Local Government Energy Audit:
Energy Audit Report

Firehouse

City of Jersey City

160 Grand Street

Jersey City, NJ 07302

February 19, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Firehouse located at 160 Grand Street in Jersey City, New Jersey. The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist Jersey City in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

The Firehouse at 160 Grand Street is a 1,800 square foot facility comprised of an apparatus floor (engine bay area), dormitories for the firefighters, a commercial kitchen and mechanical rooms in the basement. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated five (5) measures which together represent an opportunity for the Firehouse to reduce its annual energy costs by $2,265 and its annual greenhouse gas emissions by 17,382 lbs CO_2e. We estimate that the measures would likely pay for themselves in energy savings in about 2 years. The breakdown of current energy costs versus potential energy costs after the proposed upgrades are shown in Figure 1 and Figure 2, respectively. We estimate that the recommended measures would reduce annual energy usage at the Firehouse by about 15.0%.

Figure 1 – Previous 12 Month Utility Costs

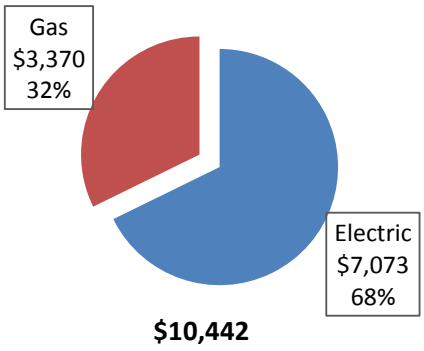
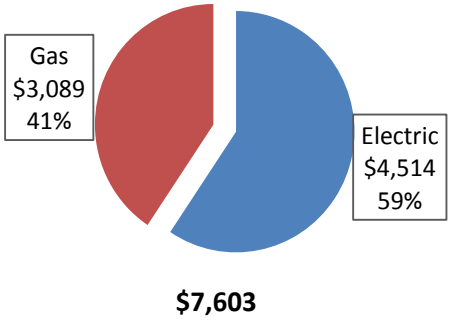


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Firehouse's existing energy use can be found in Section 3.

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual ECMs can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**12,489**	**1.6**	**0.0**	**$1,804.33**	**$3,328.29**	**$200.00**	**$3,128.29**	**1.73**	**12,576**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	7,298	0.9	0.0	$1,054.36	$2,073.90	$0.00	$2,073.90	1.97	7,349
ECM 2	Retrofit Fixtures with LED Lamps	Yes	5,191	0.7	0.0	$749.97	$1,254.39	$200.00	$1,054.39	1.41	5,227
Lighting Control Measures			**883**	**0.1**	**0.0**	**$127.62**	**$232.00**	**$40.00**	**$192.00**	**1.50**	**890**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	883	0.1	0.0	$127.62	$232.00	$40.00	$192.00	1.50	890
Electric Unitary HVAC Measures			**364**	**0.1**	**0.0**	**$52.54**	**$1,088.76**	**$0.00**	**$1,088.76**	**20.72**	**366**
ECM 4	Install High Efficiency Electric AC	Yes	364	0.1	0.0	$52.54	$1,088.76	$0.00	$1,088.76	20.72	366
Domestic Water Heating Upgrade			**0**	**0.0**	**30.3**	**$280.96**	**$192.94**	**$0.00**	**$192.94**	**0.69**	**3,550**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	30.3	$280.96	$192.94	$0.00	$192.94	0.69	3,550
TOTALS			**13,736**	**1.8**	**30.3**	**$2,265.44**	**$4,841.99**	**$240.00**	**$4,601.99**	**2.03**	**17,382**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when conditions allow. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Electric Unitary HVAC measures generally involve replacing old inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide cooling equivalent to older air condition systems, but use less energy. These measures save energy by reducing the power used by the air condition system due to improved electrical efficiency.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses. Measures in this category mas also include installation of certain “low-flow” devices that are designed to reduce excessive water usage. By cutting overall water usage the amount of energy needed to heat domestic hot water is also reduced.

