | Office              | 30%  |
| Heating            | 2, Infrared Radiant<br>Heaters  | Pump Room            | Roberts Gordon/ Vantage<br>II | Natural<br>Gas | Pump Room           | 80%  |
| Water<br>Pumps     | 2, Baldor 40 hp<br>pumps, 208-230/460<br>V, 106-98/49 A, 1770<br>RPM, 3ph, 60Hz | Pump Room            | Baldor/ M2539T                | Electric       | Water lines         | 80%  |
| Water<br>Pumps     | Baldor Pump, 30 HP,<br>230/460 V, 72/36 A,<br>1760 RPM, 3 ph, 60<br>Hz          | Pump Room            | Baldor/ M2535T                | Electric       | Water lines         | 80%  |

**Note:** The remaining useful life of a system (in %) is the relationship between the system manufactured and / or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

## 4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA and PMK have separated the investment opportunities into three categories of recommendations:

- 1. Capital Improvements Upgrades not directly associated with energy savings
- 2. Operations and Maintenance Low Cost/No Cost Measures
- 3. Energy Conservation Measures Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- 1) Water Department- BSG-PMK and SWA recommend that the cracks be repaired and special attention be paid to probable further cracking or degradation of structural integrity.
- 2) Water Department-The wood garage door is in disrepair and should be replaced.

Category II Recommendations: Operations and Maintenance

1) All sink faucets and toilets should be converted to low-flow unit. Low-flow toilets use 1.6 gallons per flush, compared to 3.5 for standard units. Water consumptions for different types of faucets vary. These units are inexpensive, but due to the fact that public buildings in Spring Lake are not billed for water, the payback would be infinitely long, and therefore, this cannot be recommended as an ECM.

2) Water Department - BSG-PMK and SWA recommend monitoring the condition of the roof regularly.

3) Repair or Replace all loose or deteriorated weather stripping at all insulated door frames and insulated roll up doors. (Window and Door replacements are listed as ECM's under each respective building.)

Category III Recommendations: Energy Conservation Measures

| ECM # | Description  |
|-------|--|
| 1     | Lighting Upgrade (Water Department)                    |
| 2     | Lighting Upgrade (DPW Main)                            |
| 3     | Convert Water Heater to Natural Gas (Water Department) |
| 4     | 43.2-kW PV System (DPW Main)                           |
| 5     | Replace Unit Heaters and Remove Boiler (DPW Main)      |
| 6     | Upgrade Furnace (Water Department)                     |
| 7     | Upgrade Boiler (DPW Main)                              |

#### **Summary Table**

## ECM#1: Lighting Upgrade (Water Department)

### **Description:**

Lighting at the Water Department consists primarily of T-12 fluorescent bulbs with magnetic ballasts. Standard 40-watt T-12's, for example, require 48 watts of power; by comparison, equivalent 32-watt, T-8 fluorescent bulbs with electronic ballasts require 30 watts and have a near equal lighting output, reducing the energy required to power the bulb by 37.5%. It is recommended that all T-12 fixtures with magnetic ballasts be replaced with T-8 fixtures with electronic ballasts. Lighting replacement generally yields a very good payback, due to the fact that most lighting in commercial buildings is used thousands of hours per year and the installation is fairly inexpensive.

Also in the building are incandescent bulbs, of various wattages. It is recommended that these be replaced with compact fluorescents. Only a 26-watt compact fluorescent is needed to produce quantities of light equivalent to that of a 100-watt incandescent, for a 74% reduction in required energy.

Recommended lighting upgrades are detailed in Appendix A.

#### Installation cost:

Estimated installed cost: Installation: \$3,264; rebates/incentives: \$440; total: \$2,264 Source of cost estimate: Similar projects **Economics:** 

| ECM# | ECM<br>description                      | Source              | Est. Installed Cost,<br>S | Est. Incentives, S | Net Est. ECM<br>Cost with<br>Incentives, \$ | kWh, 1st Yr<br>Savings | kW, Demand<br>Reduction/Mo | Therms, 1st Yr<br>Savings | k.Buu/sq.ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, S | Total 1.st Yr<br>Savings, \$ | Life of Measure,<br>Yrs | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Payback,<br>Yrs | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Return, % | Net Present Value,<br>S | CO <sub>2</sub> Reduced.<br>Ibsiyr |
|------|---|---------------------|---------------------------|--------------------|---|------------------------|----------------------------|---------------------------|--------------------------------|--|------------------------------|-------------------------|--|------------------------|-------------------------------------|-----------------------------------|-------------------------------|-------------------------|------------------------------------|
| 1    | Lighting<br>Upgrade<br>(Water<br>Dept.) | Similar<br>Projects | \$3,264                   | \$440              | \$2,824                                     | 15,113                 | 6.67                       | 0                         | 9.55                           | \$0  | \$3,074                      | 15                      | \$36,172                                   | 0.92                   | 7872%                               | 525%                              | 109%                          | \$33,873                | 20,705                             |

#### **Assumptions:**

The electric cost used in this ECM was 0.20/kWh, which was the Water Department's average rate for the 12-month period ranging from October 1<sup>st</sup>, 2008 through September 30<sup>th</sup>, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

#### **Rebates/financial incentives:**

The New Jersey SmartStart rebate for upgrading lighting fixtures to LED exit signs and T-8 bulbs ranges from \$10 to \$20 per bulb. The total rebate this ECM qualifies for is \$440.

## ECM#2: Lighting Upgrade (DPW Main)

#### **Description:**

The DPW's lighting consists of a variety of fixtures. Some of these are T-12 fluorescent bulbs with magnetic ballasts. Standard 40-watt T-12's, for example, require 48 watts of power; by comparison, equivalent 32-watt, T-8 fluorescent bulbs with electronic ballasts require 30 watts and have a near equal lighting output, reducing the energy required to power the bulb by 37.5%. It is recommended that all T-12 fixtures with magnetic ballasts be replaced with T-8 fixtures with electronic ballasts. Lighting replacement generally yields a very good payback, due to the fact that most lighting in commercial buildings is used thousands of hours per year and the installation is fairly inexpensive.

Also in the building are incandescent bulbs, of various wattages. It is recommended that these be replaced with compact fluorescents. Only a 26-watt compact fluorescent is needed to produce quantities of light equivalent to that of a 100-watt incandescent, for a 74% reduction in required energy. There are also a few high-pressure sodium fixtures, which are recommended to be replaced with metal halides, and some halogen fixtures, which are recommended to be replaced with T-5 bulbs.

Recommended lighting upgrades are detailed in Appendix A.

