CDM Smith

Draft Energy Audit Report Rev3

Duke Farms Foundation
October 26, 2016

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Executive Summary

As part of an initiative to reduce energy cost and consumption, Duke Farms Foundation has secured the services of CDM Smith to perform an energy audit for thirty-four (34) facilities which are owned and operated by the Foundation, in an effort to develop comprehensive Energy Conservation and Retrofit Measures (ECRMs). Duke Farms Foundation is a large estate garden dedicated to environmental stewardship. The facilities include residential, green houses, pumping houses, offices, and maintenance shops. Normal operation is every day from 8:30 to 6pm closing earlier in the winter. The grounds are closed to visitors on Wednesdays.

CDM Smith's energy audit team visited the facilities January 20 and 21 and February 3, 2016. As a result of the site visit and evaluation of the historical energy usage of the facilities, CDM Smith was successful in identifying opportunities for energy savings measures.

CDM Smith has also evaluated the potential for renewable energy technologies to be implemented at the Foundation's facilities to offset the electrical energy usage. Specifically, the use of wind turbines were investigated.

Not all ECRMs identified as a result of the energy audit are recommended. ECRMs must be economically feasible to be recommended to the Foundation for implementation. The feasibility of each ECRM was measured through a simple payback analysis. The simple payback period was determined after establishing Engineer's Opinion of Probable Construction Cost estimates, Operation and Maintenance (O&M) cost estimates, projected annual energy savings estimates, and the potential value of New Jersey Clean Energy rebates, or Renewable Energy Credits, if applicable. ECRMs with a payback period of 25 years or less can be recommended.

Historical Energy Usage

The following table, Table ES-1, summarizes the historical energy usage at each of the Foundation's facilities as presented in Section 3. The data in Table ES-1 has been taken from the facility data forms, provided by the Foundation. These values can serve as a bench-marking tool. This data along with the building profiles that have been established through the EPA's Portfolio Manager Program are used to quantify the reduction in electrical energy and natural gas usage following the implementation of the recommended ECRMs.

Table ES-1
Summary of Annual Energy Usage & Cost

Building	Floor Area (Sqft)	Electrical Energy Use (kWh)	Fuel Oil Use (Gallons)	Propane Use (Gallons)	Natural Gas Use (Therms)	Cost for Electric Service	Cost for Fuel Oil	Cost for Propane	Cost for Natural Gas
Building 22 - Motor pool*	2,304	-*			2,456	$0			$2,275
Building 23*	4,500	-*			2,686	$0			$1,733
Building 24*	2,965	-*			1,539	$0			$1,466
Building 56*	1,948	-*				$0			

Building	Floor Area (Sqft)	Electrical Energy Use (kWh)	Fuel Oil Use (Gallons)	Propane Use (Gallons)	Natural Gas Use (Therms)	Cost for Electric Service	Cost for Fuel Oil	Cost for Propane	Cost for Natural Gas
Community Garden Well*	1	-*				$0			
Conservatory 26*	47,000	-*		1,056	24,807	$0		$4,663	$22,547
Cottage 35*	1,871	-*			1,439	$0			$945
Cottage 37*	1,948	-*			1,158	$0			$1,146
Cottage 43*	1,948	-*			1,486	$0			$1,434
Cottage 45*	2,230	-*			1,516	$0			$1,450
Garage 19*	1,790	-*				$0			
House 21*	3,230	-*		955	1,769	$0		$4,302	$1,150
House 47*	2,271	-*			1,518	$0			$1,003
Reservoir Well Pump*	1	-*				$0			
Shop 18*	2,192	-*		409		$0		$1,844	
House 29*	1,779	17			95	$2			$136
House 9*	909	2,544			993	$114			$979
House 7*	909	2,930			1,136	$132			$1,112
House 8*	1,183	3,085			1,362	$139			$923
House 30*	1,779	3,214			1,749	$144			$1,129
Shop 70*	1,820	3,224			984	$145			$989
House 13*	2,834	5,597			2,425	$251			$2,223
House 27*	1,779	6,629			672	$298			$683
House 10*	1,166	14,932			490	$671			$370
Building 32 - Orchid Range*	11,599	15,034			23,626	$1,503			$18,942
Building 12 - Coach Barn*	21,187	74,855			8,980	$7,486			$7,900
Building 39 - Farm Barn*	19,278	260,733				$26,073			
FB Electrical Service		**369,575**				**$36,958**			
Building 5 - Pump house	1,000	120,043			1,697	$14,969			$1,614
House 52	4,579	12,504	1,179			$2,234	$3,345		
House 59**	3,420	**	**	**		**	**	**	
House 74	3,400	365				$75			
House 79	2,580	14,428	1,029			$2,012	$3,062		
House 87	2,967	537		208		$145		$957	
House 120	3,400	5,918		791		$1,197		$3,639	
Total	163,767	546,625	2,208	3,420	84,583	$94,547	$6,407	$15,404	$71,149

*Building Electrical usage is a part of the FB Substation Electrical Service.

**House 59 uses electrical, fuel oil and propane. Usage and costs paid by another authority.

Farm Barn Substation Electrical Service annually consumes 707,977 kWh from the grid, and 868,232 kWh from the solar system for a total of 1,576,209 kWh

Recommended ECRMs

The following Table ES-2 presents the ranking of recommended ECRMs identified for the building lighting and HVAC systems based on the simple payback analysis. These ECRMs are ranked by the measure for the buildings where the measure is recommended. For the buildings that are recommended and additional details, see Section 4.

Additional ECRMs associated with the building envelope and other miscellaneous appliances were identified and evaluated, as discussed in Sections 2 and 4. However, these were not recommended due to longer payback periods. This table includes the Engineer's Opinion of Probable Construction Cost. Projected annual energy cost savings, projected annual energy usage savings, and total simple payback period for each recommended ECRM are also tabulated. The ECRMs below are the recommended measures and are ranked based on payback period.

Table ES-2
Ranking of Energy Savings Measures Summary

Overall Ranking (Based on Simple Payback)	Facility Measure	Total Cost	Energy Savings	Annual Fiscal Savings[2]	Simple Payback (Years)	Greenhouse Gas Emission Reduction (Metric Tons)
1	**House 79** Smart Thermostat	$300	154 FO Gallons	$459	**0.7**	1.5
2	**House 52** Lighting Upgrades	$701	3,268 kWh	$588	**1.2**	1.0
3	**House 120** Lighting Upgrades	$357	1,305 kWh	$261	**1.4**	0.4
4	**House 30*** Smart Thermostat	$300	262 therms	$169	**1.8**	1.5
5	**House 7*** Smart Thermostat	$300	170 therms	$167	**1.8**	1.0
6	**Shop 18*** Ceiling Insulation	$2,893	342 P Gallons 0 kWh	$1,540	**1.9**	2.2
7	**House 9*** Smart Thermostat	$300	149 therms	$147	**2.0**	0.9
8	**House 8*** Smart Thermostat	$300	204 therms	$138	**2.2**	1.2
9	**House 59** Ceiling Insulation	$2,244	429 FO Gallons 0 kWh	$922	**2.4**	4.2
10	**Building 32 - Orchid Range*** Lighting Upgrades	$498	2,200 kWh	$176	**2.8**	0.6

Overall Ranking (Based on Simple Payback)	Facility Measure	Total Cost	Energy Savings	Annual Fiscal Savings[2]	Simple Payback (Years)	Greenhouse Gas Emission Reduction (Metric Tons)
11	**House 120** Smart Thermostat	$600	40 P Gallons	$182	**3.3**	0.3
12	**House 52** Smart Thermostat	$1,800	177 FO Gallons	$502	**3.6**	1.7
13	**House 120** Ceiling Insulation	$2,244	123 P Gallons 0 kWh	$565	**4.0**	0.8
14	**House 87** Smart Thermostat	$600	31 P Gallons	$144	**4.2**	0.2
15	**Building 5 - Pump House** Premium Eff Motors	$12,500	0 therms 22,203 kWh	$2,753	**4.5**	6.5
16	**Building 22 – Motorpool*** Lighting Upgrades	$1,700	4,358 kWh	$349	**4.9**	1.3
17	**House 13*** Smart Thermostat	$600	121 therms	$111	**5.4**	0.7
18	**House 10*** Smart Thermostat	$300	74 therms	$56	**5.4**	0.4
19	**Building 26 – Conservatory*** Lighting Upgrades	$527	1,160 kWh	$93	**5.7**	0.3
20	**House 87** Lighting Upgrades	$583	372 kWh	$100	**5.8**	0.1
21	**House 74** Lighting Upgrades	$292	236 kWh	$50	**5.9**	0.1
22	**House 47*** Smart Thermostat	$900	228 therms	$150	**6.0**	1.3
23	**House 27*** Lighting Upgrades	$198	350 kWh	$28	**7.1**	0.1
24	**House 29*** Lighting Upgrades	$198	350 kWh	$28	**7.1**	0.1
25	**House 21*** Ceiling Insulation	$2,132	407 therms 0 kWh	$265	**8.0**	2.4
26	**Building 5 – Pump house** Lighting Upgrades	$280	432 kWh	$35	**8.1**	0.1
27	**House 8*** Lighting Upgrades	$90	130 kWh	$10	**8.7**	0.0

Overall Ranking (Based on Simple Payback)	Facility Measure	Total Cost	Energy Savings	Annual Fiscal Savings[2]	Simple Payback (Years)	Greenhouse Gas Emission Reduction (Metric Tons)
28	**House 79** Lighting Upgrades	$212	170 kWh	$24	**8.9**	0.1
29	**House 13*** Lighting Upgrades	$108	140 kWh	$11	**9.6**	0.0
30	**Building 39 - Farm Barn*** Lighting Upgrades	$854	970 kWh	$88	**9.7**	0.3
31	**Building 12 - Coach Barn*** Condensing Boiler	$16,095	1,171 therms	$1,581	**10.2**	6.8
32	**House 47*** Lighting Upgrades	$214	255 kWh	$20	**10.5**	0.1
33	**Cottage 35*** Lighting Upgrades	$226	250 kWh	$20	**11.3**	0.1
34	**Building 23*** Lighting Upgrades	$164	180 kWh	$14	**11.4**	0.1
35	**Building 12 - Coach Barn*** Lighting Upgrades	$6,890	7,371 kWh	$590	**11.7**	2.2
36	**House 120** Condensing Boiler	$11,782	103 P Gallons	$998	**11.8**	0.7
37	**Shop 18*** Lighting Upgrades	$3,843	3,868 kWh	$309	**12.4**	1.1
38	**House 10*** Lighting Upgrades	$100	100 kWh	$8	**12.5**	0.0
39	**Garage 19*** Lighting Upgrades	$20	20 kWh	$2	**12.5**	0.0
40	**House 30*** Lighting Upgrades	$40	40 kWh	$3	**12.5**	0.0
41	**Cottage 43*** Lighting Upgrades	$140	140 kWh	$11	**12.5**	0.0
42	**House 7*** Lighting Upgrades	$390	250 kWh	$30	**12.8**	0.1
43	**House 9*** Lighting Upgrades	$390	130 kWh	$30	**12.8**	0.0
44	**Cottage 37*** Lighting Upgrades	$261	253 kWh	$20	**12.9**	0.1

Overall Ranking (Based on Simple Payback)	Facility Measure	Total Cost	Energy Savings	Annual Fiscal Savings[2]	Simple Payback (Years)	Greenhouse Gas Emission Reduction (Metric Tons)
45	**Building 24*** Lighting Upgrades	$2,771	2,581 kWh	$206	**13.4**	0.8
46	**Cottage 45*** Lighting Upgrades	$334	293 kWh	$23	**14.2**	0.1
47	**Building 56*** Lighting Upgrades	$492	416 kWh	$33	**14.8**	0.1
48	**House 13*** Condensing Boiler	$11,782	316 therms	$797	**14.8**	1.8
49	**House 21*** Lighting Upgrades	$1,206	1,008 kWh	$81	**15.0**	0.3
50	**Building 12 - Coach Barn*** Premium Eff Motors	$921	0 therms 495 kWh	$61	**15.1**	0.1
51	**House 23*** Condensing Boiler	$11,782	350 therms	$737	**16.0**	2.0
52	**House 27*** Smart Thermostat	$600	34 therms	$34	**17.6**	0.2
53	**House 30*** Condensing Boiler	$11,063	228 therms	$654	**16.9**	1.3
54	**House 27*** Condensing Boiler	$11,063	88 therms	$593	**18.6**	0.5
55	**House 47*** Condensing Boiler	$11,782	198 therms	$637	**18.5**	1.1
56	**House 7*** Ceiling Insulation	$1,200	66 therms 0 kWh	$64	**18.8**	0.4
57	**House 9*** Ceiling Insulation	$1,200	66 therms 0 kWh	$64	**18.8**	0.4
58	**House 29*** Condensing Boiler	$11,063	12 therms	$519	**21.3**	0.1

1. Engineers Probable Construction Cost takes into account any applicable rebates.
2. Annual Fiscal Savings takes into account additional O&M cost or savings associated with the measure.
3. Measures with paybacks greater than 25 years are not recommended.
4. Greenhous gas emissions reduction based upon 11.6 lbs/therm natural gas, 0.59 lbs/kWh, 19.4 lbs/gallon fuel oil and 12.7 lbs/gal propane
5. Electrical savings are to the Farm Barn Substation for "*" noted buildings.

Table ES-3
ECRM's Ranking by Measures

Overall Ranking (Based on Simple Payback)	Facility Measure	Total Cost	Energy Savings	Annual Fiscal Savings[2]	Simple Payback (Years)	Greenhouse Gas Emission Reduction (Metric Tons)
A	**All Buildings** Smart Thermostat	$6,900	1,242 therms 331 FO Gallons 71 P Gallons	$2,259	**3.1**	30.1
B	**All Buildings** Ceiling Insulation	$13,475	624 therms 429 FO Gallons 465 P Gallons	$3,478	**3.9**	5.8
C	**All Buildings** Premium Efficiency Motors	$17,357	23,487 kWh	$2,911	**6.0**	6.9
D	**All Buildings** Lighting Upgrades	$24,080	35,598 kWh	$3,244	**7.4**	9.6
E	**All Buildings** Condensing Boiler	$100,976	2,363 therms 103 P Gallons	$6,406	**15.8**	14.4

1. Greenhous gas emissions reduction based upon 11.6 lbs/therm natural gas, 0.59 lbs/kWh, 19.4 lbs/gallon fuel oil and 12.7 lbs/gal propane

Recommended ECRMs

Table ES-3 summarizes the Total Engineer's Opinion of Probable Construction Cost, annual energy savings, projected annual energy and O&M cost savings and the payback period based on the implementation of all of the above recommended ECRMs. These savings from the recommended measures equate to about 7% of the site energy usage and 10% of the total site energy cost.

Table ES-4
Recommended ECRM's

Total Engineer's Opinion of Probable Construction Cost	Projected Annual Energy Savings	Projected Annual Fiscal Savings	Simple Payback Period (years)	Greenhouse Gas Emission Reduction (Metric Tons)
$162,788	4,229 therms 639 P Gallons 760 FO Gallons 56,085 kWh	$18,298	**8.9**	**52.5**

Cost includes $1,995 in lighting incentives and $8,000 in boiler rebates.
Annual Energy Savings is $12,718. Annual boiler maintenance cost avoided $4,000. No published incentives for smart thermostats.

Renewable Energy Technologies

Wind Power Generation

Section 4 of the report provides for an economic evaluation of a wind turbine energy system. The evaluation covered the economic feasibility of furnishing and installing a wind turbine energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

CDM Smith completed a preliminary desktop wind power production analysis and has concluded that the Foundation should reevaluate on site wind power when NJ clean energy incentives are published.

Wind power as a renewable energy source also qualifies for Renewable Energy Certificates (REC's). The prevailing energy market, Renewable Energy Incentive Program (REIP) and REC's comprise the major factors influencing a wind turbine energy system installation. Other options, such as government bonds or a Power Purchase Agreement are potentially available and can assist with the financing of this project.

Operation and Maintenance Measures

Operation and Maintenance

Building maintenance throughout the Foundation appears to be current. The equipment appears to be regularly repaired and replaced. These repairs and replacements have been to maintain building function and not for the reason of energy efficiency. Lighting systems were generally in good operating condition.

Site staff are capable of performing many of the recommendations included in the report. This could save at least a portion of the installation cost of the measures.

One operation measure that may create savings would be consolidation. Many of the building have low energy usage. Also, these buildings are very similar in function or use. Consolidating the multiple, similar occupancies into a single building can create savings. This is a decision that should weigh the cost of operating multiple buildings against the difficulties of consolidation. Buildings listed below are common usage, and appear to be partially occupied.

Use	Buildings
Office	Building 23, Building 24, Cottage 35, Cottage 37, Cottage 43
Shop or Service	Shop 18, Motor pool 22, Shop 70
Storage	Building 5 – Pump House, Garage 19, House 21, House 74

Section 1
Introduction

1.1 General

As part of an initiative to reduce energy cost and consumption, Duke Farms Foundation has secured the services of Camp Dresser McKee & Smith (CDM Smith) to perform an energy audit at thirty-four (34) facilities in an effort to develop comprehensive energy conservation initiatives. The costs associated with this energy audit report qualify for reimbursement through New Jersey Clean Energy Local Government Energy Audit Program.

The performance of an Energy Audit requires a coordinated phased approach to identify, evaluate and recommend energy conservation and retrofit measures (ECRM). The various phases conducted under this Energy Audit included the following:

Gather preliminary data on all facilities;

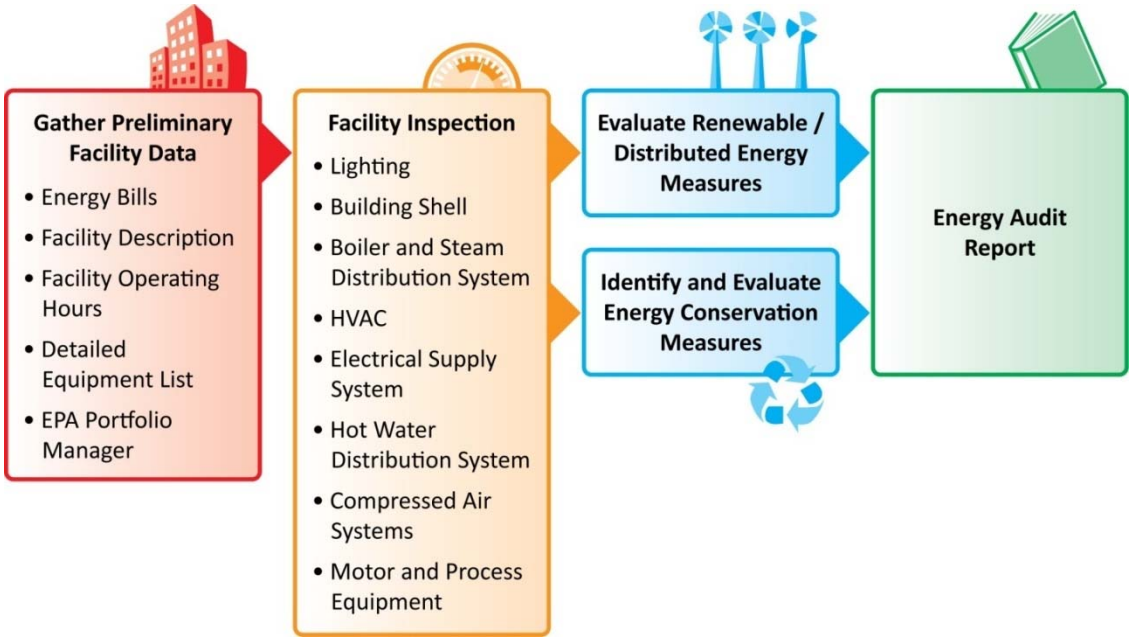
Facility inspection;

Identify and evaluate potential ECRMs and evaluate renewable/distributed energy measures;

Develop the energy audit report.

Figure 1-1 is a schematic representation of the phases utilized by CDM Smith to prepare the Energy Audit Report

Figure 1-1: Energy Audit Phases



1.2 Purpose and Scope

An ASHRAE level II energy audit includes conducting a detailed survey of a facility and analyzing its energy consumption. This effort provides a list of potential capital-intensive improvements (energy conservation and retrofit measures, or ECRMs). These ECRM's require more thorough data collection and engineering analysis, along with an estimate of associated potential costs and savings.

The objective of this energy audit is to identify energy conservation and retrofit measures. In an effort to reduce facility energy usage and to develop an economic basis to financially validate the planning and implementation of ECRM's.

Significant energy savings may be available with retrofits to the heating and cooling systems and lighting systems. It should be noted that the magnitude of energy savings available is not only dependent on the type of heating, lighting or insulation systems in use, but also on the age and condition of the equipment and the capital available to implement major changes. Due to the rising cost of power and the desire to minimize dependence on foreign oil supplies, energy consumption is taking a higher priority across the nation. Feasible alternatives for reducing energy consumption and operating costs must be evaluated on a case-by-case basis.

The purpose of this energy audit is to identify the various critical building comfort systems that are major consumers of electrical energy and are clear candidates for energy savings measures. In addition, potential energy producing systems such as wind energy systems were also evaluated. A discussion on these technologies is included in Section 4 Energy Conservation and Retrofit Measures (ECRM).

In addition to identifying ECRMs and the potential for on-site energy generation, there is potential for further energy cost savings through the use of a third party energy supplier and participation in a Demand Response Program. This is discussed further in Section 5.

Section 2
Facility Description

Duke Farms is a privately owned property dedicated to environmental stewardship. The facilities include residential, green houses, pumping houses, offices, and maintenance shops. Normal operation is every day from 8:30 to 6pm closing earlier in the winter. The grounds are closed to visitors on Wednesdays.

The energy audit included an evaluation of the building's envelope (exterior shell) to determine the components' effective R-values to be utilized in the building model and to locate and fix any thermal weaknesses that may be present. The components of a building envelope include the exterior walls, foundation and roof. The construction and material, age and general condition of these components, including exterior windows and doors, impact the building's energy use.

The building HVAC and plumbing systems are described as to the equipment, capacity and working fluid and system fuel. These are used for building modeling and impact replacement costs. The building lighting and electrical systems are also noted for identifying the potential system upgrades with energy savings.

2.1 Building 39 – Farm Barn

The Farm Barn is the campus center. It provides a house for the administrative offices, a small museum, classroom and a cafeteria. The building's second floor of offices is open Monday to Friday from 7 am to 5 pm. The first floor is open Thursday to Tuesday from 8:30 am to 6 pm.

2.1.1 Description of Building Envelope

The Farm Barn is assumed to be constructed around 1900 with a LEED Platinum renovation in 2013. The building has a stone exterior. The interior has a drywall finish. The walls are assumed to have an insulation value of R-4 and no insulation installed. The ceiling is vaulted with drywall and exposed timbers. The ceiling is assumed to have 6 inch fiberglass batts. The roof is pitched with slate roofing. The roof is assumed to have an insulation value of R-19.

The Farm Barn has double pane windows with aluminum frames. The windows are in good condition. The doors are full glass configurations with single pane glass. Doors are near new condition.

2.1.2 Description of Building HVAC

The heating and cooling in the Farm Barn is produced by a water-source heat pump system. The water source heat pump uses a ground coupled loop as a heat source during the winter and the heat sink during the summer.

The building heat pumps generate space conditioning with heat pumps. The majority of heat pumps are water to air heat pumps. There are two water to water heat pump to heat the first floor slab for radiant heating. The air systems serve the spaces through an overhead system for the first floor and an under floor system for the second floor.

The mechanical rooms have electric unit heaters. The well field pumps and water loop pumps are all on variable speed drives. The larger fans are also on variable speed drives.

An A.O. Smith electric, domestic water heater with a 50 gallon storage tank located in the janitor's closet has an input capacity of 4.5 kW. This unit is in good condition.

The building control system is direct digital control, or DDC. The system has local controls with a few degrees of set point adjustment. The building controls system does not appear to have trending or an on-site operator.

2.1.3 Description of Building Lighting

The lighting system is primarily T8 fixtures, compact fluorescents, and LED fixtures with some T5 fixtures. T8 and T5 fixtures have electronic ballasts. Many of the bathrooms and a few conference rooms have occupancy sensors. Light levels are generally low. Task lighting is very common in detail work areas.

Building electrical service is assumed to be 1200 amp, 3 phase, and 460 volts. The electrical systems are in good condition.

2.2 Building 12 – Coach Barn

The Coach Barn has had many functions. Originally, it was the home of the financial office and horse stable. It later stored cars and housed staff. A small portion was used for an office which has been relocated. The building is currently being renovated for use.

2.2.1 Description of Building Envelope

The Coach Barn is assumed to be constructed around 1899 and is currently under renovation. The building has a stone exterior. The interior walls are made of plaster with timber framing. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with slate roofing. The roof is assumed to have an insulation value of R-10.

The Coach Barn has single pane windows with historical wooden frames. The windows are in fair condition. The doors are metal half-light configurations with single pane glass. Doors are in fair condition.

2.2.2 Description of Building HVAC

The heating in the Coach Barn is provided by hot water generated from boilers. Hot Water is generated in the original building boiler room by two gas-fired Burnham boilers. These boilers each have an input capacity of 275 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80%. Hot water pumps deliver hot water to the hot water coils of the convectors, unit ventilators, and baseboard heaters in various locations throughout the building. A packaged rooftop air conditioning unit with hot water heat provides heating for the Coach Barn. The upstairs has some electric baseboard heaters rated for 2kW (6.82 MBH).

A 1990s Bradford White, domestic water heater with a 40 gallon storage tank located in the boiler room has an input capacity of 40 MBH. This water heater provides domestic hot water throughout the building.

Split-system air conditioners units provide localized cooling for the second floor office portion of the building.

The building control system is based upon local thermostats with zone pumps.

2.2.3 Description of Building Lighting

The lighting system is primarily T-12 fixtures with magnetic ballasts. Some spaces have T8 fixtures with electronic ballasts. Other fixtures screw in compact fluorescent. The lighting controls are manual.

The electrical service is old and the connected capacity is not labelled. Building electrical systems have had many upgrades. The electrical systems are generally in good condition.

2.3 Orchid Range and Building 26 – Conservatory

These buildings are primarily green houses. The orchid range is in full use year round. The greenhouses grow many varieties of exotic plants. The building also has 2 exotic plant display rooms, offices and bathrooms. The Orchid Range is a LEED Platinum building. The building is occupied from 8 am to 5 pm weekdays.

The Conservatory green house is almost entirely empty. The building contains around 20 green houses. Around 10 of them contain active plantings. The Conservatory greenhouses are being used to grow native plants.

2.3.1 Description of Building Envelope – Orchid Range

The Orchid Range was constructed around 1899. The building is primarily greenhouses with their exterior surfaces being metal frames and glass. The facility has a building that is opaque construction. The roofs are sloped with shingles. The ceilings are drywall and assumed to have 6 inch insulation batts. The exterior walls are assumed to be 2x4 framing with 4in insulation batts. This is the office. The office walls are assumed to have R-11 walls and R-19 ceilings.

The office has double pane vinyl windows that are in good condition. The doors are metal half-light configurations with single pane glass. Doors are in fair condition.

2.3.2 Description of Building Envelope – Conservatory

The Conservatory was constructed around 1899. The building is primarily greenhouses with their exterior surfaces being metal frames and glass.

The facility has a building that is opaque construction. The roofs are sloped with shingles. The ceilings are drywall and assumed to have 6-inch insulation batts. The exterior walls are assumed to be 2x4 framing with 4in insulation batts. This is the potting shed. The potting shed walls are assumed to have R-11 walls and R-19 ceilings.

The windows in the potting shed are double pane vinyl windows that are in good condition. The doors are metal half-light configurations with single pane glass. Doors are in fair condition.

2.3.3 Description of Building HVAC – Orchid Range

The heating in the Orchid Range is provided by fin-tubed convector heaters located beneath the plants in each of the greenhouse sections. The heat in the Orchid Range is provided by hot water generated from 4 Aerco boilers. These boilers are 88% efficiency. Two boilers are rated at 802 MBH and 2 are rated at 865 MBH input each.

The Orchid Range office building is heated by hot-water generated in the boiler room by a gas-fired Burnham boiler. This boilers has an input capacity of 62 MBH (1 MBH = 1,000 BTU/Hr). This boiler has an estimated operating efficiency of 80%. Hot-water from the boilers is delivered to radiators throughout the building. The display areas have radiant heat under the floors. There are unit heaters in the basement providing heat to all the piping.

An A.O. Smith gas-fired, domestic water heater with a 65 gallon storage tank located in the boiler room has an input capacity of 65 MBH. This water heater provides domestic hot water throughout the building.

The office has a thermostat to regulate the heat provided.

The greenhouse control system is powered by Johnson Controls. This system uses local devices and sensors which report back to a central computer known as a head end. The system controls

the space temperature of each green house. The office building is controlled by local thermostats for the office and potting shed areas.

The heating system equipment is in good condition. The detailed equipment list is in Appendix F.

2.3.4 Description of Building HVAC – Conservatory

The heating plant in the Conservatory has been removed or abandoned. The boiler room is heated by electric unit heaters. The potting shed is heated by electric heat. Around 4 of the green houses are not heated. The remining 6 greenhouse sections that are still in use that are heated by a gas-fired mobile heater for the central houses. The detailed equipment list is in Appendix F.

Window air conditioning units provide localized cooling for the building.

The Conservatory controls are all unit controls with fixed set-points.

2.3.5 Description of Building Lighting – Orchid Range

The lighting system for the Orchid range is primarily compact fluorescents. Some spaces have T8 fixtures with electronic ballasts. The lighting controls are manual.

The Orchid Range building electrical service is estimated to be 400 amp, 3 phase, and 208 volts. The electrical systems are in good condition.

2.3.6 Description of Building Lighting – Conservatory

The lighting system for the Conservatory is primarily compact fluorescents in the green houses. Some spaces have T12 fixtures with electronic ballasts. The lighting controls are manual.

The Conservatory building electrical service is estimated to be 400 amp, 3 phase, and 208 volts. The electrical systems are in good condition.

2.4 Cottage 45 (Safety and Security)

This building has the Security office, locker rooms, video monitoring and associated servers and systems. The building is staffed 24 hours a day 7 days a week.

2.4.1 Description of Building Envelope

Cottage 45 was constructed in 1921. The exterior walls of Cottage 45 are stone with an aluminum framed interior. The walls are assumed to have an insulation value of R-10. The building's roof is roof is sloped with shingles. The roof is in good condition. The roof is assumed to have an insulation value of R-19.

Most of the building windows were noted to be double pane windows. Most exterior doors are composite construction with half-light, and no weather-stripping. The exterior doors are in good condition.

2.4.2 Description of Building HVAC

The heating in Cottage 45 is provided by steam generated from a boiler. Low-pressure steam is generated in the boiler room by a gas-fired Burnham boiler. The boiler each have an input capacity of 210 MBH (1 MBH = 1,000 BTU/Hr). These boilers have a rated operating efficiency of 80.9%. Steam from the boilers is delivered to radiators in various locations throughout the building. The radiators are a 1 pipe system with no traps, just air vents on the radiators. The system appears to have no leaks and does not appear to use excessive amounts of make-up water.

A Bradford-White gas-fired, domestic water heater with a 48 gallon indirect storage tank located in the boiler room has an input capacity of 40 MBH. This water heater provides domestic hot water throughout the building.

Split-system air conditioners and computer room air conditioning units provide localized cooling for the building. The CRAC unit have an outdoor dry cooler.

The building control system is a Johnson Controls system. This system uses local devices and sensors which report back to a central computer known as a head end. The rooms are controlled by local thermostats for each unit ventilator. Local thermostats have a temporary occupied button, so the system is assumed to set back the local temperatures.

The boilers are in good condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.4.3 Description of Building Lighting

The lighting system for the Cottage 45 is primarily compact fluorescents. Some spaces have T8 fixtures with electronic ballasts. The lighting controls are manual.

Cottage 45 electrical service is assumed to be 200 amp, 3 phase, and 240 volts. The electrical systems are in good condition.

2.5 House 7, 8 & 9

These are residences that are occupied for a portion of the year. Site staff reported that they are a primarily occupied during the summer, which staff reported to be the busy season.

2.5.1 Description of Building Envelope

Houses 7, 8 & 9 were constructed in 1930. The building exterior walls are cedar shakes. The interior walls are plaster. The inside has 2x4 framing and the walls are assumed to have an insulation value of R-4. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-8. The insulation

The houses have single pane windows with aluminum frames. The windows are in good condition. The doors are wooden. Doors are in fair condition.

2.5.2 Description of Building HVAC

The heating in House 7, 8, and 9 is provided by steam generated from boilers. Low-pressure steam is generated in the basements by three gas-fired Burnham boilers. These boilers each have an input capacity of 140 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80%. Steam from the boilers is delivered to radiators, and the steam coils of the unit ventilators, and air handling units in various locations throughout the building. The steam system appears to be tight. These system don't appear to use an excessive amount of make-up water.

A Bradford White gas-fired, domestic water heater with a 40 gallon storage tank located in the basements and has an input capacity of 40 MBH. These water heaters provide domestic hot water throughout the buildings. The Bradford White water heater is in good condition.

Window air conditioning units provide cooling for the building.

The heating system is controlled by a single thermostat.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition. The detailed equipment list is in Appendix F.

2.5.3 Description of Building Lighting

The lighting system for the House 7, 8 & 9 is primarily compact fluorescents. The lighting controls are manual.

House 7, 8 & 9 electrical service is 200A, 240V, and single phase. The electrical systems are in good condition.

2.6 Cottage 10

Cottage 10 is a residence that is for a member of site staff.

2.6.1 Description of Building Envelope

Cottage 10 was constructed around 1930. The building exterior walls are clapboard. The interior finishes plaster. The walls are assumed to have an insulation value of R-4 and are assumed to have some insulation. The roof is sloped with shingled roofing. The roofing has some insulation, about 6" under roof. The insulation against the roof was rated at R-11, but has been damaged and missing. The roof is assumed to have an insulation value of R-8.

The cottage has single pane windows with aluminum exterior frames. The windows are in good condition. The doors are wooden with side lights. Doors are in fair condition.

2.6.2 Description of Building HVAC

The heating in Cottage 10 is provided by a condensing furnace located in the basement. This furnace has an input capacity of 100 MBH (1 MBH = 1,000 BTU/Hr). This furnace has an estimated operating efficiency of 88%. Warm air from the furnace is delivered to via ducts to various locations throughout the building. There is also a 1.5kW baseboard heater located upstairs in the cottage.

A Bradford White gas-fired, domestic water heater with a 65 gallon storage tank located in the basement room has an input capacity of 4500W (15.34 MBH).

Window air conditioning units provide localized cooling for the building.

The heating is controlled by a local thermostat.

The condensing furnace is in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition. The detailed equipment list is in Appendix F.

2.6.3 Description of Building Lighting

The lighting system for Cottage 10 is primarily compact fluorescents. The lighting controls are manual. The lighting levels are generally low in the house.

Cottage 10 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.7 House 13

This building is a residence used for special guests and seasonal site staff. It is only occupied a portion of the year.

2.7.1 Description of Building Envelope

House 13 was constructed in 1905. The building exterior walls are stone construction. The interior finishes are plaster. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is flat with bitumen rolled roofing. The roof is assumed to have an insulation value of R-19.

House 13 has single pane windows with wooden frames and aluminum exterior storm windows. The windows are in good condition. The doors are wooden with side lights. Doors are in fair condition.

2.7.2 Description of Building HVAC

The heating in House 13 is provided by hot water generated from a boiler. Space heating hot water is generated in the boiler room by a gas-fired Burnham. The boiler has an input capacity of 198 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80%. Hot water from the boiler is delivered to the hot water radiators throughout the building.

Heating is also provided by two electric baseboard heaters, 500 W (1.70 MBH) and 1000 W (3.41MBH) both located in the upstairs bathroom.

No air conditioning units were seen during visit.

The heating is controlled by a local thermostat.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition. The detailed equipment list is in Appendix F.

2.7.3 Description of Building Lighting

The lighting system for the Cottage 13 is primarily compact fluorescents with a Magnetic T12 fixture in the kitchen. The lighting controls are manual.

Cottage 13 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.8 House 21

This building had been used as office space. It is presently under renovation.

2.8.1 Description of Building Envelope

House 21 was constructed in 1926. It is used as office space. The exterior walls of House 21 are of wooden clapboard. The interior finish is plaster. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with shingles. The attic has no insulation and the radiant barrier is removed. The roof is assumed to have an insulation value of R-12. Some fiberglass insulation is installed in floor of the attic.

House 21 has single pane windows with wooden frames and exterior storm windows. The windows are in good condition. The doors are wooden with side lights. Doors are in fair condition.

2.8.2 Description of Building HVAC

The heating in House 21 is provided by steam generated from a boiler. Low-pressure steam is generated in the basement a gas-fired Burnham boiler. This boilers has an input capacity of 280 MBH (1 MBH = 1,000 BTU/Hr). This boilers has an estimated operating efficiency of 82.2%. Steam from the boilers is delivered to radiators throughout the building. The steam system appears to be tight. These system don't appear to use an excessive amount of make-up water.

A Bradford White gas-fired, domestic water heater with a 50-gallon storage tank located in the basement has an input capacity of 50 MBH. This domestic water heater provides domestic hot water throughout the building.

The rooms are controlled by local thermostats for each unit ventilator, or other HVAC unit.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition. The detailed equipment list is in Appendix F.

2.8.3 Description of Building Lighting

The lighting system for the House 21 is primarily compact fluorescents with some spaces have T8 fixtures with electronic ballasts in some of the offices. The lighting controls are manual.

House 21 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.9 House 27 and 29

These building are residences. Building 29 was unoccupied during the site visit and in need of renovation. Building 27 was occupied during the site visit.

2.9.1 Description of Building Envelope

Houses 27 and 29 were constructed around 1948. Currently House 27 is occupied while House 29 is not. The buildings have stucco exteriors. The interior walls are plaster. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-8.

The houses have single pane windows with wooden frames and exterior storm windows. The windows are in good condition. The doors are wooden. Doors are in fair condition.

2.9.2 Description of Building HVAC

The heating in these houses is provided by hot water generated from boilers. Space heating hot water is generated in the basements by two gas-fired Burnham boilers. These boilers each have an input capacity of 164 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80.3%. Hot water from the boilers is delivered to radiators locations throughout the building.

A 2003 Rheem electric domestic water heater with a 50 gallon storage tank located in the basements of each house has an input capacity of 4500 W (15.35 MBH).This water heater provides domestic hot water throughout the buildings. The Rheem water heater is in poor condition.

Window Air Conditioning units provide localized cooling for the building.

The rooms are controlled by local thermostats for each unit ventilator, or other HVAC unit.

Most of the HVAC equipment appeared to vary from fair to good condition. The detailed equipment list is in Appendix F.

2.9.3 Description of Building Lighting

The lighting system for the House 27 & 29 is primarily compact fluorescents. The lighting controls are manual.

House 27 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.10 House 30

House 30 is a residence that is occupied year round.

2.10.1 Description of Building Envelope

House 30 was constructed in around 1940. The exterior walls of House 30 are masonry with stucco exterior. The interior is a plaster finish. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-19.

House 30 has single pane windows with wooden frames and exterior storm windows. The windows are in good condition. The doors are wooden with side lights. Doors are in fair condition.

2.10.2 Description of Building HVAC

The heating in House 30 is provided by hot water generated from a boiler. Space heating hot water is generated in the basement by a gas-fired 1998 Burnham boiler. This boiler has an input capacity of 164 MBH (1 MBH = 1,000 BTU/Hr). This boiler has an estimated operating efficiency of 80.3%. Hot water is pumped to cast iron radiators in the various spaces. The kitchen has an electric toe kick heater controlled by a wall thermostat.

A Rheem electric, domestic water heater with an 80 gallon storage tank located in the basement room has an input capacity of 4500W (15.34 MBH). Window air conditioning units provide localized cooling for the building.

Window air conditioning units provide localized cooling for the building.

The heating system is controlled by a local thermostat.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.10.3 Description of Building Lighting

The lighting system for House 30 is primarily compact fluorescents. The lighting controls are manual. The lighting levels are generally low in the house.

House 30 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.11 House 47

This building is the residence of the executive director. It is occupied year round.

2.11.1 Description of Building Envelope

House 47 was constructed around 1950. This is a residential space. There was an addition added in 2000. The building exterior walls are stone with plaster. The interior finish is plaster. The addition is 2x4 framing with drywall. The walls are assumed to have an insulation value of R-11 and no insulation installed. The roof is sloped with shingled roofing. The roof is assumed to have an insulation value of R-19.

House 47 has single pane windows with aluminum storm frames in the original part of the house. The windows are in good condition. The addition has wooden framed double paned windows. The doors are wood half-light configuration. Doors are in fair condition with daylight visible between the door and threshold.

2.11.2 Description of Building HVAC

The heating in House 47 is provided by hot water generated from a boiler. Space heating hot-water is generated in the basement by a gas-fired Burnham boiler. This boiler has an input capacity of 198 MBH (1 MBH = 1,000 BTU/Hr). This boiler has an estimated operating efficiency of 80.4%. Hot water from the boiler is delivered to the radiators in various locations throughout the original building. The addition is heated by a gas furnace providing 75 MBH heating. The addition heat is forced air provided by the gas furnace.

A Bradford White gas-fired, domestic water heater with a 75 gallon storage tank located in the basement has an input capacity of 76 MBH. This water heater provides domestic hot water throughout the building. The Bradford White water heater is in good condition.

The building air conditioning is provided by split systems. The addition cooling is circulated by the gas furnace. Two air conditioning units provide cooling to the original house. One unit in the basement conditions the first floor and a unit in the attic conditions the second floor.

The rooms are controlled by local thermostats for each HVAC unit.

The boiler and heating equipment is in good condition. Most of the other AC equipment appeared to be good condition.

2.11.3 Description of Building Lighting

The lighting system for House 47 is primarily compact fluorescents. Some spaces have T8 fixtures with electronic ballasts and T12 fixtures with magnetic ballasts. The lighting controls are manual.

Cottage 47 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.12 House 52 A & B

This building is a residence that was only half occupied, one unit, at the time of the site visit.

2.12.1 Description of Building Envelope

Houses 52 A & B were constructed around 1900. House 52 A is currently occupied. House 52B is currently unoccupied. The building exterior walls are clapboard. The interior finishes are plaster. The inside has rough sawn timber framing. The walls are assumed to have insulation with a value of R-11. The roof is sloped with cedar shingles. The roof is assumed to have an insulation value of R-19.

The houses have single pane windows with storm windows. The windows are in good condition. The doors are wooden. Doors are in fair condition.

2.12.2 Description of Building HVAC

The heating in House 52 A & B is provided by hot-water generated from boilers. Space heating hot-water is generated in the basements by two oil-fired Burnham boilers. The boiler in House A has an input capacity of 125 MBH (1 MBH = 1,000 BTU/Hr). The Boiler in House B has an input capacity of 115 MBH. These boilers have an estimated operating efficiency of 85% and 80% respectively. Each boiler has 3 zones that serve hot water baseboard radiators in the apartment spaces.

A Whirlpool electric, domestic water heater with a 30 gallon storage tank located in the basement of House B has an input capacity of 4kW (13.6 MBH). A Whirlpool electric, domestic water heater with a 40 gallon storage tank located in the basement of House A has an input capacity of 3.5kW (11.9 MBH). These water heaters provide domestic hot water throughout the buildings. The Whirlpool water heaters are in good condition.

Window air conditioning units provide cooling for the buildings.

The space heating is controlled by thermostats for each zone. Each building has 3 zone valves with a thermostat for the first floor and 2 for the upstairs bedrooms. Thermostats were observed to be set at 65°F.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.12.3 Description of Building Lighting

The lighting system for the House 52 A is primarily compact fluorescents and incandescent. The lighting controls are manual. The lighting system for the House 52 B is primarily compact fluorescents and incandescent. Some of the rooms did not have any lighting fixtures. Some spaces have T8 fixtures with electronic ballasts. The lighting controls are manual. Replacing incandescent lamps with LED or fluorescent have the greatest potential savings.

House 52 A and B have separate electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.13 House 59

This building was a house that has been converted in to offices. The building is typically occupied 9 AM to 5 PM weekdays.

2.13.1 Description of Building Envelope

House 59 was constructed around 1930. The building exterior walls are wood clap board. The interior is post and beam construction with plaster walls with no insulation installed. The walls are assumed to have an insulation value of R-11. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-10 from the air space held in the attic floor.

The house has single pane windows with aluminum frames. The windows are in good condition. The doors are metal half-light style. Doors are in fair condition.

2.13.2 Description of Building HVAC

The heating in House 59 is provided by hot water generated from a boiler. Space heating hot water is generated by one oil-fired Burnham boiler from 1998. This boiler has an input capacity of 156MBH (1 MBH = 1,000 BTU/Hr. This boilers have an estimated operating efficiency of 80%. Hot water pumps deliver hot water to the hot water radiators in each space. The building is a single zone on a single thermostat.

A 2011 whirlpool gas/LP-fired, domestic water heater with a 40 gallon storage tank located in the boiler room has an input capacity of 83 MBH. This water heater provides domestic hot water throughout the building. The water heaters are in good condition.

Window air conditioning units provide localized cooling for the building.

The heat is controlled by a local thermostat.

The boilers are in fair condition. The window air conditioners are of various age and condition.

2.13.3 Description of Building Lighting

The lighting system for House 59 is primarily compact fluorescents. Some spaces do not have any lighting fixtures. The lighting controls are manual. The basement and attic had low lighting levels.

Cottage 59 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.14 House 74

This building was a residence that is now unoccupied. The building is currently being used as unconditioned storage for the bee hives of the property.

2.14.1 Description of Building Envelope

House 74 was constructed around 1930. The building is unconditioned and only used for storage. The building exterior walls are clapboard. The interior walls are wood framed with plaster. The walls are assumed to have an insulation value of R-4 and little insulation installed. The roof is sloped with shingled roofing. The roof is assumed to have an insulation value of R-8.

The house has single pane windows with exterior storm windows. Some of the exterior storm windows were missing. The windows are in good condition. The doors are wood construction half-light style. Doors are in fair condition with daylight visible between the door and threshold.

2.14.2 Description of Building HVAC

House 74 had parts of a steam heating system installed. Currently the steam boilers are disassembled and abandoned. Complete boiler replacement would be required to restore system operation.