Energy Efficient Practices

TRC also identified five (5) low cost (or no cost) energy efficient practices. A facility’s energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified for the Firehouse include:

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule

- Perform Proper Boiler Maintenance
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installation of on-site generation at the Firehouse. Based on the configuration of the site and its electric and thermal loads there appears to be a low potential for installing a solar PV array or combined heat and power (CHP) system. For details on our evaluation and the self-generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Mercer	Assistant Business Administrator	jmercer@jcnj.org	201-547-4417
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 12, 2015, TRC performed an energy audit for the Firehouse at 160 Grand Street in Jersey City, New Jersey. TRC's team met with Chief Battalion Michael Conforti to review the facility operations and focus the investigation on specific energy-using systems.

The Firehouse at 160 Grand Street is a 1,800 square foot facility. The building was constructed in 1850. Interior space is comprised of an Apparatus floor (engine bay area), dormitories for the fire fighters, a commercial kitchen and mechanical rooms in the basement.

2.3 Building Occupancy

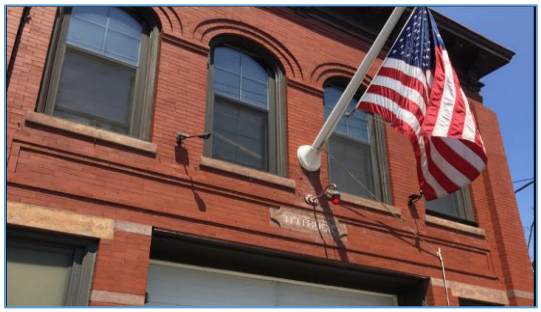
The apparatus floor and the dormitories, including the kitchen are functional and occupied all year round. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Firehouse	Weekday	8AM - 8AM
Firehouse	Weekend	8AM - 8AM

2.4 Building Envelope

The building exterior is brick masonry and the interior construction is wood and Stucco. It has a flat roof and framed windows. The building is old and show signs of air infiltration. The apparatus floor has a garage doors for the access of the fire engines.



Building envelope

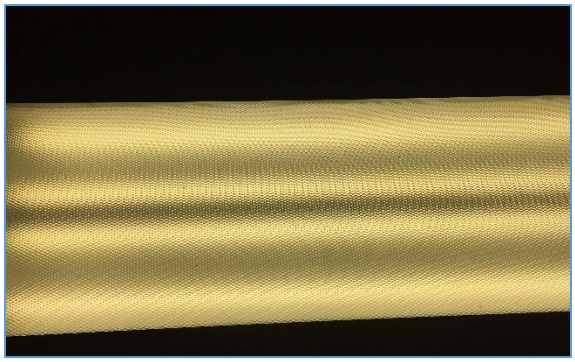
2.5 On-site Generation

The Firehouse does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided predominately by linear fluorescent T12 and T8 lamps as well as incandescent lamps. Lighting control in most spaces is provided by wall switches. It is recommended that the facility install occupancy sensors only in the captain's office and dormitory. The occupancy sensors can be either wall or ceiling mounted depending on the space layout.



4-foot, 4-lamp T12 light fixture

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Hot Water / Steam System

The hot water system consists of one (1) Weil McLain boiler with an output capacity of 209 MBh. The boiler is 12 years old and has a nominal combustion efficiency of 82%. The apparatus floor does not have any unit heaters and are assumed to be heated using the main boiler. As this area has a high ceiling and heat losses through the garage doors, the heating may be inadequate and inefficient. We recommend the facility to install a separate low intensity infrared (IR) tube heaters for the engine bay. These are more efficient because they do not heat the entire volume of air but just the people and the objects. They can also be concentrated to smaller areas instead of being installed in a common area at great heights.

Weil Mclain boiler at the basement

Air Conditioning (DX)

The Firehouse has one (1) Mitsubishi split system serving the kitchen and recreation area in the ground floor. This unit is 1.5 ton and has an SEER rating of 15.3. The unit was recently installed and in good working condition. The dormitory has a window Ac system (Frigidaire) and a plug-in air cooler which serves the area. The window AC is an older 1-ton unit with a SEER rating of 11. Our recommendation is to replace this with a more efficient unit.