#### Installation cost:

Estimated installed cost: Installation: \$10,783; rebates/incentives: \$375; total: \$10,408 Source of cost estimate: Similar projects

#### **Economics:**

| ECM# | ECM<br>description                   | Source              | Est. Installed<br>Cost, S | Est. Incentives, \$ | Net Est. ECM<br>Cost with<br>Incentives, S | kWh, Ist Yr<br>Stvings | kW, Demand<br>Reduction/Mo | Thems, 1st Yr<br>Szvings | k Bau'sq ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, S | Total Ist Yr<br>Savings, S | Life of Measure,<br>Yrs | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Paybock,<br>Yrs | Lifetime Return<br>on Investment, % | Annual Rotum on<br>Investment, % | Internal Rate of<br>Return, % | Not Present<br>Value, S | CO2 Reduced,<br>Ibs/yr |
|------|--------------------------------------|---------------------|---------------------------|---------------------|--|------------------------|----------------------------|--------------------------|--------------------------------|--|----------------------------|-------------------------|--|------------------------|-------------------------------------|----------------------------------|-------------------------------|-------------------------|------------------------|
| 2    | Lighning<br>Upgrade<br>(DPW<br>Main) | Similar<br>Projects | \$10,783                  | \$375               | \$10,408                                   | 19,417                 | 8.44                       | 0                        | 12.27                          | \$0  | \$3,322                    | 15                      | \$39,093                                   | 3.13                   | 1837%                               | 122%                             | 31%                           | \$29,253                | 26,602                 |

### **Assumptions:**

The electric cost used in this ECM was 0.17/kWh, which was the DPW's average rate for the 12-month period ranging from October 1<sup>st</sup>, 2008 through September 30<sup>th</sup>, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

## **Rebates/financial incentives:**

The New Jersey SmartStart rebate for upgrading lighting fixtures to LED exit signs and T-8 bulbs ranges from \$10 to \$20 per bulb. The total rebate this ECM qualifies for is \$375.

## ECM#3: Convert Water Heater to Natural Gas (Water Department)

#### **Description:**

Domestic hot water is provided by a Rheem electric-powered water heater, which has a volume of 49 gallons. A unit fired by natural gas would be much more cost-efficient. The current water heater is located in the same room as a gas-fired furnace, so switching to a gas-fired water heater is economically feasible.

#### Installation cost:

Estimated installed cost: Installation: \$3,500; rebates/incentives: \$50; total: \$3,450 Source of cost estimate: Contractor (Struble Mechanical Services, Fairfield, NJ)

### **Economics:**

| ECM# | ECM<br>description                           | Source  | Est. Installed Cost.<br>S | Est. Incentives, 5 | Net Est. ECM<br>Cost with<br>Incentives, 5 | kWh, 1st Yr<br>Savings | LW, Demand<br>Reduction/Mo | Therms, 1st Yr<br>Savings | kBau/sq.ft, 1st Yr<br>Savings | Eit Operating<br>Cost, Ist Yr<br>Savings, S | Total 1st Yr<br>Savings, S | Life of Measure,<br>Yrs | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Paytnck,<br>Yrs | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Return, % | Not Present Value,<br>\$ | CO <sub>2</sub> Reduced,<br>Ibs/yr |
|------|--|---|---------------------------|--------------------|--|------------------------|----------------------------|---------------------------|-------------------------------|---|----------------------------|-------------------------|--|------------------------|-------------------------------------|-----------------------------------|-------------------------------|--------------------------|------------------------------------|
| 3    | Convert<br>Water<br>Heater to<br>Natural Gas | Contractor -<br>Struble<br>Mechanical<br>Associates,<br>Fairfield, NJ | \$3,500                   | \$50               | \$3,450                                    | 4,768                  | 0                          | -151                      | 0.22                          | \$0   | \$742                      | 13                      | \$7,792                                    | 4.65                   | 968%                                | 74%                               | 19%                           | \$4,442                  | 4,764                              |

#### **Assumptions:**

Using the facility's electricity bills from October  $1^{st}$ , 2008 through September  $30^{th}$ , 2009, it was determined that the cost of electricity during the cooling season (May through September) is currently \$0.20/kWh, which is equivalent to \$5.96 per therm. By comparison, the water department pays a rate of \$1.51 per therm, making electric heat 296% more expensive.

To calculate the savings from switching from electricity to gas, a spreadsheet created by Rheem was used. The temperature rise of the heated water was set at 77°F on the spreadsheet, and the energy factor (a unit that specifies the efficiency of water heaters) is specified as 0.94 for the electric unit, although it was decreased to 0.71 (75% of the original) to account for age, and 0.62 for the gas unit.

The proposed unit would not save many more therms of energy annually than the current one, but due to the difference in electric and gas rates, would save \$671 annually and yield a 5.1-year payback.

## **Rebates/financial incentives:**

This ECM qualifies for a New Jersey SmartStart rebate of \$50.

### ECM#4: 43.2-kW PV System (DPW Main)

#### **Description:**

Currently, the Department of Public Works building does not use any renewable energy systems. Renewable energy systems, such as photovoltaic panels, can be mounted on the roof of the facility, in an open area behind the facility, and can offset a significant portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc. being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. PMK and SWA present below the economics of installing a 43.2-kW PV system to offset electrical demand for the building and reduce the annual net electric consumption for the building. A system of 216 commercial multi-crystalline 200 watt panels would generate 49,937 kWh per year, or 54.8% of the main building's annual electric bill.

#### Installation cost:

Estimated installed cost: Installation: \$302,400; rebates/incentives: \$43,200; total: \$259,200 Source of cost estimate: Similar projects

#### **Economics:**

| ECM # | ECM<br>description                    | Source              | Est. Insulled<br>Cost, S | Est. Incentives, \$ | Net Est. ECM<br>Cost with<br>Incentives, S | KWh, 1st Yr<br>Savings | kW, Demand<br>Roduction/Mo | Therms, 1st Yr<br>Savings | kBtuisq ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, S | Total 1st Yr<br>Savings, S | Life of Measure,<br>Yrs | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Payback,<br>Yrs | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Recum, % | Net Present<br>Value, S | CO2 Roduced,<br>Ibs/yr |
|-------|---------------------------------------|---------------------|--------------------------|---------------------|--|------------------------|----------------------------|---------------------------|-------------------------------|--|----------------------------|-------------------------|--|------------------------|-------------------------------------|-----------------------------------|------------------------------|-------------------------|------------------------|
| 4     | 43.2-kW<br>PV System<br>(DPW<br>main) | Similar<br>Projects | \$302,400                | \$43,200            | \$259,200                                  | 49,937                 | 16.52                      | 0                         | 20.28                         | \$8,544                                      | \$33,013                   | 30                      | \$392,664                                  | 7.85                   | 172%                                | 6%                                | 11%                          | \$206,343               | 68,414                 |

#### **Assumptions:**

Cost of installation was estimated, using data from similar projects, at \$7,000 per kW. Annual energy savings were calculated PV Watts, an online tool on the website of the National Renewable Energy Laboratory.

### **Rebates/financial incentives:**

This ECM is eligible for New Jersey's Customer On-site Renewable Energy (CORE) rebate, totaling \$43,200 at \$1,000 per kilowatt.