There are two electric baseboard heaters in the house with 1.5kW and 2kW heating output. The building was not being heated. The electric heaters were off at the time of the site visit.

The water heating system is currently abandoned.

No cooling system observed.

2.14.3 Description of Building Lighting

The lighting system for House 74 is primarily incandescent. The lighting controls are manual. Lighting fixtures, controls and the electrical system in general are in need or replacement or upgrades. Replacing incandescent lamps with LED or fluorescent have the greatest potential savings.

Cottage 74 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.15 House 79

House 79 is a residence that is occupied year round.

2.15.1 Description of Building Envelope

House 79 was constructed in the 1800's. The exterior walls of House 79 are of wooden clapboard. The interior finish is plaster, and is insulated with brick and mud. The walls have insulation

installed with a value of R-11. The insulation is discolored due to air movement which de-rates the insulation value. The roof is sloped with cedar shakes. The roof is assumed to have an insulation value of R-19.

House 13 has single pane windows with wooden frames and aluminum exterior storm windows. The windows are in good condition. The doors are wooden with side lights. Doors are in fair condition.

2.15.2 Description of Building HVAC

The heating in House 79 provided by hot-water generated from an oil fired boiler. Space heating hot water is generated in the basement room by one oil-fired Burnham boiler. This boiler has an input capacity of 101 MBH (1 MBH = 1,000 BTU/Hr). The Energy Guide tag on the boiler indicated an operating efficiency of 87%. Hot-water from the boiler is delivered to radiators in various locations throughout the building. A 500 W (1.70 MBH) electric baseboard heater is located in the upstairs bath room.

A Whirlpool electric, domestic water heater with a 50 gallon storage tank located in the basement has an input capacity of 4500W (15.34 MBH). This water heater provides domestic hot water throughout the building

No cooling system observed.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.15.3 Description of Building Lighting

The lighting system for House 79 is primarily compact fluorescents. The lighting controls are manual.

House 79 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.16 House 87

This building is a residence that is occupied year round. The building has a radon mitigation system.

2.16.1 Description of Building Envelope

House 87 was constructed around 1900. The interior has had multiple upgrades including finishing the attic space about 20 years ago. The basement is stone foundation. The building exterior walls are wooden clapboard. The interior finishes are plaster. The walls are assumed to have 4in insulation batts for an insulation value of R-11. The roof is sloped with shingled roofing. The ceiling and roof is assumed to have 6 in insulation batts for an insulation value of R-19.

House 87 has single pane wooden framed windows with aluminum storm exteriors. The windows are in good condition. The doors are wooden.

2.16.2 Description of Building HVAC

The heating in House 87 is provided by hot water generated from a boiler. Space heating hot water is generated in the basement by a propane-fired Burnham boiler. This boiler has an input capacity of about 100 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80.4%. Hot water from the boilers is delivered to the hot water coils of the unit ventilators, and convectors in various locations throughout the original building. The 3rd floor has air conditioning with electric heat.

A Bradford White gas-fired, domestic water heater with an 80 gallon storage tank located in the basement room has an input capacity of 4500W (15.4 MBH). This water heater provides domestic hot water throughout the building. The Bradford White water heater is in good condition.

The rooms are controlled by two programmable thermostats for the 2 zones. Thermostats were set at 70°F.

The boiler, water heater and central air systems are in good condition.

2.16.3 Description of Building Lighting

The lighting system for House 87 is primarily compact fluorescents. The lighting controls are manual.

House 87 electrical service is assumed to be 200 amp, 3 phase, and 240 volts. The electrical systems are in good condition.

2.17 House 120

This building is a residence that is occupied during a portion of the year. It was occupied at the time of the site visit.

2.17.1 Description of Building Envelope

House 120 was constructed around 1930. House 120 is currently used as a residence. The building exterior walls are clapboards. The interior finishes are drywell and plaster. The walls are assumed to have an insulation value of R-11 with insulation installed. The roof is sloped shingle panes roofing and has 3½" of insulation. The roof is assumed to have an insulation value of R-11.

House 120 has single pane windows. The windows are in good condition. The doors are wooden with half-light glazing. Doors are in fair condition.

2.17.2 Description of Building HVAC

The heating in House 120 is provided by hot-water generated from a propane boiler. Space heating hot water is generated in the boiler room by a gas-fired Weil-McLain boilers. This boiler has an input capacity of 200 MBH (1 MBH = 1,000 BTU/Hr). This boiler has an estimated

operating efficiency of 80%. Hot water from the boiler is delivered to the hot water coils of the unit ventilators, and convectors in various locations throughout the building.

A Bradford White electric, domestic water heater with a 50 gallon storage tank located in the basement room has an input capacity of 4kW (13.6 MBH). This water heater provides domestic hot water throughout the building. The Bradford White water heater is in good condition.

There was no observed cooling system.

The rooms are controlled by local thermostats for each unit ventilator, or other HVAC unit.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.17.3 Description of Building Lighting

The lighting system for House 120 is primarily compact fluorescents. Some spaces incandescent lighting. The lighting controls are manual.

House 120 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.18 Shop 18 and Shop 70

Shop 18 appears to house material, tools and act as a break room. It does not appear that much work or production is done in this building. Building is used intermittently from 7 am to 3 pm weekdays.

Shop 70 has lots of wood working equipment, including an air compressor and dust collection system. The air compressor has a 3 HP motor and the dust collection system has a 5 HP motor. This shop was used heavily, but not in recent history. Building is used intermittently from 7 am to 3 pm weekdays.

2.18.1 Description of Building Envelope

Shop 18 was constructed around 1920. The building exterior is wood clapboard siding. The building has 2x4 framing and wood and dry wall interior. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with wooden roofing. The roof is assumed to have an insulation value of R-4.

The windows are single pane with wooden frames. The windows are in fair condition. The doors are wooden with single pane glass. Doors are in fair condition.

Shop 70 was constructed around 1920. The building exterior and interior is made of block wall. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with shingled roofing. The roof is assumed to have an insulation value of R-8.

The windows are single pane with wooden frames. The windows are in fair condition. The doors are wooden with single pane glass. Doors are in fair condition.

2.18.2 Description of Building HVAC

The heating in Shop 18 is provided by two condensing furnaces. The furnaces each have an input capacity of 100 MBH (1 MBH = 1,000 BTU/Hr). These furnace units have an estimated operating efficiency of 92%. A 2000W (6.82 MBH) baseboard heater is also located in the shop to provide heat. The programmable thermostats for each unit were set at 65°F, at the time of the site visit.

A Bradford White electric, domestic water heater with an 8 gallon storage tank located in the garage has an input capacity of 2000 W (6.82 MBH). This water heater provides domestic hot water throughout the building.

Window air conditioning units provide localized cooling for the building.

The heating in Shop 70 is provided by two unit heaters. Each heater is controlled by a wall thermostat. The thermostats are set for 62°F. The unit heaters are rated for 75 MBH and 150 MBH.

Window air conditioning units provide localized cooling for the building.

2.18.3 Description of Building Lighting

The lighting system in Shop 18 is primarily T12 fixtures. Other fixtures included compact fluorescent, T8, and one exterior high pressure sodium light. The lighting controls are manual, except for the HPS which has a day light sensor, or DLS control.

Shop 18 electrical service is 400A, 208V, 3 phase. Building electrical systems are in good condition. Each addition had different electrical layouts.

The lighting system in Shop 70 is primarily T12 fixtures. Other fixtures included a compact fluorescent and a T8 fixture. The lighting controls are manual. T12 lamp and ballast replacements can have significant savings.

Shop 70 electrical service is 400A, 208V, 3 phase. Building electrical systems are in good condition. Each addition had different electrical layouts.

2.19 Motor Pool

The motor pool has an office, locker room, bathroom, 3 service bays and a car wash bay. The building is occupied intermittently during the day. The service bays don't appear to be used heavily. The building has a small air compressor that is used primarily for filling tires that was unplugged at the time of the site visit. The building office is typically occupied from 8 am to 4 pm weekdays.

2.19.1 Description of Building Envelope

The Motor Pool was constructed around 1980. The building exterior walls are sheet metal with fiberglass insulation. The building has steel structure. The walls are assumed to have an insulation value of R-11. The roof is corrugated steel deck. The roof has 6" of insulation and an insulation value of R-19.

The Motor Pool has double pane windows with wooden frames. The windows are in good condition. The doors are metal with half-lights. Doors are in good condition.

2.19.2 Description of Building HVAC

The heating in the Motor Pool is provided by a 500W electric baseboard heater in the bathroom. The remainder of the building is heated by gas fired radiant heaters. The office has central air and a wall mounted programmable thermostat set at 68°F.

Two Bradford White electric, domestic water heaters with a 30 and 40 gallon storage tanks located in on the roof of the bathroom has input capacities of 2 kW. This water heater provides domestic hot water to the building. The Bradford White water heaters are in good condition.

2.19.3 Description of Building Lighting

The lighting system in the Motor Pool is primarily T8 fixtures with some T12 fixtures and compact fluorescents. The lighting controls are primarily OS with some manual controls.

The motor pool electrical service is 200 amp, 3 phase, and 240 volts. Building electrical systems are in good condition.

2.20 Building 5 – Pump House

The pump house is a building that was built to house pumps that pump from the Raritan River to the Duke Farms Lakes. Site Staff reported that a river dam has been removed and the water level may not be sufficient to use the pump house anymore. The Reservoir pump station was installed to increase the lake levels. The installed transfer pumps are rated at 125 HP and 50 HP. The building is visited daily but not consistently occupied according to site staff.

2.20.1 Description of Building Envelope

The Pump House was constructed in the 1800's. The building exterior walls are brick construction. The interior finishes brick with cast iron metal interior finish. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is flat with wooden timber. The roof is assumed to have an insulation value of R-8.

The Pump House has single pane windows with wooden frames. The windows are in good condition. The doors are metal with half-lights. Doors are in fair condition.

2.20.2 Description of Building HVAC

The heating in Pump House 15 is provided by a gas fired unit heaters. The main room unit heater has an input capacity of 230 MBH (1 MBH = 1,000 BTU/Hr). This heater is controlled by a sensor

bulb. The unit heater is set to maintain a fixed temperature. This appeared to be around 60°F. The office area has a gas fired radiant heater. This unit is self-controlled. The office area heater is only used when the office is occupied. The building is visited multiple times a day.

The heating units are over 20 years and assumed to be 75% efficient.

There was no observed cooling system.

2.20.3 Description of Building Lighting

The lighting system in Building 5 is primarily compact fluorescents. The other fixture is incandescent. The lighting controls are manual.

The pump house electrical service is assumed to be 800 amp, 3 phase, and 240 volts. Building electrical systems are in good condition.

2.21 Garage 19

This building is an unconditioned storage with electric for lighting and a few duplex outlets. Building is not occupied.

2.21.1 Description of Building Envelope

Garage 19 was constructed around 1900. The building exterior walls are clapboard. The interior wall is wood planks. The roof is sloped with shingles. Garage 19 has single pane windows with wooden frames. The windows are in good condition. The doors are wood. Doors are in good condition.

2.21.2 Description of Building HVAC

The building does not have heating or cooling.

2.21.3 Description of Building Lighting

The lighting system for Garage 19 is primarily compact fluorescents and T12 fixtures. The lighting controls are manual and daylight sensors.

Garage 19 electrical service is assumed to be 200A, 240V, single phase. The electrical systems are in good condition.

2.22 Building 23 (Staff Office)

Building 23 is the site maintenance staff building. The building spaces include offices, classrooms and conference rooms for the facilities maintenance staff. The building is occupied from 6 am to 5 pm weekdays.

2.22.1 Description of Building Envelope

Building 23 was constructed around 1926. It is used as office space. The exterior walls of building 23 are brick and stucco. The interior is made of post and beams with a plaster finish. The walls are assumed to have an insulation value of R-10. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-19.

Building 23 has single pane windows with some exterior storm windows. The windows are in good condition. The doors are wooden in the original building. Doors are in good condition. The building has an addition that is comprised of modular structures. These have double pane windows and metal doors.

2.22.2 Description of Building HVAC

The heating in Building 23 is provided a hot-water generated from a boiler is the source of heat for the main building. Space heating hot-water is generated in the basement a gas-fired Burnham boiler from 1998. This boilers has an input capacity of 198 MBH (1 MBH = 1,000 BTU/Hr). This boilers has an estimated operating efficiency of 82.2%. Hot-water from the boilers is delivered to radiators throughout the main building basement, first and second floor.

A Whirlpool electric, domestic water heater with a 50-gallon storage tank located in the basement has an input capacity of 4.5kW (15.35 MBH). This domestic water heater provides domestic hot water throughout the building.

The original building is air conditioned by multiple dx split systems. There were 2 systems rated at 2.5 tons and 1 system rated at 2 tons of capacity. The addition is air conditioned and heated by packaged air cooled systems. These 4 systems are rated at 5 tons each of cooling capacity.

The building has an addition that consist of 3 modular buildings. These units are electrically heated and consist of the bathrooms and conference rooms.

The building is controlled by multiple thermostats. These thermostats were set at 70°F at the time of the site visit.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.22.3 Description of Building Lighting

The lighting system for Building 23 is primarily compact fluorescents and T8 fixtures. There is one hall with 12 Halogen lamp fixtures. The lighting controls are manual and occupancy sensors.

Building 23 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.23 Building 24

This building is a house that is being used as unoccupied office area.

2.23.1 Description of Building Envelope

Building 24 was constructed around 1926. It is a house being used as office space. The exterior walls of building 24 are stucco on brick. The interior is a plaster finish. The walls are assumed to have an insulation value of R-11. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-19.

Building 24 has single pane windows with wooden frames and exterior storm windows. The windows are in good condition. The doors are wooden. Doors are in good condition.

2.23.2 Description of Building HVAC

The heating in Building 24 is provided by an air condition furnace. This furnace has an input capacity of 100 MBH (1 MBH = 1,000 BTU/Hr). This boilers has an estimated operating efficiency of 90%. Heat air from the furnace provides heat throughout the house.

A Bradford White gas-fired, domestic water heater with a 40-gallon storage tank located in the basement has an input capacity of 40 MBH. This domestic water heater provides domestic hot water throughout the building.

A Direct Expansion split-system air conditioners unit provide cooling for the building.

The rooms are controlled by local thermostats for each unit ventilator, or other HVAC unit.

The furnace is in good condition. Most of the other HVAC equipment appeared to be in good condition.

2.23.3 Description of Building Lighting

The lighting system for Building 24 is primarily 2x4 T8 fixtures with electrical ballasts. Some spaces have compact fluorescents. There is a T12 fixture and a high pressure sodium light as well. The lighting controls are manual.

Building 24 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.24 Building 56 – Gate House

The gate house was the guarded entry for the gated portion of the campus known as the core. The building is currently unoccupied due to the function has been moved to the security building. The gate house has office and break room area with storage in the basement.

2.24.1 Description of Building Envelope

The exterior walls of the Gate House are shake exterior. The interior finish is plaster. The walls are assumed to have an insulation value of R-11 and no insulation installed. The roof is sloped with shingles. The roof is assumed to have an insulation value of R-19.

The windows in the original building are single pane, with wooden frames and storm exteriors. The doors are metal doors with half-light configuration. Doors are in good condition.

2.24.2 Description of Building HVAC

The heating in the Gate House is provided from electric radiant panels in the control room. A 500 W (1.7 MBH) baseboard heater is located on the first floor office area. In the basement there is a 6000 W (20.4 MBH) unit heater.

A domestic water heater with a 5 gallon storage tank located in the boiler room has an input capacity of 1,500 W. This water heater provides domestic hot water throughout the building.

Window air conditioning units provide cooling for the building.

The heating is controlled by unit mounted controls or wall thermostats in each room. These units were fixed set point.

2.24.3 Description of Building Lighting

The lighting system for Building 56 is primarily compact fluorescents. Some spaces have T8 fixtures with electronic ballasts. There is also an exterior High Pressure Sodium light. The lighting controls are manual.

Building 56 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.25 Cottages 35 and 37

These building are storage and seasonal offices. Cottage 35 is the seasonal offices and storage for the farmers. Cottage 37 is used for offices and storage for the cafeteria and food service staff.

2.25.1 Description of Building Envelope

Cottages 35 and 37 were constructed in 1926. They are used as storage space. The exterior walls of Cottages 35 and 37 are stone. The wall interior has a plaster finish. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roofs are sloped and slate. The roof is assumed to have an insulation value of R-10.

Cottages 35 and 37 has single pane windows with exterior storm windows. The windows are in good condition. The doors are wooden with a half light. Doors are in fair condition.

2.25.2 Description of Building HVAC

The heating in these Cottages is provided by steam generated from two boilers. Low-pressure steam is generated in the basements by a gas-fired Burnham boiler. The boilers have an input capacity of 210 MBH (1 MBH = 1,000 BTU/Hr). These boilers have an estimated operating efficiency of 80.9%. Steam from the boilers is delivered to radiators, and the steam coils of the unit ventilators, and air handling units in various locations throughout the building. A unit heater located in the basement provides 5kW (17 MBH) of heat. The steam system appears to be tight. The system does not use excess make-up water.

Two Bradford White gas-fired, domestic water heater with a 48 gallon storage tank located in the basements has an input capacity of 40 MBH. This water heater provides domestic hot water throughout the buildings. The Bradford White water heaters are in good condition.

The heat is controlled by a local thermostat.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.25.3 Description of Building Lighting

The lighting system for these Cottages is primarily compact fluorescents. There is a T8 fixture. The lighting controls are manual.

Cottages 35 and 37 electrical service are 200A, 240V, single phase. The electrical systems are in good condition.

2.26 Cottage 43

The building has been converted from a house to offices and storage. The building has computers and desks in each room.

2.26.1 Description of Building Envelope

Cottage 43 was constructed around 1930. The building does not appear to have been remodeled recently and therefore is assumed to have no insulation installed. The building exterior walls are stone. The interior finish is plaster. The house has 2x4 framing. The walls are assumed to have an insulation value of R-4 and no insulation installed. The roof is sloped with shingled roofing. The roof is assumed to have an insulation value of R-8.

Cottage 43 has single pane windows with aluminum storm frames. The windows are in good condition. The doors are metal with side lights. Doors are in fair condition with daylight visible between the door and threshold.

2.26.2 Description of Building HVAC

The heating in Cottage 43 is provided by steam generated from a boiler. Low-pressure steam is generated in the basement by a gas-fired Weil-McLain boiler. This boiler has an input capacity of 175 MBH (1 MBH = 1,000 BTU/Hr). This boilers has an estimated operating efficiency of 78%. Steam from the boiler is delivered to the steam coils of the unit ventilators, and convectors in various locations throughout the building. The steam system appears to be tight. The system does not use excess make-up water.

There are two electric unit heaters. One is located in the basement providing 5kW (17.1 MBH) of heat and the other is located in the fire pump room providing 3.3 kW (11.3 MBH) of heat.

A Bradford White gas-fired, domestic water heater with a 50 gallon storage tank located in the basement room has an input capacity of 40 MBH. This water heater provides domestic hot water throughout the building. The Bradford White water heater is in good condition.

Window air conditioning units provide localized cooling for the building.

The building is controlled by local thermostats for the heating and unit mounted controls for the window air conditioners.

The boilers are in fair condition. Most of the other HVAC equipment appeared to vary from fair to good condition.

2.26.3 Description of Building Lighting

The lighting system for Cottage 43 is primarily compact fluorescents. There is a T8 fixture and a T12 fixture. The lighting controls are manual.

Cottage 43 electrical service is 200A, 240V, single phase. The electrical systems are in good condition.

2.27 Reservoir Well Pump & Community Garden Well

The Reservoir pump station was installed to increase the lake levels. The Reservoir pump is sized for 180ft of lift and 300 gallons per minute. This equates to approximately 20 HP. Given the variation of the well height, the actual gallons per minute declines with well elevation. The pumps schedule is varied by the staff manually. The schedule was 12 hours at night, 7 PM to 7 AM, at the time of the site visit.

Community Garden Well is an irrigation system for outdoor gardens. The Community Garden Well pump has a VFD that is installed on the outside of one of the structures. The VFD is programmed to maintain system pressure. The Community Garden Well pump power supply is capable of powering a 25 HP pump.

2.27.1 Description of Building Envelope

Reservoir Well Pump is outdoor structure with no walls.

The gardens have a small wooden shed containing isolation valves and a well pressure tank.

2.27.2 Description of Building HVAC

Reservoir Well Pump is an outdoor control panel with no HVAC.

Community Garden Well has one electric baseboard heater rated for 2000W (6.82 MBH). The space temperature setting is around 50°F.

2.27.3 Description of Building Lighting

The reservoir pump does not have any lighting fixtures.

The Community Gardens have a 4 foot fluorescent fixture in the shed. These installations have electrical connection to the common Farm Barn electrical service.

Section 3

Baseline Energy Use

3.1 Utility Data Analysis

The first step in the energy audit process is the compilation and quantification of the facility's current and historical energy usage and associated utility costs. It is important to establish the existing patterns of electricity, gas, and oil usage in order to be able to identify areas in which energy consumption can be reduced.

For this study, the monthly gas, propane, fuel oil and electric bills per facility were analyzed and unit costs of energy were obtained. These unit costs were used for financial evaluations with in this report.

The utility map of the campus was provided by the Foundation. The connections to the electrical services and the delivered fuels are noted on the diagram. This diagram is included in Appendix J.

3.1.1 Electric Charges

It is also important to understand how the utilities charge for the service. The majority of the energy consumed is electric as a result of both indoor and outdoor lighting and appliances, such as kitchen appliances, computers, printers and projectors. Electricity is charged by three basic components: electrical consumption (kWh), electrical demand (kW) and power factor (kVAR) or reactive power. The majority of electrical connections are single phase and do not record kW or KVAR. The only connection that would have kW would be the Farm Barn Substation.

The other parts of the electric bill are the supply charges, delivery charges, system benefits, transmission revenue adjustments, state and municipality tariff surcharges and sales taxes, which cannot be avoided.

Public Service Electric & Gas (PSE&G) is to be the current distributor and supplier of electric energy for all Foundation facilities included in this report.

The electrical usage on the campus is augmented by the production of the on-site solar array. The solar array is rate at 635.5 kW of installed capacity.

3.1.2 Natural Gas Charges

PSE&G is the current distributor of natural gas for all Foundation facilities included in this report. The charges and usages were provided by the Foundation.

3.1.3 Propane and Fuel Oil Charges

Fuel oil and propane deliveries are charged at the market or contract rate at the time of delivery. The Foundation provided delivery amounts and costs for the fuels and locations.

3.1.4 Water and Sewer Charges

The facility drinking water is provided by wells on the property. The individual sewer lines are connected to septic systems. The only costs associated with the water and sewer are the electric usage for the well pumping, and the upkeep of the well treatment and septic systems.

3.2 Electrical Usage

A large number of structures at the Duke Farm Foundation have very low electrical usage. The 2 largest users are shown below.

3.2.1 Farm Barn Substation

Electric power for the Farm Barn Substation is fed from a Secondary three phase line from PSE&G on the LPLP Tariff. Figure 3.2-1 illustrates the average annual total energy consumption from Jan, 2014 through Dec, 2015. The electrical usage measured at the Farm Barn Substation is actually used at many buildings including the buildings in Table 3.2-1.

Table 3.2-1: Farm Barn Substation Electricity Usage

Building	Electrical Energy Use (kWh)
Building 22 – Motor pool	Not Metered
Building 23	Not Metered
Building 24	Not Metered
Building 56	Not Metered
Community Garden Well	Not Metered
Conservatory 26	Not Metered
Cottage 35	Not Metered
Cottage 37	Not Metered
Cottage 43	Not Metered
Cottage 45	Not Metered
Garage 19	Not Metered
House 21	Not Metered
House 47	Not Metered
Reservoir Well Pump	Not Metered
Shop 18	Not Metered
House 29*	17
House 9	2,544
House 7	2,930
House 8	3,085
House 30	3,214
Shop 70	3,224
House 13	5,597

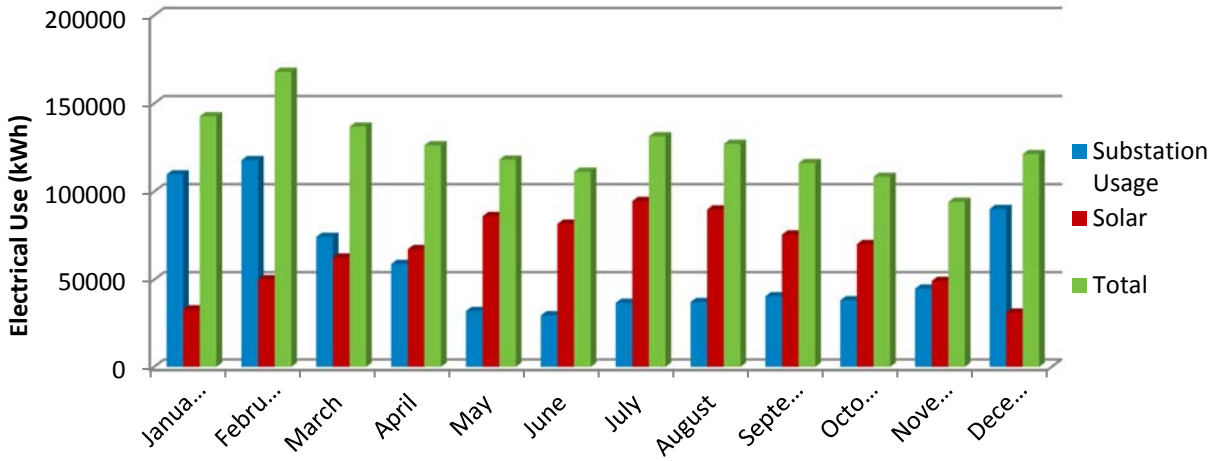
Building	Electrical Energy Use (kWh)
House 27	6,629
House 10	14,932
Building 32 – Orchid Range	15,034
Building 12 – Coach Barn	74,855
Building 39 – Farm Barn	260,733

*House 29 electric meter

The average electrical consumption for Farm Barn Substation is approximately 59,000 kWh/month. The average of the values in the table above is approximately 31,000 kWh/month.

Monthly consumption rates have been re-ordered as needed to illustrate a typical January-December year. This approach has been taken for all monthly utility consumption graphs shown in this report. The information presented is only as recent as the most recent bill received.

Figure 3.2-1: Farm Barn Substation Electricity Usage



The solar system produced 868,232 kWh. This is about half of the electric usage of the connected loads. As the profile shows, the solar power increases with the daylight hours.

Refer to Table 3.6-1, in Section 3.6 for the average electrical aggregate cost. These tariffs are subject to change quite frequently.

Large Power and Lighting Service - Primary (LPL-P)	
Delivery Charge	
Service Charge	372.11
Service Charge Primary Distribution	19.13
Distribution Kilowatt Charges: $/kW	
Annual Demand Charge	1.7063
Summer Demand Charge (1)	9.4725

Large Power and Lighting Service - Primary (LPL-P)	
Distribution Kilowatt-hour Charges: $/kWh	
All Use	0
Commercial and Industrial Energy Pricing (CIEP) Standby Fee	0.000161
Societal Benefits Charge (5)	0.008081
Non-Utility Generation Charge (5)	0.003376
Securitization Transition Charges (TBC + MTC - Tax) (5)	0.011131
System Control Charge	0
Solar Pilot Recovery Charge (5)	0.000161
Green Programs Recovery Charge (5)	0.002907
Electric Supply Charges	
Basic Generation Service: $/kWh	
All Use	Determined Hourly
Reconciliation Charge	Determined Monthly
Capacity Charge: $/kW Generation Obligation	
Summer (1)	8.8839
Winter (1)	8.8839
Transmission Charge: $/kW Transmission Obligation (5)	6.7883
(1) Summer is defined as the months of June through September. Winter is defined as all other months.	
(5) Charge may change periodically. Refer to pseg.com for current charge.	

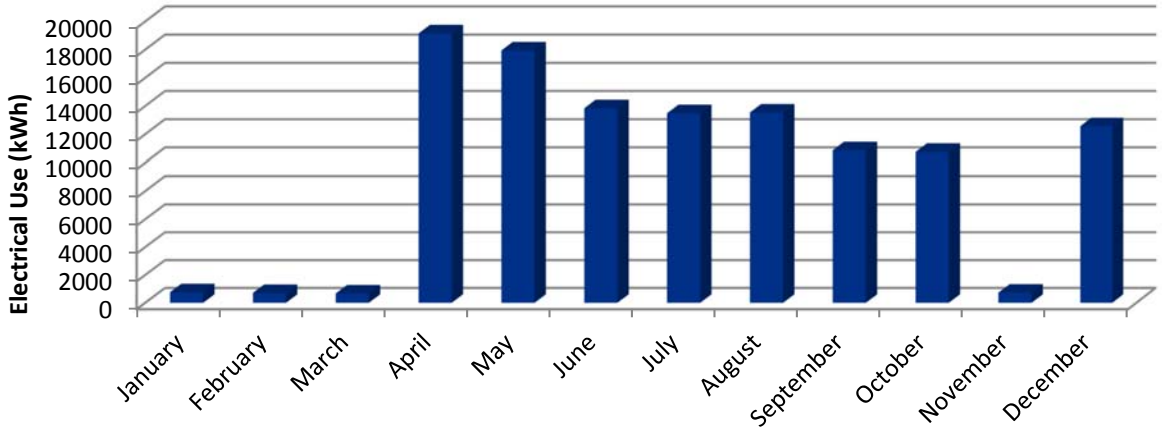
Refer to Appendix A for a complete Historical Data Analysis.

3.2.2 Building 5 – Pump house

Electric power for the Building 5 - Pump house is fed from one General Service Secondary three phase line from PSE&G on the LPLP Tariff. Figure 3.2-5 illustrates the average monthly total energy consumption Jan, 2014 through Dec, 2015.

From this data, it can be determined that the average electrical consumption for Building 5 is approximately, 9,600 kWh/month.

Figure 3.2-2: Building 5 – Pump House Electricity Usage



The building usage is primarily the pumps. The pumps are only operated to transfer water from the River to the Lakes on the property. The pumps are run when the river level is high enough for the pump inlets. Site staff said that a river dam was removed which may render the building pumps useless.

Refer to Table 3.6-1, in Section 3.6 for the average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.2.3 Other Buildings

The following buildings have individual electric meters that aren't served by the Farm Barn Substation. Table 3.2-2 illustrates the annual total energy consumption from Jan, 2014 through Dec, 2015.

Table 3.2-2: Building Electricity Usage

Building	Electrical Energy Use (kWh)	Tariff
House 52	12,504	RS
House 59**	0	-
House 74	365	RHS
House 79	14,428	RHS
House 87	537	RS
House 120	5,918	RS

**House 59 has electrical devices but the usage is paid for by a separate entity

Building 32 – Orchid range electrical usage is dedicated to the growth and cultivation of flowers. The Orchid range operates year round and has fairly consistent electrical usage.

House 74 and House 87 have higher usage in the winter. House 74 has no occupants and only lighting and electric heat. House 87 appears to only have been occupied during a portion of the utility history.

House 120 has a spike in electricity in November. This is due to new occupants over using. This issue was corrected by the next billing cycle.

Refer to Table 3.6-1, in Section 3.6 for the average electrical aggregate cost. These tariffs are subject to change quite frequently.

Large Power and Lighting Service - Primary (RS)		
Delivery Charge	**October to May**	**June to September**
Service Charge	2.95	2.95
Distribution Kilowatt-hour Charges: $/kWh		
First 600	0.033344	0.036008
Above 600	0.033344	0.039829
Societal Benefits Charge (5)	0.008081	0.008081
Non-Utility Generation Charge (5)	0.003376	0.003376
Securitization Transition Charges (TBC + MTC - Tax) (5)	0.011131	0.011131
System Control Charge	0	0
Solar Pilot Recovery Charge (5)	0.000161	0.000161
Green Programs Recovery Charge (5)	0.002907	0.002907
Electric Supply Charges		
Basic Generation Service: $/kWh		
First 600	0.112055	0.114461
Above 600	0.112055	0.123443
New Jersey Sales and Use Tax (SUT)	0.001484	0.001484
(1) Summer is defined as the months of June through September. Winter is defined as all other months.		
(5) Charge may change periodically. Refer to pseg.com for current charge.		

Large Power and Lighting Service - Primary (RHS)		
Delivery Charge	**October to May**	**June to September**
Service Charge	2.95	2.95
Distribution Kilowatt-hour Charges: $/kWh		
First 600	0.031502	0.048722
Above 600	0.011716	0.054231
Societal Benefits Charge (5)	0.008081	0.008081
Non-Utility Generation Charge (5)	0.003376	0.003376

Large Power and Lighting Service - Primary (RHS)		
Securitization Transition Charges (TBC + MTC - Tax) (5)	0.011131	0.011131
System Control Charge	0	0
Solar Pilot Recovery Charge (5)	0.000161	0.000161
Green Programs Recovery Charge (5)	0.002907	0.002907
Electric Supply Charges		
Basic Generation Service: $/kWh		
First 600	0.112055	0.114461
Above 600	0.112055	0.123443
New Jersey Sales and Use Tax (SUT)	0.001484	0.001484
(1) Summer is defined as the months of June through September. Winter is defined as all other months.		
(5) Charge may change periodically. Refer to pseg.com for current charge.		

Refer to Appendix A for a complete Historical Data Analysis.

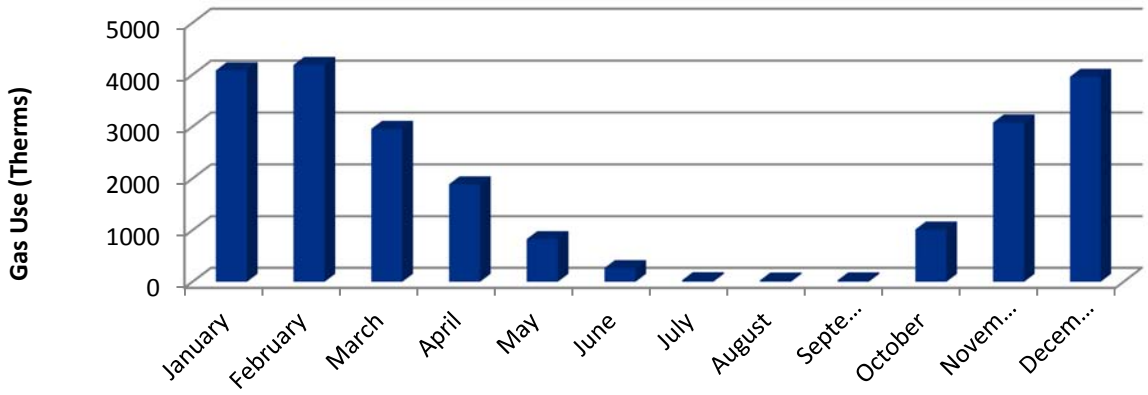
3.3 Natural Gas

Natural gas is metered at each building. The gas usage for the 2 largest users is included in the following sections the smaller users are discussed in the final section.

3.3.1 Building 32 - Orchid Range

Figure 3.3 -1 illustrates the monthly average natural gas consumption, derived from gas bills, at the Orchid Range from Jan, 2014 through Dec, 2015. The average monthly usage is 1900 therms.

Figure 3.3-1: Orchid Range Gas Usage



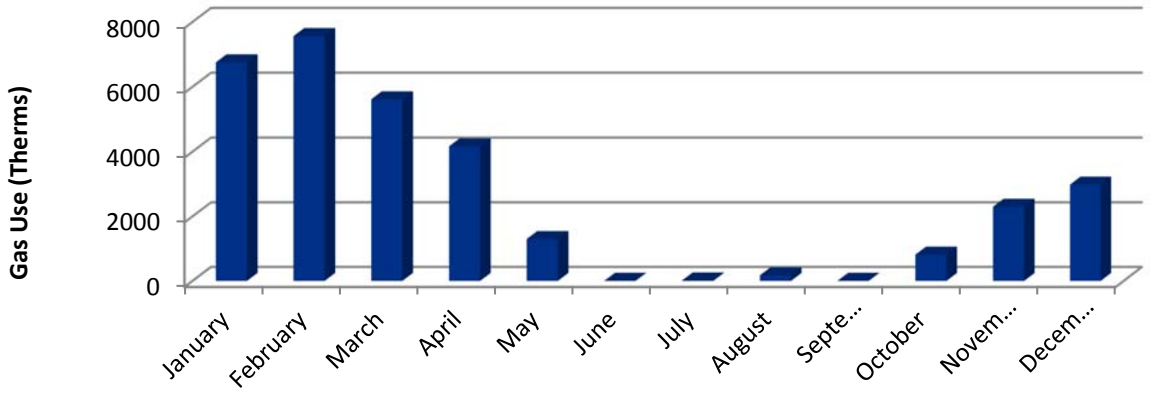
The natural gas usage is heating dominated. The summer usage is minimal.

Refer to Table 3.6-2, in Section 3.6 for the average natural gas aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.3.2 Conservatory - 26

Figure 3.3 -1 illustrates the monthly average natural gas consumption, derived from gas bills, at the Conservatory from Jan, 2014 through Dec, 2015. The average monthly usage is 2600 therms.

Figure 3.3-2: Conservatory 26 Gas Usage



The natural gas usage is for space heating. The summer usage is minimal.

Refer to Table 3.6-2, in Section 3.6 for the average natural gas aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.3.3 Other Buildings

Figure 3.3 -1 illustrates the annual natural gas consumption, derived from gas bills, at the following buildings from Jan, 2015 through Dec, 2015.

Building	Natural Gas Use (Therms)
Building 22 – Motor pool	5,456
Building 23	2,686
Building 24	1,539
Conservatory 26	24,807
Cottage 35	1,439
Cottage 37	1,158
Cottage 43	1,486
Cottage 45	1,516
House 21	1,769
House 47	1,518
House 29	95
House 9	993

Building	Natural Gas Use (Therms)
House 7	1,136
House 8	1,362
House 30	1,749
Shop 70	984
House 13	2,425
House 27	672
House 10	490
Building 32 – Orchid Range	23,626
Building 12 – Coach Barn	8,980
Building 5 – Pump house	1,697

Refer to Table 3.6-2, in Section 3.6 for the average natural gas aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.4 Propane

The propane usage is not directly linked to the billing because the propane deliveries are indicative of storage being empty. For this reason the propane usage is being presented in annual totals.

Figure 3.4-1 illustrates the total propane purchased from Jan, 2014 through Dec, 2015.

Figure 3.4-1: Building Propane Usage

Building	Propane Purchased (Gallons)
Conservatory 26	1,056
House 21	955
Shop 18	409
House 59**	x
House 87	208
House 120	791

**House 59 has propane appliances but the usage is paid for by a separate organization.

Refer to Table 3.6-3, in Section 3.6 for the average propane aggregate costs. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.5 Fuel Oil

The fuel oil usage is not directly linked to the billing because the fuel oil deliveries are indicative of storage being empty. For this reason the fuel oil usage is being presented in annual totals.

Figure 3.5-1 illustrates the total fuel oil purchased consumption from Jan, 2014 through Dec, 2015.

Figure 3.2-23: Building Fuel Oil Usage

Building	Fuel Oil Purchased (Gallons)
House 52	1,179
House 59**	x
House 79	1,029

**House 59 has fuel oil appliances but the usage is paid for by a separate organization.

Refer to Table 3.6-4, in Section 3.6 for the average fuel oil aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

3.6 Aggregate Costs

For the purposes of computing energy savings for all identified energy conservation and retrofit measures, aggregate unit costs for electrical energy and fuel, in terms of cost/kWh and cost/therm, were determined for each service location and utilized in the simple payback analyses discussed in subsequent sections. The aggregate unit cost accounts for all distribution and supply charges for each location, unless otherwise noted.

Table 3.6-1 thru Table 3.6-4 summarize the aggregate costs for electrical, natural gas, fuel oil and propane utilized, respectively.

Table 3.6-1: Electrical Aggregate Unit Costs

Service Location	Aggregate $ / kW-hr
Building 22 – Motor pool	$0.08
Building 23	$0.08
Building 24	$0.08
Building 56	$0.08
Community Garden Well	$0.08
Conservatory 26	$0.08
Cottage 35	$0.08
Cottage 37	$0.08
Cottage 43	$0.08
Cottage 45	$0.08

Service Location	Aggregate $ / kW-hr
Garage 19	$0.08
House 21	$0.08
House 47	$0.08
Reservoir Well Pump	$0.08
Shop 18	$0.08
House 29	$0.08
House 9	$0.08
House 7	$0.08
House 8	$0.08
House 30	$0.08
Shop 70	$0.08
House 13	$0.08
House 27	$0.08
House 10	$0.08
Building 32 – Orchid Range	$0.08
Building 12 – Coach Barn	$0.08
Building 39 – Farm Barn	$0.08
Building 5 – Pump house	$0.12
House 52	$0.18
House 59**	
House 74	$0.21
House 79	$0.14
House 87	$0.27
House 120	$0.20

**House 59 has electrical devices but the usage is paid for by a separate entity

The costs for the buildings connected to the Farm Barn Substation, $0.082, is for new usage. The rate paid per kWh with the solar production is $0.042/kWh. All buildings listed before the farm barn are on the Farm Barn substation which is on the LPL-P tariff. Building 5 – Pump house is on the LPL-P tariff. House 74 and 79 are on the RHS tariff. The remainder of the buildings are on the RS tariff. The variation of electric rate it totally dependent on the usage of the building. The buildings that are over $0.20/kWh have very low electric usage.

For the low use meters the fixed costs, monthly but not usage dependent, outweigh the marginal cost per unit. For this reason, summary billing or adding buildings to a common service could generate cost savings. These buildings are not likely to be summary billed due to the buildings being hundreds of yards apart. Also, the 2 lowest users, House 74 and 87 use less than $220 per year combined, offering very little realized cost savings.

Table 3.6-2: Natural Gas Aggregate Unit Costs

Service Location	Aggregate $ / therm
Building 22 – Motor pool	$0.93
Building 23	$0.65
Building 24	$0.95
Conservatory 26	$0.91
Cottage 35	$0.66
Cottage 37	$0.99
Cottage 43	$0.96
Cottage 45	$0.96
House 21	$0.65
House 47	$0.66
House 29	$1.43
House 9	$0.99
House 7	$0.98
House 8	$0.68
House 30	$0.65
Shop 70	$1.01
House 13	$0.92
House 27	$1.02
House 10	$0.76
Building 32 – Orchid Range	$0.80
Building 12 – Coach Barn	$0.88
Building 5 – Pump house	$0.95

The costs for the natural gas vary by building due to the variation of usage. The buildings with rates at or above $1.00 per therm, have fairly low usage. The average rate for the campus usage and costs is $0.83/therm.

Table 3.6-3: Propane Aggregate Unit Costs

Service Location	Aggregate $ /Gallon
Conservatory 26	$4.42
House 21	$4.50
Shop 18	$4.50
House 120	$4.60
House 87	$4.60
House 59**	

**House 59 has propane devices but the usage is paid for by a separate entity

Table 3.6-4: Fuel Oil Aggregate Unit Costs

Service Location	Aggregate $ /Gallon
House 52	$2.84
House 79	$2.98
House 59**	

**House 59 has utilities paid for by a separate organization

3.7 Portfolio Manager

3.7.1 Portfolio Manager Overview

Portfolio Manager is an interactive energy management tool sponsored by the USEPA Energy Star Program. It allows the Foundation to track and assess energy consumption at the facilities in a secure online environment. Portfolio Manager can help the Foundation set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

Portfolio Manager can be used to monitor energy performance of all types of buildings. Building ratings are only applied to rated buildings. Portfolio manager will generate Energy Use Intensities, or EUI's. This can be used to rate the building against itself year to year, or to compare to the similar buildings on the campus.

3.7.2 Energy Performance Rating

For many facilities, you can rate their energy performance on a scale of 1–100 relative to similar facilities nationwide. Your facility is *not* compared to the other facilities entered into Portfolio Manager to determine your ENERGY STAR rating. Instead, statistically representative models are used to compare your facility against similar facilities from a national survey conducted by the Department of Energy's Energy Information Administration.

This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years.

This survey gathers data on building characteristics and energy use from thousands of facilities across the United States. Your facility's peer group of comparison is those facilities in the CBECS survey that have similar facility and operating characteristics. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of all similar facilities nationwide. A rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

3.7.3 Portfolio Manager Account Information

A Portfolio Manager profile has been established for the Foundation, which includes a profile for 1 building. Information entered into this Portfolio Manager Facility profile, including electrical energy consumption has been used to establish a performance baseline. The higher EnergyStar score the better the energy performance.

It is recommended that the information be updated to track the buildings' energy usage. Ratings shown below are based on the 12 month period for which utility data was available. Ratings were given for one building. Results are a reflection of the information supplied, if more recent information is entered into the Portfolio Manager account, there is a possibility for better results. The other Foundation buildings are not occupancies that are given ratings.

Farm Barn: 69

CDM Smith created a user account for the buildings in this report that had 12 months of metered usage. The user account log in information is listed below.

[redacted]

3.8 Benchmarking

To determine if a building is using more energy than average, it is necessary to compare the building and its energy usage. The standard terminology is benchmarking. Benchmarking compares the building energy usage to the square footage and building use.

Comparing the energy usage and cost to similar buildings places the building in a certain percentile index. The scores given to benchmarked buildings are limited to 10, 25, 50, 75 and 90. A score of 75 means that only 75% of other similar buildings use less energy, indicating lower scores are better. Benchmarking is important to perform as it gives the building owner a general indication that there may be energy saving opportunities.

3.8.1 EUI Profile

Below are the building Energy Use Indexes, or EUI's. These values are intended for a general understanding of the building energy usage.