Window AC in the dormitory

Plug in air-cooler in the dormitory

Domestic Hot Water

The domestic hot water system for the facility consists of one (1) Bradford White gas fired hot water heater with an input capacity of 40,000 Btu/hr each and a nominal efficiency of 78%. The water heater has a storage capacity of 48 gallons. The recirculation pumps operate continuously.

Bradford White domestic hot water heater unit

Plug Load & Vending Machines

The major plug load in the Firehouse consists of four (4) computers, two (2) printers, air coolers, televisions, laundry, and kitchen equipment. They account for about 3% of the energy consumption in the Firehouse. There is no centralized PC power management software installed.

2.7 Water-Using Systems

There is one (1) restroom at the facility. Faucets and showerheads are rated for 3 gallons per minute (gpm). Replacement of these fixtures with low flow devices could provide significant domestic hot water savings. Another simple solution would be attaching aerators to the faucets which reduces the faucet water flow rates, thereby reducing the water usage and energy needed to generate hot water.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost/ft^2 and energy use/ft^2. These energy use indices are indicative of the relative energy effectiveness of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy use for other facilities identified as: Fire/Police Station. Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. Please refer to the Benchmarking section within Section 0 for additional information.

3.1 Total Cost of Energy

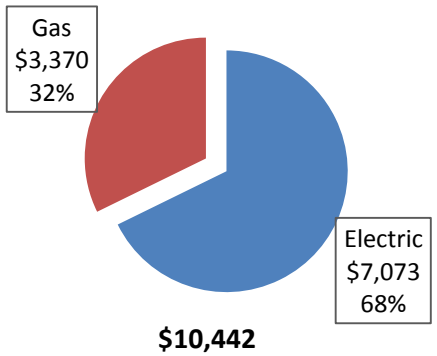
The following energy consumption and cost data is based on the last 12 month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Firehouse 160 Grand St.		
Fuel	**Usage**	**Cost**
Electricity	44,532 kWh	$7,073
Natural Gas	3,636 Therms	$3,370
Total		**$10,442**

The current utility cost for this site is $10,442 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.144/kWh, which is the blended rate used throughout the analyses in this report. The third party supply is provided by Constellation Energy. The monthly electricity consumption and peak demand is represented in the chart below.