This ECM is also eligible for New Jersey's Solar Renewable Energy Certificates (SREC). SRECs are marketable certificates issued to the owner of a PV system for each 1,000 kWh (1MWh) of electricity generated. SRECs are sold or traded separately from the power generated; the income from the sale of the SREC can be used to offset the cost of the system by applying the revenue to a loan payment or debt service. The value of the SREC is market driven, and is controlled by the amount of the Solar Alternative Compliance Payment (SACP) which is set by the NJBPU. The SREC market is derived from New Jersey's Renewable Portfolio Standard (RPS), which requires that all licensed energy suppliers in the state invest in energy generated from renewable sources, with specific requirements for solar power. If a supplier does not invest by purchasing SRECs, the supplier must pay the SACP for a percentage of the total annual power produced. Since SRECs typically trade just below the SACP, there is an incentive for the supplier to buy SRECs. The SREC Program provides a market for SRECs to be created and verified on the owner's behalf. The New Jersey Clean Energy program facilitates the sale of SRECs to New Jersey electric suppliers. PV system owners in New Jersey with a grid-connected PV system are eligible to participate in New Jersey's SREC Program.

The NJBPU has stated its intention to continue to operate a program of rebates and SRECs, On September 12, 2007, the NJBPU approved an SREC only pilot incentive program. The program set the SACP at an initial value of \$711, decreasing annually for an eight (8) year period. SRECs would be generated for fifteen (15) years (referred to as the Qualification Life), and have a two (2) year trading life. The NJBPU believes that to achieve an internal rate of return of twelve (12) percent, the target SREC price would be \$611, reducing by three (3) percent per year for the same eight (8) year period that the SACP is set.

## ECM#5: Replace Unit Heaters and Remove Boiler (Carpenter's Shop)

#### **Description:**

Heating is provided to the Carpenter's shop by a hot water Hydrotherm boiler, which is fueled by natural gas. This boiler feeds two unit heaters, which were installed in the 1960's. The units have all surpassed their useful lives. It is recommended that the boiler and the unit heaters be replaced simply by two high-efficiency gas-fired unit heaters. This is a much cheaper option than simply replacing the whole system, as well as a more energy-efficient one.

#### **Installation cost:**

Estimated installed cost: \$23,000 Source of cost estimate: Contractor (Struble Mechanical Services, Fairfield, NJ)

#### **Economics:**

| ECM # | ECM<br>description                                 | Source  | Est. Installed<br>Cost, \$ | Est. Incentives, \$ | Net Est. BCM<br>Cost with<br>Incentives, S | kWh, 1st Yr<br>Savings | kW, Demand<br>Reduction/Mo | Therms, 1st Yr<br>Savings | ldBtu/sq ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, 5 | Total 1st Yr<br>Savings, S | Life of Measure,<br>Y is | Est. Lifeúme<br>Energy Cost<br>Savings, S | Simple Payback,<br>Y is | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Return, % | Net Present<br>Value, S | CO <sub>2</sub> Reduced.<br>Ibsiyr |
|-------|--|---|----------------------------|---------------------|--|------------------------|----------------------------|---------------------------|--------------------------------|--|----------------------------|--------------------------|---|-------------------------|-------------------------------------|-----------------------------------|-------------------------------|-------------------------|------------------------------------|
| 5     | Replace<br>Unit<br>Heaters and<br>Remove<br>Boiler | Contractor -<br>Struble<br>Mechanical<br>Associates,<br>Fairfield, NJ | \$23,000                   | 0                   | \$23,000                                   | 0                      | 0                          | 1050                      | 12.51                          | \$0  | \$1,583                    | 20                       | \$23,123                                  | 14.53                   | 3%                                  | 0%                                | 108%                          | \$553                   | 12,290                             |

#### **Assumptions:**

The cost per therm of natural gas that was used, taken from twelve months of the DPW's energy bills, was \$1.51. The annual energy consumption was calculated using the degree day method, using values of 2,259 degree days for Spring Lake, NJ, a 99.6% dry bulb heating design temperature of 10°F, and a desired indoor temperature of 50°F. The degree day and indoor temperature values are lower than a unit in, for example, an office would be, because garages are not typically kept as warm as other indoor facilities. The annual savings by the new system was the annual fuel consumption, multiplied by the difference between the efficiencies of the new and old systems. In the new system, all replacement unit heaters have a 95% efficiency; in the old system, the efficiency, due to the age and condition of the unit, was assumed to be 64%, or 80% of the original efficiency of the system, which was 80%. An additional 8% of the annual fuel consumption was added to the savings, representing the energy saved by the outdoor air reset control. The input capacity of the old boiler was 250 MBH, so the capacities of the unit heaters should be about 125 MBH.

#### **Rebates/financial incentives:**

No rebates or incentives for unit heaters were found.

## **ECM#6: Upgrade Furnace (Water Department)**

#### **Description:**

Heating is provided to the break area by a hot water York forced hot air furnace, which is fueled by natural gas. The unit has not surpassed its useful life, but is about 80% efficient, and more efficient units have been manufactured since it was installed. It is recommended that the furnace be replaced by a high-efficiency modulating unit.

### Installation cost:

Estimated installed cost: Installation: \$7,500; rebates/incentives: \$400; total: \$7,100 Source of cost estimate: Contractor (Struble Mechanical Services, Fairfield, NJ

### **Economics:**

| ECM # | ECM<br>description | Source  | Est. Installed<br>Cost, S | Est. Incentives, S | Not Est ECM<br>Cost with<br>Incentives, S | kWh, 1st Yr<br>Savings | kW, Demand<br>ReductionMo | Thoms, 1st Yr<br>Savings | kBtu/sq ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, S | Total 1st Yr<br>Savingu, S | Life of Measure,<br>Y is | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Payback,<br>Y n | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Return, % | Net Present<br>Value, 5 | CO2 Reduced,<br>Ibs/r |
|-------|--------------------|---|---------------------------|--------------------|---|------------------------|---------------------------|--------------------------|-------------------------------|--|----------------------------|--------------------------|--|------------------------|-------------------------------------|-----------------------------------|-------------------------------|-------------------------|-----------------------|
| 6     | Upgrade<br>Furnace | Contractor -<br>Struble<br>Mechanical<br>Associates,<br>Fairfield, NJ | \$7,500                   | \$400              | \$7,100                                   | 0                      | 0                         | 265.8                    | 4.92                          | \$0  | \$401                      | 20                       | \$5,850                                    | 17.73                  | -88%                                | -4%                               | 1%                            | -\$1,141                | 3,109                 |

#### **Assumptions:**

The cost per therm of natural gas that was used, taken from twelve months of the Water Department's energy bills, was 1.51. The annual energy consumption was calculated using the degree day method, using values of 5,674 degree days for Spring Lake, NJ, a 99.6% dry bulb heating design temperature of 10°F, and a desired indoor temperature of 68°F. The annual savings by the new furnace was the annual fuel consumption, multiplied by the difference between the efficiencies of the new and old units. It is recommended that a modulating furnace that is 97% efficient be purchased; in the old system, the efficiency, due to the age and condition of the unit, was assumed to be 73%, slightly less than the original efficiency of the system of the original efficiency of the system, which was about 80%.