Building	Use	Floor Area (Sqft)	kbtu/sf/ year	kwh/sf/ year	$/sf/year	percentile kbtu index	percentile kwh index	percentile cost index
Building 22 - Motor pool	Vehicle Service	2,304	131.29	-	$ 0.99*	90		10
Building 23	Office	4,500	59.69	-	$ 0.39*	50		10
Building 24	Office	2,965	51.91	-	$ 0.49*	50		10
Building 56	Safety	1,948	-	-	$ -			
Conservatory 26	Greenhouse	47,000	54.83	-	$ 0.58*			50
Cottage 35	Office	1,871	76.91	-	$ 0.51*	75		25
Cottage 37	Office	1,948	59.45	-	$ 0.59*	50		25
Cottage 43	Office	1,948	76.28	-	$ 0.74*	75		25
Cottage 45	Safety	2,230	67.98	-	$ 0.65*	50		10
Garage 19	Warehouse	1,790	-	-	$ -			
House 21	Warehouse	3,230	81.76	-	$ 1.69*	90		over

Building	Use	Floor Area (Sqft)	kbtu/sf/ year	kwh/sf/ year	$/sf/year	percentile kbtu index	percentile kwh index	percentile cost index
House 47	Residential	2,271	66.84	-	$ 0.44*			10
Shop 18	Repair Shop	2,192	17.05	-	$ 0.84*	50		75
House 29	Residential	1,779	5.37	0.01	$ 0.08			10
House 9	Residential	909	113.53	1.26	$ 1.20			75
House 7	Residential	909	129.91	1.45	$ 1.37			90
House 8	Residential	1,183	119.13	1.17	$ 0.90			50
House 30	Residential	1,779	101.08	0.81	$ 0.72			25
Shop 70	Repair Shop	1,820	56.78	0.80	$ 0.62	75	10	75
House 13	Residential	2,834	88.60	0.89	$ 0.87			50
House 27	Residential	1,779	43.49	1.67	$ 0.55			10
House 10	Residential	1,166	61.66	5.75	$ 0.89			50
Building 32 - Orchid Range	Greenhouse	11,599	208.11	1.30	$ 1.76			50
Building 12 - Coach Barn	Museum	21,187	54.44	3.53	$ 0.73	75	75	50
Building 39 - Farm Barn	Office	19,278	46.16	13.52	$ 1.35	50	75	50
Building 5 - Pump house	Warehouse	1,000	579.41	120.04	$ 16.58	over	over	over
House 52	Residential	4,579	44.99	2.73	$ 1.22			90
House 74	Warehouse	3,400	0.37	0.11	$ 0.02	10	10	10
House 79	Residential	2,580	74.33	5.59	$ 1.97			over
House 87	Residential	2,967	7.02	0.18	$ 0.37			10
House 120	Residential	3,400	27.19	1.74	$ 1.42			90

* Values are inherently missing electrical costs.

Percentiles published are 10, 25, 50, 75, and 90. No published percentiles for greenhouse or residential.

Electrical and heating energy usage information is missing in the table for some of the buildings. The usage information was not available for many of the buildings for both electrical and heating energy usage. In addition to that, some of the buildings are connected to the Farm Barn electrical service meter so there is no individual building kWh usage. Those reasons prevent many the buildings from being able to participate in the kWh and kbtu index.

Section 4

Energy Conservation and Retrofit Measures (ECRM)

The following is a summary of how Annual Return on Investment (AROI), Internal Rate of Return (IRR), and Net Present Value (NPV) will be calculated in the cost analysis for all ECRMs recommended in this report.

Included in the simplified payback analysis summary table is the 'Annual Return on Investment' (AROI) values. This value is a performance measure used to evaluate the efficiency of an investment and is calculated using the following equation:

$$AROI = \frac{AECS + OCS}{NET\ ECM\ Cost} - \frac{1}{Lifetime}$$

Where OCS = Operating Cost Savings, and AECS = Annual Energy Cost Savings.

Also included in the table are net present values for each option. The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (DR) (assume bond rate of 3%). NPV is calculated using the following equation:

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1 + DR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

The Internal Rate of Return (IRR) expresses an annual rate that results in a break-even point for the investment. If the Foundation is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the Foundation to compare ECRM's against each other to determine the most appealing choices.

$$IRR \rightarrow 0 = \sum_{n=0}^{N} \frac{C_n}{(1 + IRR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

The lifetime energy savings represents the cumulative energy savings over the assumed life of the ECRM. As noted in previous sections of this report, CDM Smith bases a recommendation solely on a measure's calculated simple payback. The metrics defined above (IRR, NPV, AROI) are included as part of the scope of this audit, and for the Foundation's consideration as additional financial metrics to consider when deciding whether or not to pursue a specific measure that has been evaluated in this report.

4.1 Building Lighting Systems

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current lamps with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

For all of the buildings, it was noted there were existing interior occupancy sensors installed. Installing occupancy sensors in rooms where there are none will typically increase energy savings. If the space does not have a lot of lighting fixture on-time, there is little energy savings by installing occupancy sensors. No specific spaces have been identified for installation of occupancy sensors. Occupancy sensors should be installed as needed to reduce on time in unoccupied spaces.

Please note that the Engineer's Estimate of Probable Construction Costs presented herein are estimates based on historic data compiled from similar installations and engineering opinions. Additional engineering will be required for each measure identified in this report. Final scope of work and budget cost estimates will need to be confirmed prior to the coordination of project financing or the issuance of a Request for Proposal.

The following Table 4.1-1 summarizes the financial returns for all lighting system improvements identified in this energy audit at all of the Foundation's facilities. Maintenance cost savings (MCS) are also included. The detailed lighting inventory and savings calculations are included in Appendix D.

Location	kW	kWh Savings
Building 5 – Pump house	0	432
House 7	0	250
House 8	0	130
House 9	0	250
House 10	0	100
Building 12 - Coach Barn	3	7,371
House 13	0	140
Shop 18	2	3,868
Garage 19	0	20
House 21	1	1,008
Building 22 – Motor pool	4	4,358
Building 23	0	180
Building 24	1	2,581
Building 26 - Conservatory	15	1,160

House 27	0	350
House 29	0	350
House 30	0	40
Cottage 35	1	250
Cottage 37	1	253
Building 39 - Farm Barn	7	970
Cottage 43	0	140
Cottage 45	1	293
House 47	2	255
House 52	3	3,268
Building 56	1	416
House 74	3	236
House 79	0	170
House 87	1	372
Building 32 - Orchid Range	5	2,200
House 120	1	1,305
Total	52	32,468

Lighting savings include fixture upgrades and automatic controls. The automatic controls are suggested for the following buildings: Building 26 – Conservatory, Building 56, Cottage 45, Orchid Range.

The lighting measure is assumed to have an equipment life of 15 years. Incentives included in the analyses provided in Table 4.1-1 are taken from the New Jersey Clean Energy SmartStart Prescriptive Lighting Application and Worksheet. These forms may also be downloaded directly from:

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/application-forms/regular-forms/regular-forms

Table 4.1-1
Duke Farms Lighting Upgrades

Location	Base Cost	Rebate	Table Cost	Annual Savings	Simple Payback	AROI	IRR	NPV	kWh Savings	Lifetime Savings
Building 5 – Pump house	$280	$0	$280	$35	8.1	5.7%	11.7%	$223	432	$643
House 7	$390	$0	$390	$30	12.8	1.1%	4.7%	$53	250	$565
House 8	$90	$0	$90	$10	8.7	4.9%	10.6%	$61	130	$193
House 9	$390	$0	$390	$30	12.8	1.1%	4.7%	$53	250	$565
House 10	$100	$0	$100	$8	12.5	1.3%	5.0%	$17	100	$149
Building 12 - Coach Barn	$7,980	$1,090	$6,890	$590	11.7	1.9%	6.0%	$53	7,371	$10,968

Location	Base Cost	Rebate	Table Cost	Annual Savings	Simple Payback	AROI	IRR	NPV	kWh Savings	Lifetime Savings
House 13	$108	$0	$108	$11	9.6	3.7%	8.8%	$55	140	$208
Shop 18	$4,118	$275	$3,843	$309	12.4	1.4%	5.1%	$663	3,868	$5,755
Garage 19	$20	$0	$20	$2	12.5	1.3%	5.0%	$3	20	$30
House 21	$1,256	$50	$1,206	$81	15.0	0.0%	2.7%	$32	1,008	$1,500
Building 22 - Motor pool	$1,770	$70	$1,700	$349	4.9	13.8%	21.9%	$3,378	4,358	$6,485
Building 23	$164	$0	$164	$14	11.4	2.1%	6.3%	$46	180	$268
Building 24	$3,196	$425	$2,771	$206	13.4	0.8%	4.1%	$236	2,581	$3,841
Building 26 - Conservatory	$552	$25	$527	$93	5.7	10.9%	18.5%	$825	1,160	$1,727
House 27	$198	$0	$198	$28	7.1	7.5%	14.1%	$210	350	$521
House 29	$198	$0	$198	$28	7.1	7.5%	14.1%	$210	350	$521
House 30	$40	$0	$40	$3	12.5	1.3%	5.0%	$7	40	$60
Building 32 - Orchid Range	$498	$0	$498	$176	2.8	28.7%	37.9%	$2,065	2,200	$3,273
Cottage 35	$226	$0	$226	$20	11.3	2.2%	6.5%	$65	250	$372
Cottage 37	$266	$5	$261	$20	12.9	1.1%	4.6%	$34	253	$377
Building 39 - Farm Barn	$854	$0	$854	$88	9.7	3.6%	8.7%	$428	970	$1,637
Cottage 43	$140	$0	$140	$11	12.5	1.3%	5.0%	$23	140	$208
Cottage 45	$344	$10	$334	$23	14.2	0.4%	3.3%	$3,378	293	$436
House 47	$214	$0	$214	$20	10.5	2.9%	7.5%	$83	255	$379
House 52	$716	$15	$701	$588	1.2	77.2%	86.9%	$7,866	3,268	$10,941
Building 56	$512	$20	$492	$33	14.8	0.1%	2.8%	$7	416	$619
House 74	$292	$0	$292	$50	5.9	10.3%	17.7%	$430	236	$922
House 79	$212	$0	$212	$24	8.9	4.6%	10.1%	$135	170	$443
House 87	$588	$5	$583	$100	5.8	10.6%	18.0%	$880	372	$1,868
House 120	$362	$5	$357	$261	1.4	66.4%	76.0%	$3,444	1,305	$4,854
Total	$26,075	$1,995	$24,080	$3,244	7.4				32,468	$60,328

*Incentives are shown from the prescriptive lighting. Incentives may be available through the NJ Smart Start Buildings Custom Measures or other programs which would improve the financial results of these measures. MCS: Maintenance Cost Savings which includes labor and lamp costs for replacing lamps at the end of service.

The calculated lighting usage is 139,001 kWh per year. The proposed replacements reduce this usage by 23%. The calculated lighting usage is 25% of the total metered usage for the buildings in this audit. The proposed reduction is about 6% of the metered usage for these buildings contained in this report.

4.2 HVAC Systems

The goal of this section is to present any heating and cooling energy reduction and cost saving measures that may also be cost beneficial. Where possible, measures will be presented with a life-cycle cost analysis. This analysis displays a payback period based on weighing the capital cost of the measure against predicted annual fiscal savings. To do this, the buildings have been modeled as accurately as possible to predict energy usage for space heating and cooling, as well as domestic hot water use.

The buildings are modeled using bin hour models to establish a baseline space heating and cooling energy usage. Climate data from Newark, NJ was used for analyses. Bin hour weather data was used for energy calculations. From this, the model may be calibrated, using historical utility bills, to predict the impact of theoretical energy savings measures.

Once annual energy savings from a particular measure have been predicted and the initial capital cost has been estimated, payback periods may be approximated. Equipment cost estimate calculations are provided in Appendix H.

A detailed inventory of HVAC equipment observed at the facilities is included in Appendix F of this report. Along with basic equipment information such as manufacturers, model numbers, and estimated efficiencies, this inventory also seeks to provide an estimate of equipment remaining useful service life. For each piece of equipment, a known or estimated age is provided alongside the ASHRAE expected service life for that type of equipment. From this, an estimated remaining useful service life can be deduced. In some cases, service locations may have been estimated based on unit proximity. Additionally, in cases where a unit's manufacturer and/or model could not be determined due to an unreadable, faded, destroyed, or lost tag, manufacturer and model number information has been represented as "unknown".

Incentives included in HVAC ECRM analyses are taken from the New Jersey Clean Energy SmartStart program. These forms may also be downloaded directly from:

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/application-forms/regular-forms/regular-forms

4.2.1 Duke Farms HVAC Improvements

4.2.1.1 Condensing Boiler Upgrade

Currently, the heating systems recommended for this measure utilize gas fired boilers. Building 12 – Coach Barn, House 13, Building 23, House 27, House 29, House 30, House 47, and House 120 are all currently equiped with gas-fired hot water boilers. Building 12 – Coach Barn's boiler is 36 years old. Building 23, House 27, House 29, House 30, House 47 have boilers that are 18 years old. House 13 has a boiler that is 12 years old.

Due to the tendency of equipment efficiency decreasing with age, CDM Smith estimates the older boilers to be between 75% and 82% efficient. The condensing boilers were sized according to the current capacities of heat exchangers. Condensing boilers are modeled with a full-load efficiency of ~93% and return water temperature of 100°F. Energy savings will be greatly reduced if the

return water temperature can not be maintained at 100°F or less. There may be an opportunity to save more energy and cost by reducing the size of the installed boilers. Often, the buildings do not use their boilers' full heating capacities. These and other considerations are to be addressed when the new system is designed.

Fiscal savings from such an upgrade are identified in Table 4.2-1 below. It's important to note that these estimates are based on building models, and further investigation is warranted before pursuing boiler replacements. Incentives are based upon the published New Jersey Clean Energy gas heating incentives. See Section 7 for program information. The condensing boilers are assumed to have an equipment life expectancy of 20 years for the measure evaluation.

Due to the improved automation and control within modern condensing boilers, their operation and maintenance costs tend to be less than those of typical cast iron, and firetube boilers. CDM Smith estimates a cast iron, or water tube boiler system will typically cost around $1,000 per year for regular preventative maintenance, whereas a condensing boiler system would cost around $500 per year. Therefore, replacing the existing boilers with condensing boilers should result in an operation and maintenance cost savings of $500 per year.

Table 4.2-1
Duke Farms Condensing Boiler Upgrade

Location	Engineer's Opinion of Probable Cost	Rebate	Total Cost	Predicted Annual Savings	Annual Energy Savings	Annual Maintenance Cost Savings (AMCS)	Simple Payback
Building 12 – Coach Barn	$17,095	$1,000	$16,095	1,171 therms	$1,081	$500	**10.2**
House 13	$12,782	$1,000	$11,782	316 therms	$297	$500	**14.8**
Building 23	$12,782	$1,000	$11,782	350 therms	$237	$500	**16.0**
House 27	$12,063	$1,000	$11,063	88 therms	$93	$500	**18.6**
House 29	$12,063	$1,000	$11,063	12 therms	$19	$500	**21.3**
House 30	$12,063	$1,000	$11,063	228 therms	$154	$500	**16.9**
House 47	$12,782	$1,000	$11,782	198 therms	$137	$500	**18.5**
House 120	$12,782	$1,000	$11,782	103 gals p	$498	$500	**11.8**

Location	Annual Return on Investment (AROI)	Lifetime Energy Savings* (24 years)	Internal Rate of Return (IRR)	Net Present Value (NPV)	Annual Estimated Greenhouse Gas Reductions (Tons CO2)
Building 12 – Coach Barn	4.82%	$36,268	8.85%	$10,508	7.2
House 13	2.60%	$17,218	3.81%	$923	1.9
Building 23	-0.41%	$15,761	2.87%	($140)	2.2
House 27	0.36%	$12,270	1.00%	($1,968)	0.5
House 29	0.52%	$10,451	-0.53%	($3,295)	0.1
House 30	1.75%	$13,753	2.13%	($887)	1.4
House 47	-1.26%	$13,334	1.19%	($1,911)	1.2

House 120	3.47%	$22,099	6.63%	$4,484	0.6

*Assumes 2% yearly inflation on natural gas costs.

4.2.1.2 Steam Boiler Replacement

The buildings with aging steam boilers are assumed to have lost some of their efficiency. The systems consist of a single thermostat and single boiler. The spaces have manual valves for each radiators. The installed boilers are assumed to be 80% efficient.

The boilers identified as likely replacements are in House 7, 8, and 9 and Cottage 43 and 45. These boilers are 18 years old or older. The replacement boilers shall be 82% efficient to qualify for the incentives. This measure is based upon saving 2% of all the natural gas usage for the building. This measure assumes that the new boilers would have a 25 year life expectancy. The incentives presented in the table below. The incentives are from the New Jersey Clean Energy Heating incentives. See Section 7 for program information.

This measure was not recommended due to the payback being longer than the expected equipment life. When these boilers are due for replacement, premium efficiency equipment should be considered.

Table 4.2-2
Duke Farms Steam Boiler Upgrade

Location	Engineer's Opinion of Probable Cost	Gas Usage Existing (Therms)	Gas Usage Proposed (Therms)	Predicted Annual Savings (Therms)	Annual Energy Savings	Incentive	Simple Payback
Cottage 43	$ 24,000	1,486	1,450	36	$ 435	$ 480	54.1
Cottage 45	$ 16,000	1,516	1,479	37	$ 235	$ 300	66.7
House 9	$ 9,000	993	969	24	$ 124	$ 300	70.2
House 7	$ 9,000	1,136	1,108	28	$ 127	$ 300	68.4
House 8	$ 12,000	1,362	1,329	33	$ 163	$ 300	72.0

4.2.1.3 Combined Heat and Power

When using thermal energy and electrical energy coincidentally, it can be cost effective to produce both on site instead of purchasing them from the grid. Commonly the grid power producers use similar technologies to produce electricity but nominally waste the thermal energy produced. Sites with continuous need for electrical and thermal energy can produce a base load of both energies.

This measure evaluation is based upon a device that will consume natural gas and produce electrical and thermal energy. The balance should be an average of 2 MBH per kW. The detailed calculations are included in Appendix C.

The evaluation shows that the limiting factor for a combined heat and power system is the summer thermal load. If the building can use the thermal production, the electrical production is typically also usable. No buildings appear to have significant

Table 4.2-3: Combined Heat and Power Screening

Location	Electric			Gas		
	kWh	kW (avg)	$	Therms	MBH (avg)	$
Building 12 - Coach Barn	74,855	9	$7,486	8,980	103	$7,902
Conservatory 26	unknown	-	-	24,807	283	$22,574
Building 32 - Orchid Range	15,034	2	$1,503	23,626	270	$18,901
Building 39 - Farm Barn	260,733	30	$26,073	0	0	$0
			*No buildings appear to be CHP candidates			

CHP candidates have a good balance between the average kW and average MBH of about 10 to 1. None of the buildings above are in that range. A system could be installed to produce half the average kW of the Orchid range, Conservatory or the Coach Barn, but this would make an insignificant impact on the thermal usage of the building.

The calculations are based upon the natural gas utility rates assumed. Rates should be verified before any further analysis is completed. There are no buildings with a good thermal and electrical balance. This measure is not recommended for this site.

Table 4.2-4 below shows a single hour CHP cost analysis per kW of system installed. The cost of the input energy is only slightly less than the value created by the CHP system. Also, CHP operation will often waste portion of the thermal energy to keep the system producing electricity. Any wasted CHP output would make system operation an economic loss.

Table 4.2-4: Combined Heat and Power Single Hour Analysis

	CHP Input (Therms)	Electricity (kWh)	CHP Output (Therms)
System per kW per hour	0.185 Therms	1 kWh	0.12 Therms
$/Unit	$ 1.00	$ 0.08	$ 1.00
Input Cost	$ 0.19	$ 0.08	$ 0.12
Input Cost	**$ 0.19**	**Output Value**	**$ 0.20**

4.2.1.4 Smart Thermostats

The buildings have a mix of thermostats. They have a fairly common settings between 66°F and 72°F. These buildings have a mix of thermostat types. Most of the buildings below have at least 2 zones.

Type	Buildings
Programmable	13, 21, 27, 29, 35, 120
Fixed	7, 8, 9, 10, 22, 43, 47, 52, 56, 79, 87

Smart thermostats are intended to have have occupant input. Smart thermostats have motion sensors, temporary overrides and will reduce conditioning when possible. These are assumed to have energy savings by reducing the space conditioning.

Smart thermostats can produce 15% heating fuel savings over fixed thermostats and 5% savings over programmable thermostat. These values are used to forcast the savings of the implementation of this measure.

This measure is based upon replacing all the existing thermostats with smart thermostats, often called wi-fi or web enabled thermostats. The thermostat shall respond to light or motion sensing. The savings below are based upon the percent savings and the annual heating fuel usage. The cost of the thermostat assumes direct replacement. If additional wiring, patching, or relocation are required, the cost estimate will require adjustment. The cost of the thermostat is assumed to be the only cost with site staff installing the thermostats. There are no published incentives for Smart Thermostats.

Table 4.2-5: Smart Thermostat Upgrade Analysis

Building	Type of Fuel	Base Usage	With Controls	Fuel $/unit	Base Fuel Cost	New Fuel Cost	Savings /year	Number of T Stats	Tstat Cost*	Payback Years
House 7	Natural Gas	1,136	966	$0.98	$1,112	$945	$167	+1	$300	1.8
House 8	Natural Gas	1,362	1,158	$0.68	$923	$785	$138	+1	$300	2.2
House 9	Natural Gas	993	844	$0.99	$979	$832	$147	+1	$300	2.0
House 10	Natural Gas	490	417	$0.76	$370	$315	$56	+1	$300	5.4
House 13	Natural Gas	2,425	2,304	$0.92	$2,223	$2,112	$111	2	$600	5.4
House 27	Natural Gas	672	638	$1.02	$683	$649	$34	2	$600	17.6
House 29	Natural Gas	95	90	$1.43	$136	$129	$7	2	$600	88.5
House 30	Natural Gas	1,749	1,487	$0.65	$1,129	$959	$169	+1	$300	1.8
House 47	Natural Gas	1,518	1,290	$0.66	$1,003	$852	$150	+3	$900	6.0
House 52	Fuel Oil	1,179	1,002	$2.84	$3,345	$2,843	$502	+6	$1,800	3.6
House 79	Fuel Oil	1,029	875	$2.98	$3,062	$2,603	$459	+1	$300	0.7
House 87	Propane	208	177	$4.60	$957	$813	$144	+2	$600	4.2
House 120	Propane	791	752	$4.60	$3,639	$3,457	$182	2	$600	3.3

*Replacement cost assumed to be $300 per thermostat.
+Existing Thermostat is programmable.

4.2.1.5 Farm Barn Heat Pump Optimization

The Farm Barn heat pump system takes heat out of the building during the summer cooling season and rejects that energy in the ground loop. During the winter heating season it takes the heat out of the ground and puts it into the building. The ground water loop temperatures appeared a little low during the site visit.

Ground loop temperature was a little low for the outdoor temperatures during the site visit. This can be due to a few reasons. The first reason is a heating/cooling imbalance. If this system is imbalanced the loop temp drops below the design temperature the heating season. Then in the summer the water loop temperature does not recorver during the cooling season.

Another posibility is that the ground loop is under sized. If that is the case, the ground loop temperature will drop below the design temperature during the heating season and rise above the design temperature during the cooling season.

If the balance is too heating heavy, then running the cooling system more during the summer will help increase the temperature of the ground loop. If the loop is under sized then the interior setpoints should be adjusted to reduce the space conditioning. If this is not possible the answer is probably installing a boiler or cooling tower to help during the higher load conditions. Heat pump operation should be trended by the building control system. This operational information can be used to further evaluate heat pump performance.

Evaluate the system performance by recording and reviewing the ground loop temperatures. They should be compared to the system design temperature. If possible, reduce the indoor conditioning when the ground loop temperature is outside the design temperature range. The hours of heating should be compared to the hours of cooling. The balance between heating and cooling would determine if an additional heat adder or rejecter is appropriate. The hours outside of the design range would determine if the ground loop is big enough.

4.2.1.6 Farm Barn Water loop Heat Adder or Heat Rejection

If the heat pump system optimization finds the system needs either more ground loop capacity or an inballance toward heating or cooling, the heat pump system could benefit from the addition of an external heat adder or heat rejection. Addition of a heat adder, such as a boiler, or heat rejection, such as a cooling tower, is intended to keep the ground loop, or condenser water, to a temperature of greater efficiency. Using the external system to adjust the condenser water loop reduces the work done by the heat pumps.

Addition of a boiler to the ground coupled heat pump can reduce the electricity used for space heating. The warmer water to the heat pumps inproves the coefficient of performance, or COP. The improved COP replaces electrical energy with the natural gas. The boiler would add heat to the water loop.

A boiler making 60 to 70 degree water increases the Heat Pump COP from 3.5 to 4.6 which would reduce the electrical usage by 1,519 kWh, but the boiler would require 405 therms. The electrical savings would save about $152 dollars per year. The additional cost of the natural gas would cost about $356. This means that the Hybrid heat pump system uses about $200 per year more than the existing system. This measure is not recommended for energy savings. If the capacity of the system becomes insufficient, this measure can be reevaluated.

4.2.1.7 Pump House and Well Cost Control Strategies

The major electrical demand for the campus is these large pumps. Controlling their electrical usage can have an impact on the electric costs for the site. There are a few specific strategies. None of the Duke Farms utility meters are on a Time Of Day electric tarrif.

Demand Limiting

Demand is the rate of power usage. Typically, the utility demand is the largest 15 minutes sustained kW. The Resevoir pump station is set to run during off peak. This reduces the on peak demand by shifting load to the off hours. This is first based upon the assumption that the majority of usage is during the day time.

If large electrical uses are on a single electrical meter, there can be the potential to interlock the two or more devices so they can't exceed a certain kW. If one device has priority over another one and fairly low on time, the controls can interupt power to the less important device while the priority one operates. An example of this may be the 2 pumps in the Raritan Pump House pumps. If these pumps are not required to be operational at the same time, the larger pump can be prioritised and the smaller one can be interupted. This would reduce the peak demand by the power of the smaller pump.

Off Peak Power

Time of day rates, or TOD, allow for cheaper power during the night. If the majority of electric usage can be shifted to the off peak, 7pm to 7 am, then the cost of the electric usage can be reduced. The Time of Day tarrif has a rate for the on peak hours and a reduced rate for the off peak hours. If the usage is about 50% on peak 50% off peak, there are no or minimal savings. Substantially more power needs to be used during the off peak to save over the non TOD rate.

Since the majority of electric usage is during the on peak hours, shifting usage to the off peak hours typically reduces the on peak demand. The Community garden pump could be set to run during the off peak hours. The existing controller may need to be modified and pumped storage may be required to make the community garden system only off peak.

4.2.1.8 Premium Efficiency Motors

Installing premium efficiency motors in place of older or standard efficiency motors reduces the electricity required to perform the same work. The motor hours are estimated based upon motor function. The motors that have no name plate efficiency are assumed to be 80% efficient.

This measure is based upon replacement of the following motors. Motors are presumed to be ODP style and 1800 RPM. The efficiencies of non-NEMA rated motors have been estimated. The calculations are presented below.

Table 4.2-6 Premium Efficiency Motor Existing

Building Premium Efficiency Motors							
			Existing				
Location	Motor Use	Qty	HP	RPM	Efficiency	Hours	Usage (kWh)
Building 5 – Pump House	Water Pump	1	25	1800	80.0%	1000	23,313
Building 5 – Pump House	Water Pump	1	125	1200	80.0%	1000	116,563
Building 12 – Coach Barn	Water Pump	1	5	1750	80.0%	1000	4,663
Building 39 – Farm Barn	Radiant Floor Pump	2	1	1800	82.5%	4000	3,617
Building 39 – Farm Barn	Return Fan	3	1	1750	82.5%	4000	3,617
Building 39 – Farm Barn	Return Fan	1	1.5	1730	84.0%	4000	5,329

Table 4.2-7 Premium Efficiency Motor Upgrade Proposed

Building Premium Efficiency Motors										
			Proposed					Savings		
Location	Motor Use	Qty	HP	RPM	Efficiency	Hours	Usage (kWh)	kWh	$	Replacement Cost
Building 5 – Pump House	Water Pump	1	25	1800	93.6%	1000	19,925	3,387	$ 420	$ 3,020
Building 5 – Pump House	Water Pump	1	125	1200	95.4%	1000	97,746	18,816	$ 2,333	$ 9,480
Building 12 – Coach Barn	Water Pump	1	5	1750	89.5%	1000	4,168	495	$ 61	$ 921
Building 39 – Farm Barn	Radiant Floor Pump	2	1	1800	85.5%	4000	3,490	254	$ 31	$ 1,312
Building 39 – Farm Barn	Return Fan	3	1	1750	85.5%	4000	3,490	381	$ 47	$ 1,968
Building 39 – Farm Barn	Return Fan	1	1.5	1730	86.5%	4000	5,175	154	$ 19	$ 656
Totals								23,487	$ 2,912	$ 17,357

4.2.1.9 Other Measures

This campus seems very dedicated to efficiency, sustainability and farming. Measures such as low energy green houses seem to be an area that would be beneficial to investigate. These structures use strategic glazing and orientation to reduce the heat loss of the structure while still growing plants, fruits and vegetables year round. An example of this would be the one that Larry Kinney and John Hutson, built and tested. Contact CDM Smith, or your local AEE representative for more information about this case study or other energy efficient greenhouse technologies.

Energy efficiency is functionally based upon many building factors. One factor that does not help with energy efficiency is small buildings. If the campus wishes to increase the efficiency of their residential property, a single larger building with multiple units has benefits over the smaller separated units. If this is appealing to the Duke Farms Foundation, further analysis could be completed.

4.2.2 Measures identified but not recommended

4.2.2.1 Condensing Furnace Upgrade

A few building have gas fired hot air furnaces. These buildings include Cottage 10 and Building 18. These units are in fair condition and are about halfway through their expected life cycle. These units are condensing furnaces. They are assumed to have an 88% AFUE, or Annual Fuel Use Efficiency.

Installing new furnaces rated at 95% AFUE would qualify for a NJ Direct Install incentive and create a fuel saving. The current incentive is $400 per furnace. The approximated costs and fuel savings are presented in the table below. This measure is not recommended due to the equipment payback being greater that the expected equipment life and the fair condition of the units that are existing. When the furnaces are due for replacement, premium efficiency condensing furnaces, +95% AFUE should be evaluated.

	Engineer's Opinion of Probable Cost	Incentive	Total Cost	Predicted Annual Savings (Therms)	Annual Energy Savings	Annual Maintenance Cost Savings (AMCS)	Simple Payback
Cottage 10	$7,000	$400	$6,600	34 therms	$ 26	$0	**254.9**
Building 18	$14,000	$800	$13,200	29 therms	$ 129	$0	**102.5**

4.3 Envelope Measures

4.3.1 Window System Overview

During the Duke Farms site visit one it was observed that the majority of windows currently installed are single pane windows with storm exteriors. Upgrading these windows to newer Energy Star rated windows is a potential opportunity for both energy and monetary savings. Upgrading the windows could save 3.02$ per window per year.

A calculation was performed based on a few assumptions about the windows and environmental data available regarding Duke Farms. For this calculation it was assumed the windows were 3 ft. x 5 ft. giving a total area of 15 sq. ft. per window. Based on weather data from NOAA, for Newark, NJ the assumed Heating Degree Days (HDD) experienced by the Duke Farms campus is 4967. The U-value of the existing windows is estimated to be 0.5 BTU/hr/ft2/°F[1] compared to the U-value for new Energy Star windows which are estimated to have a U-value of 0.35 BTU/hr/ft2/°F[1]. The following calculations shows how the amount of therms saved was calculated.

$$(Area) * (U\ Value) * (\Delta T) = BTU$$

$$\text{Existing Windows: } (15\ ft^2) * \left(\frac{0.5\frac{BTU}{hr}}{\frac{ft^2}{°F}}\right) * \left(4967\ HDD * \frac{24hr}{day}\right) = 894{,}060\ BTU$$

$$\text{Proposed Windows: } (15\ ft.) * \left(\frac{0.35\frac{BTU}{hr}}{\frac{ft^2}{°F}}\right) * \left(4967\ \text{H}DD * \frac{24hr}{day}\right) = 625{,}842\ BTU$$

$$894{,}060\ BTU - 625{,}842\ BTU = 268{,}218\ BTU$$

$$\frac{268{,}218\ BTU}{\frac{100{,}000\ BTU}{therms}} = 2.7\ therms$$

$$\text{Existing Windows: } (15\ ft^2) * \left(\frac{0.5\frac{BTU}{hr}}{\frac{ft^2}{°F}}\right) * \left(1242\ CDD * \frac{24hr}{day}\right) = 223{,}560\ BTU$$

$$\text{Proposed Windows: } (15\ ft.) * \left(\frac{0.35\frac{BTU}{hr}}{\frac{ft^2}{°F}}\right) * \left(1242\ CDD * \frac{24hr}{day}\right) = 156{,}492\ BTU$$

$$223{,}560\ BTU - 156{,}492\ BTU = 67{,}068\ BTU$$

$$\frac{67{,}068\ BTU}{\frac{12{,}000\ BTU}{tonne}} \text{ x } \frac{1.11\ kWh}{tonne} = 6.1 \text{ kWh}$$

The therms saved per window is 2.7 therms. The efficiency of the heater and the cost per therm are needed to find the financial savings. Based upon the provided Utility Bills, the approximate aggregate cost of natural gas is $0.9/therm (varying from building to building). Most of the current heating equipment on the Duke Farms campus has an efficiency around 80% so that is the value for efficiency used in this calculation. Using this information the monetary savings per window per year can be calculated.

$$\frac{2.7\ therms}{0.8\ efficient} = 3.4\ therms$$

$$3.4\frac{therms}{window} * \frac{\$0.9}{therm} = \$3.02/window$$

$$6.1\frac{kWh}{window} * \frac{\$0.08}{kWh} = \$0.49/window$$

Other factors could also have a potential impact. Installation of new windows could mean a better seal between the windows and the wall reducing the infiltration of outside air. However, proceeding with the basic assumptions, and assuming the cost to replace a 3 ft. x 5 ft. window is $450 total including labor costs, it would be around 130 years to make up the cost of the windows with the cost of the window and its installation. This measure is not recommended for energy savings alone. When the windows are replaced, EnergyStar rated replacements should be evaluated.

$$\frac{\left(\frac{\$450}{window}\right)}{\left(\frac{\$3.51}{\frac{window}{year}}\right)} = 128\ Years$$

[1] https://basc.pnnl.gov/sites/default/files/resource/BuildingAmerica_Low-E_StormWindow_Brochure_051413.pdf

4.3.2 Air Sealing

Air sealing was also observed to be an area for improvement. Sealing around ceiling and wall penetrations reduces the amont of conditioned air that escapes and unconditioned air the enters the building. It is also important to seal any holes in insulated cavaties. This can include where pipes or wire enter walls or ceilings, electrical boxes or lighting fixtures. It is, however, important to maintain ventilation, in areas with combustion appliances, such as gas ranges and fuel fired boilers.

The list below is of a few areas that deserve specific attention. Recessed lighting fixtures in insulated or exterior surfaces should be IC, or insulated ceiling rated. Doors should have their weatherstripping checked. Attic or roof hatches should be sealed and gasketed. Wall paneling should be air sealed or replaced. Strorm windows are recommended for installation on single pane windows. Chimneys in conditioned spaces or passing through conditioned spaces should be sealled to prevent leakage. Outlets cut into exterior walls should be sealed between the electrical box and the wall, and gasket the cover to the box. Wall penetrations into or thru walls should be sealled with foam or caulk as the penetration requires.

Area to Seal	Building
Recessed Lighting	7, 8, 9, 21
Door	5, 23
Attic, roof hatch	5, 10, 12, 13
Wall Paneling	12, 18
Storm windows	18, 35, 120
Chimney	13, 47
Outlets	52
Wall Penetrations	70

4.3.2.1 Operation and Maintenance Measures

There are many good operational savings observed during the site visit. These measures, such as removing the air conditioners during the heating season, reduce the heating load by reducing the infiltration of the buildings.

Areas that have a need for improvement include replacement or repair of storm windows. At least 2 building observed were missing exterior storm windows. These reduce the infiltration of the window and create a pocket of still air that increase the insulation value of the window. These are especially important with single pane windows. The 2 buildings with missing storm windows were Shop 18, Cottage 35 and House 120.

Operation of electric heaters should be limited. House 74 utility usage appears to have electric usage increase during the winter months. This is assumed to be due to electric heat. Thermostat settings and electric heat operation should be verified. Reducing the electric heat operation will reduce the electric consumption of the building. The building does have water piping and should be protected from freezing or have the water systems “winterized”.

4.3.3 Insulation

Insulation issues were observed using the thermal camera. Issues were seen in areas where the structure compromised the building insulation. Common areas where cold spots resulted from poor insulation were at exterior wall corners, where sloped roofs meet the wall and ceiling, and where floors meet exterior walls. Insulation has been added to many of the structures. A few common insulation errors that may have been observed include vertical batt insulation with an open vertical face, batt insulation with metal studs or structure, and compromised or incorrect vapor barrier. These all reduce the effectiveness of the insulation installed.

To correct these issues would require opening the surface, wall or roof, and correcting the problem or adding insulation. Being destructive this measure is only recommended when the surface requires other work or associtated repair.

4.3.3.1 Farm Barn Slat Wall

One specific area that was having infiltration and insulation issues is in the open office area upstairs in the farm barn. In areas where the wall construction was interupted cold spots were observed. Where the drywall was stopped to reveal structural timbers was frequently colder than the drywall surface. This may be due to a lower insulation value of the timber or air movement at the edge of the drywall.

Another specific area is the decorative horizontal wood slats. This area is compromises portion of wall in the office cubicles. It appears that to accommodate the slats at the same surface level, the wall lacks draft and thermal barriers. Site staff reported that this may be intended for ventilation, but that seems unlikely.

A means of fixing this would be to remove the slats and black covering, insulate and seal the structure install a surface flush with the existing drywall surface, paint and reinstall the wood slats. This would have the wood slats intruding into the space by an inch and a half, but reduce the energy loss and occupant discomfort. See the thermal imaging in Appendix E for more information and images of specific locations. Further investigation is required to find a true corrective action. If it can be determined that the air movement is not required, the wall can be sealled up and a new interior surface finish applied.

4.3.3.2 Damage Insulation or improper installation

The insulation in many buildings needed repair. The issues were created by rodents, construction projects, or improper installation. Batt or Blanket insualtion only has the rated effectiveness if it completely fills the cavity it is installed in. Also, atleast 1 of the mating surfaces needs to be air tight. If the batt is installed vertically, it must be closed in on all sides by construction materials. Many locations found these damaged areas and improper installation. Those locations are listed below.

Building	Area insulation
10	Attic
21	Attic

Building	Area insulation
22	Shop Roof, Wall
70	Roof
79	Attic

4.3.3.3 Ceiling installation

The buildings have various levels of insulation. A few of the attics observed have no insulation installed in the attics or ceilings of the conditioned space. Present value for energy code levels of attic insulation in New Jersey. This measure assumes that the building is comfort heated, space temperature at least 70°F.

This measure involves installing 6 inches of blown cellulose on to the ceiling or attic floor of the building to reduce the heat transfer to from the conditioned space in the heating season. This measure is calculated using the heating degree days equation from the window measure. The cost is based upon $ 1.32 per squarefoot of insulation installed.

Building	Cost	Area (sqft)	CDD	Initial u-value	Propose u-value	$/therm	Savings (therms)	Savings ($)	Payback
House 7	$1,200	909	4967	0.09	0.03	$0.98	66	$64	18.6
House 8	$1,562	1,183	4967	0.09	0.03	$0.68	85	$58	26.9
House 9	$1,200	909	4967	0.09	0.03	$0.99	66	$65	18.5
Shop 18	$2,893	2,192	4967	0.17	0.04	$4.50	342	$1,540	1.9
House 21	$2,132	1,615	4967	0.25	0.04	$0.65	407	$265	8.1
House 59	$2,244	1,700	4967	0.25	0.04	$2.15*	429	$922	2.4
House 120	$2,244	1,700	4967	0.09	0.03	$4.60	123	$565	4.0
Total	**$13,475**	**10,208**					**1518**	**$3,479**	**3.9**

*House 59 utility cost estimated for purpose of analysis.

4.4 Alternative Energy Sources

4.4.1 Photovoltaic Solar Energy System Overview

The site presently has a large solar array. The solar array is connected to the Farm Barn Service. The existing solar system is rated at 635.5 kW on the DC side of the inverter. The facility also has a web based dash board showcasing the system and its production.

4.4.2 On-Site Wind Power Generation

On-site wind power generation typically utilizes a form of turbine, which is rotated with the flow of wind across it, this rotational force powers a generator, producing DC electricity. The DC electricity is then converted into AC electricity, which can be used for onsite power, or can be fed

back into the power grid, reducing the overall electric demand. The size of the turbine is proportional to the amount of wind and concurrently the amount of energy it can produce. An ideal location for a wind turbine is 20 feet above any surrounding object within a 250 foot radius. In general this relates to a property size of one acre or more.

Utilizing NASA's online wind mapping tool, it was determined that the local average wind speeds at Duke Farms is 6 mph. In general, around 7 mph of average wind speed, as determined over the course of a year, is necessary to "fuel" the turbine. Wind speed at Duke Farms is not within the range of feasibility for installation of a new wind turbine system. The NREL, national renewable energy laboratories, have rated this area of New Jersey at a level below "fair for wind energy production".

For the purposes of this feasibility analysis, CDM Smith chose a 35 kW wind turbine. This turbine size is used most often for small commercial applications. This is larger than any single load connected at the Foundation. This turbine would have to be connected to the Farm Barn Substation to be used by the Foundation. The facility has an interest in wind power, and this size seems appropriate mostly in tower height and rotational diameter. This tower is sized to be about 120 ft (40 meters) tall. Power Curve data was determined through the use of the product specification sheets on vendor websites, and vendor provided tools. Actual turbine size, height, location, and manufacturer should be determined upon design of a wind turbine system.

The estimated wind speed data, associated wind probability distribution function (Weibull value), turbulence losses, and other relevant data were then incorporated into the Wind Cad Modeling spreadsheet to estimate the annual output for the wind turbine. Refer to Appendix C for Wind Cad Modeling.

Table 4.4-1 includes a simple payback analysis for the installation of a wind turbine energy system on the most desirable site. Refer to Appendix C for a more detailed wind turbine financing spreadsheet, including utility cost avoidance and REC's.

Table 4.4-1
Simple Payback Analysis for Wind Turbine Energy System

Parameter	Wind Turbine
Probable Cost	$151,000
Simple Payback	27.3 years
Annual Return On Investment (AROI)	-1.44%
Lifetime Energy Savings (15 years)	$162,572
Internal Rate of Return (IRR)	-1.88%
Net Present Value (NPV)	$-57,238

*Refer to Appendix C for Wind Cad Modeling

Based on the simple payback model, summarized in Table 4.4-1, the wind power has minimal cost savings of the life of the equipment. If the New Jersey begins offering wind energy incentives, the Foundation could re-evaluate specific locations and incentives. Also, the technology is constantly changing and will most likely continue to lower in price.

It should be noted that CDM Smith used only REC values, utility cost avoidance factors, and the REIP incentive in determining simple payback periods. As stated above, other incentives and

financial programs such as Power Purchase Agreements are available to help finance this installation. For example, if a Power Purchase Agreement is completed, the private company financing the project would benefit from the 30% tax credit. Other incentives such as CREB's and first year usage incentives could be available to the Foundation in lowering the payback period. Refer to *www.dsireusa.org* for an extensive listing of possible incentives for the New Jersey area.

It should also be noted that the wind turbine represented above is for feasibility purposes only. If the Foundation decides to install a wind turbine, different mounting heights, turbine sizes, and manufacturers should be considered. In addition, permits may be required for installation according to local zoning laws. The FAA must also be notified in order to give clearance for the tower, and for installation of aviation safety lights if necessary.

4.5 Water Systems

As a result of the National Energy Policy Act water use standards for commercial plumbing products were established. The standards required that toilets use no more than 1.6 gallons per flush, urinals were limited to 1 gallon per flush and faucets and shower heads were allowed a maximum flow of 1.5 gallons per minute (gpm) at 80 psi.

Prior to the National Energy Policy Act, originally passed in 1992, standard toilets used 3.5 – 5.5 gallons per flush, urinals required 2 to 3 gallons per flush and standard lavatory faucets has flow rates of 2.5 to 5 gpm.

Duke Farm facilities have many upgraded of their urinals and toilets to use 1 and 1.6 gallons per flush respectively. Water savings realizable from replacement of these fixtures would be minimal, and fixture replacement is therefore not expected to be cost effective. Appendix G presents a compiled inventory of the water fixtures per building.

In general, replacement of older water fixtures results in a 40 – 50% reduction in water consumption. Although these water savings retrofits are a sustainable solution, benefiting society as a whole, the associated cost savings are typically insignificant when compared to the investment and it is anticipated that the resulting payback period will be well in excess of 20 years. As such, these measures have not been evaluated further.

Section 5

Evaluation of Energy Purchasing and Procurement Strategies

5.1 Energy Deregulation

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, the deregulation of the market, allowed all consumers to shop for their electric supplier. The intent was to create a competitive market for electrical energy supply. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party supplier. Energy deregulation in New Jersey increased the energy buyers' options by separating the function of electricity distribution from that of electricity supply.