Figure 8 - Electric Usage & Demand

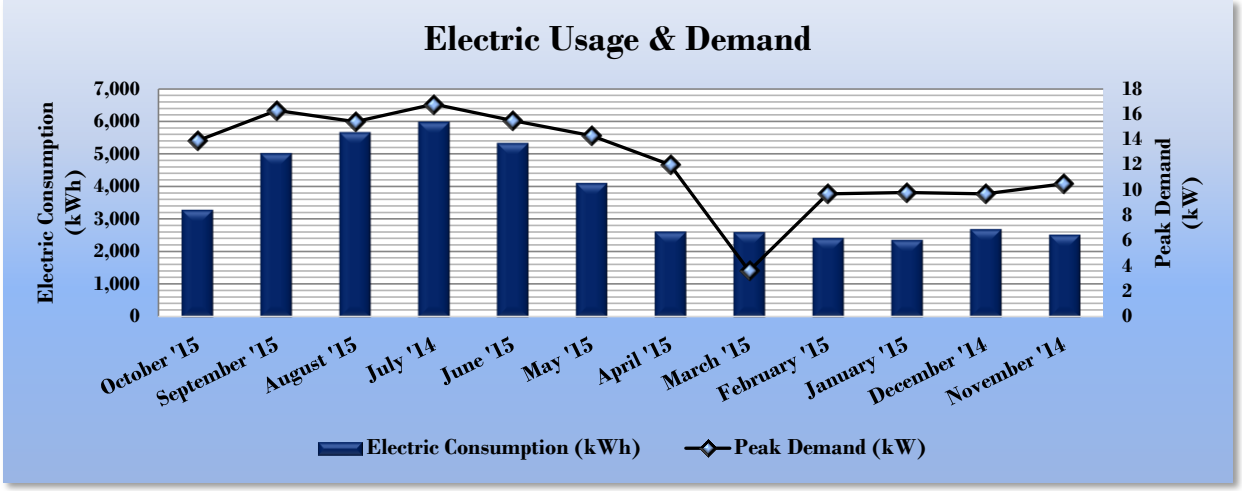


Figure 9 - Electric Usage & Demand

Electric Billing Data for Firehouse 160 Grand St.					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
11/4/15	30	3,291	14	$61	$477
10/5/15	32	5,022	16	$71	$709
9/3/15	29	5,664	15	$67	$947
8/5/14	29	5,983	17	$73	$1,026
7/7/15	32	5,331	16	$67	$925
6/5/15	30	4,111	14	$62	$747
5/6/15	29	2,622	12	$52	$400
4/7/15	32	2,603	4	$16	$361
3/6/15	30	2,432	10	$42	$365
2/4/15	29	2,369	10	$42	$357
1/6/15	33	2,699	10	$42	$400
12/4/14	31	2,527	11	$46	$380
Totals	**366**	**44,654**	**16.8**	**$641**	**$7,092**
Annual	**365**	**44,532**	**16.8**	**$639**	**$7,073**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.927/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented in the chart below.

Figure 10 - Natural Gas Usage

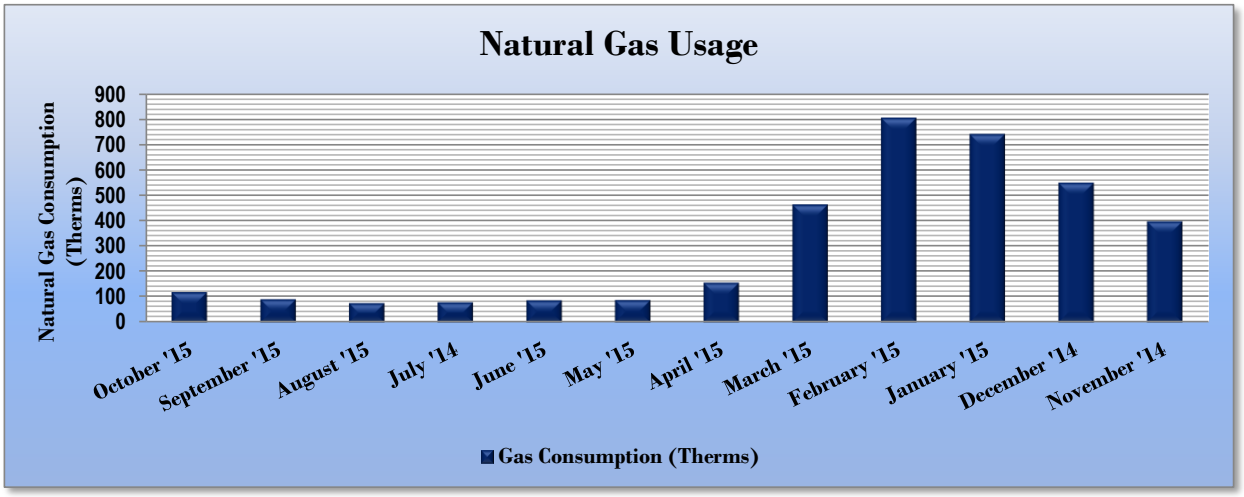


Figure 11 - Natural Gas Usage

Gas Billing Data for Firehouse 160 Grand St.			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
11/4/15	30	119	$102
10/5/15	32	91	$79
9/3/15	29	76	$71
8/5/14	29	79	$73
7/7/15	32	86	$79
6/5/15	30	88	$79
5/6/15	29	156	$131
4/7/15	32	463	$385
3/6/15	30	804	$725
2/4/15	29	740	$692
1/6/15	33	549	$566
12/4/14	31	397	$398
Totals	**366**	**3,646**	**$3,379**
Annual	**365**	**3,636**	**$3,370**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Firehouse 160 Grand St.	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	477.2	154.4
Site Energy Use Intensity (kBtu/ft^2)	286.4	88.3