#### **Rebates/financial incentives:**

This ECM is eligible for an NJ SmartStart rebate of \$400.

## ECM#7: Upgrade Boiler and Install Outside Air Reset Control

#### **Description:**

Heating is provided to the break area by a hot water Weil McLain CG-8 boiler, which is fueled by natural gas. The unit has not surpassed its useful life, but is only about 72% efficient. It is recommended that the boiler be replaced by a high-efficiency condensing unit. The pumps associated with the heating system, also beyond their useful lives, should also be replaced with high-efficiency units. It is also recommended that hot water outdoor air reset control be installed. These controls can decrease the hot water supply temperature during low building heating load conditions, and then reset it when the building load increases. Outdoor air reset generally decreases heating costs by 8-15%.

#### **Installation cost:**

Estimated installed cost: Installation: \$30,000; rebates/incentives: \$300; total: \$29,700 Source of cost estimate: Contractor (Struble Mechanical Services, Fairfield, NJ)

#### **Economics:**

| ECM # | ECM<br>description | Source  | Est. Installed<br>Cost, S | Est. Incentives, 5 | Not Est ECM<br>Cost with<br>Incentives, S | kWh, 1st Yr<br>Savings | kW, Demad<br>Reduction Mo | Thorns, 1st Yr<br>Savings | kBtu/sq ft, 1st Yr<br>Savings | Est. Operating<br>Cost, 1st Yr<br>Savings, S | Total 1st Yr<br>Savingt, S | Life of Measure,<br>Y 15 | Est. Lifetime<br>Energy Cost<br>Savings, S | Simple Payback,<br>Y n | Lifetime Return<br>on Investment, % | Annual Return on<br>Investment, % | Internal Rate of<br>Return, % | Net Present<br>Value, S | CO2 Reduced,<br>Ibs/r |
|-------|--------------------|---|---------------------------|--------------------|---|------------------------|---------------------------|---------------------------|-------------------------------|--|----------------------------|--------------------------|--|------------------------|-------------------------------------|-----------------------------------|-------------------------------|-------------------------|-----------------------|
| 7     | Upgrade<br>Boiler  | Contractor -<br>Struble<br>Mechanical<br>Associates,<br>Fairfield, NJ | \$30,000                  | \$300              | \$29,700                                  | 0                      | 0                         | 929.6                     | 11.07                         | \$0  | \$1,401                    | 25                       | \$23,861                                   | 21.20                  | -79%                                | -3%                               | 1%                            | -\$5,305                | 10,876                |

#### **Assumptions:**

The cost per therm of natural gas that was used, taken from twelve months of the DPW's energy bills, was \$1.51. Also taken from the energy bills was the annual heating consumption for the system, 2,312 therms (there are two boilers, about the same size, so this unit consumes about half of the facility's annual heating consumption). The annual savings by the new system was the annual fuel consumption, multiplied by the difference between the efficiencies of the new and old systems. In the new system, all replacement units have a 95% efficiency; in the old system, the efficiency of the age and condition of the unit, was assumed to be 65%, slightly less than the original efficiency of the system of the original efficiency of the system, which was about 72%. An additional 8% of the annual fuel consumption was added to the savings, representing the energy saved by the outdoor air reset control. The input capacity of the old boiler was 245 MBH, so the capacity of the new boiler will be about 250 MBH.

## **Rebates/financial incentives:**

This unit is eligible for an NJ SmartStart Rebate of \$300.

## 5. **RENEWABLE AND DISTRIBUTED ENERGY MEASURES** (facility wide)

### 5.1. Existing systems

There are currently no existing renewable energy systems.

#### 5.2. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this project and are not recommended due to the low amount of domestic hot water use throughout the building.

#### 5.3. Combined Heat and Power

CHP is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

#### 5.4. Geothermal

Geothermal is not applicable to this project because it would require modifications to the existing heat distribution system, which would not be cost effective.

#### 5.5. Wind

Initial analysis revealed that wind power production could be possible on site. SWA and BSG-PMK recommends installing an anemometer to log data about the wind speed and consistency for one year on the roof or the water tower.

### **5.6.** Solar Photovoltaic

As a result of our study, the roof of the Main Garage building has been identified as conducive for the application of a Photovoltaic (PV) system.

Based on the goal of generating as much of the building's electric load as possible utilizing renewable energy while meeting the limitations of usable space available, a PV system with a design peak output of 43.2 kW was selected. The total annual generating capacity of the system is 49,937 kWh as estimated using PV WATTS calculator provided by the Department of Energy (DOE), National Renewable Energy Laboratory (NREL).

This proposed PV system would include 216 flat, crystalline PV modules installed on the roof. The system is based on commonly used 200 Watt PV modules, and one (1) inverter for conversion to AC power.

The proposed system would generate approximately 54.8 percent of the electric power consumed annually by the Main Garage building. It is noted this system would supplement the utility power supply since PV electricity production is based on weather and the system size is limited to 54.8 percent. The estimated cost of construction would be approximately \$280,800 for this system. The approximate annual savings would be \$32,958, which would make the approximate payback 7.2 years.

### 6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

#### 6.1. Load profiles

The average electrical peak demand for the Mechanic Garage and Office building for the previous year was 13.45 kW and the maximum peak demand was 14.4 kW. The average electrical peak demand for the Main Garage building for the previous year was 30.1kW and the maximum peak demand was 34.2 kW. The average electrical peak demand for the Water Dept. building for the previous year was 1.7 kW and the maximum peak de mand was 5.3 kW. The electric and gas load profiles for this project are presented in the following charts. The first set of charts show electric demand (in kW) for each building for the previous 12 months and the other two sets of charts show electric and gas usage (in kWh) for each building, respectively.



The Mechanic Garage and Office



The Main Garage









The Main Garage Building



The Water Department Building



The DPW facility

Currently, New Jersey commercial buildings of similar type pay \$0.150/kWh for electricity and \$1.55/therm for natural gas. The average electricity rate for the buildings is \$.18/kWh, which means there is a p otential cost savings of \$3,780 per year. The gas rate for the building is \$1.51/therm which is better than the average gas cost. A small cost savings potential for electricity exists, how ever this involves contacting third party suppliers and negotiating utility rates. S WA recommends that the Borough of Spring Lake further explore opportunities of purchasing electricity from third party e nergy suppliers i n o rder to r educe r ate f luctuation a nd ul timately r educe t he annual cost of energy for the building. Appendix B contains a complete list of third party energy suppliers for the Borough of Spring Lakes service area.