To sell electric generation service in New Jersey, electric power suppliers must be licensed by the New Jersey Board of Public Utilities (NJ BPU). They must also be registered with the local public utility (JCP&L/PSE&G) to sell electric service in that utility's service areas. The following suppliers are licensed with the NJ BPU and are registered to sell electric service in the PSE&G service territory:

- Abest Power & Gas of NJ, LLC
- AEP Energy, Inc.
- Alpha Gas & Electric, LLC
- Ambit Northeast, LLC (Ambit Energy)
- American Powernet Management, LP
- Amerigreen Energy, Inc.
- AP Gas & Electric, LLC
- Astral Energy, LLC
- Barclays Capital Services, Inc.
- BBPC, LLC (Eastern Energy)
- Blue Pilot Energy, LLC
- CCES LLC (Clean Currents Energy Services)
- Champion Energy Services, LLC

- Choice Energy, LLC
- Clearview Electric, Inc.
- Commerce Energy, Inc.
- Community Energy, Inc.
- ConEdison Solutions
- Constellation NewEnergy, Inc.
- Credit Suisse (USA) Inc.
- Direct Energy Business, LLC
- Discount Energy Group, LLC
- Dominion Retail, Inc.
- DTE Energy Supply, Inc.
- Energy.me Midwest, Inc.
- Energy Plus Holdings, LLC
- Ethical Electric Benefit Co. (Ethical Electric)
- Energy Service Providers (New Jersey Gas & Electric)
- FirstEnergy Solutions
- Gateway Energy Services Corp.
- GDF SUEZ Energy Resources NA, Inc.
- Glacial Energy of New Jersey, Inc.
- Global Energy Marketing LLC
- Green Mountain Energy Company
- Harborside Energy LLC
- Hess Corporation
- Hess Energy Marketing LLC
- Hess Small Business Services, LLC
- HIKO Energy, LLC

- HOP Energy LLC
- Hudson Energy Services, LLC
- IDT Energy, Inc.
- Independence Energy Group, LLC
- Integrys Energy Services, Inc.
- Keil & Sons, Inc (Systrum Energy)
- Liberty Power Delaware, LLC
- Liberty Power Holdings, LLC
- Linde Energy Services
- Marathon Power LLC
- MP2 Energy NJ, LLC
- Natures Current, LLC
- MPower Energy NJ LLC
- NATGASCO, Inc (Supreme Energy, Inc)
- NextEra Energy Services New Jersey, LLC
- Noble Americas Energy Solutions
- Nordic Energy Services, LLC
- North American Power & Gas, LLC
- North Eastern States, Inc. (Entrust Energy)
- Oasis Power, LLC (Oasis Energy)
- Palmco Power NJ, LLC
- Park Power, LLC
- Plymouth Rock Energy, LLC
- Power Management Co. (PMC Lightsavers Limited Liability Company)
- PPL Energy Plus, LLC
- Public Power & Utility of New Jersey, LLC

- Reliant Energy
- ResCom Energy LLC
- Respond Power LLC
- Save on Energy, LLC
- SJ Energy Partners, Inc.
- South Jersey Energy Company
- Sperian Energy Corp.
- Spark Energy, LP
- Sprague Energy Corp.
- Starion Energy PA Inc.
- Stream Energy New Jersey, LLC
- Texas Retail Energy, LLC
- TransCanada Power Marketing Ltd.
- TriEagle Energy, LP
- UGI Energy Services Inc.
- Verde Energy USA, Inc.
- Viridian Energy
- Xoom Energy New Jersey, LLC
- YEP Energy
- Your Energy Holdings, LLC

The Foundation may also be able to purchase aggregate energy through the Government Energy Aggregation Act (GEA) of 2003. This is a process where a third party contract administrator solicits third party energy supplier quotes for aggregate blocks of energy at lower costs. This option is typically more feasible for large energy users (such as Water and Wastewater Treatment Plants) and for large municipalities. The Foundation should do more research on this topic and determine if a partnership with another municipality would be an option to peruse.

5.2 Demand Response Program

Demand Response is a program through which a business can make money on reducing their electricity use when wholesale electricity prices are high or when heavy demand causes

instability on the electric grid, which can result in voltage fluctuations or grid failure. Demand Response is an energy management program that compensates the participant for reducing their energy consumption at critical times. Demand Response is a highly efficient and cost effective means of reducing the potential for electrical grid failure and price volatility and is one of the best solutions to the Mid-Atlantic region's current energy challenges.

The program provides at least 2 hours advance notice before curtailment is required. There is typically 1 event a year that lasts about 3 hours in the summer months, when demand for electricity is at its highest.

Participation in Demand Response is generally done through companies known as Curtailment Service Providers, or CSPs, who are members of PJM Interconnection, the regional transmission organization. There is no cost to enroll in the program and participation is voluntary, for instance, you can choose when you want to participate. In most cases, there is no penalty for declining to reduce your electricity use when you're asked to do so. The event is managed remotely by notifying your staff of the curtailment request and then enacting curtailment through your Building Management System.

CSPs will share in a percentage of your savings, which may differ among various CSPs, since there may be costs associated with the hardware and /or software required for participation, so it is recommended that a number of CSPs be contacted to review their offers.

Buildings with non-emergency services, and with high electrical usage during peak hours (typically mid-day to early afternoon), that can shut down portions of the building loads are ideal for the implementation of demand response.

The Foundation does not appear to be a good candidate for Demand Response program. The site does not have sufficient electrical demand or curtailment ability for electrical grid demand response. The individual buildings have insufficient electrical demand for demand response. The FB Service has an average demand of 171 kWh and average grid demand of around 75 kW. Participation in demand curtailment would require the equivalent of going off grid. This is not recommended for Duke Farms.

Section 6

Ranking of Energy Conservation and Retrofit Measures (ECRM)

6.1 ECRMs

The main objective of this energy audit is to identify potential Energy Conservation and Retrofit Measures and to determine whether or not the identified ECRM's are economically feasible to warrant the cost for planning and implementation of each measure. Economic feasibility of each identified measure was evaluated through a simple payback analysis. The simple payback analysis consists of establishing the Engineer's Opinion of Probable Construction Cost estimates; O&M cost savings estimates, projected annual energy savings estimates and the potential value of New Jersey Clean Energy Rebates or Renewable Energy Credits, if applicable. The simple payback period is then determined as the amount of time (years) until the energy savings associated with each measure amounts to the capital investment cost.

As discussed in Section 3, aggregate unit costs for electrical energy delivery and usage and natural gas delivery and usage, which accounts for all demand and tariff charges at each complex, was determined and utilized in the simple payback analyses.

In general, ECRMs having a payback period of 25 years or less have been recommended and only those recommended ECRMs within Section 4 of the report have been ranked for possible implementation. The most attractive rankings are those with the lowest simple payback period.

Ranking of ECRMs has been broken down into the following categories:

- Lighting Systems
- HVAC Systems

6.1.1 Lighting Systems

Table 6.1-1 includes the recommended ECRMs to provide energy savings for all building lighting systems, which include the installation of energy-efficient luminaires. A detailed discussion on building lighting systems is presented in Section 4.1.

Table 6.1-1

Ranking of Energy Savings Measures Summary – Lighting System Retrofits

Location	Base Cost	Rebate	Table Cost	Annual Savings	Simple Payback
House 52	$716	$15	$701	$588	1.2
House 120	$362	$5	$357	$261	1.4
Orchid Range	$498	$0	$498	$176	2.8
Building 22 - Motor pool	$1,770	$70	$1,700	$349	4.9

Location	Base Cost	Rebate	Table Cost	Annual Savings	Simple Payback
Building 26 - Conservatory	$552	$25	$527	$93	5.7
House 87	$588	$5	$583	$100	5.8
House 74	$292	$0	$292	$50	5.9
House 27	$198	$0	$198	$28	7.1
House 29	$198	$0	$198	$28	7.1
Building 5 - Pump house	$280	$0	$280	$35	8.1
House 8	$90	$0	$90	$10	8.7
House 79	$212	$0	$212	$24	8.9
House 13	$108	$0	$108	$11	9.6
Building 39 - Farm Barn	$854	$0	$854	$88	9.7
House 47	$214	$0	$214	$20	10.5
Cottage 35	$226	$0	$226	$20	11.3
Building 23	$164	$0	$164	$14	11.4
Building 12 - Coach Barn	$7,980	$1,090	$6,890	$590	11.7
Shop 18	$4,118	$275	$3,843	$309	12.4
House 10	$100	$0	$100	$8	12.5
Garage 19	$20	$0	$20	$2	12.5
House 30	$40	$0	$40	$3	12.5
Cottage 43	$140	$0	$140	$11	12.5
House 7	$390	$0	$390	$30	12.8
House 9	$390	$0	$390	$30	12.8
Cottage 37	$266	$5	$261	$20	12.9
Building 24	$3,196	$425	$2,771	$206	13.4
Cottage 45	$344	$10	$334	$23	14.2
Building 56	$512	$20	$492	$33	14.8
House 21	$1,256	$50	$1,206	$81	15.0

Note: No replacements were identified for Reservoir Well Pump, and Community Garden Well.

6.1.2 HVAC Systems

Table 6.1-2 includes the recommended ECRM to provide energy savings for building HVAC systems, which provide a simple payback of less than 25 years. A detailed discussion on building HVAC systems is presented in Section 4.2.

Table 6.1-2
Ranking of Energy Savings Measures Summary – HVAC System Upgrade

Facility Measure	Retrofit Cost	Incentives	Total Cost	Annual Fiscal Savings	Simple Payback (Years)
House 79 Smart Thermostat	$300	$0	$300	$459	**0.7**
House 30 Smart Thermostat	$300	$0	$300	$169	**1.8**
House 7 Smart Thermostat	$300	$0	$300	$167	**1.8**
Shop 18 Attic Insulation	$2,893	$0	$2,893	$ 1,540	**1.9**
House 9 Smart Thermostat	$300	$0	$300	$147	**2.0**
House 8 Smart Thermostat	$300	$0	$300	$138	**2.2**
House 59 Attic Insulation	$2,244	$0	$2,244	$ 922	**2.4**
House 120 Smart Thermostat	$600	$0	$600	$182	**3.3**
House 52 Smart Thermostat	$1,800	$0	$1,800	$502	**3.6**
House 120 Attic Insulation	$2,244	$0	$2,244	$ 565	**4.0**
House 87 Smart Thermostat	$600	$0	$600	$144	**4.2**
Building 5 - Pump House Premium Eff Motors	$12,500	$0	$12,500	$ 2,753	**4.5**
House 13 Smart Thermostat	$600	$0	$600	$111	**5.4**
House 10 Smart Thermostat	$300	$0	$300	$56	**5.4**
House 47 Smart Thermostat	$900	$0	$900	$150	**6.0**
House 21 Attic Insulation	$2,132	$0	$2,132	$ 265	**8.0**
Building 12 - Coach Barn Condensing Boiler	$17,095	$1,000	$16,095	$ 1,581	**10.2**
House 120	$12,782	$1,000	$11,782	$ 998	**11.8**

Facility Measure	Retrofit Cost	Incentives	Total Cost	Annual Fiscal Savings	Simple Payback (Years)
Condensing Boiler					
House 13 Condensing Boiler	$12,782	$1,000	$11,782	$ 797	**14.8**
Building 12 - Coach Barn Premium Eff Motors	$921	$0	$921	$ 61	**15.1**
Building 23 Condensing Boiler	$12,782	$1,000	$11,782	$ 737	**16.0**
House 30 Condensing Boiler	$12,063	$1,000	$11,063	$ 654	**16.9**
House 27 Smart Thermostat	$600	$0	$600	$34	**17.6**
House 9 Attic Insulation	$1,200	$0	$1,200	$ 65	**18.5**
House 47 Condensing Boiler	$12,782	$1,000	$11,782	$ 637	**18.5**
House 27 Condensing Boiler	$12,063	$1,000	$11,063	$ 593	**18.6**
House 7 Attic Insulation	$1,200	$0	$1,200	$ 64	**18.8**
House 29 Condensing Boiler	$12,063	$1,000	$11,063	$ 519	**21.3**

Section 7

Grants, Incentives and Funding Sources

7.1 Energy Efficiency

7.1.1 Introduction

New Jersey's Clean Energy Program (NJ CEP) promotes increased energy efficiency and the use of clean, renewable sources of energy including solar, wind, geothermal, and sustainable biomass. The results for New Jersey are a stronger economy, less pollution, lower costs, and reduced demand for electricity. NJCEP offers financial incentives, programs, and services for residential, commercial, and municipal customers.

NJCEP reduces the need to generate electricity and burn natural gas which eliminates the pollution that would have been caused by such electric generation or natural gas usage. The benefits of these programs continue for the life of the measures installed, which on average is about 15 years. Thus, the public receives substantial environmental and public health benefits from programs that also lower energy bills and benefit the economy.

7.1.2 New Jersey Smart Start Buildings Program (NJ BPU)

The New Jersey Smart Start Buildings Program offers rebate incentives for several qualifying equipment such as high efficient premium motors and lighting, and lighting controls. The incentives mentioned in Section 4 are Smart Start incentives.

Incentive information and incentive calculation worksheets are available online at the following link. http://www.njcleanenergy.com/main/rebates-and-promotions/rebates-and-promotions

7.1.3 Pay for Performance Program (NJ BPU)

Duke Farms does not meet the demand requirement or the 15% minimum savings which makes them a poor candidate for P4P. CDM Smith anticipates that none of the buildings are possible candidates for the Pay for Performance Program. These candidates are based upon the program requirement for 200 kW peak demand during the prior 12 months. Also the program requires at least a 15% total energy usage savings. There are no buildings that are projected to save this much based upon the building models and energy savings calculations, and require further analysis to confirm they will qualify for the Pay for Performance Program.

Please note: This is a preliminary estimate of P4P incentives based on the assumptions in this report and P4P program eligibility rules. P4P incentives are not guaranteed until an application has been submitted and approved by the P4P program and all other program eligibility requirements have been met. Please see below for an overview of the P4P program.

The Pay for Performance Program is offered through the New Jersey Smart Start Program. Commercial, industrial and institutional buildings are eligible for participation if not already receiving Energy Efficiency and Conservation Block Grants.

Incentives are available for buildings that are able to present an Energy Reduction Plans that reduce the building's current energy consumption by 15% or more, in addition to incentives for installing the recommended measures and incentives for presenting the energy savings in a post-construction benchmarking report.

7.1.4 Direct Install (NJ BPU)

Owners of existing small to mid-size commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies.

This program will cover up to 70% of the retro-fitting costs associated with the use of new energy efficient equipment. Lighting, HVAC, refrigeration, motors, natural gas systems, and variable frequency drives are covered under the Direct Install program.

The buildings covered under this audit that are potentially eligible for participation in the Direct Install Program, based on the requirement to have not exceeded a peak demand of 200 kW in the preceding 12 months, are all building on the entire campus.

The Direct Install Program is designed to fast-track project implementation so energy savings can be realized sooner rather than later. The steps for participation are to contact the contractor assigned and trained to provide Direct Install services in your County and schedule an Energy Assessment with this contractor. The contractor will assist in completing the Program Application and Participation Agreement.

The Energy Assessment with the participating contractor will work to determine which conservation measures qualify and the resulting project cost. Following this assessment, a scope of work will be finalized and installation will be arranged. Following completion of the installation a 'project completion form' must be submitted to the program representative assigned to the project.

Currently NJCEP is reviewing its agreements with the network of Direct Install contractors and refreshing the measures that can be installed (included) under the program. This will ensure that we are including the latest technologies and are continuing to secure competitive prices for all eligible measures, to make certain you are getting the best energy solutions for your facility. NJCEP will post a notice on this page when the program is ready to start scheduling assessments again, likely in Spring 2016.

If you are interested in participating at that time, or would like more information, please send an email to directinstall@NJCleanEnergy.com. Any additional information on the Direct Install Program can be obtained by calling 866-NJSMART or by e-mail to directinstall@NJCleanEnergy.com

7.2 Renewable Energy

7.2.1 Renewable Energy Certificates (NJ BPU)

As part of New Jersey's Renewable Portfolio Standards (RPS), electric suppliers are required to have an annually-increasing percentage of their retail sales generated by renewable energy. Electric suppliers fulfill this obligation by purchasing renewable energy certificates (RECs) from the owners of solar generating systems. One REC is created for every 1,000 kWh (1 MWh) of renewable electricity generated. Although solar systems generate electricity and SRECs in tandem, the two are independent commodities and sold separately.

The RPS, and creation of RECs, is intended to provide additional revenue flow and financial support for renewable energy projects in New Jersey. Class I RECs, which include electricity generation from wind, wave, tidal, geothermal and sustainable biomass typically trade at around $0.90/MWh. RECs generated from solar electricity, or SRECs, have recently been trading between $63 - $510 per MWh, with the weighted average trade value at approximately $180-$200.

7.2.2 Renewable Energy Incentive Program (NJ BPU)

The Renewable Energy Incentive Program (REIP) is currently offering incentives for municipalities to invest in CHP systems through the Small and Large Scale Combined Heat and Power (CHP)/Fuel Cell Program. The existing small and large CHP-Fuel Cell programs will be combined to offer rolling grants to support CHP and fuel cell projects serving commercial, industrial, and institutional customers in New Jersey. There is a total of $50 million in grants available. The Large Scale CHP/Fuel Cell program is operated by the New Jersey BPU. Details on further qualifications, disbursement caps, and grant applications have not yet been released. Information on these details will be posted to the NJ BPU website. Other incentives are also available under this program, for more information on REIP, please see www.njcleanenergy.com.

7.2.3 Utility Financing Programs

All four Electric Distribution Companies (EDCs) in New Jersey have developed long term contracting or financing programs for the development of solar energy systems. In all of the programs, Solar Renewable Energy Credits (SRECs) generated by the solar energy systems will be sold at auction to energy suppliers who are required to purchase a certain quantity of SRECs to meet their Renewable Portfolio Standard requirements.

7.2.4 Clean Renewable Energy Bonds (IRS)

The IRS is currently not accepting application for CREBs. For more information, please refer to http://www.irs.gov/pub/irs-drop/a-10-54.pdf.

7.2.5 Qualified Energy Conservation Bonds (IRS)

These IRS 0% interest bonds are very similar to CREBs except they are allocated based on state and county population. New Jersey was allocated $90 million as part of the ARRA stimulus fund. QECBs are typically distributed through municipal bond banks or state economic development agencies.

7.2.6 Global Climate Change Mitigation Incentive Fund (US EDA)

The Economic Development Agency (part of the U.S. Department of Commerce) administers the GCCMIF to public works projects that reduce greenhouse gas emissions and creates new jobs. In FY 2012, $16.5 million was allocated to the fund, and additional funding is expected to be allocated in FY 2013. Applications are due on a rolling basis. Private sector and or for-profit companies are not eligible for this fund.

7.2.7 Private Tax-Exempt Financing

Similar to traditional municipal bond financing, there are many private financial service companies that offer a myriad of options for tax-exempt financing of municipal projects. The providers of these services suggest that this capital can be offered at competitive rates in an expedited timeframe and with fewer complications when compared to traditional municipal financing methods. Though these factors would need to be compared on a case-by-case basis, the one distinct advantage to private financing on the current project would likely be the flexibility to structure payments to meet budget needs with consideration given to the terms and conditions of existing loan and/or bond agreements.

For example, this mechanism could be used to limit the initial debt payments when the current bond debt is the greatest and the operations savings of the project has yet to be fully realized. It should also be noted that, in many cases, the construction and long term financing can be rolled into a single private financing agreement. Also, in some instances, equipment manufacturers have the ability to offer competitive financing terms (e.g. Siemens Financial Services Corporation), though financing from these sources is generally contingent upon a substantial portion of the project cost (~20% to 30%) being for their respective equipment.

7.2.8 Performance Based Contracts (ESCOs)

A second financing alternative for a project of this nature would be to enter into a Performance Based Contract with an Energy Services Company (ESCO). The premise of this type of contract is that it requires no initial municipal capital contributions in order to implement the project - instead relying on future operations cost savings and/or energy production, to fund the annual payments. Prior to entering into an agreement for the funding of the project, an ESCO would perform an energy audit and/or conceptual studies to confirm future energy cost savings or energy production inherent with the projects implementation and operation. The contract would then be formulated based on some measurable parameter(s) (energy production, etc) which would be verified by measurement throughout the contract duration. The savings in energy costs or energy production would then be used to pay back the capital investment of the project over the contract time period (typically on the order of 10-years or less).

The ESCO would guarantee the agreed upon energy savings or energy production. If the project does not meet energy savings or production commitments, the ESCO pays the owner the equivalent difference.

With this funding alternative, the ownership and operation of the facility would be maintained by the original owner. A performance contract may also include ESCO operation and maintenance of

the energy-related facilities if that were deemed appropriate. Significant ESCO's with experience in this area include Siemens Building Technologies, Chevron and Johnson Controls. CDM Smith has functioned in several roles on performance based contracts including being the owner's representative and, on different contracts, providing design-build services (as a subcontractor to the ESCO). CDM Smith can provide additional experience-based information upon request.

7.2.9 Power Purchase Agreements (SPCs)

A Power Purchase Agreement (PPA) also delivers a project with no initial capital contribution by the original owner. In this model, a Special Purpose Company (SPC) created by a developer, would own the energy production facilities. Within the framework of a PPA, a SPC will typically lease property from the owners for construction and operation of the new facilities. The funding and construction of the new facilities would be performed by the SPC who would then own and operate the facilities for the duration of the contract (typically 20 to 30 years). Throughout that period of time, the original owner would purchase power from the SPC at a pre-negotiated rate which would take into account the initial capital cost, operation and maintenance of the constructed facility, ancillary benefits of the project and investor returns on investment. For renewable energy, financial incentives may enable this financing approach to compete favorably with utility power tariffs. Incentives include state and local tax credits, renewable energy credits, and Federal energy production tax credits or energy investment tax credits. It is expected that a number of experienced companies and developers may be interested in a PPA for New Jersey municipal renewable energy projects.

Appendix A

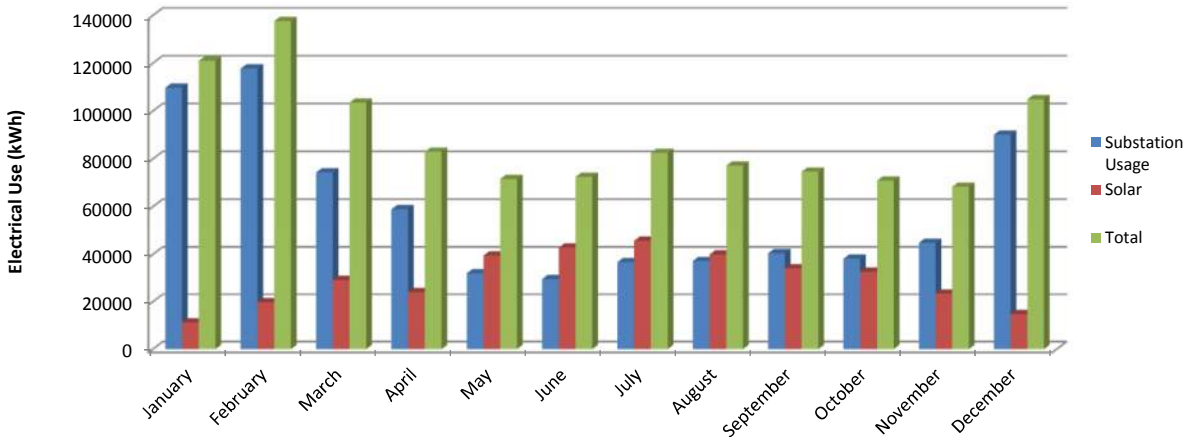
Energy Audit Building	Farm Barn Net Meter
Service Provider	PSE&G
Account Number	
Meter Number	EL20

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Grid kWh	Total Solar	Total kWh
Jan	1	Feb	1	$ 9,703.92	$ 9,703.92	101210	43421	144631
Feb	1	Mar	1	$ 15,785.10	$ 15,785.10	113875	60811	174686
Mar	1	Apr	1	$ 10,452.50	$ 10,452.50	80839	66680	147519
Apr	1	May	1	$ 4,543.50	$ 4,543.50	47391	86606	133997
May	1	June	1	$ 2,737.82	$ 2,737.82	40002	93070	133072
June	1	July	1	$ 4,429.81	$ 4,429.81	40215	77646	117861
July	1	Aug	1	$ 4,692.89	$ 4,692.89	46273	97770	144043
Aug	1	Sept	1	$ 5,299.42	$ 5,299.42	45229	99832	145061
Sept	1	Oct	1	$ 4,597.80	$ 4,597.80	43129	83054	126183
Oct	1	Nov	1	$ 3,206.03	$ 3,206.03	42359	75001	117360
Nov	1	Dec	1	$ 3,218.64	$ 3,218.64	42711	51730	94441
Dec	1	Jan	1	$ 3,977.12	$ 3,977.12	64744	32611	97355

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Grid kWh	Total Solar	Total kWh
Jan	1	Feb	1	$ 19,700.26	$ 19,700.26	118,333	22,604	140,937
Feb	1	Mar	1	$ 22,508.76	$ 22,508.76	121,767	39,618	161,385
Mar	1	Apr	1	$ 12,918.00	$ 12,918.00	67,823	58,454	126,277
Apr	1	May	1	$ 7,229.39	$ 7,229.39	70,492	48,113	118,605
May	1	June	1	$ 2,292.13	$ 2,292.13	24,089	79,083	103,172
June	1	July	1	$ 3,310.53	$ 3,310.53	18,939	85,829	104,768
July	1	Aug	1	$ 3,350.55	$ 3,350.55	27,203	91,590	118,793
Aug	1	Sept	1	$ 3,447.12	$ 3,447.12	29,220	79,917	109,137
Sept	1	Oct	1	$ 3,809.23	$ 3,809.23	37,911	68,268	106,179
Oct	1	Nov	1	$ 3,300.04	$ 3,300.04	34,009	65,387	99,396
Nov	1	Dec	1	$ 4,923.04	$ 4,923.04	47,099	46,914	94,013
Dec	1	Jan	1	$ 9,935.21	$ 9,935.21	115,553	29,600	145,153



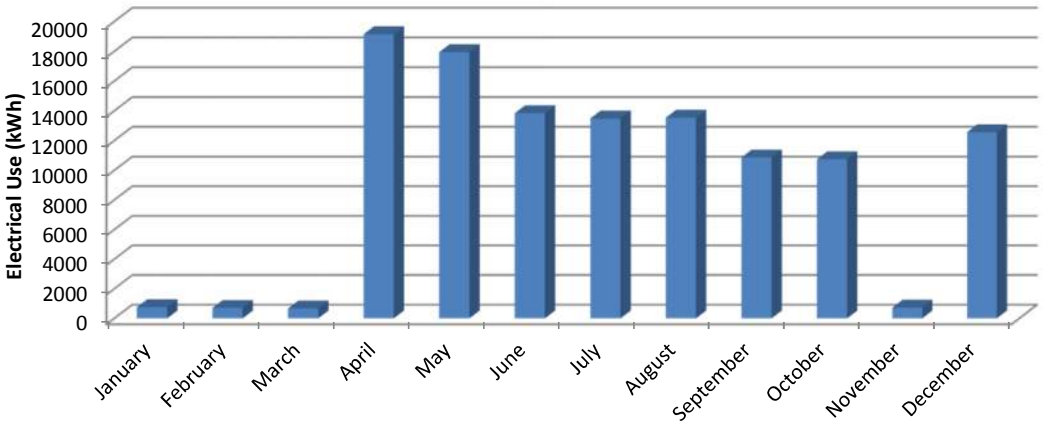
Energy Audit Building	Bldg 05 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	EL 21

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ 5,011.85	$ 5,011.85	36,887	36887
May	1	June	1	$ 1,430.43	$ 1,430.43	15,105	15105
June	1	July	1	$ 1,665.18	$ 1,665.18	14,554	14554
July	1	Aug	1	$ 1,589.68	$ 1,589.68	14,217	14217
Aug	1	Sept	1	$ 1,773.00	$ 1,773.00	14,433	14433
Sept	1	Oct	1	$ 1,410.71	$ 1,410.71	10,332	10332
Oct	1	Nov	1	$ 1,122.59	$ 1,122.59	11,217	11217
Nov	1	Dec	1	$ 482.80	$ 482.80	1,465	1465
Dec	1	Jan	1	$ 482.42	$ 482.42	1,833	1833

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 672.25	$ 672.25	1520	1,520
Feb	1	Mar	1	$ 838.83	$ 838.83	1421	1,421
Mar	1	Apr	1	$ 602.89	$ 602.89	1344	1,344
Apr	1	May	1	$ 528.33	$ 528.33	1410	1,410
May	1	June	1	$ 2,203.39	$ 2,203.39	20777	20,777
June	1	July	1	$ 1,857.51	$ 1,857.51	13123	13,123
July	1	Aug	1	$ 1,810.68	$ 1,810.68	12757	12,757
Aug	1	Sept	1	$ 1,778.20	$ 1,778.20	12646	12,646
Sept	1	Oct	1	$ 1,717.82	$ 1,717.82	11399	11,399
Oct	1	Nov	1	$ 1,169.74	$ 1,169.74	10273	10,273
Nov	1	Dec	1	$ -	$ -	0	0
Dec	1	Jan	1	$ 2,637.02	$ 2,637.02	23296	23,296



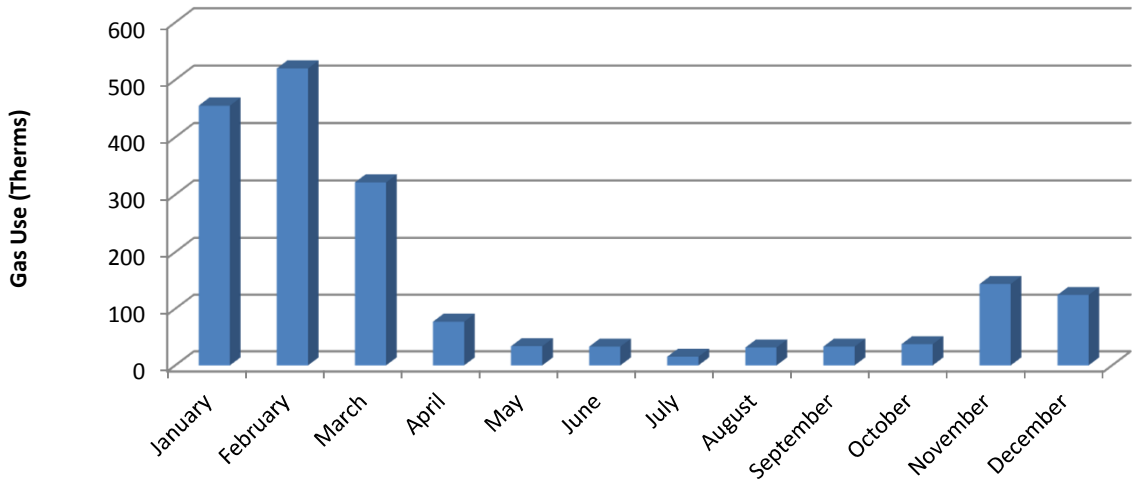
Energy Audit Building	Bldg 5 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	NG 06

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 392.76	$ 392.76	408	408
Feb	1	Mar	1	$ 517.29	$ 517.29	563	563
Mar	1	Apr	1	$ 266.70	$ 266.70	294	294
Apr	1	May	1	$ 73.42	$ 73.42	80	80
May	1	June	1	$ 36.97	$ 36.97	34	34
June	1	July	1	$ 38.31	$ 38.31	35	35
July	1	Aug	1	$ 34.89	$ 34.89	30	30
Aug	1	Sept	1	$ 36.11	$ 36.11	32	32
Sept	1	Oct	1	$ 37.61	$ 37.61	34	34
Oct	1	Nov	1	$ 43.01	$ 43.01	42	42
Nov	1	Dec	1	$ 63.27	$ 63.27	67	67
Dec	1	Jan	1	$ 73.35	$ 73.35	78	78

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 565.86	$ 565.86	502	502
Feb	1	Mar	1	$ 225.18	$ 225.18	477	477
Mar	1	Apr	1	$ 190.47	$ 190.47	348	348.3
Apr	1	May	1	$ 85.03	$ 85.03	74	73.9
May	1	June	1	$ 45.34	$ 45.34	34	33.8
June	1	July	1	$ 1,857.51	$ 1,857.51	32	31.5
July	1	Aug	1	$ -	$ -	0	0.0
Aug	1	Sept	1	$ 39.92	$ 39.92	31	31.5
Sept	18	Oct	18	$ 41.20	$ 41.20	33	32.63
Oct	18	Nov	14	$ 41.36	$ 41.36	33	32.69
Nov	14	Dec	17	$ 224.69	$ 224.69	220	219.97
Dec	17	Jan	16	$ 185.66	$ 185.66	171	170.83



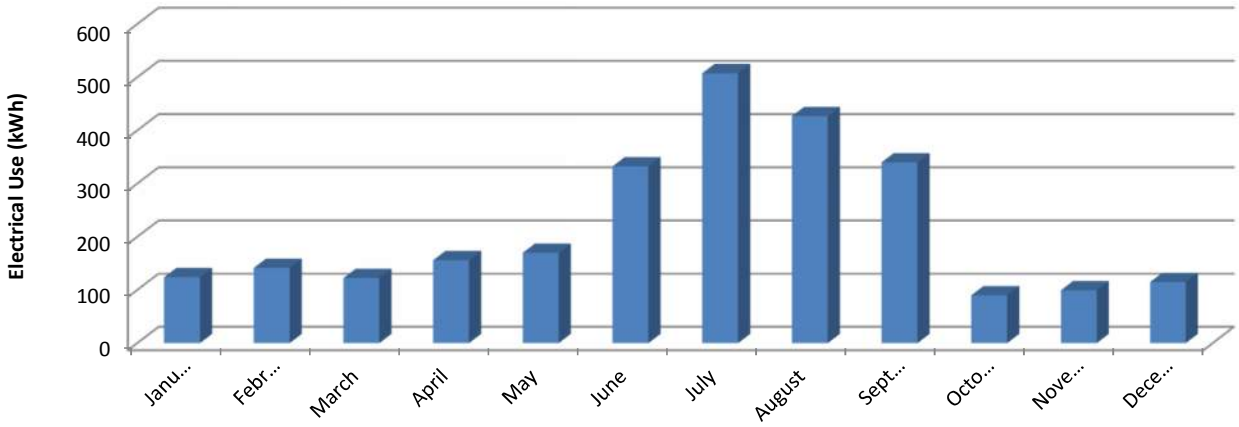
Energy Audit Building	Bldg 07 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	EL63(on FB circuit)

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	110	110
Feb	1	Mar	1	$ -	$ -	121	121
Mar	1	Apr	1	$ -	$ -	110	110
Apr	1	May	1	$ -	$ -	127	127
May	1	June	1	$ -	$ -	161	161
June	1	July	1	$ -	$ -	448	448
July	1	Aug	1	$ -	$ -	621	621
Aug	1	Sept	1	$ -	$ -	542	542
Sept	1	Oct	1	$ -	$ -	401	401
Oct	1	Nov	1	$ -	$ -	96	96
Nov	1	Dec	1	$ -	$ -	91	91
Dec	1	Jan	1	$ -	$ -	102	102

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	138	138
Feb	1	Mar	1	$ -	$ -	162	162
Mar	1	Apr	1	$ -	$ -	135	135
Apr	1	May	1	$ -	$ -	185	185
May	1	June	1	$ -	$ -	179	179
June	1	July	1	$ -	$ -	217	217
July	1	Aug	1	$ -	$ -	394	394
Aug	1	Sept	1	$ -	$ -	312	312
Sept	1	Oct	1	$ -	$ -	279	279
Oct	1	Nov	1	$ -	$ -	84	84
Nov	1	Dec	1	$ -	$ -	108	108
Dec	1	Jan	1	$ -	$ -	128	128



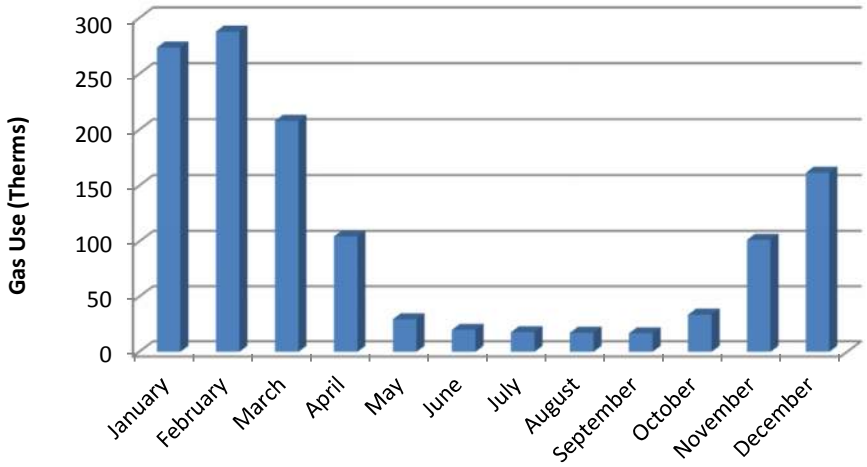
Energy Audit Building	**Bldg 07 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 07**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 226.82	$ 226.82	230	230
Feb	1	Mar	1	$ 282.42	$ 282.42	301	301
Mar	1	Apr	1	$ 179.85	$ 179.85	193.7	194
Apr	1	May	1	$ 92.27	$ 92.27	104.8	105
May	1	June	1	$ 29.71	$ 29.71	24.3	24
June	1	July	1	$ 30.09	$ 30.09	24.2	24
July	1	Aug	1	$ 25.89	$ 25.89	18.9	19
Aug	1	Sept	1	$ 26.97	$ 26.97	20.0	20
Sept	1	Oct	1	$ 26.21	$ 26.21	19.0	19
Oct	1	Nov	1	$ 40.64	$ 40.64	39.0	39
Nov	1	Dec	1	$ 55.61	$ 55.61	56.8	57
Dec	1	Jan	1	$ 95.04	$ 95.04	103.0	103

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 364.62	$ 364.62	317	317
Feb	1	Mar	1	$ 347.96	$ 347.96	274	274
Mar	1	Apr	1	$ 271.62	$ 271.62	222.3	222.3
Apr	1	May	1	$ 115.73	$ 115.73	104.5	104.5
May	1	June	1	$ 46.41	$ 46.41	34.8	34.8
June	1	July	1	$ 26.66	$ 26.66	15.8	15.8
July	1	Aug	1	$ 27.44	$ 27.44	16.7	16.7
Aug	1	Sept	1	$ 24.57	$ 24.57	14.7	14.7
Sept	18	Oct	18	$ 24.74	$ 24.74	14.7	14.74
Oct	18	Nov	14	$ 37.46	$ 37.46	28.5	28.47
Nov	14	Dec	17	$ 153.60	$ 153.60	146.3	146.30
Dec	17	Jan	16	$ 238.12	$ 238.12	220.4	220.39



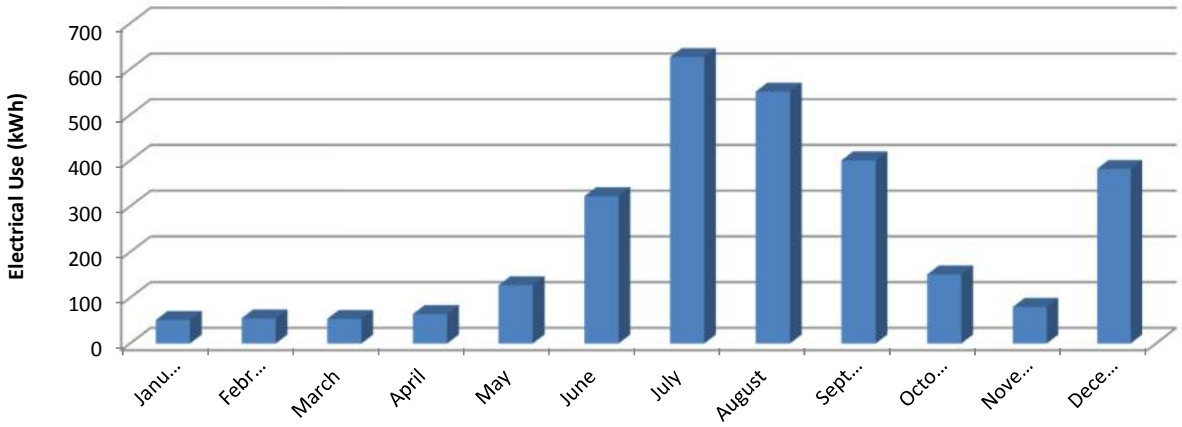
Energy Audit Building	**Bldg 08 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL64(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	43	43
Feb	1	Mar	1	$ -	$ -	53	53
Mar	1	Apr	1	$ -	$ -	59	59
Apr	1	May	1	$ -	$ -	76	76
May	1	June	1	$ -	$ -	206	206
June	1	July	1	$ -	$ -	464	464
July	1	Aug	1	$ -	$ -	498	498
Aug	1	Sept	1	$ -	$ -	466	466
Sept	1	Oct	1	$ -	$ -	324	324
Oct	1	Nov	1	$ -	$ -	92	92
Nov	1	Dec	1	$ -	$ -	94	94
Dec	1	Jan	1	$ -	$ -	710	710

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	60	60
Feb	1	Mar	1	$ -	$ -	57	57
Mar	1	Apr	1	$ -	$ -	49	49
Apr	1	May	1	$ -	$ -	53	53
May	1	June	1	$ -	$ -	49	49
June	1	July	1	$ -	$ -	180	180
July	1	Aug	1	$ -	$ -	755	755
Aug	1	Sept	1	$ -	$ -	636	636
Sept	1	Oct	1	$ -	$ -	477	477
Oct	1	Nov	1	$ -	$ -	210	210
Nov	1	Dec	1	$ -	$ -	66	66
Dec	1	Jan	1	$ -	$ -	54	54



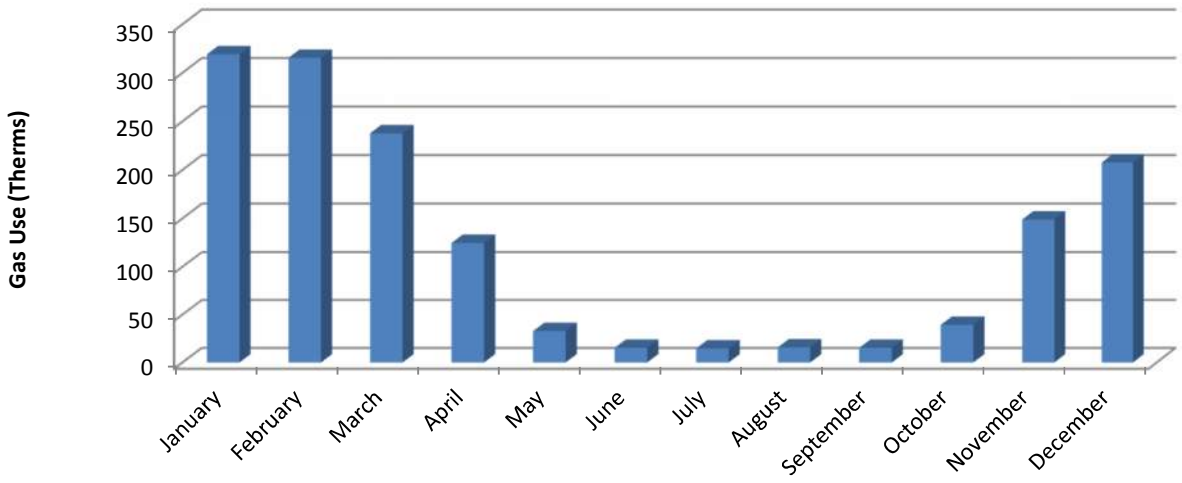
Energy Audit Building	**Bldg 08 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 08**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 164.61	$ 164.61	273	273
Feb	1	Mar	1	$ 191.92	$ 191.92	319	319
Mar	1	Apr	1	$ 135.72	$ 135.72	223.4	223
Apr	1	May	1	$ 70.18	$ 70.18	122.8	123
May	1	June	1	$ 25.12	$ 25.12	24.3	24
June	1	July	1	$ 19.40	$ 19.40	16.9	17
July	1	Aug	1	$ 15.99	$ 15.99	12.6	13
Aug	1	Sept	1	$ 16.86	$ 16.86	13.7	14
Sept	1	Oct	1	$ 16.12	$ 16.12	12.7	13
Oct	1	Nov	1	$ 51.92	$ 51.92	50.2	50
Nov	1	Dec	1	$ 104.39	$ 104.39	121.0	121
Dec	1	Jan	1	$ 110.72	$ 110.72	172.4	172

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 361.98	$ 361.98	366	366
Feb	1	Mar	1	$ 255.87	$ 255.87	312	312
Mar	1	Apr	1	$ 199.36	$ 199.36	251.9	251.9
Apr	1	May	1	$ 116.16	$ 116.16	126.7	126.7
May	1	June	1	$ 42.98	$ 42.98	41.2	41.2
June	1	July	1	$ 18.07	$ 18.07	13.7	13.7
July	1	Aug	1	$ 20.87	$ 20.87	16.7	16.7
Aug	1	Sept	1	$ 21.88	$ 21.88	17.8	17.8
Sept	18	Oct	18	$ 21.91	$ 21.91	17.9	17.89
Oct	18	Nov	14	$ 29.13	$ 29.13	28.5	28.47
Nov	14	Dec	17	$ 118.96	$ 118.96	176.8	176.82
Dec	17	Jan	16	$ 146.79	$ 146.79	242.5	242.54



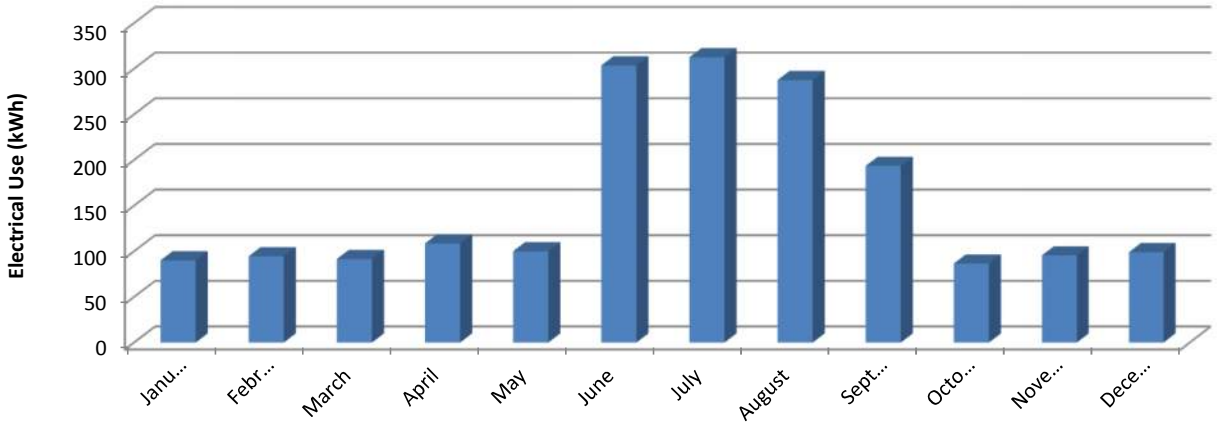
Energy Audit Building	**Bldg 09 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL65(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	79	79
Feb	1	Mar	1	$ -	$ -	104	104
Mar	1	Apr	1	$ -	$ -	100	100
Apr	1	May	1	$ -	$ -	113	113
May	1	June	1	$ -	$ -	156	156
June	1	July	1	$ -	$ -	447	447
July	1	Aug	1	$ -	$ -	498	498
Aug	1	Sept	1	$ -	$ -	476	476
Sept	1	Oct	1	$ -	$ -	276	276
Oct	1	Nov	1	$ -	$ -	98	98
Nov	1	Dec	1	$ -	$ -	95	95
Dec	1	Jan	1	$ -	$ -	102	102