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

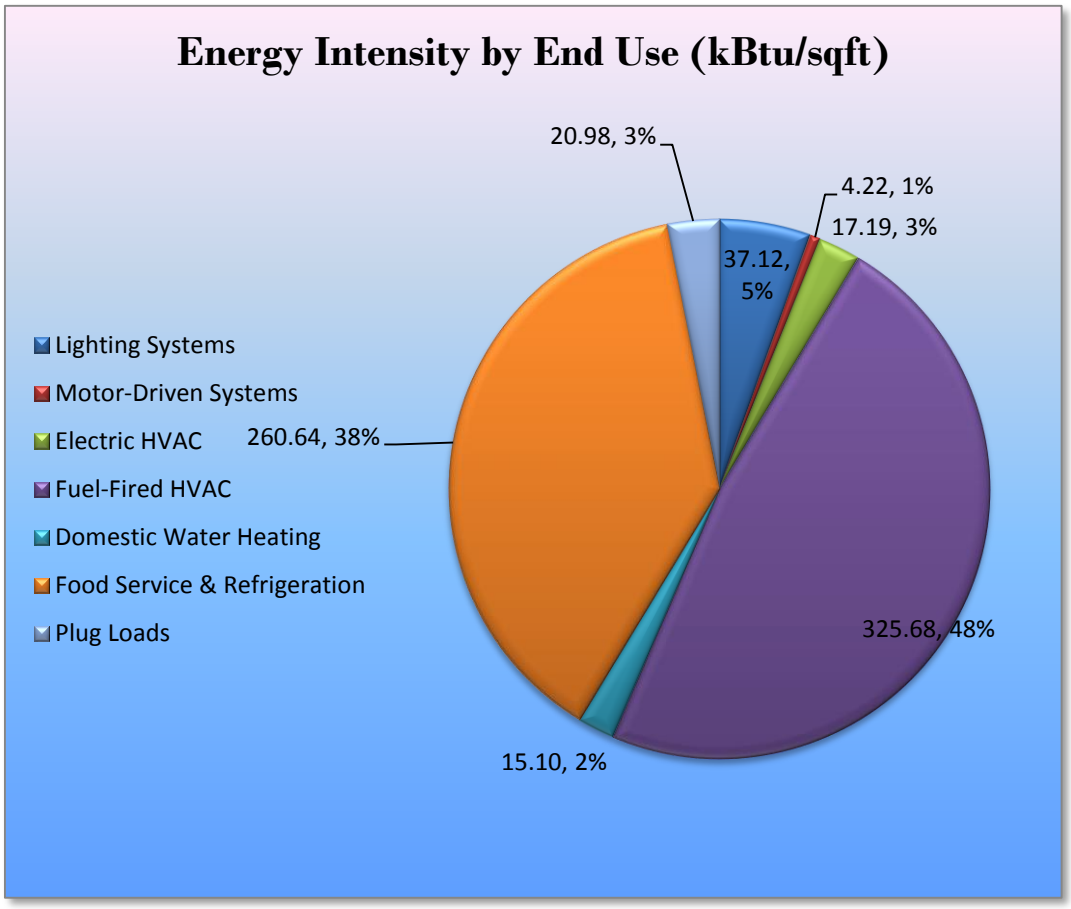
Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Firehouse 160 Grand St.	National Median Building Type: Fire/Police Station
Source Energy Use Intensity (kBtu/ft^2)	377.7	154.4
Site Energy Use Intensity (kBtu/ft^2)	243.6	88.3

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score. This building type is currently not eligible for an ENERGY STAR® score. However, a Portfolio Manager "Statement of Energy Performance" was developed for this site and can be found in Appendix B: ENERGY STAR® Statement of Energy Performance.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy projects, help prioritize specific measures for implementation, and set the Firehouse on the path to receive financial incentives. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is considered sufficient to make decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJ prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**12,489**	**1.6**	**0.0**	**$1,804.33**	**$3,328.29**	**$200.00**	**$3,128.29**	**1.73**	**12,576**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	7,298	0.9	0.0	$1,054.36	$2,073.90	$0.00	$2,073.90	1.97	7,349
ECM 2	Retrofit Fixtures with LED Lamps	5,191	0.7	0.0	$749.97	$1,254.39	$200.00	$1,054.39	1.41	5,227
Lighting Control Measures		**883**	**0.1**	**0.0**	**$127.62**	**$232.00**	**$40.00**	**$192.00**	**1.50**	**890**
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ECM 4	Install High Efficiency Electric AC	364	0.1	0.0	$52.54	$1,088.76	$0.00	$1,088.76	20.72	366
Domestic Water Heating Upgrade		**0**	**0.0**	**30.3**	**$280.96**	**$192.94**	**$0.00**	**$192.94**	**0.69**	**3,550**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	30.3	$280.96	$192.94	$0.00	$192.94	0.69	3,550
TOTALS		**13,736**	**1.8**	**30.3**	**$2,265.44**	**$4,841.99**	**$240.00**	**$4,601.99**	**2.03**	**17,382**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended Lighting Upgrades are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**12,489**	**1.6**	**0.0**	**$1,804.33**	**$3,328.29**	**$200.00**	**$3,128.29**	**1.73**	**12,576**
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ECM 2	Retrofit Fixtures with LED Lamps	5,191	0.7	0.0	$749.97	$1,254.39	$200.00	$1,054.39	1.41	5,227