## 6.2. Energy Procurement strategies

Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs)

that can act as third party energy suppliers. Purchasing electricity from an ESCO can reduce electric rate fluctuation and ultimately reduce the annual cost of energy for the school. Appendix B contains a complete list of third party energy suppliers.



The Mechanic Garage and Office Building







Electricity prices reflect electricity usage



Natural gas prices fluctuate as expected with usage

## 7. METHOD OF ANALYSIS

### 7.1. Assumptions and methods

| Energy modeling method: | Spreadsheet-based calculation methods                              |
|-------------------------|--|
| Cost estimates:         | RS Means 2009 (Facilities Maintenance & Repair Cost Data)          |
|                         | RS Means 2009 (Building Construction Cost Data)                    |
|                         | RS Means 2009 (Mechanical Cost Data)                               |
|                         | Note: Cost estimates also based on utility bill analysis and prior |
|                         | experience with similar projects.                                  |

## 7.2. Disclaimer

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

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

# Appendix A: Lighting study

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# Appendix B: Third Party Energy Suppliers (ESCOs)

| Third Party Electric Suppliers for PSEG Service | Telephone & Web Site        | Third Party Gas Suppliers for Elizabethtown | Telephone & Web Site      |
|---|-----------------------------|---|---------------------------|
| Hess Corporation                                | (800) 437-7872              | Cooperative Industries                      | (800) 628-9427            |
| 1 Hess Plaza                                    | (000) 437-7672              | 412-420 Washington Avenue                   | www.cooperativenet.com    |
| Woodbridge NL07095                              | www.ness.com                | Belleville NI 07109                         | www.cooperativenet.com    |
| American Powernet Management I P                | (877) 977-2636              | Direct Energy Services LLC                  | (866) 547-2722            |
| 437 North Grove St                              | www.americanpowernet.com    | 120 Wood Avenue, Suite 611                  | www.directenergy.com      |
| Berlin, NJ 08009                                |                             | Iselin, NJ 08830                            |                           |
| BOC Energy Services. Inc.                       | (800) 247-2644              | Gateway Energy Services Corp.               | (800) 805-8586            |
| 575 Mountain Avenue                             | www.boc.com                 | 44 Whispering Pines Lane                    | www.gesc.com              |
| Murray Hill, NJ 07974                           |                             | Lakewood, NJ 08701                          |                           |
| Commerce Energy, Inc.                           | (800) 556-8457              | UGI Energy Services, Inc.                   | (856) 273-9995            |
| 4400 Route 9 South, Suite 100                   | www.commerceenergy.com      | 704 East Main Street, Suite 1               | www.ugienergyservices.com |
| Freehold, NJ 07728                              |                             | Moorestown, NJ 08057                        |                           |
| ConEdison Solutions                             | (888) 665-0955              | Great Eastern Energy                        | (888) 651-4121            |
| 535 State Highway 38                            | www.conedsolutions.com      | 116 Village Riva, Suite 200                 | www.greateastern.com      |
| Cherry Hill, NJ 08002                           |                             | Princeton, NJ 08540                         |                           |
| Constellation NewEnergy, Inc.                   | (888) 635-0827              | Glacial Energy of New Jersey, Inc.          | (877) 569-2841            |
| 900A Lake Street, Suite 2                       | www.newenergy.com           | 207 LaRoche Avenue                          | www.glacialenergy.com     |
| Ramsey, NJ 07446                                |                             | Harrington Park, NJ 07640                   |                           |
| Credit Suisse, (USA) Inc.                       | (212) 538-3124              | Hess Corporation                            | (800) 437-7872            |
| 700 College Road East                           | www.creditsuisse.com        | 1 Hess Plaza                                | www.hess.com              |
| Princeton, NJ 08450                             |                             | Woodbridge, NJ 07095                        |                           |
| Direct Energy Services, LLC                     | (866) 547-2722              | Intelligent Energy                          | (800) 724-1880            |
| 120 Wood Avenue, Suite 611                      | www.directenergy.com        | 2050 Center Avenue, Suite 500               | www.intelligentenergy.org |
| Iselin, NJ 08830                                |                             | Fort Lee, NJ 07024                          |                           |
| FirstEnergy Solutions                           | (800) 977-0500              | Metromedia Energy, Inc.                     | (877) 750-7046            |
| 300 Madison Avenue                              | www.fes.com                 | 6 Industrial Way                            | www.metromediaenergy.com  |
| Morristown, NJ 07926                            |                             | <br>Eatontown, NJ 07724                     |                           |
| Glacial Energy of New Jersey, Inc.              | (877) 569-2841              | MxEnergy, Inc.                              | (800) 375-1277            |
| 207 LaRoche Avenue                              | www.glacialenergy.com       | 510 Thornall Street, Suite 270              | www.mxenergy.com          |
| Harrington Park, NJ 07640                       |                             | Edison, NJ 08837                            |                           |
| Metro Energy Group, LLC                         | (888) 536-3876              | NATGASCO (Mitchell Supreme)                 | (800) 840-4427            |
| 14 Washington Place                             | www.metroenergy.com         | <br>532 Freeman Street                      | www.natgasco.com          |
| Hackensack, NJ 07601                            | (977) 763 0077              | <br>Drange, NJ 07050                        | (900) 262 7400            |
| Integrys Energy Services, Inc.                  | (877) 763-9977              | 112 Main Street                             | (800) 383-7499            |
| Isolin N108830                                  | www.integrysenergy.com      | Lebanon NL 08833                            | www.pepco-services.com    |
| Liberty Power Delaware LLC                      | (866) 769-3799              |   | (800) 281-2000            |
| Park 80 West Plaza II. Suite 200                | www.libertypowercorp.com    | 811 Church Road                             |                           |
| Saddle Brook NJ 07663                           | www.inbertypowereoip.com    | Cherry Hill NJ 08002                        |                           |
| Liberty Power Holdings LLC                      | (800) 363-7499              | South Jersey Energy Company                 | (800) 756-3749            |
| Park 80 West Plaza II. Suite 200                | www.libertypowercorp.com    | One South Jersey Plaza, Route 54            | www.southiersevenergy.com |
| Saddle Brook, NJ 07663                          |                             | Folsom, NJ 08037                            |                           |
| Pepco Energy Services. Inc.                     | (800) 363-7499              | Spraque Energy Corp.                        | (800) 225-1560            |
| 112 Main St.                                    | www.pepco-services.com      | 12 Ridge Road                               | www.spraqueenergy.com     |
| Lebanon, NJ 08833                               |                             | Chatham Township, NJ 07928                  |                           |
| PPL EnergyPlus, LLC                             | (800) 281-2000              | Woodruff Energy                             | (800) 557-1121            |
| 811 Church Road                                 | www.pplenergyplus.com       | 73 Water Street                             | www.woodruffenergy.com    |
| Cherry Hill, NJ 08002                           |                             | Bridgeton, NJ 08302                         |                           |
| Sempra Energy Solutions                         | (877) 273-6772              |   |                           |
| 581 Main Street, 8th Floor                      | www.semprasolutions.com     |   |                           |
| Woodbridge, NJ 07095                            |                             |   |                           |
| South Jersey Energy Company                     | (800) 756-3749              |   |                           |
| One South Jersey Plaza, Route 54                | www.southjersevenergy.com   |   |                           |
| Folsom, NJ 08037                                |                             |   |                           |
| Sprague Energy Corp.                            | (800) 225-1560              |   |                           |
| 12 Ridge Road                                   | www.spragueenergy.com       |   |                           |
| Chatham Township, NJ 07928                      |                             |   |                           |
| Strategic Energy, LLC                           | (888) 925-9115              |   |                           |
| 55 Madison Avenue, Suite 400                    | www.sel.com                 |   |                           |
| Morristown, NJ 07960                            |                             |   |                           |
| Suez Energy Resources NA, Inc.                  | (888) 644-1014              |   |                           |
| 333 Thornall Street, 6th Floor                  | www.suezenergyresources.com |   |                           |
| Edison, NJ 08837                                |                             |   |                           |
| UGI Energy Services, Inc.                       | (856) 273-9995              |   |                           |
| 704 East Main Street, Suite 1                   | www.uqienergyservices.com   |   |                           |
| Moorestown, NJ 08057                            |                             |   |                           |