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	101	101
Feb	1	Mar	1	$ -	$ -	85	85
Mar	1	Apr	1	$ -	$ -	83	83
Apr	1	May	1	$ -	$ -	104	104
May	1	June	1	$ -	$ -	44	44
June	1	July	1	$ -	$ -	160	160
July	1	Aug	1	$ -	$ -	127	127
Aug	1	Sept	1	$ -	$ -	99	99
Sept	1	Oct	1	$ -	$ -	111	111
Oct	1	Nov	1	$ -	$ -	75	75
Nov	1	Dec	1	$ -	$ -	96	96
Dec	1	Jan	1	$ -	$ -	96	96



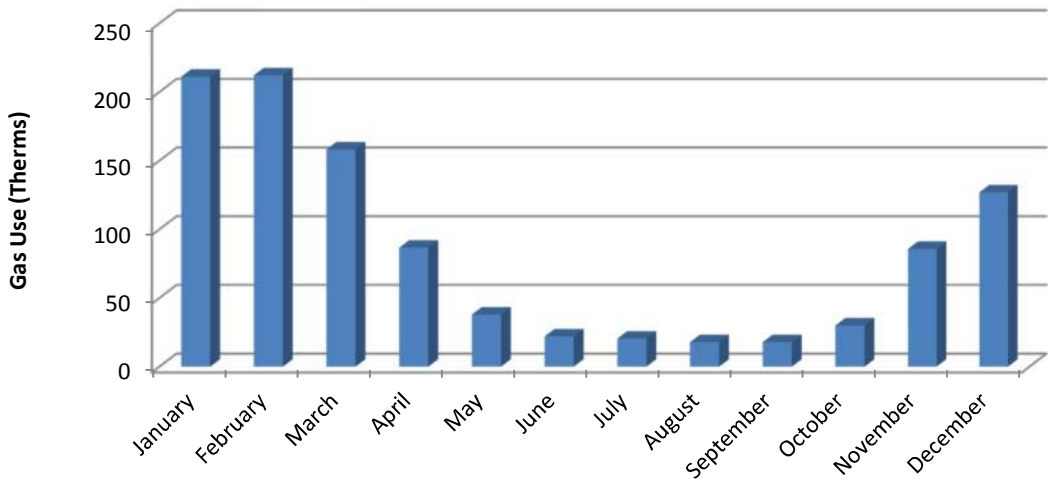
Energy Audit Building	**Bldg 09 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 09**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 172.05	$ 172.05	172	172
Feb	1	Mar	1	$ 219.24	$ 219.24	232	232
Mar	1	Apr	1	$ 149.15	$ 149.15	158.8	159
Apr	1	May	1	$ 78.35	$ 78.35	86.8	87
May	1	June	1	$ 39.39	$ 39.39	37.0	37
June	1	July	1	$ 30.09	$ 30.09	24.2	24
July	1	Aug	1	$ 29.16	$ 29.16	23.1	23
Aug	1	Sept	1	$ 26.97	$ 26.97	20.0	20
Sept	1	Oct	1	$ 26.21	$ 26.21	19.0	19
Oct	1	Nov	1	$ 39.85	$ 39.85	38.0	38
Nov	1	Dec	1	$ 69.82	$ 69.82	74.7	75
Dec	1	Jan	1	$ 98.41	$ 98.41	107.3	107

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 290.22	$ 290.22	250	250
Feb	1	Mar	1	$ 247.77	$ 247.77	193	193
Mar	1	Apr	1	$ 195.92	$ 195.92	157.7	157.7
Apr	1	May	1	$ 97.75	$ 97.75	86.6	86.6
May	1	June	1	$ 50.71	$ 50.71	39.1	39.1
June	1	July	1	$ 30.82	$ 30.82	20.0	20.0
July	1	Aug	1	$ 28.46	$ 28.46	17.8	17.8
Aug	1	Sept	1	$ 25.51	$ 25.51	15.7	15.7
Sept	18	Oct	18	$ 26.68	$ 26.68	16.8	16.84
Oct	18	Nov	14	$ 31.62	$ 31.62	22.1	22.15
Nov	14	Dec	17	$ 104.95	$ 104.95	96.8	96.83
Dec	17	Jan	16	$ 161.60	$ 161.60	146.6	146.58



Energy Audit Building	**Bldg 10 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL66(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	1714	1714
Feb	1	Mar	1	$ -	$ -	2197	2197
Mar	1	Apr	1	$ -	$ -	1465	1465
Apr	1	May	1	$ -	$ -	1023	1023
May	1	June	1	$ -	$ -	625	625
June	1	July	1	$ -	$ -	1037	1037
July	1	Aug	1	$ -	$ -	1141	1141
Aug	1	Sept	1	$ -	$ -	1203	1203
Sept	1	Oct	1	$ -	$ -	890	890
Oct	1	Nov	1	$ -	$ -	924	924
Nov	1	Dec	1	$ -	$ -	1217	1217
Dec	1	Jan	1	$ -	$ -	1496	1496

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	238	238
Feb	1	Mar	1	$ -	$ -	211	211
Mar	1	Apr	1	$ -	$ -	186	186
Apr	1	May	1	$ -	$ -	147	147
May	1	June	1	$ -	$ -	143	143
June	1	July	1	$ -	$ -	172	172
July	1	Aug	1	$ -	$ -	431	431
Aug	1	Sept	1	$ -	$ -	622	622
Sept	1	Oct	1	$ -	$ -	819	819
Oct	1	Nov	1	$ -	$ -	410	410
Nov	1	Dec	1	$ -	$ -	738	738
Dec	1	Jan	1	$ -	$ -	1,589	1,589

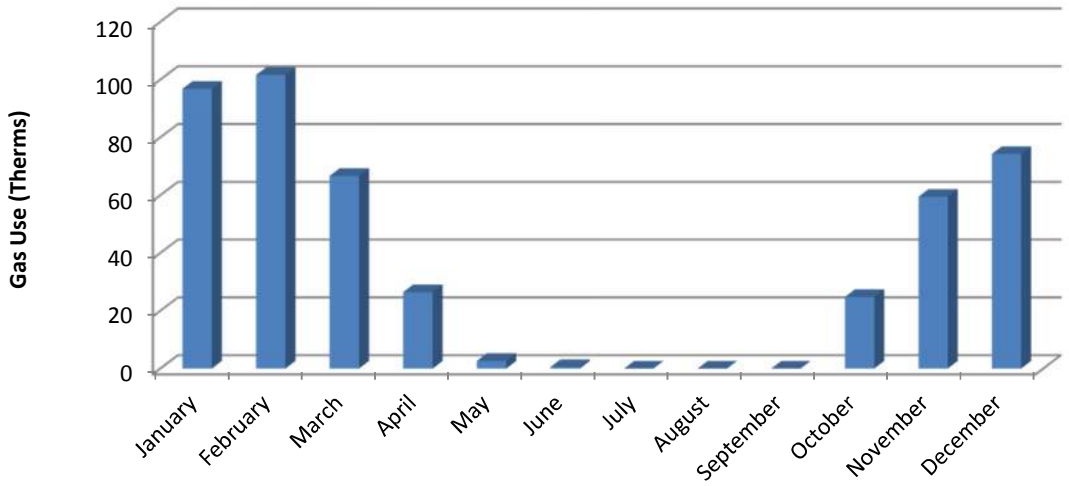
Energy Audit Building	**Bldg 10 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 10**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 66.51	$ 66.51	104	104
Feb	1	Mar	1	$ 80.20	$ 80.20	127	127
Mar	1	Apr	1	$ 56.09	$ 56.09	85.7	86
Apr	1	May	1	$ 31.35	$ 31.35	48.7	49
May	1	June	1	$ 10.10	$ 10.10	5.3	5
June	1	July	1	$ 6.69	$ 6.69	1.1	1
July	1	Aug	1	$ 5.84	$ 5.84	0.0	0
Aug	1	Sept	1	$ 5.84	$ 5.84	0.0	0
Sept	1	Oct	1	$ 5.84	$ 5.84	0.0	0
Oct	1	Nov	1	$ 24.40	$ 24.40	24.3	24
Nov	1	Dec	1	$ 36.08	$ 36.08	36.8	37
Dec	1	Jan	1	$ 41.22	$ 41.22	57.8	58

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 93.71	$ 93.71	90	90
Feb	1	Mar	1	$ 66.95	$ 66.95	76	76
Mar	1	Apr	1	$ 42.42	$ 42.42	47.6	47.6
Apr	1	May	1	$ 9.65	$ 9.65	4.2	4.2
May	1	June	1	$ 5.84	$ 5.84	0.0	0.0
June	1	July	1	$ 5.84	$ 5.84	0.0	0.0
July	1	Aug	1	$ 5.84	$ 5.84	0.0	0.0
Aug	1	Sept	1	$ 5.84	$ 5.84	0.0	0.0
Sept	18	Oct	18	$ 5.84	$ 5.84	0.0	0.00
Oct	18	Nov	14	$ 26.58	$ 26.58	25.3	25.31
Nov	14	Dec	17	$ 58.95	$ 58.95	82.1	82.09
Dec	17	Jan	16	$ 58.98	$ 58.98	90.7	90.69



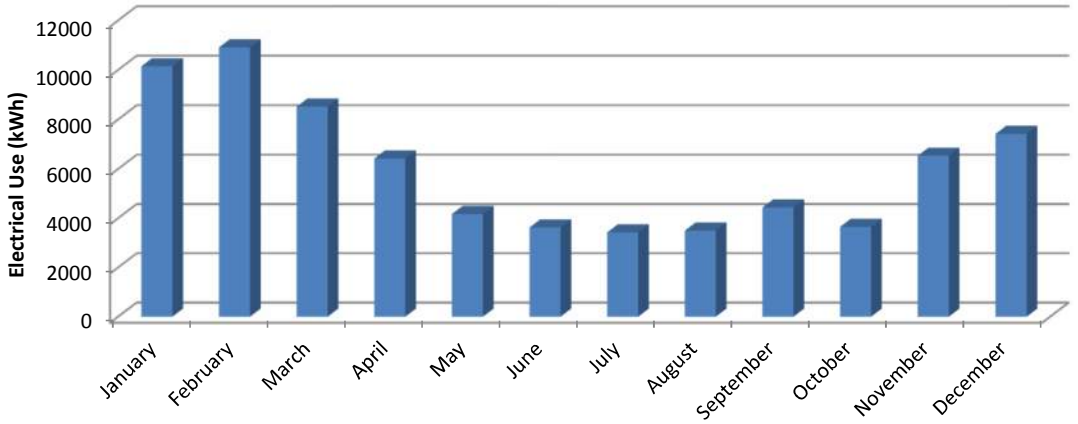
Energy Audit Building	**Bldg 12 Coach Barn - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL62(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1		$ -	9792	9792
Feb	1	Mar	1		$ -	11644	11644
Mar	1	Apr	1		$ -	8985	8985
Apr	1	May	1		$ -	7467	7467
May	1	June	1		$ -	4129	4129
June	1	July	1		$ -	3542	3542
July	1	Aug	1		$ -	3491	3491
Aug	1	Sept	1		$ -	3612	3612
Sept	1	Oct	1		$ -	3926	3926
Oct	1	Nov	1		$ -	4339	4339
Nov	1	Dec	1		$ -	5182	5182
Dec	1	Jan	1		$ -	8746	8746

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1		$ -	10,505	10,505
Feb	1	Mar	1		$ -	10,183	10,183
Mar	1	Apr	1		$ -	8,051	8,051
Apr	1	May	1		$ -	5,377	5,377
May	1	June	1		$ -	4,211	4,211
June	1	July	1		$ -	3,707	3,707
July	1	Aug	1		$ -	3,359	3,359
Aug	1	Sept	1		$ -	3,378	3,378
Sept	1	Oct	1		$ -	4,946	4,946
Oct	1	Nov	1		$ -	2,961	2,961
Nov	1	Dec	1		$ -	7,890	7,890
Dec	1	Jan	1		$ -	6,092	6,092



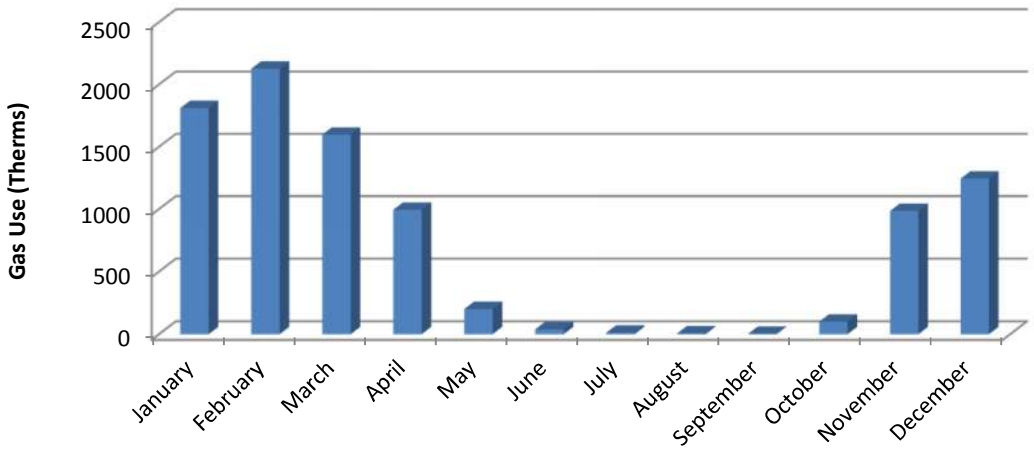
Energy Audit Building	**Bldg 12 Coach Barn - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 03**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 1,496.96	$ 1,496.96	1582	1582
Feb	1	Mar	1	$ 2,209.58	$ 2,209.58	2436	2436
Mar	1	Apr	1	$ 1,512.09	$ 1,512.09	1,716.0	1716
Apr	1	May	1	$ 920.65	$ 920.65	1,175.0	1175
May	1	June	1	$ 41.82	$ 41.82	40.0	40
June	1	July	1	$ 14.46	$ 14.46	4.0	4
July	1	Aug	1	$ 14.44	$ 14.44	4.0	4
Aug	1	Sept	1	$ 14.50	$ 14.50	4.0	4
Sept	1	Oct	1	$ 14.78	$ 14.78	4.0	4
Oct	1	Nov	1	$ 120.81	$ 120.81	147.0	147
Nov	1	Dec	1	$ 657.26	$ 657.26	810.0	810
Dec	1	Jan	1	$ 882.98	$ 882.98	1,058.0	1058

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 2,278.22	$ 2,278.22	2039	2039
Feb	1	Mar	1	$ 2,241.16	$ 2,241.16	1817	1817
Mar	1	Apr	1	$ 1,743.27	$ 1,743.27	1,478.0	1,478.0
Apr	1	May	1	$ 826.84	$ 826.84	814.0	814.0
May	1	June	1	$ 379.12	$ 379.12	362.0	362.0
June	1	July	1	$ 84.13	$ 84.13	74.0	74.0
July	1	Aug	1	$ 30.49	$ 30.49	20.0	20.0
Aug	1	Sept	1	$ 20.76	$ 20.76	10.0	10.0
Sept	18	Oct	18	$ 15.05	$ 15.05	4.0	4.00
Oct	18	Nov	14	$ 45.34	$ 45.34	53.0	53.00
Nov	14	Dec	17	$ 1,147.62	$ 1,147.62	1,161.0	1,161.00
Dec	17	Jan	16	$ 1,490.77	$ 1,490.77	1,432.0	1,432.00



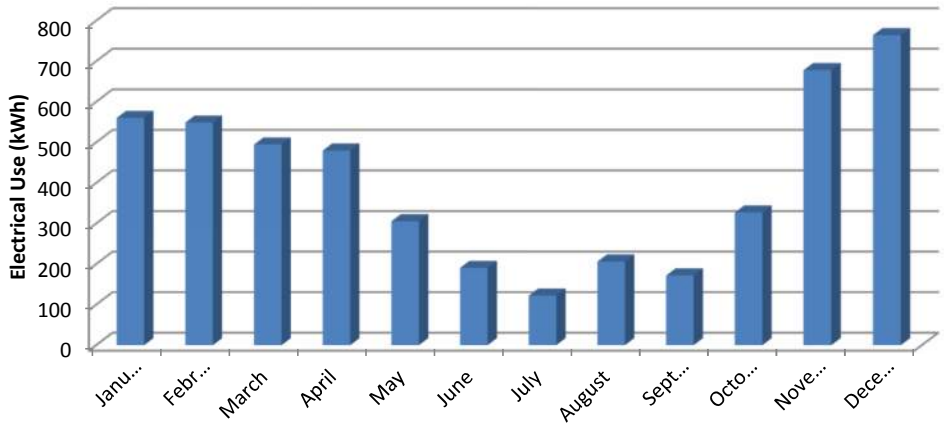
Energy Audit Building	**Bldg 13 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL67(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1			557	557
Feb	1	Mar	1			611	611
Mar	1	Apr	1			536	536
Apr	1	May	1			523	523
May	1	June	1			388	388
June	1	July	1			239	239
July	1	Aug	1			113	113
Aug	1	Sept	1			275	275
Sept	1	Oct	1			135	135
Oct	1	Nov	1			390	390
Nov	1	Dec	1			875	875
Dec	1	Jan	1			955	955

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1			569	569
Feb	1	Mar	1			489	489
Mar	1	Apr	1			447	447
Apr	1	May	1			437	437
May	1	June	1			211	211
June	1	July	1			136	136
July	1	Aug	1			127	127
Aug	1	Sept	1			143	143
Sept	1	Oct	1			207	207
Oct	1	Nov	1			274	274
Nov	1	Dec	1			505	505
Dec	1	Jan	1			577	577



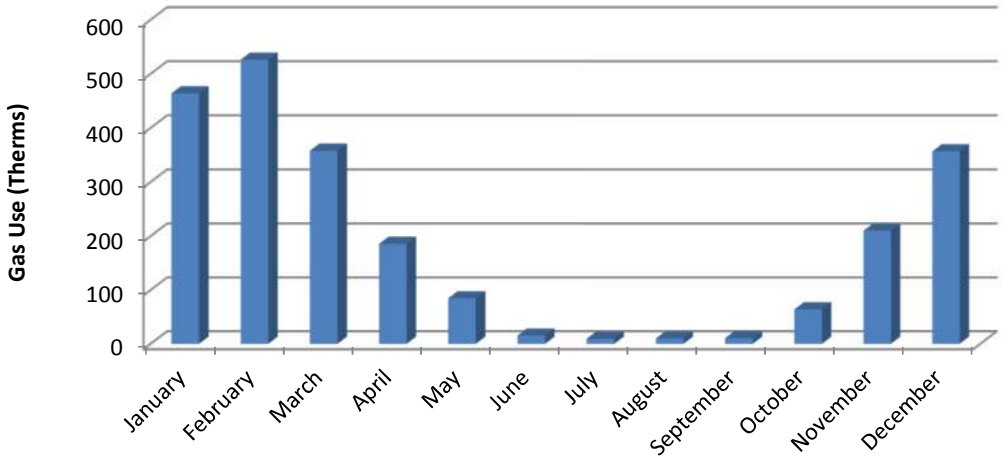
Energy Audit Building	**Bldg 13 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 11**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 440.66	$ 440.66	457	457
Feb	1	Mar	1	$ 571.23	$ 571.23	621	621
Mar	1	Apr	1	$ 381.27	$ 381.27	423.4	423
Apr	1	May	1	$ 209.45	$ 209.45	256.2	256
May	1	June	1	$ 66.00	$ 66.00	72.0	72
June	1	July	1	$ 23.51	$ 23.51	15.8	16
July	1	Aug	1	$ 18.54	$ 18.54	9.5	9
Aug	1	Sept	1	$ 19.48	$ 19.48	10.5	11
Sept	1	Oct	1	$ 19.66	$ 19.66	10.6	11
Oct	1	Nov	1	$ 82.30	$ 82.30	94.9	95
Nov	1	Dec	1	$ 152.64	$ 152.64	177.9	178
Dec	1	Jan	1	$ 238.64	$ 238.64	276.5	277

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 534.56	$ 534.56	470	470
Feb	1	Mar	1	$ 540.43	$ 540.43	431	431
Mar	1	Apr	1	$ 353.59	$ 353.59	292.2	292.2
Apr	1	May	1	$ 126.29	$ 126.29	115.1	115.1
May	1	June	1	$ 109.74	$ 109.74	97.1	97.1
June	1	July	1	$ 25.61	$ 25.61	14.7	14.7
July	1	Aug	1	$ 20.32	$ 20.32	9.4	9.4
Aug	1	Sept	1	$ 19.74	$ 19.74	9.4	9.4
Sept	18	Oct	18	$ 20.87	$ 20.87	10.5	10.53
Oct	18	Nov	14	$ 41.36	$ 41.36	32.7	32.69
Nov	14	Dec	17	$ 247.79	$ 247.79	242.1	242.07
Dec	17	Jan	16	$ 462.09	$ 462.09	436.6	436.57



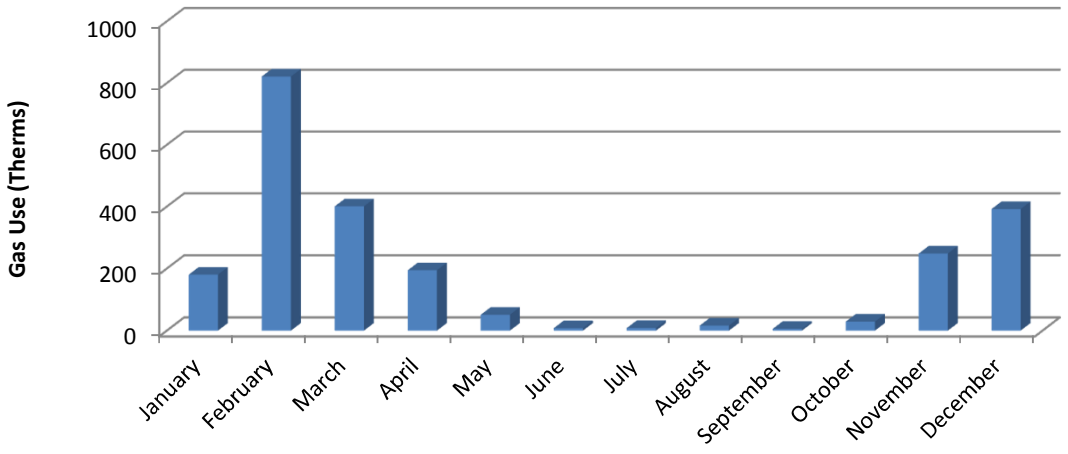
Energy Audit Building	**Bldg 21 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 12**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 154.78	$ 154.78	254.6	255
Feb	1	Mar	1	$ 313.52	$ 313.52	525.6	526
Mar	1	Apr	1	$ 202.18	$ 202.18	335.6	336
Apr	1	May	1	$ 76.83	$ 76.83	135.5	135
May	1	June	1	$ 12.66	$ 12.66	8.5	8
June	1	July	1	$ 10.08	$ 10.08	5.3	5
July	1	Aug	1	$ 9.22	$ 9.22	4.2	4
Aug	1	Sept	1	$ 8.38	$ 8.38	3.2	3
Sept	1	Oct	1	$ 9.28	$ 9.28	4.2	4
Oct	1	Nov	1	$ 29.26	$ 29.26	30.6	31
Nov	1	Dec	1	$ 121.41	$ 121.41	141.0	141
Dec	1	Jan	1	$ 202.70	$ 202.70	320.7	321

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 108.87	$ 108.87	106.0	106
Feb	1	Mar	1	$ 901.80	$ 901.80	1,116.8	1117
Mar	1	Apr	1	$ 363.22	$ 363.22	465.8	465.8
Apr	1	May	1	$ 226.46	$ 226.46	253.3	253.3
May	1	June	1	$ 90.59	$ 90.59	93.9	93.9
June	1	July	1	$ 15.26	$ 15.26	10.5	10.5
July	1	Aug	1	$ 17.12	$ 17.12	12.6	12.6
Aug	1	Sept	1	$ 32.25	$ 32.25	29.4	29.4
Sept	1	Oct	1	$ 12.46	$ 12.46	7.4	7.37
Oct	1	Nov	1	$ 28.28	$ 28.28	27.4	27.42
Nov	1	Dec	1	$ 234.81	$ 234.81	355.7	355.74
Dec	1	Jan	1	$ 276.04	$ 276.04	462.9	462.93



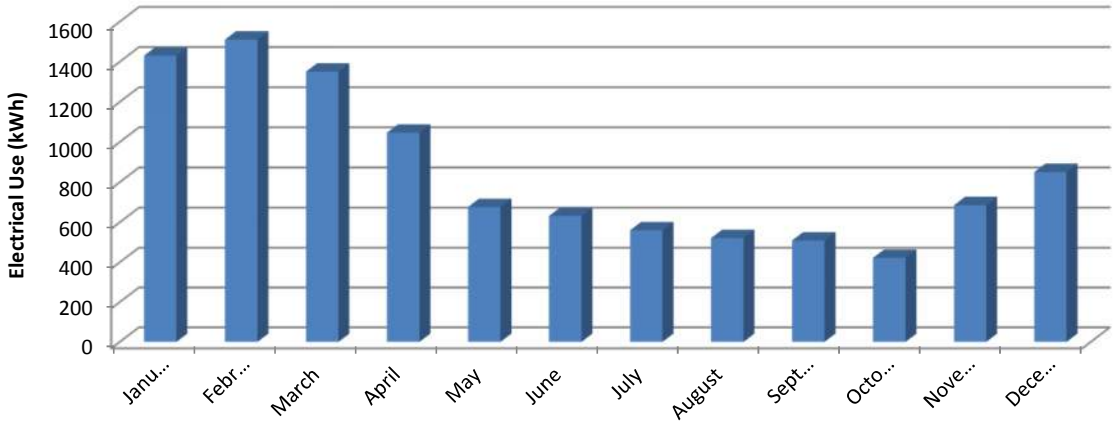
Energy Audit Building	**Bldg 22 - Duke Farms**
Service Provider	**PSE&G**
Account Number	**FB Station**
Meter Number	**EL68 (on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	1811	1811
Feb	1	Mar	1	$ -	$ -	1741	1741
Mar	1	Apr	1	$ -	$ -	1647	1647
Apr	1	May	1	$ -	$ -	1009	1009
May	1	June	1	$ -	$ -	441	441
June	1	July	1	$ -	$ -	441	441
July	1	Aug	1	$ -	$ -	614	614
Aug	1	Sept	1	$ -	$ -	506	506
Sept	1	Oct	1	$ -	$ -	510	510
Oct	1	Nov	1	$ -	$ -	436	436
Nov	1	Dec	1	$ -	$ -	862	862
Dec	1	Jan	1	$ -	$ -	1152	1152

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	1,050	1,050
Feb	1	Mar	1	$ -	$ -	1,281	1,281
Mar	1	Apr	1	$ -	$ -	1,055	1,055
Apr	1	May	1	$ -	$ -	1,085	1,085
May	1	June	1	$ -	$ -	912	912
June	1	July	1	$ -	$ -	823	823
July	1	Aug	1	$ -	$ -	507	507
Aug	1	Sept	1	$ -	$ -	537	537
Sept	1	Oct	1	$ -	$ -	509	509
Oct	1	Nov	1	$ -	$ -	409	409
Nov	1	Dec	1	$ -	$ -	509	509
Dec	1	Jan	1	$ -	$ -	550	550



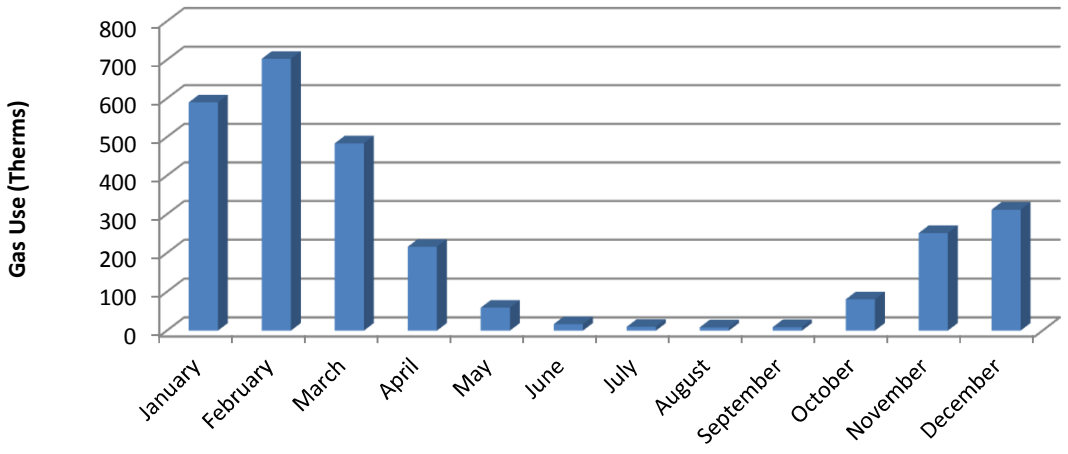
Energy Audit Building	**Bldg 22 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 13**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 487.39	$ 487.39	507.1	507
Feb	1	Mar	1	$ 698.24	$ 698.24	761.4	761
Mar	1	Apr	1	$ 414.59	$ 414.59	461.5	462
Apr	1	May	1	$ 171.74	$ 171.74	207.5	207
May	1	June	1	$ 35.37	$ 35.37	31.8	32
June	1	July	1	$ 20.21	$ 20.21	11.6	12
July	1	Aug	1	$ 20.17	$ 20.17	11.6	12
Aug	1	Sept	1	$ 17.83	$ 17.83	8.4	8
Sept	1	Oct	1	$ 18.84	$ 18.84	9.5	10
Oct	1	Nov	1	$ 65.01	$ 65.01	71.7	72
Nov	1	Dec	1	$ 120.85	$ 120.85	137.9	138
Dec	1	Jan	1	$ 204.96	$ 204.96	235.5	236

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 758.13	$ 758.13	672.8	673
Feb	1	Mar	1	$ 800.40	$ 800.40	644.2	644
Mar	1	Apr	1	$ 602.89	$ 602.89	506.0	506.0
Apr	1	May	1	$ 236.36	$ 236.36	224.8	224.8
May	1	June	1	$ 99.01	$ 99.01	86.6	86.6
June	1	July	1	$ 32.93	$ 32.93	22.1	22.1
July	1	Aug	1	$ 19.30	$ 19.30	8.4	8.4
Aug	1	Sept	1	$ 18.78	$ 18.78	8.4	8.4
Sept	18	Oct	18	$ 18.92	$ 18.92	8.4	8.42
Oct	18	Nov	14	$ 93.92	$ 93.92	89.6	89.63
Nov	14	Dec	17	$ 368.47	$ 368.47	365.2	365.21
Dec	17	Jan	16	$ 411.80	$ 411.80	388.1	388.06



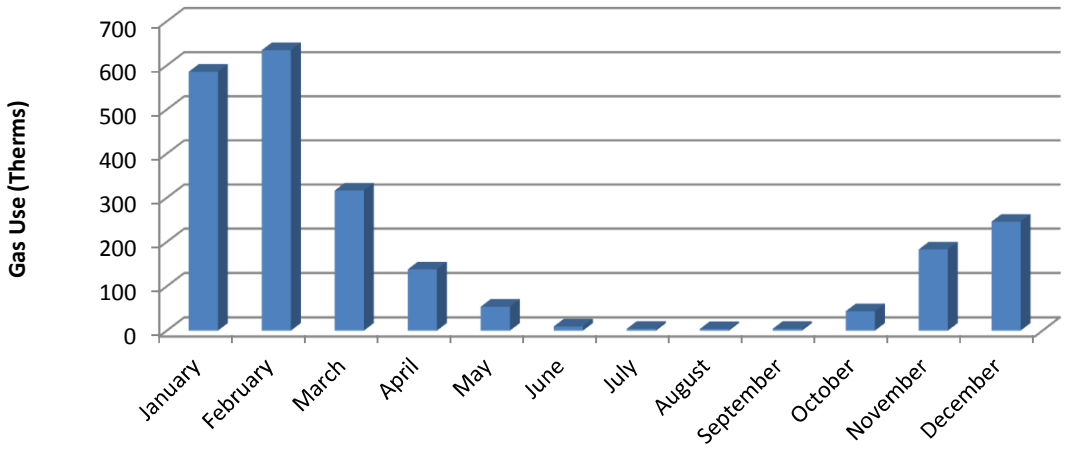
Energy Audit Building	Bldg 23 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	NG 14

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 318.22	$ 318.22	534.6	535
Feb	1	Mar	1	$ 386.59	$ 386.59	651.4	651
Mar	1	Apr	1	$ 271.04	$ 271.04	454.1	454
Apr	1	May	1	$ 140.06	$ 140.06	256.2	256
May	1	June	1	$ 85.81	$ 85.81	101.6	102
June	1	July	1	$ 16.86	$ 16.86	13.7	14
July	1	Aug	1	$ 9.22	$ 9.22	4.2	4
Aug	1	Sept	1	$ 8.38	$ 8.38	3.2	3
Sept	1	Oct	1	$ 9.28	$ 9.28	4.2	4
Oct	1	Nov	1	$ 68.86	$ 68.86	82.3	82
Nov	1	Dec	1	$ 206.00	$ 206.00	244.2	244
Dec	1	Jan	1	$ 212.33	$ 212.33	336.5	336

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 625.90	$ 625.90	636.8	637
Feb	1	Mar	1	$ 501.53	$ 501.53	617.7	618
Mar	1	Apr	1	$ 143.25	$ 143.25	178.9	178.9
Apr	1	May	1	$ 23.40	$ 23.40	20.1	20.1
May	1	June	1	$ 11.56	$ 11.56	6.3	6.3
June	1	July	1	$ 10.54	$ 10.54	5.3	5.3
July	1	Aug	1	$ 9.60	$ 9.60	4.2	4.2
Aug	1	Sept	1	$ 9.61	$ 9.61	4.2	4.2
Sept	18	Oct	18	$ 9.62	$ 9.62	4.2	4.21
Oct	18	Nov	14	$ 10.08	$ 10.08	5.3	5.27
Nov	14	Dec	17	$ 84.44	$ 84.44	122.1	122.09
Dec	17	Jan	16	$ 96.36	$ 96.36	155.0	155.01



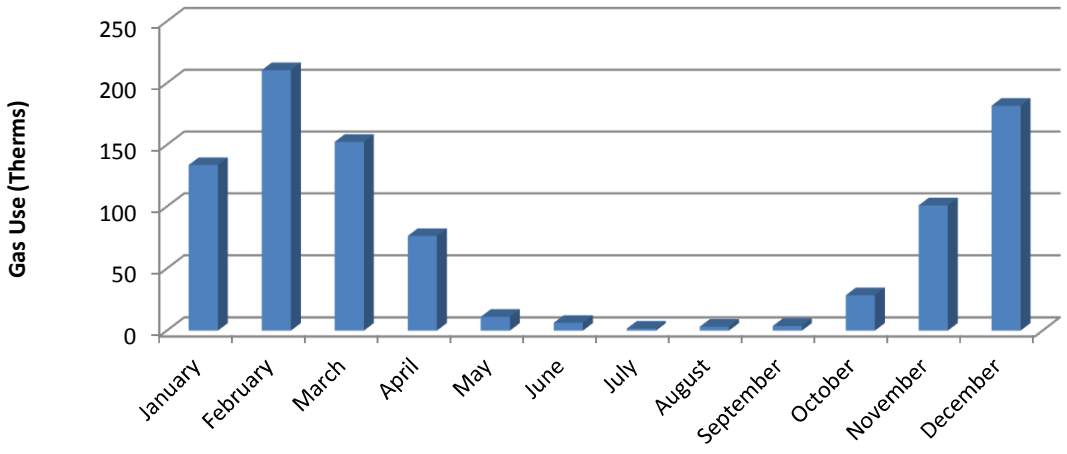
Energy Audit Building	**Bldg 24 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 15**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 262.46	$ 262.46	267.3	267
Feb	1	Mar	1	$ 391.26	$ 391.26	420.9	421
Mar	1	Apr	1	$ 278.00	$ 278.00	304.9	305
Apr	1	May	1	$ 129.17	$ 129.17	152.4	152
May	1	June	1	$ 28.10	$ 28.10	22.2	22
June	1	July	1	$ 21.04	$ 21.04	12.6	13
July	1	Aug	1	$ 13.62	$ 13.62	3.2	3
Aug	1	Sept	1	$ 12.84	$ 12.84	2.1	2
Sept	1	Oct	1	$ 14.78	$ 14.78	4.2	4
Oct	1	Nov	1	$ 50.88	$ 50.88	52.7	53
Nov	1	Dec	1	$ 93.45	$ 93.45	103.1	103
Dec	1	Jan	1	$ 170.64	$ 170.64	193.5	193

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 11.27	$ 11.27	0.0	0
Feb	1	Mar	1	$ 11.03	$ 11.03	0.0	0
Mar	1	Apr	1	$ 11.00	$ 11.00	0.0	0.0
Apr	1	May	1	$ 11.00	$ 11.00	0.0	0.0
May	1	June	1	$ 11.00	$ 11.00	0.0	0.0
June	1	July	1	$ 11.00	$ 11.00	0.0	0.0
July	1	Aug	1	$ 11.15	$ 11.15	0.0	0.0
Aug	1	Sept	1	$ 14.98	$ 14.98	4.2	4.2
Sept	18	Oct	18	$ 14.08	$ 14.08	3.2	3.16
Oct	18	Nov	14	$ 15.06	$ 15.06	4.2	4.22
Nov	14	Dec	17	$ 108.05	$ 108.05	98.9	98.93
Dec	17	Jan	16	$ 186.74	$ 186.74	169.8	169.78



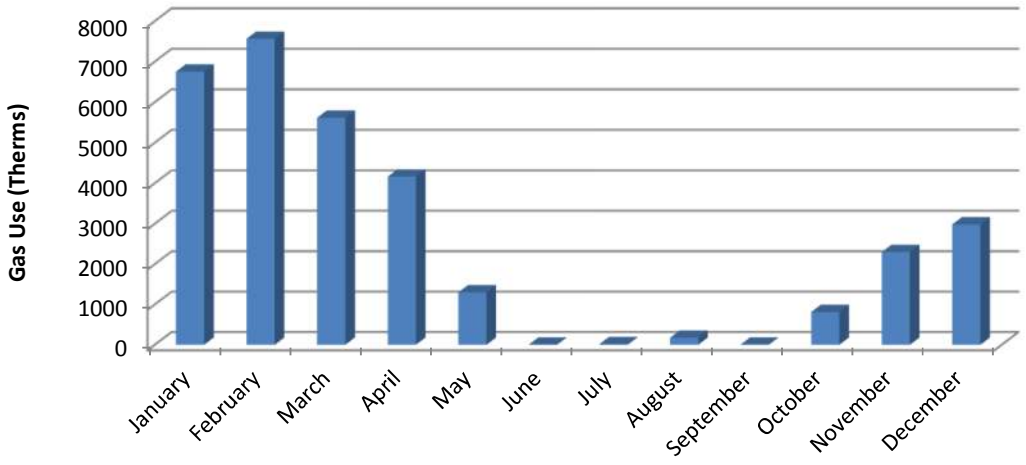
Energy Audit Building	Bldg 26 (Conservatory) - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	NG 16

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 5,171.81	$ 5,171.81	5788	5788
Feb	1	Mar	1	$ 6,802.06	$ 6,802.06	8272	8272
Mar	1	Apr	1	$ 4,942.60	$ 4,942.60	5799	5799
Apr	1	May	1	$ 2,269.90	$ 2,269.90	3866	3866
May	1	June	1	$ 525.35	$ 525.35	760	760
June	1	July	1	$ 109.71	$ 109.71	11	11
July	1	Aug	1	$ 115.99	$ 115.99	22	22
Aug	1	Sept	1	$ 109.79	$ 109.79	11	11
Sept	1	Oct	1	$ 112.68	$ 112.68	11	11
Oct	1	Nov	1	$ 107.13	$ 107.13	0	0
Nov	1	Dec	1	$ 1,140.06	$ 1,140.06	267	267
Dec	1	Jan	1	$ 1,140.06	$ 1,140.06	0	0

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 7,925.15	$ 7,925.15	7717	7717
Feb	1	Mar	1	$ 7,969.70	$ 7,969.70	6856	6856
Mar	1	Apr	1	$ 6,235.25	$ 6,235.25	5430	5,430.3
Apr	1	May	1	$ 3,622.53	$ 3,622.53	4457	4,456.5
May	1	June	1	$ 1,599.36	$ 1,599.36	1838	1,838.3
June	1	July	1	$ 101.76	$ 101.76	0	0.0
July	1	Aug	1	$ 111.56	$ 111.56	11	11.0
Aug	1	Sept	1	$ 341.19	$ 341.19	336	335.6
Sept	18	Oct	18	$ 103.31	$ 103.31	0	0.00
Oct	18	Nov	14	$ 1,262.10	$ 1,262.10	1625	1,625.07
Nov	14	Dec	17	$ 4,361.46	$ 4,361.46	4333	4,332.62
Dec	17	Jan	16	$ 5,931.95	$ 5,931.95	5966	5,966.03



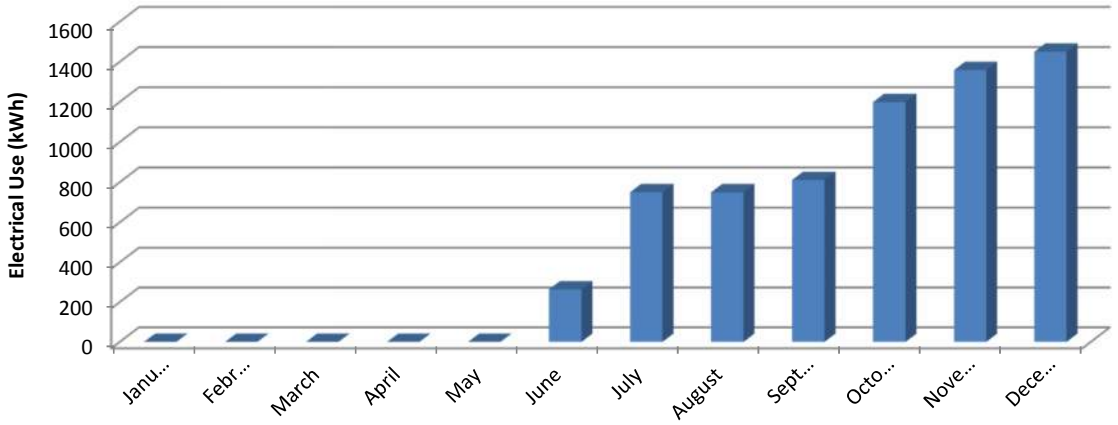
Energy Audit Building	**Bldg 27 - Duke Farms**
Service Provider	**PSE&G**
Account Number	**FB Station**
Meter Number	**EL69(on FB circuit) meter broken, repaired 6/2015**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	273	273
July	1	Aug	1	$ -	$ -	765	765
Aug	1	Sept	1	$ -	$ -	749	749
Sept	1	Oct	1	$ -	$ -	814	814
Oct	1	Nov	1	$ -	$ -	1211	1211
Nov	1	Dec	1	$ -	$ -	1365	1365
Dec	1	Jan	1	$ -	$ -	1452	1452

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ -	$ -	0	0
Sept	1	Oct	1	$ -	$ -	0	0
Oct	1	Nov	1	$ -	$ -	0	0
Nov	1	Dec	1	$ -	$ -	0	0
Dec	1	Jan	1	$ -	$ -	0	0



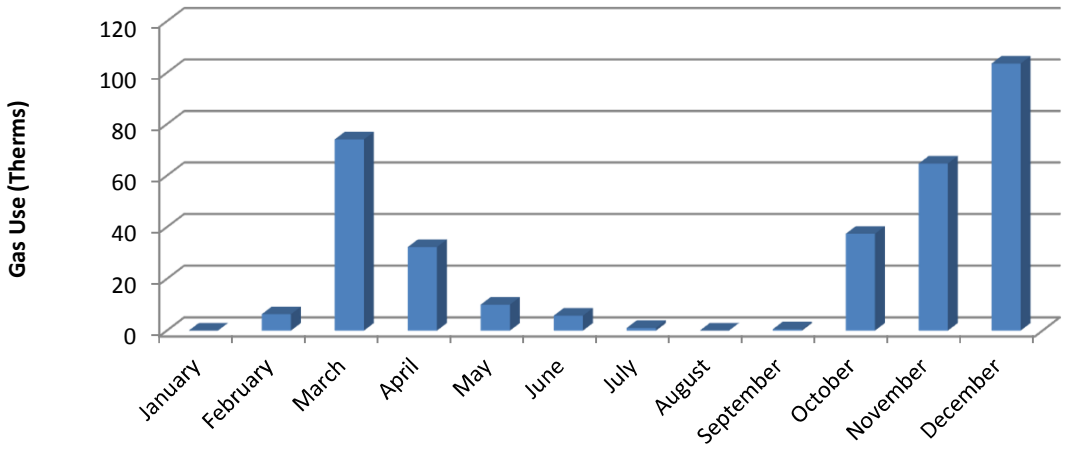
Energy Audit Building	**Bldg 27 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 17**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 11.27	$ 11.27	0.0	0
Feb	1	Mar	1	$ 11.03	$ 11.03	12.7	13
Mar	1	Apr	1	$ 11.00	$ 11.00	148.2	148
Apr	1	May	1	$ 11.00	$ 11.00	64.6	65
May	1	June	1	$ 11.00	$ 11.00	20.1	20
June	1	July	1	$ 11.00	$ 11.00	11.6	12
July	1	Aug	1	$ 11.15	$ 11.15	2.1	2
Aug	1	Sept	1	$ 11.17	$ 11.17	0.0	0
Sept	1	Oct	1	$ 11.17	$ 11.17	1.1	1
Oct	1	Nov	1	$ 11.17	$ 11.17	74.9	75
Nov	1	Dec	1	$ 11.17	$ 11.17	129.5	129
Dec	1	Jan	1	$ 11.17	$ 11.17	207.1	207