ECM 1: Retrofit Fluorescent Fixtures with LED Lamps and Driver

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	7,298	0.9	0.0	$1,054.36	$2,073.90	$0.00	$2,073.90	1.97	7,349
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

We recommend retrofitting existing fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Any fixture replacement involving the T12 lamps will not qualify for the SmartStart incentive program.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten (10) times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	5,191	0.7	0.0	$749.97	$1,254.39	$200.00	$1,054.39	1.41	5,227
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

We recommend replacing incandescent screw-in or plug-in based lamps with LED lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten (10) times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Recommended Lighting Control Measures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**883**	**0.1**	**0.0**	**$127.62**	**$232.00**	**$40.00**	**$192.00**	**1.50**	**890**
ECM 3	Install Occupancy Sensor Lighting Controls	883	0.1	0.0	$127.62	$232.00	$40.00	$192.00	1.50	890

ECM 3: Install Occupancy Sensor Lighting Controls

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
883	0.1	0.0	$127.62	$232.00	$40.00	$192.00	1.50	890

Measure Description

We recommend installing occupancy sensors to control light fixtures that are currently manually controlled in restrooms, hallways and private offices. Sensors detect occupancy using ultrasonic and/or infrared technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result from only operating lighting systems when they are required.

It is recommended that the facility install occupancy sensors only in the captain's office and dormitory. The occupancy sensors can be either wall or ceiling mounted depending on the space layout.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

4.1.3 Electric Unitary HVAC Measures

Recommended Unitary HVAC are summarized in Figure 18 below.

Figure 18 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**364**	**0.1**	**0.0**	**$52.54**	**$1,088.76**	**$0.00**	**$1,088.76**	**20.72**	**366**
ECM 4	Install High Efficiency Electric AC	364	0.1	0.0	$52.54	$1,088.76	$0.00	$1,088.76	20.72	366

ECM 4: Install High Efficiency Electric AC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
364	0.1	0.0	$52.54	$1,088.76	$0.00	$1,088.76	20.72	366

Measure Description

We recommend replacing standard efficiency air conditioning units with high efficiency air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies in the past several years. Therefore, electricity savings can be achieved by replacing old units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the old and new unit, the cooling load, and the annual operating hours.

4.1.4 Domestic Water Heating Upgrade

Recommended domestic hot water heating system upgrades are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**30.3**	**$280.96**	**$192.94**	**$0.00**	**$192.94**	**0.69**	**3,550**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	30.3	$280.96	$192.94	$0.00	$192.94	0.69	3,550

ECM 5: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	30.3	$280.96	$192.94	$0.00	$192.94	0.69	3,550

Measure Description

Installing low flow faucets or faucet aerators, low flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Water Conservation

Installing dual flush or low flow toilets and low flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5

gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that on-site power generation could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