# **Appendix C: Historical Utility Billing Data**

## **Electric:**

# **Mechanic Garage and Office**

| Press of String Lake     |              |            | And in Factor |           | 00%          |            |         |                      |                   |                   |
|--------------------------|--------------|------------|---------------|-----------|--------------|------------|---------|----------------------|-------------------|-------------------|
| 1856                     |              |            |               | 100       |              |            |         |                      | 51                | 1                 |
| Westmanner<br>Westmanner |              |            | hhi           | 0.02      |              |            |         |                      |                   |                   |
| Firm.                    | 14.          | Mil Faint  | March Your    | Magi Adde | Encount Alle | Bagan: Law | hi- 900 | Ext Bandi of Westman | Pulad Loope start | Aug. Later 7.7559 |
| ALDert                   | 3.9089       | - 8155 W   | - tipel       | 5.89      |              | 11.04/9    | 177     | 144                  | 28                | 818               |
| 28/2/2007                | WYNL/PRO     | United.    | dant?         | 3.847     | . 266        | 75.489.79. | 644     | 1.84                 |                   | 0128              |
| 25/5/2007                | 11/30-0007   | 61/21/11   | . 88-81       | 5-879     | 314          | 10.052.34  | 401     | 1.84                 | 28                | 01.25             |
| 10/10/0007               | 540 507 2007 | ARISH &    | 78-47         | 340       | 82           | 14.84316   | 10      | 1.00                 |                   | 0.0               |
| in the paper             | \$15433999   | \$129.00   | 100-00        | 1346      | 81.8         | 11.45%     | 100     | 1.84                 | in                | (3.14             |
| 0/1/2000                 | 2129/2008    | 205.00     | Peternet      | 32.2%     | 814          | 0.75218    | 194     | 1.84                 | 28                | 0128              |
| -0/1/2484                | WILLIPPE     | ALC: N     | - the still   | 6:129     | 46.6         | 01.279.29  | 974     | 1.84                 |                   | 01.25             |
| -011/2499                | 410/2008     | \$125.000  | 10.000        | 11.10     | 81           | 10,722,94  | 107     | 1.00                 | 27                | 0.0               |
| 5372400                  | 6/11/2000    | 11400      | 5Au-46        | 4.89      | 42.5         | 1407.51    | 34      | 1.000                | 59                | 85.02             |
| - 9/1/2009               | sith/blee    | \$15.84    | 1445          | 7.40      | 11.0         | 11.499.04  |         | 1.89                 | 18                | 1815              |
| 61413484                 | 7510844      | 2116-04    | 114-44        | 5.88      | -26.5        | 10.452.08  | 14      | 1.80                 | 58                | 9.4               |
| 6/3/2019                 | 8121.2299    | ALC: NO    | ikig-68 .     | 1.84      | 制品           | 25,588,88  | 48      | 1.80                 |                   | 1912              |
| - 101000                 | 615264       | bret-ma    | iep-ti-       | 1.86      |              | 11/4-60    | 14      | 1.48                 | 28                | 10.25             |
| - Main Sept-             | (8/3L/2844   | oktowe.    | 0.044         | 1 au      | 314          | 10,000.04  | 100     | 2.46                 |                   | 19034             |
| 01/0/0446                | 0.067666     | 1111-101   | mar dit .     | 1.80      | 31.0         | 11,488,39  | 5.841   | 2.44                 |                   | 19.14             |
| add ( fame)              | 101072686    | 100104700  | Decide        | 8.15      |              | 71,404-34  | Tarti   | 2.46                 |                   | 195.54            |
| 0/1/2400                 | \$131/36/8   | gran/da    | 'speak'       | 8.58      | 81.0         | 11,400 %   | - 4.56  | 2.44                 |                   | 18.42             |
| 3/3/2499                 | Anter anell  | 2714-04    | 246-07        | 116       | 48.2         | 71,448,75  | 14      | 2.44                 |                   | 19.43             |
| - 3/3/2488               | 3.12.2046    | 3."Lartes  | atp-di-       | 1.40      | 315          | 10,54214   | 40      | 2.44                 |                   | 194.64            |
| - A/3/2488               | 630340       | \$125-04   | 40-01         | 3.25      | 364          | 11.48.28   | 174     | 2.86                 | 23                | 196.3A            |
| · 8/3/2499               | 3/72.3244    | 0.716-010  | 100000        | 1.508     | 31.5         | 11,0477    | 140     | 2.44                 |                   | 38.47             |
| - A/3/2488               | 67403940     | m115-04    | 100.05        | 1.74      | 214          | 10.007.02  | 1.00    | 2.44                 | 23                | 20.64             |
| 2/3/2488                 | 1112-3246    | the second | 1444          | 1.80      | 344          | 10,246,34  | F-1     | 2.44                 |                   | 36.68             |
| A/1/2009                 | Artur2944    | AT A LOT   | 84991         | 6.26      | .27.6        | 11,217,45  | 1       | 2.89                 | - 2               | 19.28             |