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 11.17	$ 11.17	0.0	0
Feb	1	Mar	1	$ 22.61	$ 22.61	0.0	0
Mar	1	Apr	1	$ 140.92	$ 140.92	0.0	0.0
Apr	1	May	1	$ 61.12	$ 61.12	0.0	0.0
May	1	June	1	$ 26.48	$ 26.48	0.0	0.0
June	1	July	1	$ 20.21	$ 20.21	0.0	0.0
July	1	Aug	1	$ 12.81	$ 12.81	0.0	0.0
Aug	1	Sept	1	$ 11.17	$ 11.17	0.0	0.0
Sept	18	Oct	18	$ 12.32	$ 12.32	0.0	0.00
Oct	18	Nov	14	$ 67.37	$ 67.37	0.0	0.00
Nov	14	Dec	17	$ 114.55	$ 114.55	0.0	0.00
Dec	17	Jan	16	$ 182.04	$ 182.04	0.0	0.00



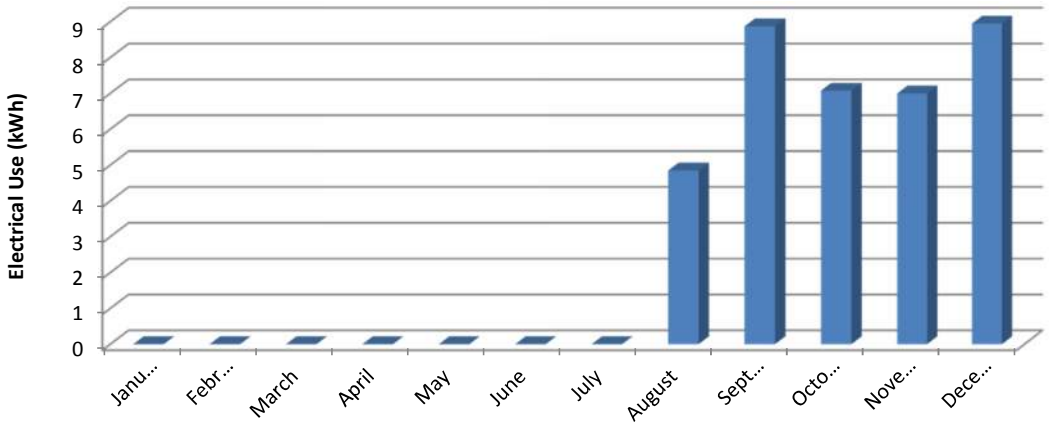
Energy Audit Building	Bldg 29 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	EL70(on FB circuit) meter broken, repaired 8/2015

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ -	$ -	5	5
Sept	1	Oct	1	$ -	$ -	9	9
Oct	1	Nov	1	$ -	$ -	7	7
Nov	1	Dec	1	$ -	$ -	7	7
Dec	1	Jan	1	$ -	$ -	9	9

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ -	$ -	0	0
Sept	1	Oct	1	$ -	$ -	0	0
Oct	1	Nov	1	$ -	$ -	0	0
Nov	1	Dec	1	$ -	$ -	0	0
Dec	1	Jan	1	$ -	$ -	0	0



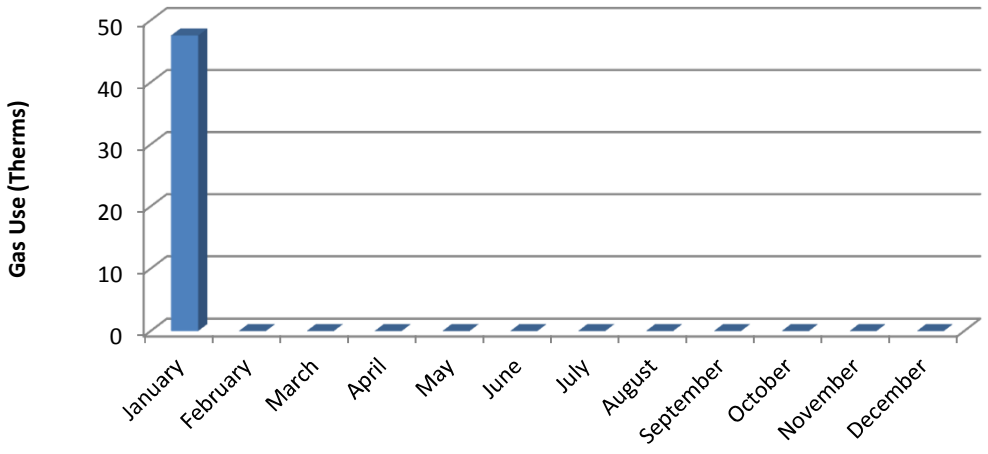
Energy Audit Building	Bldg 29 - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	NG 18

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 100.55	$ 100.55	95	95
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1		$ -	0.0	0
Apr	1	May	1	$ -	$ -	0.0	0
May	1	June	1		$ -	0.0	0
June	1	July	1	$ -	$ -	0.0	0
July	1	Aug	1	$ -	$ -	0.0	0
Aug	1	Sept	1	$ -	$ -	0.0	0
Sept	1	Oct	1	$ 0.33	$ 0.33	0.0	0
Oct	1	Nov	1	$ 11.59	$ 11.59	0.0	0
Nov	1	Dec	1	$ 11.59	$ 11.59	0.0	0
Dec	1	Jan	1	$ 11.59	$ 11.59	0.0	0

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 11.27	$ 11.27	0	0
Feb	1	Mar	1	$ 11.03	$ 11.03	0	0
Mar	1	Apr	1	$ 11.00	$ 11.00	0.0	0.0
Apr	1	May	1	$ 11.00	$ 11.00	0.0	0.0
May	1	June	1	$ 11.00	$ 11.00	0.0	0.0
June	1	July	1	$ 11.00	$ 11.00	0.0	0.0
July	1	Aug	1	$ 11.15	$ 11.15	0.0	0.0
Aug	1	Sept	1	$ 11.17	$ 11.17	0.0	0.0
Sept	18	Oct	18	$ 11.17	$ 11.17	0.0	0.00
Oct	18	Nov	14	$ 11.17	$ 11.17	0.0	0.00
Nov	14	Dec	17	$ 11.17	$ 11.17	0.0	0.00
Dec	17	Jan	16	$ 11.17	$ 11.17	0.0	0.00



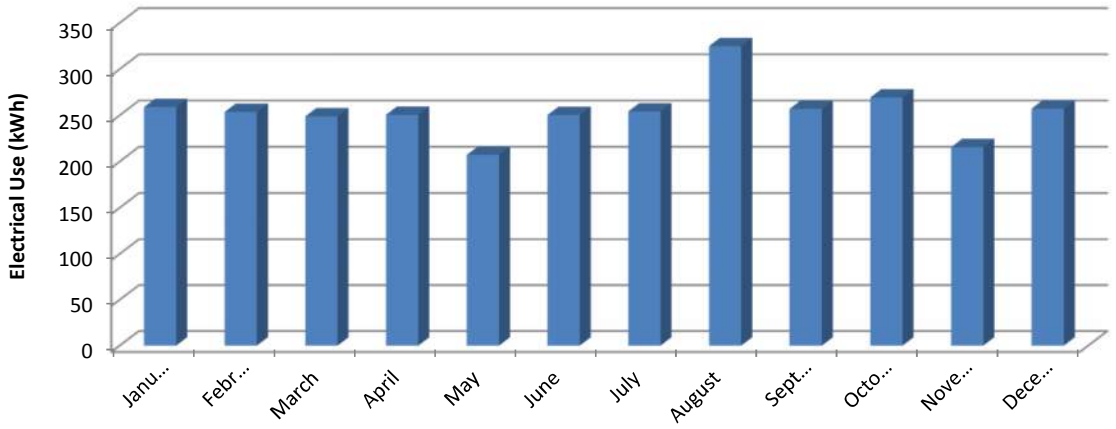
Energy Audit Building	**Bldg 30 Guest House - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL71(on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	226	226
Feb	1	Mar	1	$ -	$ -	291	291
Mar	1	Apr	1	$ -	$ -	220	220
Apr	1	May	1	$ -	$ -	226	226
May	1	June	1	$ -	$ -	202	202
June	1	July	1	$ -	$ -	308	308
July	1	Aug	1	$ -	$ -	287	287
Aug	1	Sept	1	$ -	$ -	453	453
Sept	1	Oct	1	$ -	$ -	236	236
Oct	1	Nov	1	$ -	$ -	285	285
Nov	1	Dec	1	$ -	$ -	220	220
Dec	1	Jan	1	$ -	$ -	260	260

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	300	300
Feb	1	Mar	1	$ -	$ -	217	217
Mar	1	Apr	1	$ -	$ -	276	276
Apr	1	May	1	$ -	$ -	276	276
May	1	June	1	$ -	$ -	209	209
June	1	July	1	$ -	$ -	196	196
July	1	Aug	1	$ -	$ -	221	221
Aug	1	Sept	1	$ -	$ -	201	201
Sept	1	Oct	1	$ -	$ -	274	274
Oct	1	Nov	1	$ -	$ -	254	254
Nov	1	Dec	1	$ -	$ -	208	208
Dec	1	Jan	1	$ -	$ -	257	257



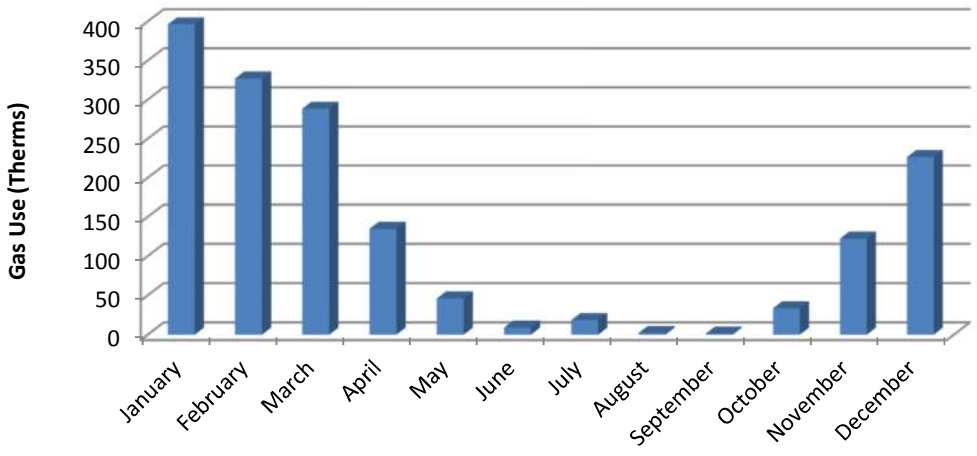
Energy Audit Building	Bldg 30 Guest House - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	NG 19

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 273.08	$ 273.08	456	456
Feb	1	Mar	1	$ 210.11	$ 210.11	349	349
Mar	1	Apr	1	$ 181.17	$ 181.17	299.6	300
Apr	1	May	1	$ 89.58	$ 89.58	159.8	160
May	1	June	1	$ 25.98	$ 25.98	25.4	25
June	1	July	1	$ 15.16	$ 15.16	11.6	12
July	1	Aug	1	$ 33.75	$ 33.75	34.7	35
Aug	1	Sept	1	$ -	$ -	0.0	0
Sept	1	Oct	1	$ -	$ -	0.0	0
Oct	1	Nov	1	$ 40.98	$ 40.98	56.9	57
Nov	1	Dec	1	$ 122.21	$ 122.21	142.1	142
Dec	1	Jan	1	$ 136.60	$ 136.60	213.4	213

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 351.06	$ 351.06	355	355
Feb	1	Mar	1	$ 247.88	$ 247.88	302	302
Mar	1	Apr	1	$ 215.24	$ 215.24	273.1	273.1
Apr	1	May	1	$ 93.40	$ 93.40	100.3	100.3
May	1	June	1	$ 61.07	$ 61.07	61.2	61.2
June	1	July	1	$ 9.60	$ 9.60	4.2	4.2
July	1	Aug	1	$ 8.66	$ 8.66	3.1	3.1
Aug	1	Sept	1	$ 8.67	$ 8.67	3.1	3.1
Sept	18	Oct	18	$ 8.68	$ 8.68	3.2	3.16
Oct	18	Nov	14	$ 22.24	$ 22.24	20.0	20.04
Nov	14	Dec	17	$ 128.72	$ 128.72	190.5	190.50
Dec	17	Jan	16	$ 182.93	$ 182.93	302.6	302.64



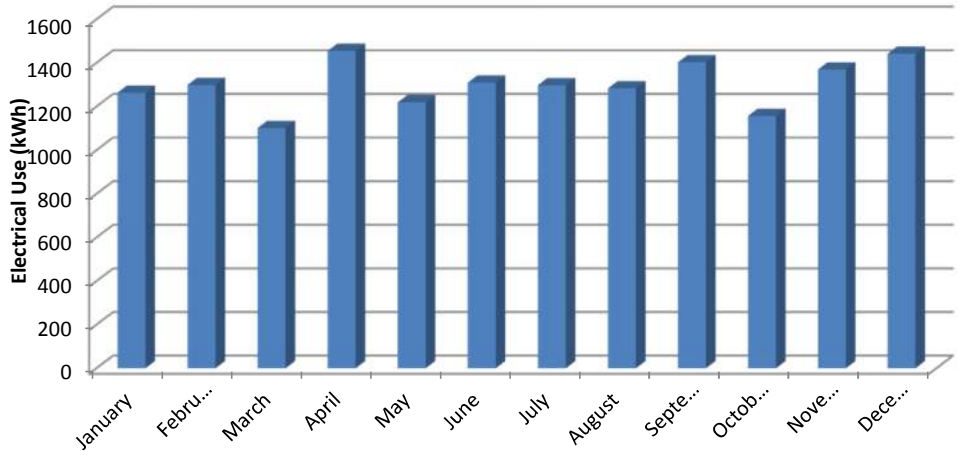
Energy Audit Building	**Bldg 32 Orchid Range - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL61 (on FB-circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	1132	1132
Feb	1	Mar	1	$ -	$ -	1264	1264
Mar	1	Apr	1	$ -	$ -	933	933
Apr	1	May	1	$ -	$ -	1424	1424
May	1	June	1	$ -	$ -	1110	1110
June	1	July	1	$ -	$ -	1310	1310
July	1	Aug	1	$ -	$ -	1234	1234
Aug	1	Sept	1	$ -	$ -	1258	1258
Sept	1	Oct	1	$ -	$ -	1339	1339
Oct	1	Nov	1	$ -	$ -	1203	1203
Nov	1	Dec	1	$ -	$ -	1299	1299
Dec	1	Jan	1	$ -	$ -	1527	1527

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	1,395	1,395
Feb	1	Mar	1	$ -	$ -	1,334	1,334
Mar	1	Apr	1	$ -	$ -	1,270	1,270
Apr	1	May	1	$ -	$ -	1,486	1,486
May	1	June	1	$ -	$ -	1,329	1,329
June	1	July	1	$ -	$ -	1,310	1,310
July	1	Aug	1	$ -	$ -	1,363	1,363
Aug	1	Sept	1	$ -	$ -	1,308	1,308
Sept	1	Oct	1	$ -	$ -	1,467	1,467
Oct	1	Nov	1	$ -	$ -	1,112	1,112
Nov	1	Dec	1	$ -	$ -	1,441	1,441
Dec	1	Jan	1	$ -	$ -	1,357	1,357



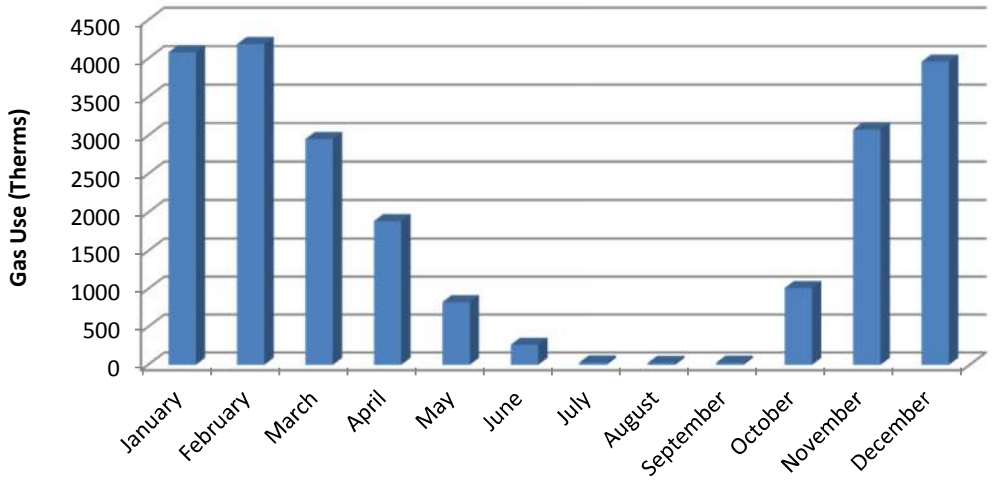
Energy Audit Building	**Bldg 32 Orchid Range - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 02**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 3,225.34	$ 3,225.34	3,630.00	3630
Feb	1	Mar	1	$ 3,784.04	$ 3,784.04	4,546.00	4546
Mar	1	Apr	1	$ 2,504.69	$ 2,504.69	2,797.00	2797
Apr	1	May	1	$ 1,112.83	$ 1,112.83	1,792.00	1792
May	1	June	1	$ 430.69	$ 430.69	589.00	589
June	1	July	1	$ 148.44	$ 148.44	79.00	79
July	1	Aug	1	$ 119.89	$ 119.89	29.00	29
Aug	1	Sept	1	$ 118.99	$ 118.99	27.00	27
Sept	1	Oct	1	$ 122.11	$ 122.11	28.00	28
Oct	1	Nov	1	$ 999.01	$ 999.01	1,690.00	1690
Nov	1	Dec	1	$ 2,719.53	$ 2,719.53	3,537.00	3537
Dec	1	Jan	1	$ 3,629.33	$ 3,629.33	4,882.00	4882

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 4,698.05	$ 4,698.05	4,535.00	4535
Feb	1	Mar	1	$ 4,524.89	$ 4,524.89	3,831.00	3831
Mar	1	Apr	1	$ 3,631.97	$ 3,631.97	3,114.00	3,114.0
Apr	1	May	1	$ 1,687.44	$ 1,687.44	1,984.00	1,984.0
May	1	June	1	$ 983.46	$ 983.46	1,065.00	1,065.0
June	1	July	1	$ 467.44	$ 467.44	453.00	453.0
July	1	Aug	1	$ 128.57	$ 128.57	33.00	33.0
Aug	1	Sept	1	$ 120.72	$ 120.72	25.00	25.0
Sept	18	Oct	18	$ 124.04	$ 124.04	29.00	29.00
Oct	18	Nov	14	$ 345.03	$ 345.03	337.00	337.00
Nov	14	Dec	17	$ 2,660.85	$ 2,660.85	2,620.00	2,620.00
Dec	17	Jan	16	$ 3,144.64	$ 3,144.64	3,039.00	3,039.00



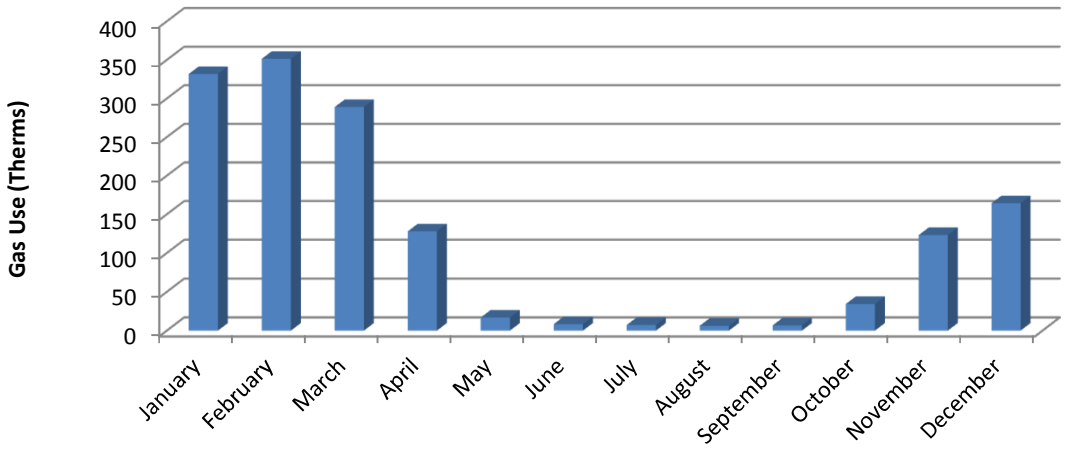
Energy Audit Building	**Bldg 35 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 20**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 178.08	$ 178.08	294.8	295
Feb	1	Mar	1	$ 234.65	$ 234.65	391.3	391
Mar	1	Apr	1	$ 175.97	$ 175.97	291.1	291
Apr	1	May	1	$ 77.39	$ 77.39	136.6	137
May	1	June	1	$ 16.06	$ 16.06	12.7	13
June	1	July	1	$ 11.77	$ 11.77	7.4	7
July	1	Aug	1	$ 11.76	$ 11.76	7.4	7
Aug	1	Sept	1	$ 10.93	$ 10.93	6.3	6
Sept	1	Oct	1	$ 11.84	$ 11.84	7.4	7
Oct	1	Nov	1	$ 42.21	$ 42.21	47.5	47
Nov	1	Dec	1	$ 78.87	$ 78.87	89.5	89
Dec	1	Jan	1	$ 95.74	$ 95.74	147.2	147

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 363.58	$ 363.58	368.7	369
Feb	1	Mar	1	$ 254.65	$ 254.65	311.5	312
Mar	1	Apr	1	$ 225.01	$ 225.01	286.9	286.9
Apr	1	May	1	$ 109.76	$ 109.76	119.3	119.3
May	1	June	1	$ 24.88	$ 24.88	21.1	21.1
June	1	July	1	$ 14.30	$ 14.30	9.5	9.5
July	1	Aug	1	$ 12.42	$ 12.42	7.3	7.3
Aug	1	Sept	1	$ 11.50	$ 11.50	6.3	6.3
Sept	18	Oct	18	$ 11.52	$ 11.52	6.3	6.32
Oct	18	Nov	14	$ 23.09	$ 23.09	21.1	21.09
Nov	14	Dec	17	$ 106.67	$ 106.67	156.8	156.82
Dec	17	Jan	16	$ 111.63	$ 111.63	181.4	181.38



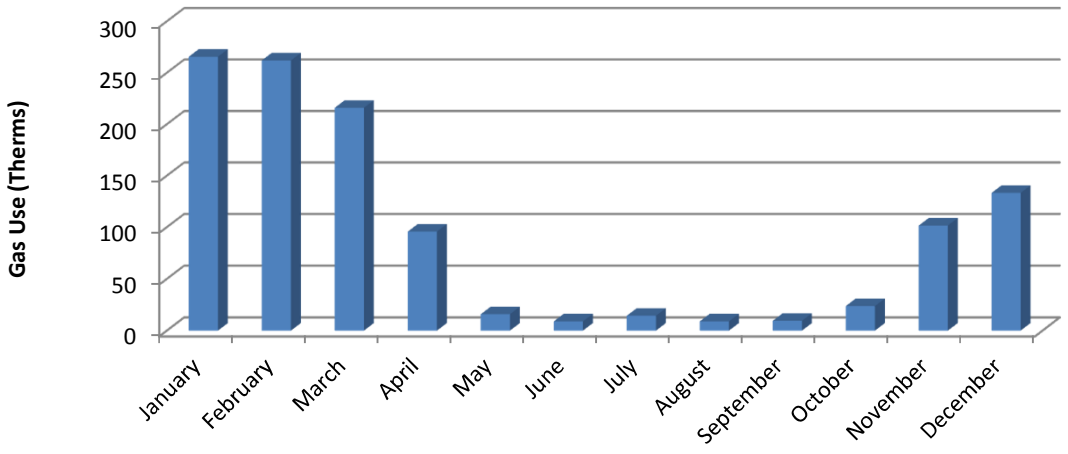
Energy Audit Building	**Bldg 37 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 21**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 270.58	$ 270.58	273.6	274
Feb	1	Mar	1	$ 298.11	$ 298.11	318.3	318
Mar	1	Apr	1	$ 187.66	$ 187.66	202.2	202
Apr	1	May	1	$ 86.53	$ 86.53	97.4	97
May	1	June	1	$ 20.85	$ 20.85	12.7	13
June	1	July	1	$ 17.77	$ 17.77	8.4	8
July	1	Aug	1	$ 17.72	$ 17.72	8.4	8
Aug	1	Sept	1	$ 18.66	$ 18.66	9.5	9
Sept	1	Oct	1	$ 18.84	$ 18.84	9.5	10
Oct	1	Nov	1	$ 28.86	$ 28.86	23.2	23
Nov	1	Dec	1	$ 66.40	$ 66.40	69.5	69
Dec	1	Jan	1	$ 114.04	$ 114.04	125.1	125

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 296.38	$ 296.38	257.5	257
Feb	1	Mar	1	$ 262.17	$ 262.17	205.6	206
Mar	1	Apr	1	$ 279.05	$ 279.05	229.7	229.7
Apr	1	May	1	$ 105.17	$ 105.17	93.9	93.9
May	1	June	1	$ 30.32	$ 30.32	19.0	19.0
June	1	July	1	$ 20.38	$ 20.38	9.5	9.5
July	1	Aug	1	$ 20.32	$ 20.32	20.3	20.3
Aug	1	Sept	1	$ 18.78	$ 18.78	8.4	8.4
Sept	1	Oct	1	$ 19.90	$ 19.90	9.5	9.47
Oct	1	Nov	1	$ 33.57	$ 33.57	24.3	24.25
Nov	1	Dec	1	$ 141.60	$ 141.60	133.7	133.67
Dec	1	Jan	1	$ 156.68	$ 156.68	141.3	141.30



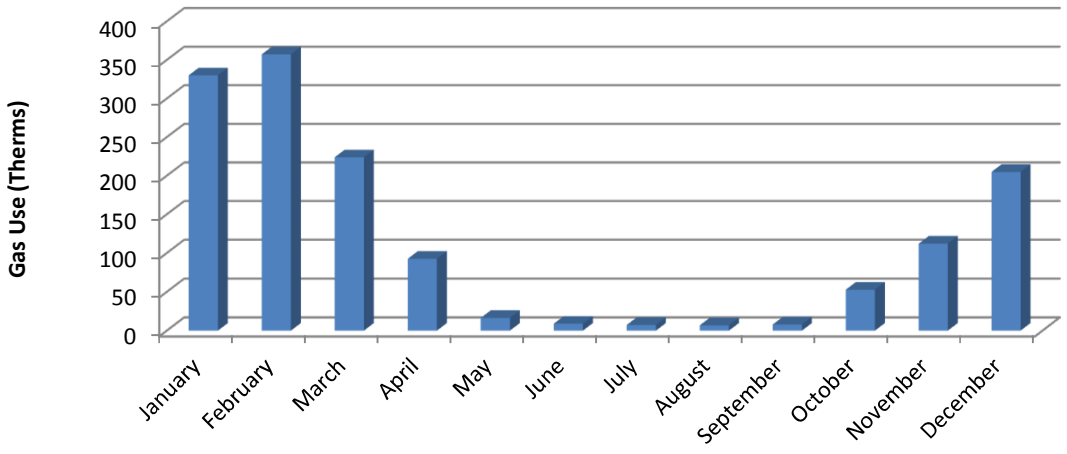
Energy Audit Building	**Bldg 43 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 22**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 341.11	$ 341.11	347.6	348
Feb	1	Mar	1	$ 411.96	$ 411.96	444.2	444
Mar	1	Apr	1	$ 202.63	$ 202.63	219.1	219
Apr	1	May	1	$ 109.50	$ 109.50	127.0	127
May	1	June	1	$ 20.85	$ 20.85	12.7	13
June	1	July	1	$ 19.41	$ 19.41	10.5	11
July	1	Aug	1	$ 16.89	$ 16.89	7.4	7
Aug	1	Sept	1	$ 16.99	$ 16.99	7.4	7
Sept	1	Oct	1	$ 18.84	$ 18.84	9.5	10
Oct	1	Nov	1	$ 43.01	$ 43.01	42.2	42
Nov	1	Dec	1	$ 86.54	$ 86.54	94.7	95
Dec	1	Jan	1	$ 146.16	$ 146.16	164.0	164

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 358.28	$ 358.28	312.6	313
Feb	1	Mar	1	$ 342.08	$ 342.08	270.2	270
Mar	1	Apr	1	$ 278.45	$ 278.45	228.6	228.6
Apr	1	May	1	$ 69.14	$ 69.14	58.1	58.1
May	1	June	1	$ 31.40	$ 31.40	20.1	20.1
June	1	July	1	$ 18.29	$ 18.29	7.4	7.4
July	1	Aug	1	$ 18.26	$ 18.26	7.3	7.3
Aug	1	Sept	1	$ 16.88	$ 16.88	6.3	6.3
Sept	1	Oct	1	$ 16.98	$ 16.98	6.3	6.32
Oct	1	Nov	1	$ 69.59	$ 69.59	63.3	63.27
Nov	1	Dec	1	$ 137.63	$ 137.63	129.5	129.46
Dec	1	Jan	1	$ 264.73	$ 264.73	245.7	245.70



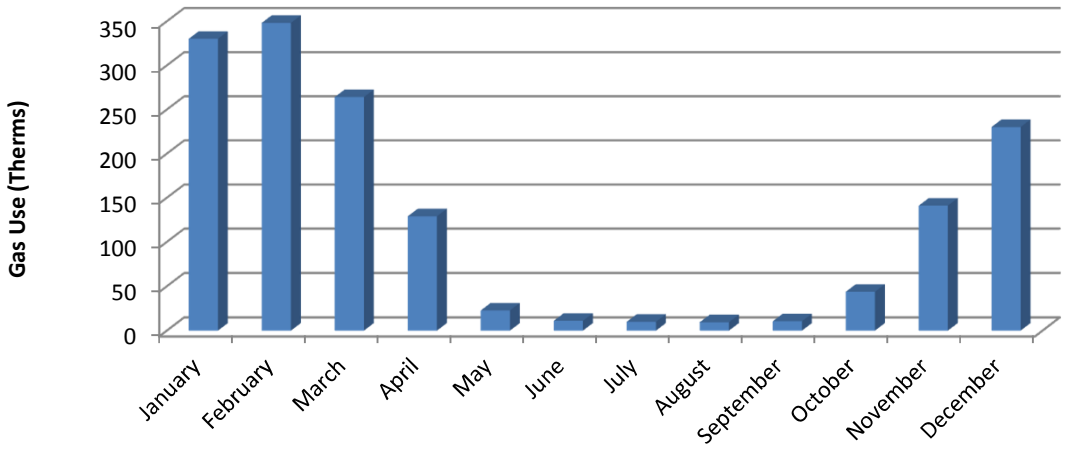
Energy Audit Building	**Bldg 45 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 23**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 318.75	$ 318.75	324.4	324
Feb	1	Mar	1	$ 384.05	$ 384.05	413.5	413
Mar	1	Apr	1	$ 215.41	$ 215.41	233.9	234
Apr	1	May	1	$ 111.93	$ 111.93	130.2	130
May	1	June	1	$ 23.26	$ 23.26	15.9	16
June	1	July	1	$ 20.21	$ 20.21	11.6	12
July	1	Aug	1	$ 18.54	$ 18.54	9.5	9
Aug	1	Sept	1	$ 18.66	$ 18.66	9.5	9
Sept	1	Oct	1	$ 19.66	$ 19.66	10.6	11
Oct	1	Nov	1	$ 54.01	$ 54.01	56.9	57
Nov	1	Dec	1	$ 95.68	$ 95.68	106.3	106
Dec	1	Jan	1	$ 170.30	$ 170.30	193.5	193

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 383.31	$ 383.31	335.9	336
Feb	1	Mar	1	$ 356.88	$ 356.88	282.9	283
Mar	1	Apr	1	$ 354.61	$ 354.61	294.3	294.3
Apr	1	May	1	$ 139.04	$ 139.04	127.7	127.7
May	1	June	1	$ 41.07	$ 41.07	29.6	29.6
June	1	July	1	$ 21.45	$ 21.45	10.5	10.5
July	1	Aug	1	$ 21.33	$ 21.33	10.5	10.5
Aug	1	Sept	1	$ 19.74	$ 19.74	9.4	9.4
Sept	1	Oct	1	$ 20.87	$ 20.87	10.5	10.53
Oct	1	Nov	1	$ 39.41	$ 39.41	30.6	30.58
Nov	1	Dec	1	$ 182.83	$ 182.83	175.8	175.76
Dec	1	Jan	1	$ 286.32	$ 286.32	266.8	266.79



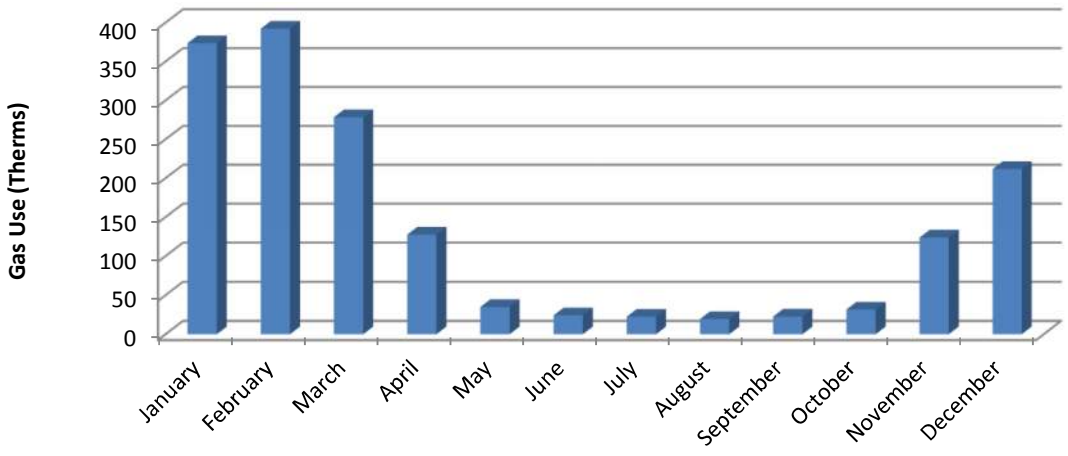
Energy Audit Building	**Bldg 47 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 24**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 196.97	$ 196.97	328.6	329
Feb	1	Mar	1	$ 244.25	$ 244.25	409.3	409
Mar	1	Apr	1	$ 155.26	$ 155.26	257.2	257
Apr	1	May	1	$ 71.84	$ 71.84	126.0	126
May	1	June	1	$ 30.23	$ 30.23	30.7	31
June	1	July	1	$ 24.48	$ 24.48	23.2	23
July	1	Aug	1	$ 22.75	$ 22.75	21.0	21
Aug	1	Sept	1	$ 22.79	$ 22.79	21.1	21
Sept	1	Oct	1	$ 26.43	$ 26.43	25.3	25
Oct	1	Nov	1	$ 34.09	$ 34.09	31.6	32
Nov	1	Dec	1	$ 64.09	$ 64.09	72.6	73
Dec	1	Jan	1	$ 109.48	$ 109.48	171.4	171

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 411.00	$ 411.00	418.5	419
Feb	1	Mar	1	$ 304.60	$ 304.60	375.1	375
Mar	1	Apr	1	$ 233.71	$ 233.71	299.6	299.6
Apr	1	May	1	$ 118.07	$ 118.07	128.8	128.8
May	1	June	1	$ 41.08	$ 41.08	39.1	39.1
June	1	July	1	$ 28.42	$ 28.42	25.2	25.2
July	1	Aug	1	$ 27.45	$ 27.45	24.1	24.1
Aug	1	Sept	1	$ 21.88	$ 21.88	17.8	17.8
Sept	1	Oct	1	$ 23.81	$ 23.81	20.0	20.00
Oct	1	Nov	1	$ 31.77	$ 31.77	31.6	31.64
Nov	1	Dec	1	$ 117.38	$ 117.38	174.7	174.71
Dec	1	Jan	1	$ 152.12	$ 152.12	252.0	252.03



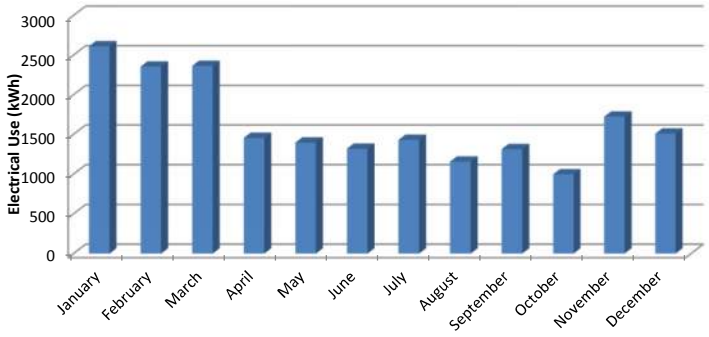
Energy Audit Building	**Bldg 52a and 52b, Vacant & Employee House - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL24 (52a) and EL25(52b)**

2015

Month	Day	Month	Day	Supply Charge (52a)	Supply Charge (52b)	Total Charge	Total kWh (52a)	Total kWh (52b)	Total kWh
Jan	1	Feb	1	$ 32.29	$ 380.82	$ 413.11	174	2206	2380
Feb	1	Mar	1	$ 56.80	$ 355.36	$ 412.16	311	2019	2330
Mar	1	Apr	1	$ 30.51	$ 414.27	$ 444.78	161	2361	2522
Apr	1	May	1	$ 31.01	$ 97.75	$ 128.76	158	527	685
May	1	June	1	$ 21.20	$ 57.00	$ 78.20	107	311	418
June	1	July	1	$ 30.09	$ 48.90	$ 78.99	150	252	402
July	1	Aug	1	$ 69.23	$ 7.22	$ 76.45	363	26	389
Aug	1	Sept	1	$ 66.05	$ 2.43	$ 68.48	347	0	347
Sept	1	Oct	1	$ 66.17	$ 2.43	$ 68.60	367	0	367
Oct	1	Nov	1	$ 50.97	$ 2.43	$ 53.40	287	0	287
Nov	1	Dec	1	$ 41.16	$ 218.53	$ 259.69	229	1278	1507
Dec	1	Jan	1	$ 120.44	$ 30.66	$ 151.10	702	168	870

2014

Month	Day	Month	Day	Supply Charge (52a)	Supply Charge (52b)	Total Charge	Total kWh (52a)	Total kWh (52b)	Total kWh
Jan	1	Feb	1	$ 62.57	$ 439.11	$ 501.68	344	2,498	2,842
Feb	1	Mar	1	$ 39.67	$ 388.89	$ 428.56	209	2,170	2,379
Mar	1	Apr	1	$ 59.71	$ 348.62	$ 408.33	313	1,892	2,205
Apr	1	May	1	$ 58.00	$ 343.33	$ 401.33	312	1,914	2,226
May	1	June	1	$ 80.68	$ 342.75	$ 423.43	444	1,931	2,375
June	1	July	1	$ 68.21	$ 344.21	$ 412.42	375	1,862	2,237
July	1	Aug	1	$ 72.17	$ 403.81	$ 475.98	382	2,091	2,473
Aug	1	Sept	1	$ 69.00	$ 299.51	$ 368.51	374	1,595	1,969
Sept	1	Oct	1	$ 126.01	$ 294.73	$ 420.74	689	1,573	2,262
Oct	1	Nov	1	$ 86.05	$ 220.22	$ 306.27	476	1,233	1,709
Nov	1	Dec	1	$ 98.45	$ 246.76	$ 345.21	547	1,392	1,939
Dec	1	Jan	1	$ 45.39	$ 336.14	$ 381.53	245	1,903	2,148



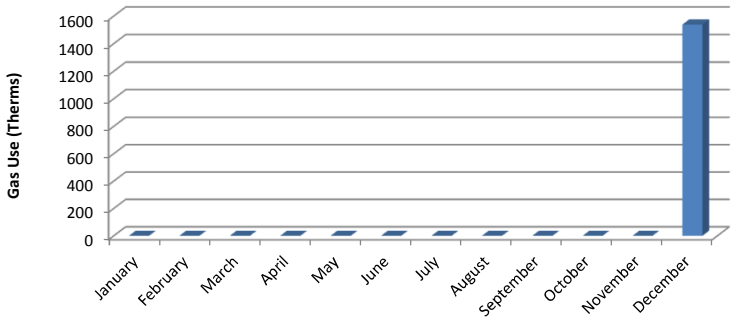
Energy Audit Building	Bldg 52a and 52b - Vacant and Employee House
Service Provider	Fuel Oil
Account Number	
Meter Number	TD01 (52a) and TD02 (52b)

2015

Month	Day	Month	Day	Supply Charge (52a)	Supply Charge (52b)	Total Charge	Gallons (52a)	Gallons (52b)	Total Gallons
Jan	1	Feb	1			$ -			0
Feb	1	Mar	1			$ -			0
Mar	1	Apr	1			$ -			0
Apr	1	May	1			$ -			0
May	1	June	1			$ -			0
June	1	July	1			$ -			0
July	1	Aug	1			$ -			0
Aug	1	Sept	1			$ -			0
Sept	1	Oct	1			$ -			0
Oct	1	Nov	1			$ -			0
Nov	1	Dec	1			$ -			0
Dec	1	Jan	1	$ 1,279.05	$ 2,066.04	$ 1,279.05	458.9	720.40	1179

2014

Month	Day	Month	Day	Supply Charge (52a)	Supply Charge (52b)	Total Charge	Gallons (52a)	Gallons (52b)	Total Gallons
Jan	1	Feb	1			$ -			0
Feb	1	Mar	1			$ -			0
Mar	1	Apr	1			$ -			0.0
Apr	1	May	1			$ -			0.0
May	1	June	1			$ -			0.0
June	1	July	1			$ -			0.0
July	1	Aug	1			$ -			0.0
Aug	1	Sept	1			$ -			0.0
Sept	18	Oct	18			$ -			0.00
Oct	18	Nov	14			$ -			0.00
Nov	14	Dec	17			$ -			0.00
Dec	17	Jan	16	$ 2,516.09	$ 4,502.76	$ 2,516.09	681.1	1,217.0	1,898.10



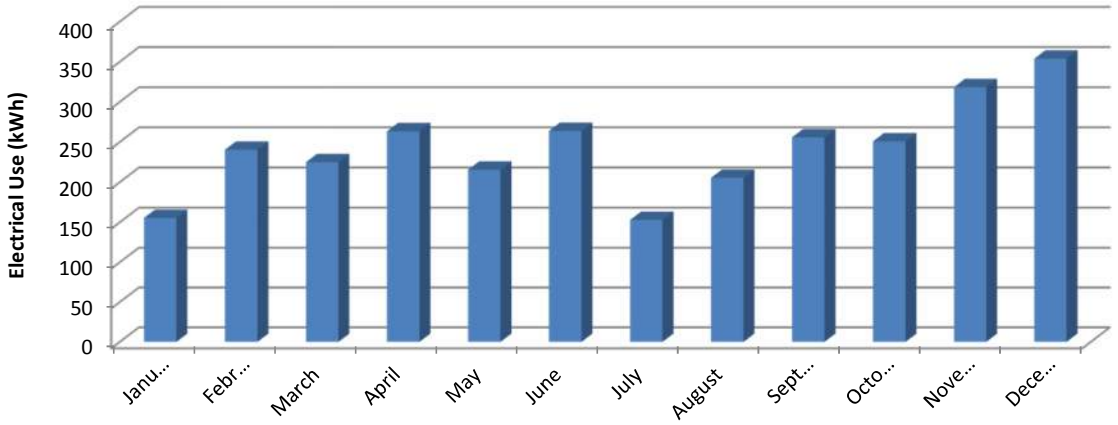
Energy Audit Building	**Bldg 70 - Duke Farms**
Service Provider	**PSE&G**
Account Number	**FB Station**
Meter Number	**EL 72 (on FB circuit)**

2015

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	311	311
Feb	1	Mar	1	$ -	$ -	374	374
Mar	1	Apr	1	$ -	$ -	250	250
Apr	1	May	1	$ -	$ -	258	258
May	1	June	1	$ -	$ -	205	205
June	1	July	1	$ -	$ -	235	235
July	1	Aug	1	$ -	$ -	200	200
Aug	1	Sept	1	$ -	$ -	207	207
Sept	1	Oct	1	$ -	$ -	274	274
Oct	1	Nov	1	$ -	$ -	262	262
Nov	1	Dec	1	$ -	$ -	306	306
Dec	1	Jan	1	$ -	$ -	342	342

2014

Month	Day	Month	Day	Delivery Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	107	107
Mar	1	Apr	1	$ -	$ -	200	200
Apr	1	May	1	$ -	$ -	269	269
May	1	June	1	$ -	$ -	226	226
June	1	July	1	$ -	$ -	293	293
July	1	Aug	1	$ -	$ -	106	106
Aug	1	Sept	1	$ -	$ -	204	204
Sept	1	Oct	1	$ -	$ -	238	238
Oct	1	Nov	1	$ -	$ -	240	240
Nov	1	Dec	1	$ -	$ -	331	331
Dec	1	Jan	1	$ -	$ -	366	366



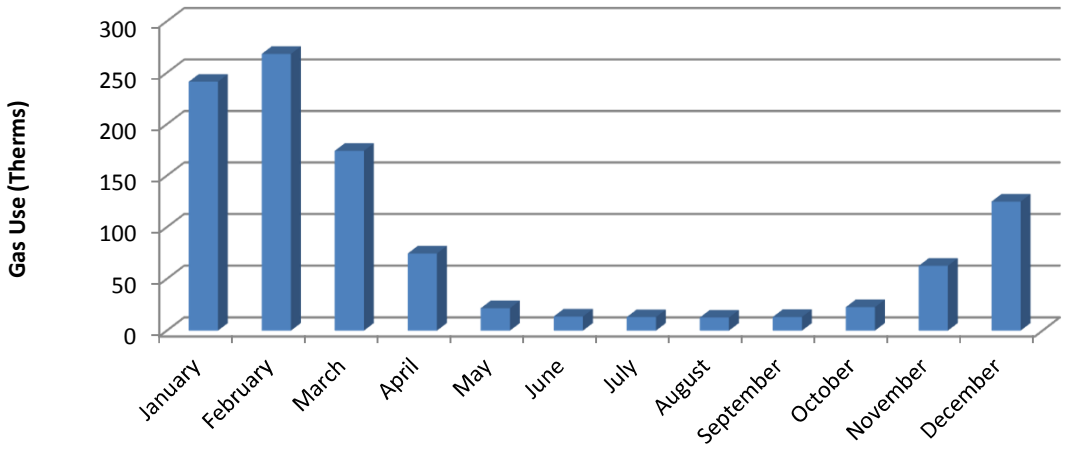
Energy Audit Building	**Bldg 70 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**NG 27**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 215.01	$ 215.01	217.6	218
Feb	1	Mar	1	$ 278.78	$ 278.78	297.2	297
Mar	1	Apr	1	$ 154.04	$ 154.04	164.1	164
Apr	1	May	1	$ 68.49	$ 68.49	74.1	74
May	1	June	1	$ 24.88	$ 24.88	18.0	18
June	1	July	1	$ 22.68	$ 22.68	14.7	15
July	1	Aug	1	$ 20.99	$ 20.99	12.6	13
Aug	1	Sept	1	$ 21.14	$ 21.14	12.6	13
Sept	1	Oct	1	$ 21.31	$ 21.31	12.7	13
Oct	1	Nov	1	$ 31.23	$ 31.23	26.4	26
Nov	1	Dec	1	$ 37.61	$ 37.61	33.7	34
Dec	1	Jan	1	$ 92.97	$ 92.97	99.9	100