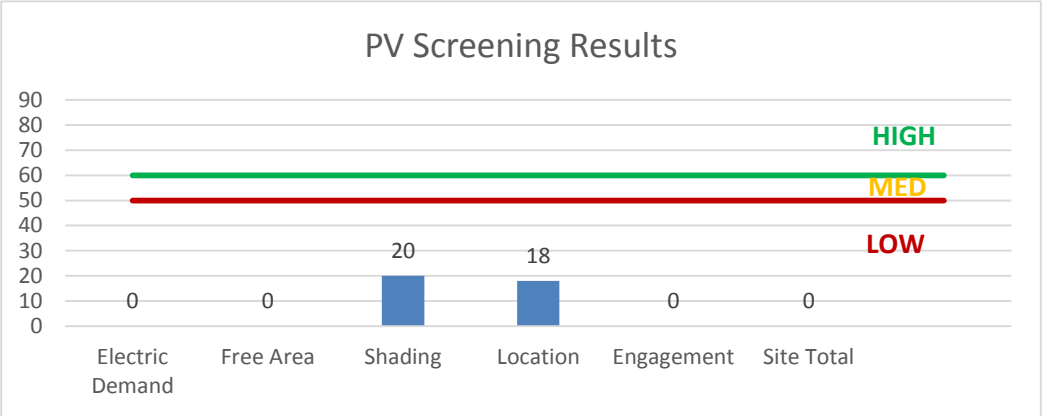
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a low potential for cost-effective installation of a solar PV array.

If the Firehouse is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 20 - Photovoltaic Screening



Owners of solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

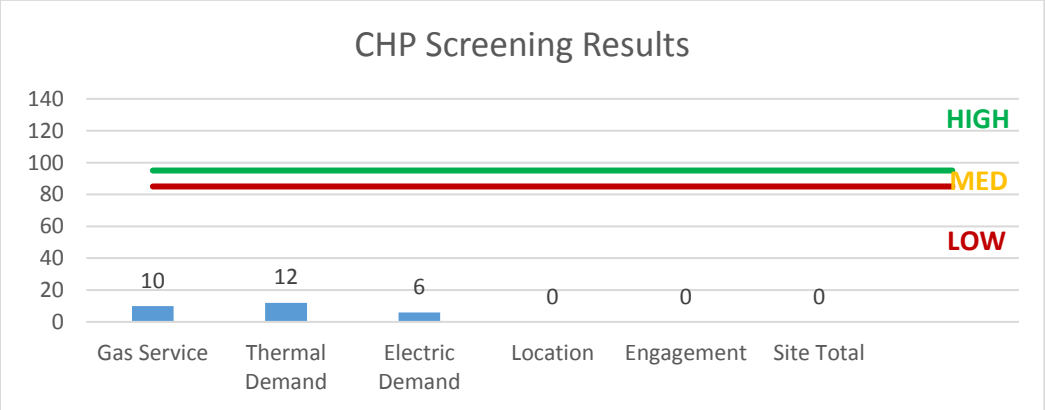
6.2 Combined Heat and Power

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a low potential for installation of a cost-effective CHP system.

Figure 21 – CHP Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce consumer electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. DR service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for Mid-Atlantic state region that is charged with maintaining electric grid reliability locally.

By enabling grid operators to call upon Curtailment Service Providers and energy consumers to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants will receive payments whether or not their facility is called upon to curtail their load.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR program often find it to be a valuable source of revenue for their facility or facilities because the payments can significantly offset annual utility costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats so that air conditioning units run less frequently or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR event cycle. DR program participants often have to install smart meters and may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

The Firehouse does not appear to have sufficient electric load to be able to participate in a DR program.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Direct Install
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x
ECM 2	Retrofit Fixtures with LED Lamps	x	x
ECM 3	Install Occupancy Sensor Lighting Controls	x	x
ECM 4	Install High Efficiency Electric AC	x	x
ECM 5	Install Low-Flow Domestic Hot Water Devices	x	x