# **Main Garage**

| Brendt of Samplake   | hard Server |
|--|-------------|
| 1250   | in int 17   |
| The and Mader Ave.   | AN OID      |
| Solding of the second s |             |

| 1.1 | Film:        | 14                 | mature      | March Taxa | Ungi Adle | Encoded AM | Bugah: Lauf | 5.c  | 911   | Est Bandiad Whiteast | · Paint Loope start | Aug. 144 33369 |
|-----|--------------|--------------------|-------------|------------|-----------|------------|-------------|------|-------|----------------------|---------------------|----------------|
|     | ALIMIT       |                    | 8125/92     | - tipe of  | 5.89      |            | 11,049      | 1000 | -147  | 1.000                | 28                  | 818            |
| _   | - understand | ANY ALL PROPERTY.  | University  | danit.     | 1.847     | 366        | 75.489.79.  |      | 84    | 1.000                |                     | 0121           |
|     | 21/1/2007    | 11/10/0807         | GUIDER!     |            | 6.429     | 314        | 10.052.46   |      | 401   | 1.000                | 28                  | 01.25          |
|     | 10.000       | 14150/2007         | ARSHIEL     | 28.42      | 3.46      | 812        | 16-89-216   |      | 44    | 1.000                | - 10                | 0.0            |
|     | in the passe | STREET, MARK       | \$129.00    | 100-00     | 2.016     | 81.8       | 11.45%      |      | 100   | 1.000                | 14                  | 10.44          |
|     | 0/1/2000     | 2129/2008          | 2125-00     | Patient    | 32.296    | 814        | -01.75aM    |      | 194   | 1.000                | 28                  | 0121           |
|     | 0/1/2000     | WILLINGS.          | 8136/84     | - the oti  | 4:129     | 46.6       | 01.279.291  |      | 174   | 1.000                |                     | 01.25          |
|     | 4/1/2000     | 41022086           | 4125/00     | 100.00     | 16.00     | 81         | 10,722,94   |      | 157   | 1.000                | 28                  | 0.0            |
|     | 53/2000      | 6/11/2000          | \$150.000   | 55m-46     | 4.89      | 42.5       | 1407-11     |      | 44.   | 1.000                |                     | 05.02          |
|     | - %/1/2000   | sith/stee          | \$15.84     | 0.0.45     | 7.48      | 10.0       | 11.09.04    |      |       | 1.89                 | 10                  | 18.15          |
| _   | 61413484     | 7310800            | Trisilia    | 114-44     | 5.88      | 35.5       | 10.452.08   |      | 14    | 1.80                 | 58                  | 94.00          |
|     | 6:313999     | 8171,7299          | ALC: N      | ing-66     | 1.84      | 制品         | 15,548,02   | _    | 40    | 1.80                 |                     | 19115          |
|     | -9110400     | 615,044            | britini     | lep-ti-    | 1.86      | 214        | 1104480     | -    | 18    | 1.48                 | - 24                | 10.24          |
|     | - SALE DERIV | (0732/2014         | phileses.   | 0.046      | 1 mil     | 364        | 10,04,94    |      | 40    | 2,460                |                     | 190.04         |
|     | 010030444    | 0.067696           | same.       | 100.00     | 1.80      | 31.0       | 35,488,39   |      | - 341 | 2.44                 | 20                  | 38.14          |
|     | agrations)   | 101072696          | 00010000    | Decide     | 8.15      |            | 71,404.04   |      | 1174  | 2.46                 |                     | 196.3A         |
|     | 6/1/24w0     | \$131/34/8         | granda      | 'specific  | 8.08      | 41.1       | 11.444.45   |      | 44    | 2.486                |                     | 38.42          |
|     | 3/3/2000     | And a state of the | 273,8194    | 246-05     | 134       | 44.2       | 71,448.75   |      | 14    | 2,460                |                     | 18.47          |
|     | - 3/3/2000   | 3.12.2046          | 3.734/018   | ata-di-    | 1.40      | 3816       | 10,102/06   |      | 410   | 2.466                |                     | 194.64         |
|     | - A/1/2000   | 6.002041           | \$25.04     | 40-01      | 3.218     | 364        | 11.449.28   |      | 174.  | 2.46                 | 20                  | 196.3A         |
|     | - R/3/2488   | 3/72/2004          | 0.7 140-004 | - Marcala  | 1.508     | 31.8       | 11,0477     |      | 160.1 | 2.446                |                     | 38.47          |
|     | A/1/2008     | 6'least            | m115-04     | 1000       | 1.74      | 214        | 10.00142    |      | 14    | 2.44                 | 29                  | 20.64          |
|     | 7/2/2000     | 7.32.3244          | diam'r      | 100.00     | 1.88      | 314        | 10.202.34   |      | · E   | 2.44                 |                     | 36.68          |
|     | ACCOURT NO.  | Arts12044          | ATTACH4     | 1000       | 4.86      | 37.6       | 71,217,41   |      | -     | 2.89                 |                     | -19.28         |

# Water Dept.

| Burragh of Spring Lake .   | Accest Surger 100/1000033096  |
|--|---|
| 1810   | a basi  |
| miguae active  | And BID   |
| and the second sec | a second s |

| These       | 78         | Midfund   | Math Ivy | Alongo detter | Fernand #W6 | Beautiet  | No.  | 1968   | Pet Dourtood Millionatio | Partiel and interior | 213 100 5385 |
|-------------|------------|-----------|----------|---------------|-------------|-----------|------|--------|--------------------------|----------------------|--------------|
| 103.2001    | 10011000   | 10/06/47  | (19.4)   | 1400          | 393         | (145.26   | 10.0 | 100    |                          |                      | 100          |
| 14/1/1017   | STREET.    | 10.00     | 00-01    | 10            | 1881        | DAMES .   |      | - 447  |                          | 10                   | 19.46        |
| 10101000    | (Arthorem) | 1010001   | 84-81    | 244           | 11.1        | 10458     |      | 100    |                          | 10                   | 10.00        |
| 0/112484    | 37337-0146 | 1000      | 110-00   | 204           | 347         | 2249-60   |      | -      | - 14                     |                      | 9.0          |
| 0/1/2009    | 225.098    | 275.00    | 110-00   | 525           | 411         | 1400.00   |      | 1 101  | *                        | 18                   | 94.04        |
| 0/1/2000    | 0.0123000  | 10100     | 014.00   | 101           | 11.1        | 0.0041    |      | 004    | 10                       |                      | 10.04        |
| 4/110499    | 434044     | 415100    | 40-08    | 8.95          | 311.0       | 2144.46   |      | (04)   | 96.                      | JH.                  | 0.14         |
| - B/02/2000 | 0171218246 | 103400    | 140-40   | 223           | 4.0         | -024.4.48 |      | 28.0   | . 40                     | (m.                  | 38,88        |
| 9/1/2009    | 11000      | Vthee     | (and     | 10            | 44          | iteral -  |      | 10     | 10                       | 24                   | 9144         |
| 1/1/2000    | 10120244   | CODE NO.  | 24.07    | 101           | 44.1        | 11177-08  |      | 1 P.   |                          | 10                   | 19035        |
| 6/3/3499    | 010.044    | \$12.00   | aug th   | URL:          | 3.4         | 1444.78   |      | 14     | - 54                     |                      | 3424         |
| - Aratisese | 3.36,266   | 101144    | ling-dd. | 146           | 34.         | 1173-04   |      | 44     |                          | 28                   | 3546         |
| -9850000    | 2/10/2014  | Street.   | 100.05   | 116           | 32          | 1262.95   |      | 7#     | - N                      | ¥.                   | 10.12        |
| 253,3490    | 0/36364    | 14110-014 | Aurel    | 308           | 144         | 254       |      | 10     |                          | 10                   | 12.54        |
| 12/12/2000  | 101011046  | 10110-06  | 0104     | 204           | .67         | 1822-68   |      | -141   |                          |                      | 10.20        |
| 8/322466    | 171/399    | 170.01    | 100.00   | 100           | 3.8         | (date)    |      | ( with |                          | W                    | 10.25        |
| 8/2/2000    | 1115-044   | 10.69     | 118-07   | 375           | 11          | 1004      |      | the l  | 100                      | 27                   | 19.18        |
| 5/12/2489   | 6.12.0947  | \$150 H   | 544-44   | 274           | 10          | 100.00    |      | 141    | 19                       | 14 C                 | 10.15        |
| 9,212666    | 414.341    | 425.04    | 100.00   | 291           | 114         | (81.49    | _    | 40     | - 10                     | 29                   | 902          |
| 6/1/2009    | trap (see  | 1/21/191  | 074-97   | - 204         |             | (36.8)    |      | 140    |                          |                      | 948          |
| 6/11/0489   | 6.00.044   | MIN IN    | Excel 1  | 301           | 10          | 10011     |      | 10     | 10                       | 28                   | 10.14        |
| Rig(Deee    | 10113244   | 1110.000  | 44.63    | 3.04          | . 4.4       | (10.4)    |      | -      | Pa.                      | (H)                  | (0.14        |
| A/322688    | A172/2046  | \$04.04   | Aug 44   | -86           | 145         | 104.46    |      | 1      | (h)                      | 38.                  | 10.05        |
| 9/1/2000    | 1000       | \$15.04   | 110-00   | 96            | 84          | 100.00    |      | 44     | - 80                     | 29.                  |              |