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Therms (1)	Total Therms
Jan	1	Feb	1	$ 304.24	$ 304.24	264.9	265
Feb	1	Mar	1	$ 303.42	$ 303.42	239.5	239
Mar	1	Apr	1	$ 225.48	$ 225.48	184.2	184.2
Apr	1	May	1	$ 105.73	$ 105.73	74.9	74.9
May	1	June	1	$ 37.05	$ 37.05	25.3	25.3
June	1	July	1	$ 23.53	$ 23.53	12.6	12.6
July	1	Aug	1	$ 24.37	$ 24.37	13.6	13.6
Aug	1	Sept	1	$ 22.65	$ 22.65	12.6	12.6
Sept	1	Oct	1	$ 23.76	$ 23.76	13.7	13.68
Oct	1	Nov	1	$ 28.70	$ 28.70	19.0	18.98
Nov	1	Dec	1	$ 100.08	$ 100.08	91.6	91.57
Dec	1	Jan	1	$ 165.21	$ 165.21	149.7	149.74



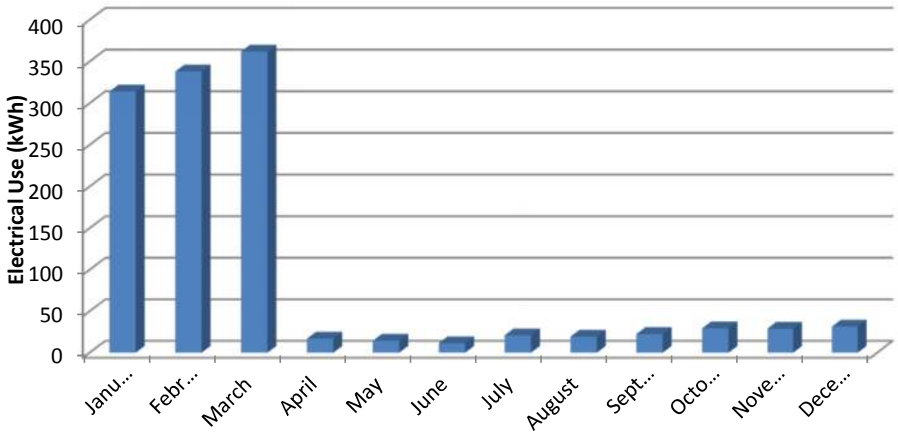
Energy Audit Building	**Bldg 74 - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL27**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 40.16	$ 40.16	220	220
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ 1.11	$ 1.11	17	17
Aug	1	Sept	1	$ 5.37	$ 5.37	16	16
Sept	1	Oct	1	$ 5.54	$ 5.54	18	18
Oct	1	Nov	1	$ 7.84	$ 7.84	32	32
Nov	1	Dec	1	$ 7.67	$ 7.67	31	31
Dec	1	Jan	1	$ 7.64	$ 7.64	31	31

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 73.76	$ 73.76	408	408
Feb	1	Mar	1	$ 122.84	$ 122.84	676	676
Mar	1	Apr	1	$ 134.92	$ 134.92	724	724
Apr	1	May	1	$ 8.49	$ 8.49	34	34
May	1	June	1	$ 7.56	$ 7.56	29	29
June	1	July	1	$ 6.46	$ 6.46	23	23
July	1	Aug	1	$ 7.00	$ 7.00	25	25
Aug	1	Sept	1	$ 6.53	$ 6.53	23	23
Sept	1	Oct	1	$ 7.23	$ 7.23	27	27
Oct	1	Nov	1	$ 7.17	$ 7.17	27	27
Nov	1	Dec	1	$ 7.16	$ 7.16	27	27
Dec	1	Jan	1	$ 8.05	$ 8.05	32	32



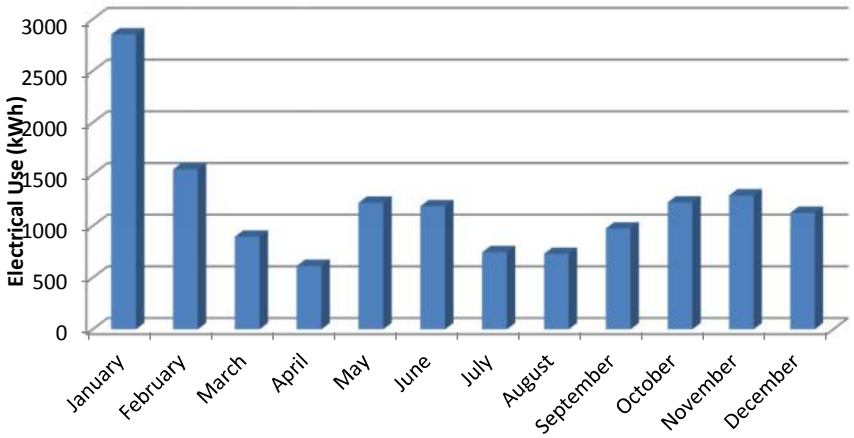
Energy Audit Building	**Bldg 79 - Employee House - Duke Farms**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL29**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 372.59	$ 372.59	2883	2883
Feb	1	Mar	1	$ 239.21	$ 239.21	1741	1741
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ 133.14	$ 133.14	1301	1301
June	1	July	1	$ 229.97	$ 229.97	1275	1275
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ 220.13	$ 220.13	1238	1238
Sept	1	Oct	1	$ 211.07	$ 211.07	1273	1273
Oct	1	Nov	1	$ 214.60	$ 214.60	1666	1666
Nov	1	Dec	1	$ 209.51	$ 209.51	1642	1642
Dec	1	Jan	1	$ 182.00	$ 182.00	1409	1409

2014

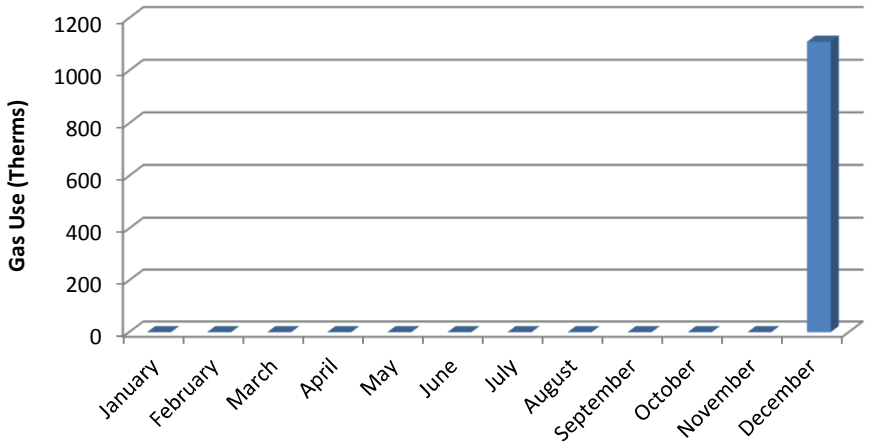
Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 380.93	$ 380.93	2,824	2,824
Feb	1	Mar	1	$ 196.50	$ 196.50	1,353	1,353
Mar	1	Apr	1	$ 262.39	$ 262.39	1,792	1,792
Apr	1	May	1	$ 176.68	$ 176.68	1,228	1,228
May	1	June	1	$ 165.30	$ 165.30	1,148	1,148
June	1	July	1	$ 194.94	$ 194.94	1,108	1,108
July	1	Aug	1	$ 276.68	$ 276.68	1,491	1,491
Aug	1	Sept	1	$ 39.43	$ 39.43	222	222
Sept	1	Oct	1	$ 117.04	$ 117.04	678	678
Oct	1	Nov	1	$ 116.73	$ 116.73	789	789
Nov	1	Dec	1	$ 137.28	$ 137.28	948	948
Dec	1	Jan	1	$ 123.79	$ 123.79	845	845



Energy Audit Building	Bldg 79
Service Provider	Fuel Oil
Account Number	
Meter Number	TD 04

2015							
Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0
Apr	1	May	1		$ -		0
May	1	June	1		$ -		0
June	1	July	1		$ -		0
July	1	Aug	1		$ -		0
Aug	1	Sept	1		$ -		0
Sept	1	Oct	1		$ -		0
Oct	1	Nov	1		$ -		0
Nov	1	Dec	1		$ -		0
Dec	1	Jan	1	$ 3,061.96	$ 3,061.96	1,029.1	1029

2014							
Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0.0
Apr	1	May	1		$ -		0.0
May	1	June	1		$ -		0.0
June	1	July	1		$ -		0.0
July	1	Aug	1		$ -		0.0
Aug	1	Sept	1		$ -		0.0
Sept	1	Oct	1		$ -		0.00
Oct	1	Nov	1		$ -		0.00
Nov	1	Dec	1		$ -		0.00
Dec	1	Jan	1	$ 4,234.99	$ 4,234.99	1,109.5	1,109.50



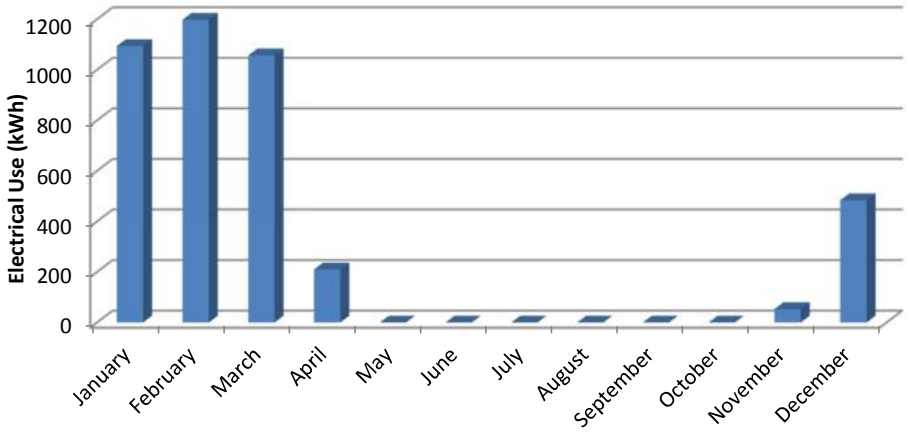
Energy Audit Building	Bldg 87 - Olghart Farm House - Duke Farms
Service Provider	PSE&G
Account Number	
Meter Number	EL30

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ -	$ -	0	0
Feb	1	Mar	1	$ -	$ -	0	0
Mar	1	Apr	1	$ -	$ -	0	0
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ -	$ -	0	0
Sept	1	Oct	1	$ -	$ -	0	0
Oct	1	Nov	1	$ -	$ -	0	0
Nov	1	Dec	1	$ 61.55	$ 61.55	53	53
Dec	1	Jan	1	$ 83.79	$ 83.79	484	484

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 193.68	$ 193.68	1,094	1,094
Feb	1	Mar	1	$ 215.78	$ 215.78	1,198	1,198
Mar	1	Apr	1	$ 195.84	$ 195.84	1,057	1,057
Apr	1	May	1	$ 39.55	$ 39.55	210	210
May	1	June	1	$ -	$ -	0	0
June	1	July	1	$ -	$ -	0	0
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ -	$ -	0	0
Sept	1	Oct	1	$ -	$ -	0	0
Oct	1	Nov	1	$ -	$ -	0	0
Nov	1	Dec	1	$ -	$ -	0	0
Dec	1	Jan	1	$ -	$ -	0	0



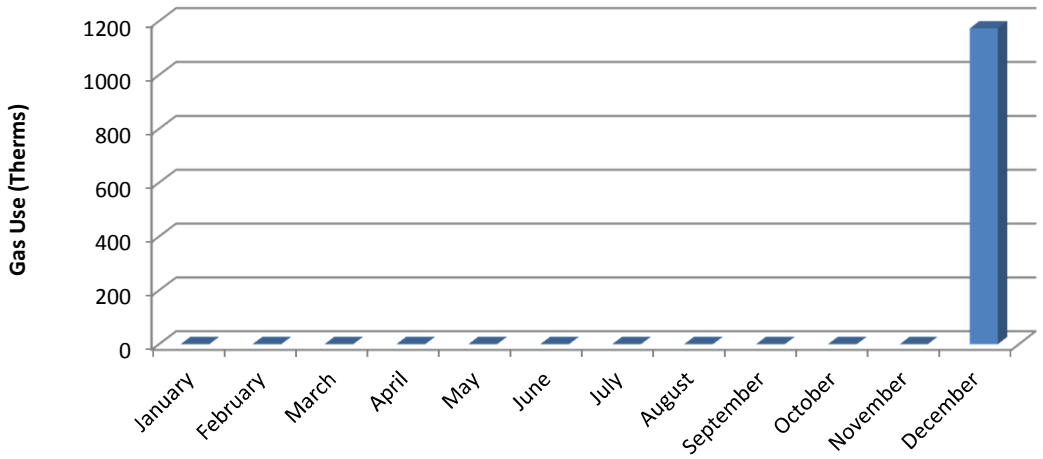
Energy Audit Building	Bldg 87 - Olghart Farm House - Duke Farms
Service Provider	Propane
Account Number	
Meter Number	TD 53

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0
Apr	1	May	1		$ -		0
May	1	June	1		$ -		0
June	1	July	1		$ -		0
July	1	Aug	1		$ -		0
Aug	1	Sept	1		$ -		0
Sept	1	Oct	1		$ -		0
Oct	1	Nov	1		$ -		0
Nov	1	Dec	1		$ -		0
Dec	1	Jan	1	$ 956.80	$ 956.80	207.9	208

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0.0
Apr	1	May	1		$ -		0.0
May	1	June	1		$ -		0.0
June	1	July	1		$ -		0.0
July	1	Aug	1		$ -		0.0
Aug	1	Sept	1		$ -		0.0
Sept	18	Oct	18		$ -		0.00
Oct	18	Nov	14		$ -		0.00
Nov	14	Dec	17		$ -		0.00
Dec	17	Jan	16	$ 5,377.24	$ 5,377.24	1,173.1	1,173.10



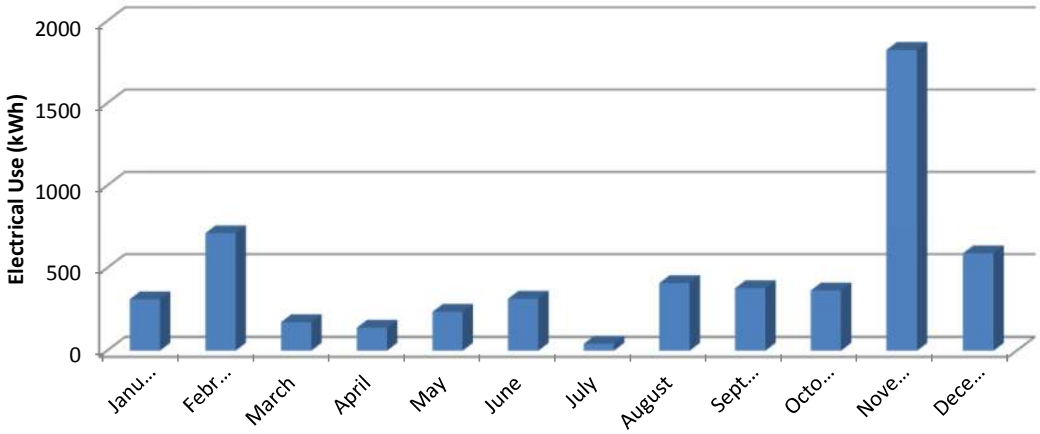
Energy Audit Building	**Bldg 120**
Service Provider	**PSE&G**
Account Number	
Meter Number	**EL31**

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 82.57	$ 82.57	470	470
Feb	1	Mar	1	$ 110.27	$ 110.27	615	615
Mar	1	Apr	1	$ 46.42	$ 46.42	252	252
Apr	1	May	1	$ 52.97	$ 52.97	278	278
May	1	June	1	$ 67.14	$ 67.14	369	369
June	1	July	1	$ 103.78	$ 103.78	546	546
July	1	Aug	1	$ -	$ -	0	0
Aug	1	Sept	1	$ 135.45	$ 135.45	717	717
Sept	1	Oct	1	$ 96.98	$ 96.98	552	552
Oct	1	Nov	1	$ 99.83	$ 99.83	576	576
Nov	1	Dec	1	$ 144.61	$ 144.61	841	841
Dec	1	Jan	1	$ 120.23	$ 120.23	702	702

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Total kWh (1)	Total kWh
Jan	1	Feb	1	$ 28.95	$ 28.95	152	152
Feb	1	Mar	1	$ 146.93	$ 146.93	807	807
Mar	1	Apr	1	$ 19.66	$ 19.66	94	94
Apr	1	May	1	$ -	$ -	0	0
May	1	June	1	$ 18.74	$ 18.74	101	101
June	1	July	1	$ 16.99	$ 16.99	83	83
July	1	Aug	1	$ 18.06	$ 18.06	85	85
Aug	1	Sept	1	$ 20.52	$ 20.52	102	102
Sept	1	Oct	1	$ 38.68	$ 38.68	204	204
Oct	1	Nov	1	$ 29.28	$ 29.28	153	153
Nov	1	Dec	1	$ 495.48	$ 495.48	2,809	2,809
Dec	1	Jan	1	$ 85.87	$ 85.87	476	476



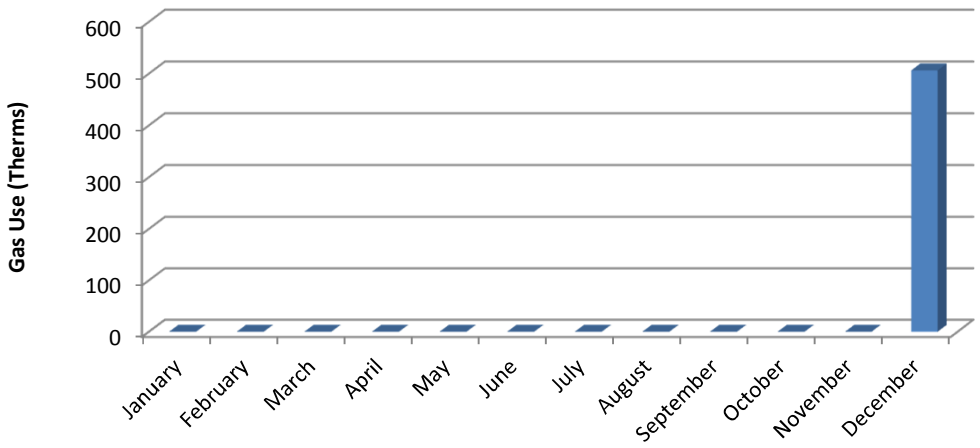
Energy Audit Building	Bldg 120
Service Provider	Propane
Account Number	
Meter Number	TD 54

2015

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0
Apr	1	May	1		$ -		0
May	1	June	1		$ -		0
June	1	July	1		$ -		0
July	1	Aug	1		$ -		0
Aug	1	Sept	1		$ -		0
Sept	1	Oct	1		$ -		0
Oct	1	Nov	1		$ -		0
Nov	1	Dec	1		$ -		0
Dec	1	Jan	1	$ 3,638.78	$ 3,638.78	791.4	791

2014

Month	Day	Month	Day	Supply Charge (1)	Total Charge	Gallons (1)	Total Gallons
Jan	1	Feb	1		$ -		0
Feb	1	Mar	1		$ -		0
Mar	1	Apr	1		$ -		0.0
Apr	1	May	1		$ -		0.0
May	1	June	1		$ -		0.0
June	1	July	1		$ -		0.0
July	1	Aug	1		$ -		0.0
Aug	1	Sept	1		$ -		0.0
Sept	18	Oct	18		$ -		0.00
Oct	18	Nov	14		$ -		0.00
Nov	14	Dec	17		$ -		0.00
Dec	17	Jan	16	$ 1,057.05	$ 1,057.05	221.0	221.00



Appendix B

ENERGY STAR® Data Verification Checklist

69

ENERGY STAR ® Score[1]

Farm Barn DF

Registry Name: Farm Barn DF
Property Type: Office
Gross Floor Area (ft²): 19,278
Built: 2013

For Year Ending: 12/31/2015
Date Generated: 03/28/2016

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

Property & Contact Information

Property Address
Farm Barn DF
1112 Dukes Pkwy W
Hillsborough Township, New Jersey 08844

Property ID: 4881503

Property Owner
Duke Farm Foundation
1112 Dukes Pkwy W
Hillsborough Township, NJ 08844
(____)____-_____

Primary Contact
Jon Wagar
1112 Dukes Pkwy W
Hillsborough Township, NJ 08844
908-722-3700
Jonathan Wagar
<jwagar@dukefarms.org>

1. Review of Whole Property Characteristics

Basic Property Information

1) **Property Name:** Farm Barn DF

Is this the official name of the property? ☐ Yes ☐ No

If "No", please specify: _____

2) **Property Type:** Office

Is this an accurate description of the primary use of this property? ☐ Yes ☐ No

3) **Location:**

1112 Dukes Pkwy W
Hillsborough Township, New Jersey 08844

Is this correct and complete? ☐ Yes ☐ No

4) Gross Floor Area: 19,278 ft²

Does this represent the entire property? (i.e., no part of the building/property was excluded/subtracted from the total) If “no” please specify what space has been excluded.

☐ Yes ☐ No

5) Average Occupancy: 100

Is this occupancy accurate for the entire 12 month period being assessed?

☐ Yes ☐ No

6) Number of Buildings: 1

Does this number accurately represent all structures?

☐ Yes ☐ No

Notes:

Indoor Environmental Standards

1) Ventilation for Acceptable Indoor Air Quality

Does this property meet the ASHRAE Standard 62 for ventilation for acceptable indoor air quality?

☐ Yes ☐ No

2) Acceptable Thermal Environmental Conditions

Does this property meet the ASHRAE Standard 55 for thermal comfort?

☐ Yes ☐ No

3) Adequate Illumination

Does this property adhere to the IESNA Lighting Handbook for lighting quality?

☐ Yes ☐ No

Notes:

2. Review of Property Use Details

Office: Office Use

This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

1) Gross Floor Area: 19,278 ft²

☐ Yes ☐ No

Is this the total size, as measured between the principal exterior surfaces of the enclosing fixed walls of the building(s)? This includes all areas inside the building(s) such as: occupied tenant areas, common areas, meeting areas, break rooms, restrooms, elevator shafts, mechanical equipment areas, and storage rooms. Gross Floor Area should not include interstitial plenum space between floors, which may house pipes and ventilation. Gross Floor Area is not the same as rentable, but rather includes all area inside the building(s). Leasable space would be a sub-set of Gross Floor Area. In the case where there is an atrium, you should count the Gross Floor Area at the base level only. Do not increase the size to accommodate open atrium space at higher levels. The Gross Floor Area should not include any exterior spaces such as balconies or exterior loading docks and driveways.

2) Weekly Operating Hours: 70

Is this the total number of hours per week that the property is occupied by the majority of the employees? It does not include hours when the property is occupied only by maintenance, security, or other support personnel. The Weekly Operating Hours is not the same as the hours during which the HVAC equipment is run, but rather should be based on the hours during which your property is actually occupied by the majority of the tenants. It is possible that these hours may correspond to hours specified within a lease, during which the owner is required to provide the leasee with conditioned space. However, this number should never include additional HVAC startup or shutdown time. For properties with a schedule that varies during the year, Weekly Operating Hours refers to the schedule most often followed.

☐ **Yes** ☐ **No**

3) Number of Workers on Main Shift: 30

Is this the total number of workers present during the primary shift? This is not a total count of workers, but rather a count of workers who are present at the same time. For example, if there are two daily eight hour shifts of 100 workers each, the Number of Workers on Main Shift value is 100. Number of Workers on Main Shift may include employees of the property, sub-contractors who are onsite regularly, and volunteers who perform regular onsite tasks. Number of Workers should not include visitors to the buildings such as clients, customers, or patients.

☐ **Yes** ☐ **No**

4) Number of Computers: 30

Is this the total number of computers, laptops, and data servers at the property? This number should not include tablet computers, such as iPads, or any other types of office equipment.

☐ **Yes** ☐ **No**

5) Percent That Can Be Heated: 100

Is this the total percentage of the property that can be heated by mechanical equipment?

☐ **Yes** ☐ **No**

6) Percent That Can Be Cooled: 100

Is this the total percentage of the property that can be cooled by mechanical equipment? This includes all types of cooling from central air to individual window units.

☐ **Yes** ☐ **No**

Notes:

3. Review of Energy Consumption

Data Overview

Site Energy Use Summary	
Electric - Grid (kBtu)	889,621 (100%)
Total Energy (kBtu)	889,621
Energy Intensity	
Site (kBtu/ft²)	46.1
Source (kBtu/ft²)	144.9

National Median Comparison	
National Median Site EUI (kBtu/ft²)	58.2
National Median Source EUI (kBtu/ft²)	182.8
% Diff from National Median Source EUI	-20.8%
Emissions (based on site energy use)	
Greenhouse Gas Emissions (Metric Tons CO2e)	119.1

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

Note: All values are annualized to a 12-month period. Source Energy includes energy used in generation and transmission to enable an equitable assessment.

Summary of All Associated Meters

The following meters are associated with the property, meaning that they are added together to get the total energy use for the property. Please see additional tables in this checklist for the exact meter consumption values.

Meter Name	Fuel Type	Start Date	End Date	Associated With
Electric Grid Meter	Electric	01/01/2013	In Use	Farm Barn DF

Total Energy Use ☐ Yes ☐ No

Do the meters shown above account for the total energy use of this property during the reporting period of this application?

Additional Fuels ☐ Yes ☐ No

Do the meters above include all fuel *types* at the property? That is, no additional fuels such as district steam, generator fuel oil have been excluded.

On-Site Solar and Wind Energy ☐ Yes ☐ No

Are all on-site solar and wind installations reported in this list (if present)? All on-site systems must be reported.

Notes:

Electric Meter: Electric Grid Meter (kWh (thousand Watt-hours))

Associated With: Farm Barn DF

Start Date	End Date	Usage	Green Power?
12/01/2014	01/01/2015	21,808	No
01/01/2015	02/01/2015	20,556	No
02/01/2015	03/01/2015	28,527	No
03/01/2015	04/01/2015	20,692	No
04/01/2015	05/01/2015	16,842	No
05/01/2015	06/01/2015	19,471	No
06/01/2015	07/01/2015	23,920	No
07/01/2015	08/01/2015	23,441	No
08/01/2015	09/01/2015	25,388	No
09/01/2015	10/01/2015	26,560	No
10/01/2015	11/01/2015	21,753	No
11/01/2015	12/01/2015	15,019	No
12/01/2015	01/01/2016	18,564	No
	Total Consumption (kWh (thousand Watt-hours)):		282,541
	Total Consumption (kBtu (thousand Btu)):		964,029.9

Total Energy Consumption for this Meter

☐ **Yes** ☐ **No**

Do the fuel consumption totals shown above include consumption of all energy tracked through this meter that affect energy calculations for the reporting period of this application (i.e., do the entries match the utility bills received by the property)?

Notes:

4. Signature & Stamp of Verifying Licensed Professional

_____ (Name) visited this site on _____ (Date). Based on the conditions observed at the time of the visit to this property, I verify that the information contained within this application is accurate and in accordance with the Licensed Professional Guide.

Signature: _____ Date: _____

Licensed Professional

Matt Goss
11 British American Blvd
Latham, NY 12110
518-782-4500
gossmt@cdmsmith.com

NOTE: When applying for the ENERGY STAR, the signature of the Verifying Professional must match the stamp.

Professional Engineer Stamp
(if applicable)

ENERGY STAR® Scorecard

69

ENERGY STAR® Score

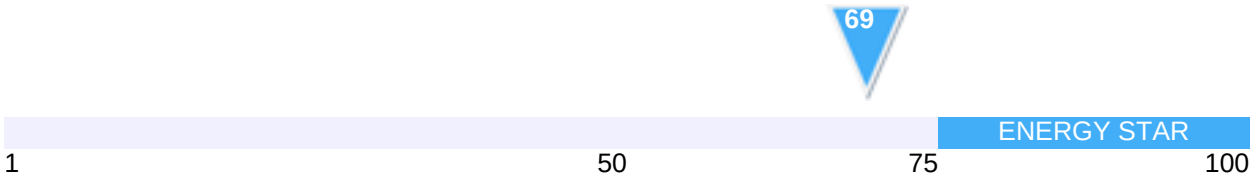
Farm Barn DF

Primary Function: Office
Gross Floor Area (ft²): 19,278
Built: 2013

For Year Ending: December 31, 2015
Date Generated: March 28, 2016

Property Address:
Farm Barn DF
1112 Dukes Pkwy W
Hillsborough Township, New Jersey 08844

For the year ending in December 2015, this building used 144.9 (kBtu/ft²) on a source energy basis. The Environmental Protection Agency's (EPA's) 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.



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

Signature of Verifying Professional

I _____ (Name) verify that the information regarding energy use and property use details is true and correct to the best of my knowledge.

Signature: _____Date: _____

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Farm Barn DF

Primary Property Type: Office
Gross Floor Area (ft²): 19,278
Built: 2013

For Year Ending: December 31, 2015
Date Generated: March 28, 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
Farm Barn DF
1112 Dukes Pkwy W
Hillsborough Township, New Jersey 08844

Property Owner
Duke Farm Foundation
1112 Dukes Pkwy W
Hillsborough Township, NJ 08844
(____)____-_____

Primary Contact
Jon Wagar
1112 Dukes Pkwy W
Hillsborough Township, NJ 08844
908-722-3700
Jonathan Wagar
<jwagar@dukefarms.org>

Property ID: 4881503

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
46.1 kBtu/ft²

Source EUI
144.9 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	889,621 (100%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	58.2
National Median Source EUI (kBtu/ft²)	182.8
% Diff from National Median Source EUI	-21%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	119

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

Matt Goss
11 British American Blvd
Latham, NY 12110
518-782-4500
gossmt@cdmsmith.com

Professional Engineer Stamp (if applicable)

Energy Performance
Date Generated: 08/22/2016 11:25 PM EDT
Number of properties in report: 18

Property Id	Property Name	Parent Property Id	Parent Property Name	Year Ending	City	State/Province	Postal Code	Property GFA - EPA Calculated (Buildings) (ft²)	Site EUI (kBtu/ft²)	Source EUI (kBtu/ft²)	Weather Normalized Site EUI (kBtu/ft²)	Weather Normalized Source EUI (kBtu/ft²)	Site EUI - Adjusted to Current Year (kBtu/ft²)	Source EUI - Adjusted to Current Year (kBtu/ft²)	National Median Site EUI (kBtu/ft²)	National Median Source EUI (kBtu/ft²)	% Difference from National Median Source EUI	Energy Cost ($)
4881503	Building 39 - Farm Barn DF	Not Applicable: Standalone Property	Not Applicable: Standalone Property	12/31/2015	Hillsborough Township	New Jersey	08844	19278	46.1	144.9	46.1	144.9	46.1	144.9	58.2	182.8	-20.8	Not Available
5034634	Duke Farms	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	300000	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	41.2	96.8	Not Available	Not Available
5034664	Building 5 Pump House DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1000	579.3	1464.3	553.4	1406.8	Not Available	Not Available	48.7	123.1	1089.3	16582.35
5034670	House 29 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	5.4	5.8	5.4	5.8	Not Available	Not Available	Not Available	Not Available	Not Available	135.65
5034673	House 7 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	135.9	165.7	129.1	157.1	Not Available	Not Available	Not Available	Not Available	Not Available	1111.52
5034679	House 8 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1183	124	148.8	119.3	143.1	Not Available	Not Available	Not Available	Not Available	Not Available	922.95
5034680	House 9 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	118.8	144.7	114.1	139.7	Not Available	Not Available	Not Available	Not Available	Not Available	978.69
5034681	House 10 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1166	85.7	181.3	84.4	180	Not Available	Not Available	Not Available	Not Available	Not Available	370.16
5034682	Building 12 - Coach Barn DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	21187	54.4	82.4	53.3	80.7	Not Available	Not Available	56.3	85.1	-3.2	7900.33
5034684	House 13 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2834	92.3	111	89.2	107.7	Not Available	Not Available	Not Available	Not Available	Not Available	2223.38
5034748	House 27 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	50.5	79.6	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	682.77
5034755	House 30 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	104.5	122.6	101.1	119.1	Not Available	Not Available	Not Available	Not Available	Not Available	1128.62
5034759	House 52 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	4579	33	53.2	Not Available	Not Available	Not Available	Not Available	79.4	127.9	-58.4	5578.81
5034760	Shop 70 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1820	60.1	75.7	56.9	72.4	Not Available	Not Available	97.7	123.1	-38.5	989.13
5034761	House 74 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	0.4	1.2	0.4	1.2	Not Available	Not Available	Not Available	Not Available	Not Available	75.33
5034765	House 79 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2580	74.1	115.5	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	5074.18
5034766	House 87 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2967	7.1	8.5	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	1102.14
5034767	House 120 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	27.4	40.3	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available	4699.03

ENERGY STAR Certification Status
Date Generated: 08/22/2016 11:26 PM EDT
Number of properties in report: 18

Property Id	Property Name	Parent Property Id	Parent Property Name	Year Ending	City	State/Province	Postal Code	Property GFA - EPA Calculated (Buildings) (ft²)	ENERGY STAR Score	ENERGY STAR Certification - Year(s) Certified	ENERGY STAR Certification - Application Status	ENERGY STAR Certification - Last Approval Date	ENERGY STAR Certification - Next Eligible Date	ENERGY STAR Certification - Eligibility	Date Property Last Modified	Property Data Administrator	Property Data Administrator - Email
4881503	Building 39 - Farm Barn DF	Not Applicable: Standalone Property	Not Applicable: Standalone Property	12/31/2015	Hillsborough Township	New Jersey	08844	19278	69	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 11:08 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034634	Duke Farms	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	300000	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/07/2016 09:15 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034664	Building 5 Pump House DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1000	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:43 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034670	House 29 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:36 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034673	House 7 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:45 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034679	House 8 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1183	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:57 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034680	House 9 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 11:04 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034681	House 10 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1166	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 11:06 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034682	Building 12 - Coach Barn DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	21187	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 09:20 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034684	House 13 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2834	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 09:35 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034748	House 27 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:32 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034755	House 30 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:37 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034759	House 52 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	4579	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:44 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034760	Shop 70 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1820	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:46 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034761	House 74 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:53 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034765	House 79 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2580	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 10:54 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034766	House 87 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2967	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 11:05 PM EDT	Matt Goss	gossmt@cdmsmith.com
5034767	House 120 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	Not Available	Not Available	Not Available	Not Available	Not Available	No	08/22/2016 09:27 PM EDT	Matt Goss	gossmt@cdmsmith.com

Sustainable Buildings Checklist Report

Date Generated: 08/22/2016 11:26 PM EDT

Number of properties in report: 18

Property Id	Property Name	Parent Property Id	Parent Property Name	Year Ending	City	State/Province	Postal Code	Property GFA - EPA Calculated (Buildings) (ft²)	US Agency Designated Covered Facility ID
4881503	Building 39 - Farm Barn DF	Not Applicable: Standalone Property	Not Applicable: Standalone Property	12/31/2015	Hillsborough Township	New Jersey	08844	19278	Not Available
5034634	Duke Farms	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	300000	Not Available
5034664	Building 5 Pump House DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1000	Not Available
5034670	House 29 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available
5034673	House 7 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	Not Available
5034679	House 8 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1183	Not Available
5034680	House 9 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	909	Not Available
5034681	House 10 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1166	Not Available
5034682	Building 12 - Coach Barn DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	21187	Not Available
5034684	House 13 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2834	Not Available
5034748	House 27 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available
5034755	House 30 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1779	Not Available
5034759	House 52 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	4579	Not Available
5034760	Shop 70 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	1820	Not Available
5034761	House 74 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	Not Available
5034765	House 79 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2580	Not Available
5034766	House 87 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	2967	Not Available
5034767	House 120 DF	5034634	Duke Farms	12/31/2015	Hillsborough	New Jersey	08867	3400	Not Available

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Property Id	Property Name	US Federal Real Property Unique Identifier	Primary Property Type - EPA Calculated	Third Party Certification	Third Party Certification Date Anticipated	Third Party Certification Date Achieved	Guiding Principles - Principles Date Anticipated
4881503	Building 39 - Farm Barn DF	Not Available	Office	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Other - Recreation	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Other - Utility	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Museum	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Multifamily Housing	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Other	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Single Family Home	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principles - Principles Date Achieved	Guiding Principles - Checklist Manager	Guiding Principles - % Complete (Yes or Not Applicable)	Guiding Principles - % Yes	Guiding Principles - % Not Applicable	Guiding Principles - % In Process
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principles - % No	Guiding Principles - % Not Assessed	Guiding Principle 1.1 Integrated - Team	Guiding Principle 1.2 Integrated - Goals	Guiding Principle 1.3 Integrated - Plan	Guiding Principle 1.4 Integrated -Occupant Feedback
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 1.5 Integrated - Commissioning	Guiding Principle 2.1 Energy - Energy Efficiency (Any Option)	Guiding Principle 2.1 Energy Efficiency - Option 1	Guiding Principle 2.1 Energy Efficiency - Option 2	Guiding Principle 2.1 Energy Efficiency - Option 3	Guiding Principle 2.2 Energy - Efficient Products
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 2.4 Energy - Measurement and Verification	Guiding Principle 2.3 Energy - Onsite Renewable	Guiding Principle 2.5 Energy - Benchmarking	Guiding Principle 3.1 Water - Indoor Water (Any Option)	Guiding Principle 3.1 Indoor Water - Option 1	Guiding Principle 3.1 Indoor Water - Option 2
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 3.2 Water - Outdoor Water (Any Option)	Guiding Principle 3.2 Outdoor Water - Option 2	Guiding Principle 3.2 Outdoor Water - Option 1	Guiding Principle 3.2 Outdoor Water - Option 3	Guiding Principle 3.3 Water - Stormwater	Guiding Principle 3.4 Water - Efficient Products
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 4.1 Indoor Environment - Ventilation and Thermal Comfort	Guiding Principle 4.2 Indoor Environment - Moisture Control	Guiding Principle 4.3 Indoor Environment - Automated Lighting Controls	Guiding Principle 4.4 Indoor Environment - Daylighting and Occupant Controls (Any Option)	Guiding Principle 4.4 Daylighting and Occupant Controls - Option 1	Guiding Principle 4.4 Daylighting and Occupant Controls - Option 2
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 4.5 Indoor Environment - Low-Emitting Materials	Guiding Principle 4.6 Indoor Environment - Integrated Pest Management	Guiding Principle 4.7 Indoor Environment - Tobacco Smoke Control	Guiding Principle 5.1 Materials - Recycled Content	Guiding Principle 5.2 Materials - Biobased Content	Guiding Principle 5.3 Materials - Environmentally Preferred Products
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Guiding Principle 5.4 Materials - Waste and Materials Mgmt	Guiding Principle 5.5 Materials - Ozone Depleting Compounds	ENERGY STAR Score	Site EUI (kBtu/ft²)	Source EUI (kBtu/ft²)	Weather Normalized Site EUI (kBtu/ft²)
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	69	46.1	144.9	46.1
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available	579.3	1464.3	553.4
5034670	House 29 DF	Not Available	Not Available	Not Available	5.4	5.8	5.4
5034673	House 7 DF	Not Available	Not Available	Not Available	135.9	165.7	129.1
5034679	House 8 DF	Not Available	Not Available	Not Available	124	148.8	119.3
5034680	House 9 DF	Not Available	Not Available	Not Available	118.8	144.7	114.1
5034681	House 10 DF	Not Available	Not Available	Not Available	85.7	181.3	84.4
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available	54.4	82.4	53.3
5034684	House 13 DF	Not Available	Not Available	Not Available	92.3	111	89.2
5034748	House 27 DF	Not Available	Not Available	Not Available	50.5	79.6	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available	104.5	122.6	101.1
5034759	House 52 DF	Not Available	Not Available	Not Available	33	53.2	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available	60.1	75.7	56.9
5034761	House 74 DF	Not Available	Not Available	Not Available	0.4	1.2	0.4
5034765	House 79 DF	Not Available	Not Available	Not Available	74.1	115.5	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	7.1	8.5	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	27.4	40.3	Not Available

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Property Id	Property Name	Weather Normalized Source EUI (kBtu/ft²)	Site EUI - Adjusted to Current Year (kBtu/ft²)	Source EUI - Adjusted to Current Year (kBtu/ft²)	Indoor Water Use (All Water Sources) (kgal)	Indoor Water Intensity (All Water Sources) (gal/ft²)	Outdoor Water Use (All Water Sources) (kgal)
4881503	Building 39 - Farm Barn DF	144.9	46.1	144.9	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	1406.8	Not Available	Not Available	Not Available	Not Available	Not Available
5034670	House 29 DF	5.8	Not Available	Not Available	Not Available	Not Available	Not Available
5034673	House 7 DF	157.1	Not Available	Not Available	Not Available	Not Available	Not Available
5034679	House 8 DF	143.1	Not Available	Not Available	Not Available	Not Available	Not Available
5034680	House 9 DF	139.7	Not Available	Not Available	Not Available	Not Available	Not Available
5034681	House 10 DF	180	Not Available	Not Available	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	80.7	Not Available	Not Available	Not Available	Not Available	Not Available
5034684	House 13 DF	107.7	Not Available	Not Available	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034755	House 30 DF	119.1	Not Available	Not Available	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034760	Shop 70 DF	72.4	Not Available	Not Available	Not Available	Not Available	Not Available
5034761	House 74 DF	1.2	Not Available	Not Available	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

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Property Id	Property Name	Energy Cost ($)	Energy Cost Intensity ($/ft²)	Total Water Cost (All Water Sources) ($)	Total GHG Emissions (Metric Tons CO2e)	Electricity Use – Generated from Onsite Renewable Systems (kWh)	Electricity Use – Generated from Onsite Renewable Systems and Exported (kWh)
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available	119.1	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available	0	Not Available	Not Available
5034664	Building 5 Pump House DF	16582.35	16.58	Not Available	63.8	Not Available	Not Available
5034670	House 29 DF	135.65	0.08	Not Available	0.5	Not Available	Not Available
5034673	House 7 DF	1111.52	1.22	Not Available	7.4	Not Available	Not Available
5034679	House 8 DF	922.95	0.78	Not Available	8.6	Not Available	Not Available
5034680	House 9 DF	978.69	1.08	Not Available	6.4	Not Available	Not Available
5034681	House 10 DF	370.16	0.32	Not Available	9.4	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	7900.33	0.37	Not Available	81.9	Not Available	Not Available
5034684	House 13 DF	2223.38	0.78	Not Available	15.4	Not Available	Not Available
5034748	House 27 DF	682.77	0.38	Not Available	3.6	Not Available	Not Available
5034755	House 30 DF	1128.62	0.63	Not Available	10.8	Not Available	Not Available
5034759	House 52 DF	5578.81	1.22	Not Available	12.7	Not Available	Not Available
5034760	Shop 70 DF	989.13	0.54	Not Available	6.7	Not Available	Not Available
5034761	House 74 DF	75.33	0.02	Not Available	0.2	Not Available	Not Available
5034765	House 79 DF	5074.18	1.97	Not Available	17.1	Not Available	Not Available
5034766	House 87 DF	1102.14	0.37	Not Available	1.5	Not Available	Not Available
5034767	House 120 DF	4699.03	1.38	Not Available	7.4	Not Available	Not Available

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Property Id	Property Name	Electricity Use – Generated from Onsite Renewable Systems and Used Onsite (kWh)	Percent of Total Electricity Generated from Onsite Renewable Systems	ENERGY STAR Certification - Last Approval Date
4881503	Building 39 - Farm Barn DF	Not Available	Not Available	Not Available
5034634	Duke Farms	Not Available	Not Available	Not Available
5034664	Building 5 Pump House DF	Not Available	Not Available	Not Available
5034670	House 29 DF	Not Available	Not Available	Not Available
5034673	House 7 DF	Not Available	Not Available	Not Available
5034679	House 8 DF	Not Available	Not Available	Not Available
5034680	House 9 DF	Not Available	Not Available	Not Available
5034681	House 10 DF	Not Available	Not Available	Not Available
5034682	Building 12 - Coach Barn DF	Not Available	Not Available	Not Available
5034684	House 13 DF	Not Available	Not Available	Not Available
5034748	House 27 DF	Not Available	Not Available	Not Available
5034755	House 30 DF	Not Available	Not Available	Not Available
5034759	House 52 DF	Not Available	Not Available	Not Available
5034760	Shop 70 DF	Not Available	Not Available	Not Available
5034761	House 74 DF	Not Available	Not Available	Not Available
5034765	House 79 DF	Not Available	Not Available	Not Available
5034766	House 87 DF	Not Available	Not Available	Not Available
5034767	House 120 DF	Not Available	Not Available	Not Available

Appendix C

Combined heat and power Analysis	- (system usage) + (system production)					
Building 12 - Coach Barn	**kwh**	**Therms**	**Kbtuh**	**$ Cost**	**$ Produced**	**$ Net**
Hourly Generator Production*	65	-8	275	-$7.41	$10.35	$2.94
Hourly Boiler Production **	0	-5	408	-$4.49	$5.71	$1.22

Annual Hours of Generator operation	4320	-$32,009	-36,374	therms
Electrical used	100%	$28,080	280,800	kWh
Thermal used	50%	$8,316	594,000	kBtuh
Annual Generator Savings		$4,387		
Estimate Cost of 65 kW Generator		$143,000		
Incentive		$42,900		
Final Cost		$100,100		
Annual Maintenance***		$2,527		
Simple Payback		**53.8**		