SmartStart is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities to bundle measures and simplify participation, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities and requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below or: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for a recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by

the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Apparatus Area	10	Linear Fluorescent - T12: 8' T12 (75W) - 2L	None	158	5,616	Fixture Replacement	No	10	LED - Linear Tubes: (4) 4' Lamps	None	58	5,616	0.81	6,346	0.0	$916.83	$1,382.60	$0.00	1.51
Bathroom	1	Halogen Incandescent: Wall mount fixture	None	65	5,616	Relamp	No	1	LED Screw-In Lamps: Wall mount fixture	None	10	5,616	0.04	349	0.0	$50.43	$48.85	$0.00	0.97
Basement	5	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	5,616	Fixture Replacement	No	5	LED - Linear Tubes: (4) 4' Lamps	None	58	5,616	0.12	952	0.0	$137.52	$691.30	$0.00	5.03
Stairwell	1	Incandescent: Wall mount fixture	None	100	5,616	Relamp	No	1	LED Screw-In Lamps: Wall mount fixture	None	15	5,616	0.07	539	0.0	$77.93	$97.85	$0.00	1.26
1st floor living area	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	114	5,616	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,931	0.36	2,795	0.0	$403.77	$686.80	$140.00	1.35
1st floor living area	1	Incandescent: Wall mount fixture	None	100	5,616	Relamp	No	1	LED Screw-In Lamps: Wall mount fixture	None	15	5,616	0.07	539	0.0	$77.93	$97.85	$0.00	1.26
1st floor living area	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	114	5,616	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	None	58	5,616	0.09	711	0.0	$102.69	$190.27	$40.00	1.46
1st floor living area	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	5,616	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	5,616	0.03	209	0.0	$30.26	$58.50	$0.00	1.93
Captains Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	114	5,616	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,931	0.12	932	0.0	$134.59	$306.27	$60.00	1.83

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Apparatus Area	Hoist Door	1	Other	0.5	78.2%	No	52	No	78.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Apparatus Area	Exhaust fan	1	Exhaust Fan	0.8	81.1%	No	4,000	No	81.1%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Pantry	Pantry Area	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Living Area	Living Area 1st floor	1	Window AC	1.00		Yes	1	Window AC	1.00		12.00		No	0.06	364	0.0	$52.54	$1,088.76	$0.00	20.72

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Basement	Firehouse living area	1	Non-Condensing Hot Water Boiler	209.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Basement	Firehouse	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Bathroom	2	Faucet Aerator (Lavatory)	3.00	1.00	0.00	0	22.7	$210.72	$14.34	$0.00	0.07
Bathroom	2	Showerhead	3.00	2.00	0.00	0	7.6	$70.24	$178.60	$0.00	2.54

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Pantry	2	Gas Convection Oven (Full Size)	No	No	0.00	0	0.0	$0.00	$18,580.09	$1,000.00	0.00
Pantry	2	Gas Griddle (≤2 Feet Width)	No	No	0.00	0	0.0	$0.00	$2,723.63	$250.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Pantry	1	Under Counter (High Temp)	Natural Gas	N/A	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Pantry	1	Refrigerator - double door	600.0	Yes
TV area	1	Printer - Small	20.0	No
TV area	1	Computer	75.0	No
TV area	1	TV	150.0	Yes
TV area	1	Water Dispenser	12.5	Yes
TV area	1	Microwave	1,000.0	No
Pantry	1	Coffee maker	400.0	No
Pantry	1	Pop up toaster	850.0	Yes
Basement	1	Dehumidifier	575.0	No
Living Area 1st floor	4	Ceiling fans	100.0	No
Living Area 1st floor	1	Washer	900.0	No
Living Area 1st floor	1	Dryer	1,600.0	No
Living Area 1st floor	1	Computer	75.0	No
Living Area 1st floor	2	Computer monitors	75.0	No
Living Area 1st floor	1	Tredmill	1,800.0	No
Captain's office	1	TV	150.0	No
Captain's office	1	Computer	75.0	No
Captain's office	1	Printer - Small	20.0	No
Living Area 1st floor	1	Aircooler	900.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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N/A

ENERGY STAR® Score[1]

Firehouse - 160 Grand Street

Primary Property Type: Fire Station
Gross Floor Area (ft²): 1,800
Built: 1850

For Year Ending: October 31, 2015
Date Generated: October 21, 2016

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Firehouse - 160 Grand Street 160 Grand St Jersey City, New Jersey 07302	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5082933

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
286.7 kBtu/ft²

Source EUI
477.4 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	151,899 (29%)
Natural Gas (kBtu)	364,218 (71%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	92.7
National Median Source EUI (kBtu/ft²)	154.4
% Diff from National Median Source EUI	209%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	40

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer Stamp (if applicable)