## **Natural Gas:**

| A.C. Brandston | 10-10-10-10-10-10-10-10-10-10-10-10-10-1 | 10.00 |                                     |
|----------------|--|-------|-------------------------------------|
| A40            |  |       | * Had annual to be while difference |
| Yama a         | - here i                                 |       |                                     |
| w              | 10.00                                    |       |                                     |
|                |  |       |                                     |

| from          | The second                  | Mill Period | 1258 | Maga Burnet           | Sum Calif (St | Angene | NO   | Patted Longfit Mayne | Barny day | hteroph 544 | Jirg Bate & thermal |
|---------------|-----------------------------|-------------|------|-----------------------|---------------|--------|------|----------------------|-----------|-------------|---------------------|
| WORKSHIP .    | 30195/3947                  | 36/64/97    |      | 193,342               | 210.0         |        | 1447 | - 19                 | 2.518     | 2.16        | 115                 |
| 20130-2002    | 11/16/345                   | 10.2492     |      |                       | 8544,78       |        | 141  | 21                   | 100.000   | 3473        | 11.#                |
| 11/10/2007    | 12/22/2001                  | 122/24/80   |      | THE OWNER.            | BY 245-22     |        | -    |                      | - 1844BT  | 3 610       | ±2 #                |
| 11/22/3867    | A-becarde                   | 94740/94    |      | 10114-314             | \$X,955.84    |        | 100  | 26                   | No LET    | 4.989       | 13-46               |
| alps/bete     | 0.14.0010                   | an line and |      | EDE MIN.              | B1 201 87     |        | -14  | 38                   | 107.044   | 4.65        | 10.00               |
| - singlemin   | 10002048                    | 10.01208    |      | 10.0454               | 10.000        |        |      | 18                   | 11100     | 3.055       | 11.00               |
| 1000000       | 0115/2010                   | 1446276     |      | 100.040               | alter al      |        |      | 16                   | 19.294    | 1.157       | 18-87               |
| 8/14/2018     | 1115/2018                   | 100.000     |      | 100000                | 4000          |        | 100  | 38                   | 4.910     | 2488        | 14.55               |
| BISS GRAD     | arbitidees.                 | 05712/06    |      | 10.000                | 100.000       |        | 44   | - 20                 | 0.014     | 1.146       | 11.09               |
| 4/23/2048     | Riberbeim                   | 40.94.08    |      |                       | 10.00         |        | 1.21 | .38                  | 0.000     | 3.489       | 195711              |
| 5/24/2498     | areactees.                  | 0130.00     |      | 18-261                | 117.00        |        | 44.  | 128                  | 0.54      | 1.348       | 11.0                |
| 1873-872/0998 | 10111/2008                  | 04729/94    |      | 2.55                  | 400.0         |        |      | 19                   | 10.5      | 0.825       | 10.56               |
| WALLERS       | TRANSPORT                   | 0412939     |      | 12.550                | 43334         |        | 104  | 10                   | 8.107     | 1014        | 0.00                |
| TRUE OWNER    | Aurizones.                  | 00000       |      | 144,000               | 8812-64       |        | 100  | 12                   | 10/701    | 1144        | 71.40               |
| ALCO NO.      | B108AG668                   | 11/20/08    |      | 815,741               | 8778-20       |        | 141  | 34                   | 10.000    | 1.444       | 18.44               |
| ATTACONS      | 1.1/35/2018                 | 44734-008   |      | 114 444               | BC 1980-000   |        | 100  |                      | 10.441    | 8.410       | 10.40               |
| 1/10/10/0894  | 3/3415858                   | 41.129-04   |      | and the second second | ALCOST TH     |        | 100  | 34                   | 27.240    | 4348        | 23. ini             |
| 1.875310868   | 0/2315848                   | 03/28/88    |      | ALC: NO.              | 81.440.00     |        | 141  | 11                   | 10.101    | 8.00        | 34.81               |
| ALC: None     | 4/21/2014                   | 000108      |      | cards 4 and           | ALCONT OF     |        | 411  | 35                   | 41.000    | 2.845       | 21.44               |
| withtness     | A/14/1004                   | 48,82,94    |      | 1000                  | ALCON M.      |        | 104  | 11                   | 6.004     | 3.84        | 18.47               |
| A/aarbeete    | \$1 bel 2008                | 10.01.00    |      | 10.000                | 144           |        |      | 14                   | 9.611     | 8,000       | 10.00               |
| Arkh/Detti    | Arbit Sette                 | an have     |      |                       | 111.00        |        | 100  | 10                   | 1.000     | 1.000       | 24.44               |
| Arith Linese  | and a local division of the | ant-sh-hab  |      |                       | Ber Ki        |        | 4    |                      | 1.14      | 1.04        |                     |
| argh/beeg     | WYN/2mm                     | 8414119     |      | 10-000                | Ann III       |        |      | 11                   | is inter  | 8.744       | 10.77               |