Utility Cost	
Therm	$0.88
kWh	$0.10
kBtuh	$0.01

* Based upon 65 kW generator

** Based upon existing plant running on Natural Gas at the plant measured 80% efficient

*** $0.009/kWh operation and maintenance cost (National Renewable Energy Laboratory 2003 data for 1 Mw system)

Combined heat and power Analysis	- (system usage) + (system production)					
Building 32 - Orchid Range	**kwh**	**Therms**	**Kbtuh**	**$ Cost**	**$ Produced**	**$ Net**
Hourly Generator Production*	65	-8	275	-$7.41	$10.35	$2.94
Hourly Boiler Production **	0	-5	408	-$4.49	$5.71	$1.22

Annual Hours of Generator operation	4320	-$29,100	-36,374	therms
Electrical used	100%	$28,080	280,800	kWh
Thermal used	50%	$8,316	594,000	kBtuh
Annual Generator Savings		$7,296		
Estimate Cost of 65 kW Generator		$143,000		
Incentive		$42,900		
Final Cost		$100,100		
Annual Maintenance***		$2,527		
Simple Payback		**21.0**		

Utility Cost	
Therm	$0.80
kWh	$0.10
kBtuh	$0.01

* Based upon 65 kW generator

** Based upon existing plant running on Natural Gas at the plant measured 80% efficient

*** $0.009/kWh operation and maintenance cost (National Renewable Energy Laboratory 2003 data for 1 Mw system)

Combined heat and power Analysis	- (system usage) + (system production)					
Conservatory 26	**kwh**	**Therms**	**Kbtuh**	**$ Cost**	**$ Produced**	**$ Net**
Hourly Generator Production*	65	-8	275	-$7.41	$10.35	$2.94
Hourly Boiler Production **	0	-5	408	-$4.49	$5.71	$1.22
Annual Hours of Generator operation		4320		-$33,101	-36,374	therms
Electrical used		100%		$28,080	280,800	kWh
Thermal used		50%		$8,316	594,000	kBtuh
			Annual Generator Savings	$3,295		
			Estimate Cost of 65 kW Generator	$143,000		
			Incentive	$42,900		
			Final Cost	$100,100		
			Annual Maintenance***	$2,527		
			Simple Payback	**130.3**		

Utility Cost	
Therm	$0.91
kWh	$0.10
kBtuh	$0.01

* Based upon 65 kW generator

** Based upon existing plant running on Natural Gas at the plant measured 80% efficient

*** $0.009/kWh operation and maintenance cost (National Renewable Energy Laboratory 2003 data for 1 Mw system)

Combined heat and power Analysis	- (system usage) + (system production)					
Building 39 - Farm Barn	**kwh**	**Therms**	**Kbtuh**	**$ Cost**	**$ Produced**	**$ Net**
Hourly Generator Production*	65	-8	275	-$7.41	$10.35	$2.94
Hourly Boiler Production **	0	-5	408	-$4.49	$5.71	$1.22
Annual Hours of Generator operation		4320		-$29,100	-36,374	therms
Electrical used		100%		$28,080	280,800	kWh
Thermal used		50%		$8,316	594,000	kBtuh
			Annual Generator Savings	$7,296		
			Estimate Cost of 65 kW Generator	$143,000		
			Incentive	$42,900		
			Final Cost	$100,100		
			Annual Maintenance***	$2,527		
			Simple Payback	**21.0**		

Utility Cost	
Therm	$0.80
kWh	$0.10
kBtuh	$0.01

* Based upon 65 kW generator

** Based upon existing plant running on Natural Gas at the plant measured 80% efficient

*** $0.009/kWh operation and maintenance cost (National Renewable Energy Laboratory 2003 data for 1 Mw system)

Building	Farm Barn	
Address	112 Dukes Pkwy W, Hillsboro	
Heating Fuel	Elec	3413
Cooling System	DX	

Existing Building Envelope		
Wall Area	13577.28	sqft
Wall Conductivity	0.052632	u Value
Window Area	822	sqft
Window Conductivity	0.5	u Value
Roof Area	12157.8	sqft
Roof Conductivity	0.05	u Value
Floor Area	19278	sqft
Volume	231336	cuft

Set Points		
Heating Set Point	70	deg F
Cooling Set Point	78	deg F

Internal Loads		
Lighting Density	0.75	w/sqft
Equipment Density	0.55	w/sqft
Occupancy	42	people
Occupant Sensible Load	150	btu/person
Infiltration	3,084.5	cfm
Exhaust	500	cfm
Equipment Density	0.00	therms
Building Equipment		
Heating System	720,000	Btuh
Heating Efficiency	3.5	COP
Cooling System	480,000	Btuh
Cooling Efficiency	15.9	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Existing Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	2	0	1	-42,470	-91,835	-94,845	-229,150
97.5	23	0	1	-33,803	-91,835	-75,489	-201,127
92.5	93	0	1	-25,136	-91,835	-56,133	-173,103
87.5	237	0	1	-16,468	-91,835	-36,777	-145,079
82.5	452	0	1	-7,801	-91,835	-17,421	-117,056
77.5	692	0	1	867	-91,835	1,936	-89,032
72.5	858	0	1	9,534	-91,835	21,292	-61,009
67.5	753	1	0	4,334	-91,835	9,678	0
62.5	735	1	0	13,001	-91,835	29,034	0
57.5	671	1	0	21,669	-91,835	48,390	0
52.5	736	1	0	30,336	-91,835	67,747	6,248
47.5	708	1	0	39,003	-91,835	87,103	34,272
42.5	756	1	0	47,671	-91,835	106,459	62,295
37.5	705	1	0	56,338	-91,835	125,815	90,319
32.5	546	1	0	65,006	-91,835	145,171	118,343
27.5	340	1	0	73,673	-91,835	164,528	146,366
22.5	229	1	0	82,340	-91,835	183,884	174,390
17.5	134	1	0	91,008	-91,835	203,240	202,413
12.5	57	1	0	99,675	-91,835	222,596	230,437
7.5	22	1	0	108,343	-91,835	241,952	258,461
2.5	9	1	0	117,010	-91,835	261,309	286,484
-2.5	2	1	0	125,678	-91,835	280,665	314,508
-7.5	0	1	0	134,345	-91,835	300,021	342,531
Total	8,760	6,403	2,357				

Existing Heating System		
Output	Usage	Usage
Btuh	Btu	kwh
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
6,248	4,598,586	313
34,272	24,264,356	1,653
62,295	47,095,246	3,631
90,319	63,674,831	4,910
118,343	64,615,016	4,982
146,366	49,764,484	3,837
174,390	39,935,251	3,079
202,413	27,123,389	2,271
230,437	13,134,907	1,100
258,461	5,686,133	476
286,484	2,578,358	216
314,508	629,016	53
342,531	0	0
	343,099,571	26,521

Existing Cooling System		
Output	Usage	Usage
Btuh	Btu	kWh
-172,944	-345,887	29
-151,794	-3,491,255	291
-130,644	-10,442,323	870
-109,494	-22,303,020	1,859
-88,344	-34,319,497	2,860
-67,194	-39,963,425	3,330
-46,044	-33,953,752	2,829
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	-144,819,159	12,068

System Summary		
Existing	Usage	
System	kWh	Therms
Heating	26,521	
Cooling	12,068	0
Vent Cooling	0	0
Lighting	126,656	0
Equipment	92,881	0
Total	258,127	0
	260,733	0
	1%	#DIV/0!

Proposed Building Envelope		
Wall Area	13577.28	sqft
Wall Conductivity	0.052632	u Value
Window Area	822	sqft
Window Conductivity	0.5	u Value
Roof Area	12157.8	sqft
Roof Conductivity	0.05	u Value
Floor Area	19278	sqft
Volume	231336	cuft

Set Points		
Heating Set Point	70	deg F
Cooling Set Point	78	deg F

Internal Loads		
Lighting Density	0.75	w/sqft
Equipment Density	0.55	w/sqft
Occupancy	42	people
Occupant Sensible Load	150	btu/person
Infiltration	3,084.5	cfm
Exhaust	500	cfm
Equipment Density	0.00	therms/sqft
Building Equipment		
Heating System	720,000	Btuh
Heating Efficiency	95	%
Cooling System	480,000	Btuh
Cooling Efficiency	15.9	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Proposed Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	2	0	1	-42,470	-91,835	-94,845	-229,150
97.5	23	0	1	-33,803	-91,835	-75,489	-201,127
92.5	93	0	1	-25,136	-91,835	-56,133	-173,103
87.5	237	0	1	-16,468	-91,835	-36,777	-145,079
82.5	452	0	1	-7,801	-91,835	-17,421	-117,056
77.5	692	0	1	867	-91,835	1,936	-89,032
72.5	858	0	1	9,534	-91,835	21,292	-61,009
67.5	753	1	0	4,334	-91,835	9,678	0
62.5	735	1	0	13,001	-91,835	29,034	0
57.5	671	1	0	21,669	-91,835	48,390	0
52.5	736	1	0	30,336	-91,835	67,747	6,248
47.5	708	1	0	39,003	-91,835	87,103	34,272
42.5	756	1	0	47,671	-91,835	106,459	62,295
37.5	705	1	0	56,338	-91,835	125,815	90,319
32.5	546	1	0	65,006	-91,835	145,171	118,343
27.5	340	1	0	73,673	-91,835	164,528	146,366
22.5	229	1	0	82,340	-91,835	183,884	174,390
17.5	134	1	0	91,008	-91,835	203,240	202,413
12.5	57	1	0	99,675	-91,835	222,596	230,437
7.5	22	1	0	108,343	-91,835	241,952	258,461
2.5	9	1	0	117,010	-91,835	261,309	286,484
-2.5	2	1	0	125,678	-91,835	280,665	314,508
-7.5	0	1	0	134,345	-91,835	300,021	342,531
Total	8,760	6,403	2,357				

Proposed Heating System		
Output	Usage	Usage
Btuh	Btu	kwh
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
6,248	4,598,586	313
34,272	24,264,356	1,653
62,295	47,095,246	3,631
90,319	63,674,831	4,910
118,343	64,615,016	4,982
146,366	49,764,484	3,837
174,390	39,935,251	2,544
202,413	27,123,389	1,728
230,437	13,134,907	837
258,461	5,686,133	362
286,484	2,578,358	164
314,508	629,016	40
342,531	0	0
	343,099,571	25,001

Proposed Cooling System		
Output	Usage	Usage
Btuh	Btu	kWh
-172,944	-345,887	29
-151,794	-3,491,255	291
-112,283	-10,442,323	870
-94,106	-22,303,020	1,859
-75,928	-34,319,497	2,860
-57,751	-39,963,425	3,330
-39,573	-33,953,752	2,829
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	-144,819,159	12,068

System Summary		
Proposed	Usage	
System	kWh	Therms
Heating	25,001	405
Cooling	12,068	0
Vent Cooling	0	0
Lighting	126,656	0
Equipment	92,881	0
Total	256,607	405

Proposed Savings		
Estimated	kWh	Therms
Savings	1,519	-405

Notes:
1. Negative Numbers indicate heat needs to be removed from the space
2. Heating and Cooling columns determine if the building should be heating or cooling
3. Vent Power is the ventilation fan motor horse power.

This model evaluates the imporvement in the heat pump COP with the increase of heat pump loop temperature. The model calculates the heat added to the loop by the boiler and the electrical savings from the improved performance. The electrical savings comes at an additional gas cost.

Newark, NJ	
Deg F	Hours
102.5	2
97.5	23
92.5	93
87.5	237
82.5	452
77.5	692
72.5	858
67.5	753
62.5	735
57.5	671
52.5	736
47.5	708
42.5	756
37.5	705
32.5	546
27.5	340
22.5	229
17.5	134
12.5	57
7.5	22
2.5	9
-2.5	2
-7.5	0
	8760

Day Time Hours		
01 to 08	09 to 16	17 to 00
	2	0
0	19	4
1	68	24
5	160	72
41	253	158
163	274	255
306	254	298
285	227	241
258	226	251
231	215	225
259	225	252
245	225	238
266	230	260
273	199	233
229	144	173
139	93	108
104	55	70
69	25	40
34	9	14
13	4	5
5	2	2
2	0	0
0	0	0
2928	2909	2923

This page is for ease of changing weather data. If building scheduling is a factor the bin hours by day time have been included for reference.

Existing Envelope						
	Wall 1	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	24	5	2			
Width (ft)	230	3	3			
Count	2	36	14	0	0	50
R-value	19	2	2	1.5	1	
U-value	0.052632	0.5	0.5	0.6666667	1	0.5
Area	11040	540	84	0	0	624
	Wall 2	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	24	5	2			
Width (ft)	52.86	3	3	0	0	
Count	2	12	3	0	0	15
R-value	19	2	2	1	1	
U-value	0.052632	0.5	0.5	1	1	0.5
Area	2537.28	180	18	0	0	198
Total Wall Area (sqft)		**13577.28**				
Average U-value		**0.0526316**				
	Roof 1	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	230	0	0	0	0	
Width (ft)	52.86	0	0	0	0	
Count	1	0	0	0	0	0
R-value	20	1	1	1	1	
U-value	0.05	1	1	1	1	0
Area	12157.8	0	0	0	0	0
	Roof 2	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)		0	0	0	0	
Width (ft)		0	0	0	0	
Count	1	0	0	0	0	0
R-value	20	1	1	1	1	
U-value	0.05	1	1	1	1	0
Area	0	0	0	0	0	0
Total Roof Area (sqft)		**12157.8**				
Average U-value		**0.05**				
Total Window Area (sqft)		**822**				
Average U-value		**0.5**				

Proposed Envelope						
	Wall 1	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	24	5	2	0	0	
Width (ft)	230	3	3	0	0	
Count	2	36	14	0	0	50
R-value	19	2	2	1.5	1	
U-value	0.052631579	0.5	0.5	0.666666667	1	0.5
Area	11040	540	84	0	0	624
	Wall 2	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	24	5	2	0	0	
Width (ft)	52.86	3	3	0	0	
Count	2	12	3	0	0	15
R-value	19	2	2	1	1	
U-value	0.052631579	0.5	0.5	1	1	0.5
Area	2537.28	180	18	0	0	198
Total Wall Area (sqft)		**13577.28**				
Average U-value		**0.052631579**				
	Roof 1	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	230	0	0	0	0	
Width (ft)	52.86	0	0	0	0	
Count	1	0	0	0	0	0
R-value	20	1	1	1	1	
U-value	0.05	1	1	1	1	0
Area	12157.8	0	0	0	0	0
	Roof 2	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	0	0	0	0	0	
Width (ft)	0	0	0	0	0	
Count	1	0	0	0	0	0
R-value	20	1	1	1	1	
U-value	0.05	1	1	1	1	0
Area	0	0	0	0	0	0
Total Roof Area (sqft)		**12157.8**				
Average U-value		**0.05**				
Total Window Area (sqft)		**822**				
Average U-value		**0.5**				

Existing Load Summaries

Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load	Ground Loop Temp
deg F	Hours			btuh	btuh	btuh	btuh	F
102.5	2	0	1	-42,470	-91,835	-94,845	-229,150	72
97.5	23	0	1	-33,803	-91,835	-75,489	-201,127	70
92.5	93	0	1	-25,136	-91,835	-56,133	-173,103	68
87.5	237	0	1	-16,468	-91,835	-36,777	-145,079	66
82.5	452	0	1	-7,801	-91,835	-17,421	-117,056	64
77.5	692	0	1	867	-91,835	1,936	-89,032	62
72.5	858	0	1	9,534	-91,835	21,292	-61,009	60
67.5	753	1	0	4,334	-91,835	9,678	0	58
62.5	735	1	0	13,001	-91,835	29,034	0	56
57.5	671	1	0	21,669	-91,835	48,390	0	54
52.5	736	1	0	30,336	-91,835	67,747	6,248	52
47.5	708	1	0	39,003	-91,835	87,103	34,272	50
42.5	756	1	0	47,671	-91,835	106,459	62,295	48
37.5	705	1	0	56,338	-91,835	125,815	90,319	46
32.5	546	1	0	65,006	-91,835	145,171	118,343	44
27.5	340	1	0	73,673	-91,835	164,528	146,366	42
22.5	229	1	0	82,340	-91,835	183,884	174,390	40
17.5	134	1	0	91,008	-91,835	203,240	202,413	38
12.5	57	1	0	99,675	-91,835	222,596	230,437	36
7.5	22	1	0	108,343	-91,835	241,952	258,461	34
2.5	9	1	0	117,010	-91,835	261,309	286,484	32
-2.5	2	1	0	125,678	-91,835	280,665	314,508	30
-7.5	0	1	0	134,345	-91,835	300,021	342,531	28
Total	8760	6403	2357	0	0	0	0	

Existing Cooling System

System	Output	Usage	Usage
EER	Btuh	Btu	kWh
15.9	-172,944	-345,887	29
15.9	-151,794	-3,491,255	291
18.5	-112,283	-10,442,323	870
18.5	-94,106	-22,303,020	1,859
18.5	-75,928	-34,319,497	2,860
18.5	-57,751	-39,963,425	3,330
18.5	-39,573	-33,953,752	2,829
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
Existing Totals		**-144,819,159**	**12,068**

Existing Heating System

System	Output	Usage	Usage
COP	Btuh	Btu	kWh
5	0	0	0
5	0	0	0
4.6	0	0	0
4.6	0	0	0
4.6	0	0	0
4.6	0	0	0
4.6	0	0	0
4.3	0	0	0
4.3	0	0	0
4.3	0	0	0
4.3	6,248	4,598,586	313
4.3	34,272	24,264,356	1,653
3.8	62,295	47,095,246	3,631
3.8	90,319	63,674,831	4,910
3.8	118,343	64,615,016	4,982
3.8	146,366	49,764,484	3,837
3.8	174,390	39,935,251	3,079
3.5	202,413	27,123,389	2,271
3.5	230,437	13,134,907	1,100
3.5	258,461	5,686,133	476
3.5	286,484	2,578,358	216
3.5	314,508	629,016	53
3.5	342,531	0	0
Existing Totals		**343,099,571**	**26,521**

Proposed Load Summaries

Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load	Ground Loop Temp
deg F	Hours			btuh	btuh	btuh	btuh	F
102.5	2	0	1	-42,470	-91,835	-94,845	-229,150	72
97.5	23	0	1	-33,803	-91,835	-75,489	-201,127	70
92.5	93	0	1	-25,136	-91,835	-56,133	-173,103	68
87.5	237	0	1	-16,468	-91,835	-36,777	-145,079	66
82.5	452	0	1	-7,801	-91,835	-17,421	-117,056	64
77.5	692	0	1	867	-91,835	1,936	-89,032	62
72.5	858	0	1	9,534	-91,835	21,292	-61,009	60
67.5	753	1	0	4,334	-91,835	9,678	0	58
62.5	735	1	0	13,001	-91,835	29,034	0	56
57.5	671	1	0	21,669	-91,835	48,390	0	54
52.5	736	1	0	30,336	-91,835	67,747	6,248	52
47.5	708	1	0	39,003	-91,835	87,103	34,272	50
42.5	756	1	0	47,671	-91,835	106,459	62,295	48
37.5	705	1	0	56,338	-91,835	125,815	90,319	46
32.5	546	1	0	65,006	-91,835	145,171	118,343	44
27.5	340	1	0	73,673	-91,835	164,528	146,366	42
22.5	229	1	0	82,340	-91,835	183,884	174,390	40
17.5	134	1	0	91,008	-91,835	203,240	202,413	38
12.5	57	1	0	99,675	-91,835	222,596	230,437	36
7.5	22	1	0	108,343	-91,835	241,952	258,461	34
2.5	9	1	0	117,010	-91,835	261,309	286,484	32
-2.5	2	1	0	125,678	-91,835	280,665	314,508	30
-7.5	0	1	0	134,345	-91,835	300,021	342,531	28
Total	8760	6403	2357	0	0	0	0	

Proposed Cooling System

System	Output	Usage	Usage
EER	Btuh	Btu	kWh
15.9	-172,944	-345,887	29
15.9	-151,794	-3,491,255	291
18.5	-112,283	-10,442,323	870
18.5	-94,106	-22,303,020	1,859
18.5	-75,928	-34,319,497	2,860
18.5	-57,751	-39,963,425	3,330
18.5	-39,573	-33,953,752	2,829
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
21.6	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
25.3	0	0	0
Proposed Totals		**-144,819,159**	**12,068**

Proposed Heating System

System	Output	Usage	Usage	Adjusted Loop	Water Loop Usage	Water Loop Usage
COP	Btuh	Btu	kWh	F	Btu	Therms
5	0	0	0	72		
5	0	0	0	70		
4.6	0	0	0	68		
4.6	0	0	0	66		
4.6	0	0	0	64		
4.6	0	0	0	62		
4.6	0	0	0	60		
4.3	0	0	0	58		
4.3	0	0	0	56		
4.3	0	0	0	54		
4.3	6,248	4,598,586	313	52		
4.3	34,272	24,264,356	1,653	50		
3.8	62,295	47,095,246	3,631	48		
3.8	90,319	63,674,831	4,910	46		
3.8	118,343	64,615,016	4,982	44		
3.8	146,366	49,764,484	3,837	42		
4.6	174,390	39,935,251	2,544	40		
4.6	202,413	27,123,389	1,728	40	21,227,000	223
4.6	230,437	13,134,907	837	40	10,279,492	108
4.6	258,461	5,686,133	362	40	4,450,017	47
4.6	286,484	2,578,358	164	40	2,017,845	21
4.6	314,508	629,016	40	40	492,273	5
4.6	342,531	0	0	40	0	-
Existing Totals		**343,099,571**	**25,001**		38,466,627	405

kWh Saved 1,519 New Therms -405

Heating Columns			Cooling		
EWT	EAT	COP	EWT	EAT	EER
30	70	3.5	50	80/67	25.3
40	70	3.8	60	80/67	21.6
50	70	4.3	70	80/67	18.5
60	70	4.6	80	80/67	15.9
70	70	5	85	80/67	14.7
80	70	5.4	90	80/67	13.6
			100	80/67	11.5
			110	80/67	9.7

EAT = Entering Air Temperature
EWT = Entering Water Temperature

Duke Farms Foundation
(Minimum Site Wind Speed @40m - 7.0 mph)

Annual kWh	55,334
Engineer's Opinion of Probable Cost	$151,000.00

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	0.34 $/MWh
REIP Incentive	

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1000	55,334.0	$5,533.4	$19	$0	($1,107)	$4,445.5	$4,445.5
2	0.1030	55,057.3	$5,670.9	$19	$0	($1,101)	$4,588.5	$9,034.0
3	0.1061	54,782.0	$5,811.8	$19	$0	($1,096)	$4,734.8	$13,768.8
4	0.1093	54,508.1	$5,956.3	$19	$0	($1,090)	$4,884.6	$18,653.4
5	0.1126	54,235.6	$6,104.3	$18	$0	($1,085)	$5,038.0	$23,691.4
6	0.1159	53,964.4	$6,256.0	$18	$0	($1,079)	$5,195.0	$28,886.5
7	0.1194	53,694.6	$6,411.4	$18	$0	($1,074)	$5,355.8	$34,242.2
8	0.1230	53,426.1	$6,570.7	$18	$0	($1,069)	$5,520.4	$39,762.6
9	0.1267	53,159.0	$6,734.0	$18	$0	($1,063)	$5,688.9	$45,451.5
10	0.1305	52,893.2	$6,901.4	$18	$0	($1,058)	$5,861.5	$51,313.0
11	0.1344	52,628.7	$7,072.9	$18	$0	($1,053)	$6,038.2	$57,351.2
12	0.1384	52,365.6	$7,248.6	$18	$0	($1,047)	$6,219.1	$63,570.3
13	0.1426	52,103.8	$7,428.7	$18	$0	($1,042)	$6,404.4	$69,974.7
14	0.1469	51,843.2	$7,613.4	$18	$0	($1,037)	$6,594.1	$76,568.8
15	0.1513	51,584.0	$7,802.5	$18	$0	($1,032)	$6,788.4	$83,357.2
16	0.1558	51,326.1	$7,996.4	$17	$0	($1,027)	$6,987.4	$90,344.6
17	0.1605	51,069.5	$8,195.2	$17	$0	($1,021)	$7,191.1	$97,535.7
18	0.1653	50,814.1	$8,398.8	$17	$0	($1,016)	$7,399.8	$104,935.5
19	0.1702	50,560.1	$8,607.5	$17	$0	($1,011)	$7,613.5	$112,549.0
20	0.1754	50,307.3	$8,821.4	$17	$0	($1,006)	$7,832.4	$120,381.4
21	0.1806	50,055.7	$9,040.6	$17	$0	($1,001)	$8,056.5	$128,437.9
22	0.1860	49,805.4	$9,265.3	$17	$0	($996)	$8,286.1	$136,724.0
23	0.1916	49,556.4	$9,495.5	$17	$0	($991)	$8,521.2	$145,245.2
24	0.1974	49,308.6	$9,731.5	$17	$0	($986)	$8,762.1	$154,007.3
25	0.2033	49,062.1	$9,973.3	$17	$0	($981)	$9,008.8	$163,016.1

WindCad Turbine Performance Model

Endurance S-343 Wind Turbine, Grid - Intertie

Prepared For:	**Duke Farms Foundation**
Site Location:	**Duke Farms, NJ**
Data Source:	**NASA Atmospheric Science Data Center**
Date:	**3/31/2016**

35 kW

Inputs:

Ave. Wind (m/s) =	3
Weibull K =	1
Site Altitude (m) =	0
Wind Shear Exp. =	0.180
Anem. Height (m) =	42.7
Tower Height (m) =	42.7
Turbulence Factor =	2.0%

Results:

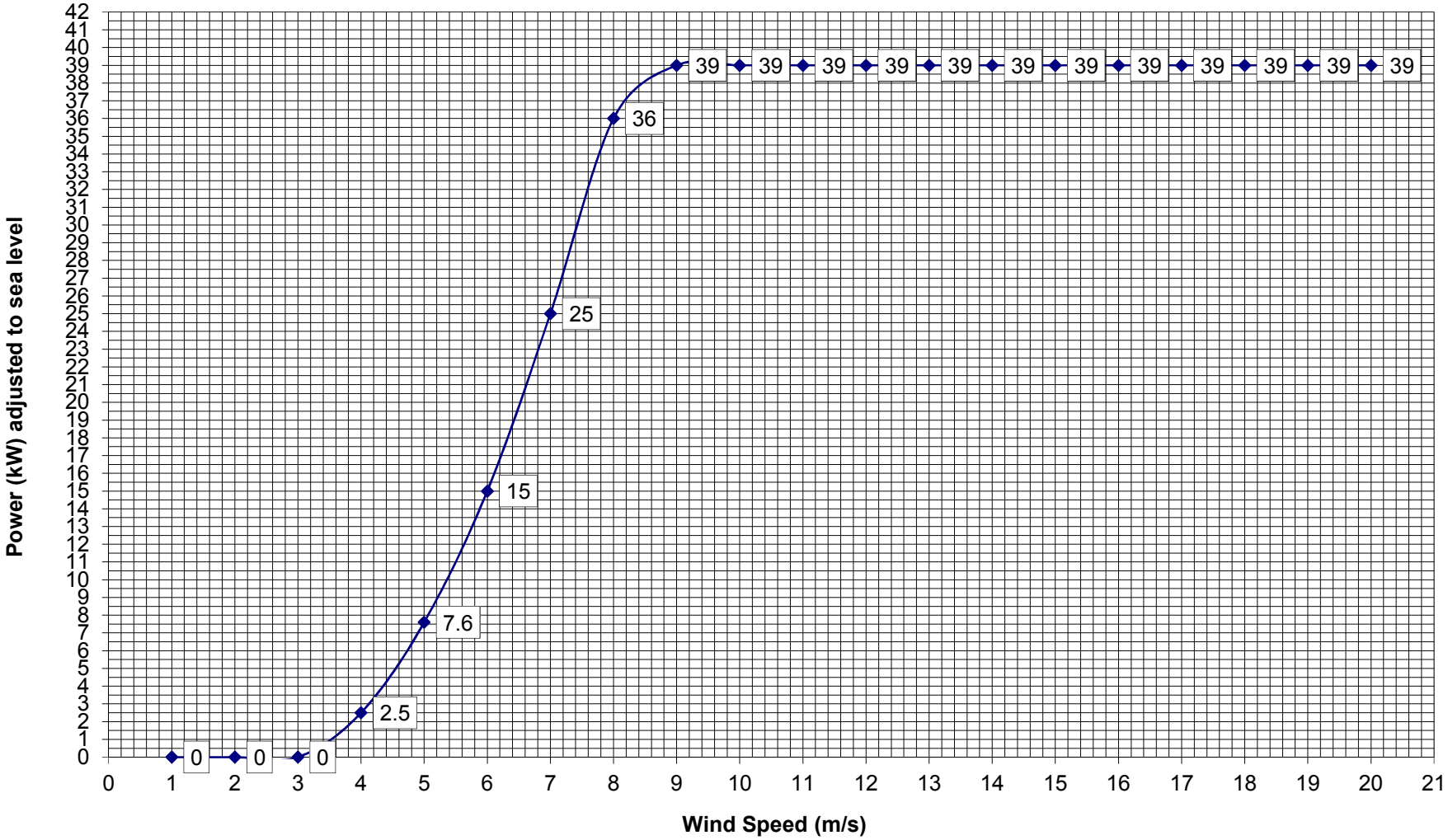
Hub Average Wind Speed (m/s) =	3.00
Air Density Factor =	0%
Average Output Power (kW) =	6.32
Daily Energy Output (kWh) =	151.6
Annual Energy Output (kWh) =	**55,334**
Monthly Energy Output =	4,611
Percent Operating Time =	35.0%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	22.05%	0.000
2	0.00	16.39%	0.000
3	0.00	12.18%	0.000
4	2.45	9.06%	0.222
5	7.45	6.73%	0.501
6	14.70	5.00%	0.735
7	24.50	3.72%	0.911
8	35.28	2.76%	0.975
9	38.22	2.05%	0.785
10	38.22	1.53%	0.584
11	38.22	1.14%	0.434
12	38.22	0.84%	0.322
13	38.22	0.63%	0.240
14	38.22	0.47%	0.178
15	38.22	0.35%	0.132
16	38.22	0.26%	0.098
17	38.22	0.19%	0.073
18	38.22	0.14%	0.054
19	38.22	0.11%	0.040
20	38.22	0.08%	0.030
2008, BWC	Totals:	85.67%	6.317

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WES Tulipo Power Curve
(Sea Level)



Bin Hour Model

Building	House 7
Address	Duke Parkway, Hillsborough, NJ
Heating Fuel	Gas
Cooling System	DX

100000

Existing Building Envelope		
Wall Area	1300	sqft
Wall Conductivity	0.1	u Value
Window Area	261	sqft
Window Conductivity	1	u Value
Roof Area	1000	sqft
Roof Conductivity	0.052631579	u Value
Floor Area	909	sqft
Volume	10908	cuft

Set Points		
Heating Set Point	70	deg F
Cooling Set Point	80	deg F

Internal Loads		
Lighting Density	0.20	w/sqft
Equipment Density	0.10	w/sqft
Occupancy	4	people
Occupant Sensible Load	150	btu/person
Infiltration	181.8	cfm
Exhaust	25	cfm
Equipment Density	0.02	therms
Building Equipment		
Heating System	140,000	Btuh
Heating Efficiency	80	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Existing Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-9,982	-3,031	-5,025	-18,038
97.5	23	0	1	-7,764	-3,031	-3,909	-14,703
92.5	93	0	1	-5,545	-3,031	-2,792	-11,368
87.5	237	0	1	-3,327	-3,031	-1,675	-8,033
82.5	451	0	1	-1,109	-3,031	-558	-4,698
77.5	693	0	1	1,109	-3,031	558	-1,363
72.5	859	0	1	3,327	-3,031	1,675	0
67.5	753	1	0	1,109	-3,031	558	0
62.5	734	1	0	3,327	-3,031	1,675	1,972
57.5	671	1	0	5,545	-3,031	2,792	5,306
52.5	737	1	0	7,764	-3,031	3,909	8,641
47.5	708	1	0	9,982	-3,031	5,025	11,976
42.5	756	1	0	12,200	-3,031	6,142	15,311
37.5	705	1	0	14,418	-3,031	7,259	18,646
32.5	545	1	0	16,636	-3,031	8,375	21,981
27.5	340	1	0	18,854	-3,031	9,492	25,316
22.5	229	1	0	21,073	-3,031	10,609	28,651
17.5	135	1	0	23,291	-3,031	11,726	31,985
12.5	57	1	0	25,509	-3,031	12,842	35,320
7.5	22	1	0	27,727	-3,031	13,959	38,655
2.5	9	1	0	29,945	-3,031	15,076	41,990
-2.5	2	1	0	32,163	-3,031	16,192	45,325
-7.5	0	1	0	34,381	-3,031	17,309	48,660
Total	8,760	6,403	2,357				

Existing Heating System			Existing Cooling System			Existing Ventilation Cooling		
Output	Usage	Usage	Output	Usage	Usage	Cooling	On Time	Usage
Btuh	Btu	therms	Btuh	Btu	kWh	Btuh	%	kWh
0	0	0	-20,614	-24,252	2	0	100	0
0	0	0	-16,803	-429,415	36	0	100	0
0	0	0	-12,992	-1,271,839	106	0	100	0
0	0	0	-9,181	-2,175,807	181	0	100	0
0	0	0	-5,369	-2,201,425	183	0	100	0
0	0	0	-1,558	-899,769	75	0	100	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
2,464	1,808,935	18	0	0	0	0	0	0
6,633	4,450,801	45	0	0	0	0	0	0
10,802	7,960,841	80	0	0	0	0	0	0
14,970	10,598,960	106	0	0	0	0	0	0
19,139	14,468,993	145	0	0	0	0	0	0
23,307	16,431,771	164	0	0	0	0	0	0
27,476	14,974,460	150	0	0	0	0	0	0
31,645	10,759,188	108	0	0	0	0	0	0
35,813	8,201,239	82	0	0	0	0	0	0
39,982	5,397,552	54	0	0	0	0	0	0
44,150	2,516,576	25	0	0	0	0	0	0
48,319	1,063,019	11	0	0	0	0	0	0
52,488	472,389	5	0	0	0	0	0	0
56,656	113,313	1	0	0	0	0	0	0
60,825	0	0	0	0	0	0	0	0
	99,218,037	992		-7,002,508	584		149,800	0

System Summary		
Existing	Usage	
System	kWh	therms
Heating	0	992
Cooling	584	0
Vent Cooling	0	0
Lighting	1,593	0
Equipment	796	131
Total	2,972	1,124
	2,930	1136
	-1%	1%

Proposed Building Envelope		
Wall Area	1300	sqft
Wall Conductivity	0.1	u Value
Window Area	261	sqft
Window Conductivity	1	u Value
Roof Area	1000	sqft
Roof Conductivity	0.052631579	u Value
Floor Area	909	sqft
Volume	10908	cuft

Set Points		
Heating Set Point	70	deg F
Cooling Set Point	80	deg F

Internal Loads		
Lighting Density	0.20	w/sqft
Equipment Density	0.10	w/sqft
Occupancy	4	people
Occupant Sensible Load	150	btu/person
Infiltration	181.8	cfm
Exhaust	25	cfm
Equipment Density	0.02	therms/sqft
Building Equipment		
Heating System	140,000	Btuh
Heating Efficiency	95	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Proposed Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-9,982	-3,031	-5,025	-18,038
97.5	23	0	1	-7,764	-3,031	-3,909	-14,703
92.5	93	0	1	-5,545	-3,031	-2,792	-11,368
87.5	237	0	1	-3,327	-3,031	-1,675	-8,033
82.5	451	0	1	-1,109	-3,031	-558	-4,698
77.5	693	0	1	1,109	-3,031	558	-1,363
72.5	859	0	1	3,327	-3,031	1,675	0
67.5	753	1	0	1,109	-3,031	558	0
62.5	734	1	0	3,327	-3,031	1,675	1,972
57.5	671	1	0	5,545	-3,031	2,792	5,306
52.5	737	1	0	7,764	-3,031	3,909	8,641
47.5	708	1	0	9,982	-3,031	5,025	11,976
42.5	756	1	0	12,200	-3,031	6,142	15,311
37.5	705	1	0	14,418	-3,031	7,259	18,646
32.5	545	1	0	16,636	-3,031	8,375	21,981
27.5	340	1	0	18,854	-3,031	9,492	25,316
22.5	229	1	0	21,073	-3,031	10,609	28,651
17.5	135	1	0	23,291	-3,031	11,726	31,985
12.5	57	1	0	25,509	-3,031	12,842	35,320
7.5	22	1	0	27,727	-3,031	13,959	38,655
2.5	9	1	0	29,945	-3,031	15,076	41,990
-2.5	2	1	0	32,163	-3,031	16,192	45,325
-7.5	0	1	0	34,381	-3,031	17,309	48,660
Total	8,760	6,403	2,357				

Proposed Heating System			Proposed Cooling System			Proposed Ventilation Cooling		
Output	Usage	Usage	Output	Usage	Usage	Cooling	On Time	Usage
Btuh	Btu	therms	Btuh	Btu	kWh	Btuh	%	kWh
0	0	0	-20,614	-24,252	2	0	100	0
0	0	0	-16,803	-429,415	36	0	100	0
0	0	0	-12,992	-1,271,839	106	0	100	0
0	0	0	-9,181	-2,175,807	181	0	100	0
0	0	0	-5,369	-2,201,425	183	0	100	0
0	0	0	-1,558	-899,769	75	0	100	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
2,075	1,523,314	15	0	0	0	0	0	0
5,586	3,748,043	37	0	0	0	0	0	0
9,096	6,703,866	67	0	0	0	0	0	0
12,607	8,925,440	89	0	0	0	0	0	0
16,117	12,184,415	122	0	0	0	0	0	0
19,627	13,837,281	138	0	0	0	0	0	0
23,138	12,610,072	126	0	0	0	0	0	0
26,648	9,060,369	91	0	0	0	0	0	0
30,159	6,906,306	69	0	0	0	0	0	0
33,669	4,545,307	45	0	0	0	0	0	0
37,179	2,119,222	21	0	0	0	0	0	0
40,690	895,174	9	0	0	0	0	0	0
44,200	397,801	4	0	0	0	0	0	0
47,711	95,421	1	0	0	0	0	0	0
51,221	0	0	0	0	0	0	0	0
	83,552,032	836		-7,002,508	584		149,800	0

System Summary		
Proposed	Usage	
System	kWh	therms
Heating	0	836
Cooling	584	0
Vent Cooling	0	0
Lighting	1,593	0
Equipment	796	131
Total	2,972	967

Proposed Savings		
Estimated	kWh	therms
Savings	0	157

Notes:

1. Negative Numbers indicate heat needs to be removed from the space
2. Heating and Cooling columns determine if the building should be heating or cooling
3. Vent Power is the ventilation fan motor horse power.

Building	House 13
Address	Duke Parkway, Hillsborough, NJ
Heating Fuel	Gas
Cooling System	DX

100000

Existing Building Envelope		
Wall Area	3000	sqft
Wall Conductivity	0.25	u Value
Window Area	363	sqft
Window Conductivity	0.8	u Value
Roof Area	1000	sqft
Roof Conductivity	0.1	u Value
Floor Area	2834	sqft
Volume	34008	cuft

Set Points		
Heating Set Point	65	deg F
Cooling Set Point	80	deg F

Internal Loads		
Lighting Density	0.10	w/sqft
Equipment Density	0.07	w/sqft
Occupancy	2	people
Occupant Sensible Load	150	btu/person
Infiltration	566.8	cfm
Exhaust	100	cfm
Equipment Density	0.02	therms
Building Equipment		
Heating System	198,000	Btuh
Heating Efficiency	82	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Existing Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-25,659	-3,944	-16,203	-45,807
97.5	23	0	1	-19,957	-3,944	-12,603	-36,504
92.5	93	0	1	-14,255	-3,944	-9,002	-27,201
87.5	237	0	1	-8,553	-3,944	-5,401	-17,898
82.5	451	0	1	-2,851	-3,944	-1,800	-8,596
77.5	693	0	1	2,851	-3,944	1,800	0
72.5	859	0	1	8,553	-3,944	5,401	0
67.5	753	0	1	14,255	-3,944	9,002	0
62.5	734	1	0	2,851	-3,944	1,800	707
57.5	671	1	0	8,553	-3,944	5,401	10,010
52.5	737	1	0	14,255	-3,944	9,002	19,312
47.5	708	1	0	19,957	-3,944	12,603	28,615
42.5	756	1	0	25,659	-3,944	16,203	37,918
37.5	705	1	0	31,361	-3,944	19,804	47,221
32.5	545	1	0	37,063	-3,944	23,405	56,523
27.5	340	1	0	42,765	-3,944	27,005	65,826
22.5	229	1	0	48,467	-3,944	30,606	75,129
17.5	135	1	0	54,169	-3,944	34,207	84,432
12.5	57	1	0	59,871	-3,944	37,808	93,734
7.5	22	1	0	65,573	-3,944	41,408	103,037
2.5	9	1	0	71,275	-3,944	45,009	112,340
-2.5	2	1	0	76,977	-3,944	48,610	121,642
-7.5	0	1	0	82,679	-3,944	52,210	130,945
Total	8,760	5,650	3,110				

Existing Heating System		
Output	Usage	Usage
Btuh	Btu	therms
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
862	632,891	6
12,207	8,190,917	82
23,552	17,357,685	174
34,897	24,706,787	247
46,241	34,958,477	350
57,586	40,598,237	406
68,931	37,567,358	376
80,276	27,293,743	273
91,620	20,981,093	210
102,965	13,900,312	139
114,310	6,515,673	65
125,655	2,764,406	28
137,000	1,232,997	12
148,344	296,689	3
159,689	0	0
	236,997,265	2,370

Existing Cooling System		
Output	Usage	Usage
Btuh	Btu	kWh
-22,857	-26,891	2
-22,857	-584,127	49
-22,857	-2,237,594	186
-20,455	-4,847,908	404
-9,824	-4,027,688	336
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	-11,724,208	977

Existing Ventilation Cooling		
Cooling	On Time	Usage
Btuh	%	kWh
0	100	0
0	100	0
0	100	0
0	100	0
0	100	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	80,500	0

System Summary		
Existing	Usage	
System	kWh	therms
Heating	0	2,370
Cooling	977	0
Vent Cooling	0	0
Lighting	2,483	0
Equipment	1,738	175
Total	5,197	2,545

	5,597	2425
	7%	-5%

Proposed Building Envelope		
Wall Area	3000	sqft
Wall Conductivity	0.25	u Value
Window Area	363	sqft
Window Conductivity	0.8	u Value
Roof Area	1000	sqft
Roof Conductivity	0.1	u Value
Floor Area	2834	sqft
Volume	34008	cuft

Set Points		
Heating Set Point	65	deg F
Cooling Set Point	80	deg F

Internal Loads		
Lighting Density	0.10	w/sqft
Equipment Density	0.07	w/sqft
Occupancy	2	people
Occupant Sensible Load	150	btu/person
Infiltration	566.8	cfm
Exhaust	100	cfm
Equipment Density	0.02	therms/sqft
Building Equipment		
Heating System	198,000	Btuh
Heating Efficiency	95	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Proposed Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-25,659	-3,944	-16,203	-45,807
97.5	23	0	1	-19,957	-3,944	-12,603	-36,504
92.5	93	0	1	-14,255	-3,944	-9,002	-27,201
87.5	237	0	1	-8,553	-3,944	-5,401	-17,898
82.5	451	0	1	-2,851	-3,944	-1,800	-8,596
77.5	693	0	1	2,851	-3,944	1,800	0
72.5	859	0	1	8,553	-3,944	5,401	0
67.5	753	0	1	14,255	-3,944	9,002	0
62.5	734	1	0	2,851	-3,944	1,800	707
57.5	671	1	0	8,553	-3,944	5,401	10,010
52.5	737	1	0	14,255	-3,944	9,002	19,312
47.5	708	1	0	19,957	-3,944	12,603	28,615
42.5	756	1	0	25,659	-3,944	16,203	37,918
37.5	705	1	0	31,361	-3,944	19,804	47,221
32.5	545	1	0	37,063	-3,944	23,405	56,523
27.5	340	1	0	42,765	-3,944	27,005	65,826
22.5	229	1	0	48,467	-3,944	30,606	75,129
17.5	135	1	0	54,169	-3,944	34,207	84,432
12.5	57	1	0	59,871	-3,944	37,808	93,734
7.5	22	1	0	65,573	-3,944	41,408	103,037
2.5	9	1	0	71,275	-3,944	45,009	112,340
-2.5	2	1	0	76,977	-3,944	48,610	121,642
-7.5	0	1	0	82,679	-3,944	52,210	130,945
Total	8,760	5,650	3,110				

Proposed Heating System		
Output	Usage	Usage
Btuh	Btu	therms
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
744	546,285	5
10,537	7,070,055	71
20,329	14,982,422	150
30,121	21,325,858	213
39,914	30,174,685	302
49,706	35,042,689	350
59,498	32,426,562	324
69,291	23,558,809	236
79,083	18,109,996	181
88,875	11,998,164	120
98,668	5,624,055	56
108,460	2,386,119	24
118,252	1,064,271	11
128,045	256,089	3
137,837	0	0
	204,566,060	2,046

Proposed Cooling System		
Output	Usage	Usage
Btuh	Btu	kWh
-22,857	-26,891	2
-22,857	-584,127	49
-22,857	-2,237,594	186
-20,455	-4,847,908	404
-9,824	-4,027,688	336
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	-11,724,208	977

Proposed Ventilation Cooling		
Cooling	On Time	Usage
Btuh	%	kWh
0	100	0
0	100	0
0	100	0
0	100	0
0	100	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
	80,500	0

System Summary		
Proposed	Usage	
System	kWh	therms
Heating	0	2,046
Cooling	977	0
Vent Cooling	0	0
Lighting	2,483	0
Equipment	1,738	175
Total	5,197	2,221

Proposed Savings		
Estimated	kWh	therms
Savings	0	324

Notes:

1. Negative Numbers indicate heat needs to be removed from the space
2. Heating and Cooling columns determine if the building should be heating or cooling
3. Vent Power is the ventilation fan motor horse power.

Building	House 21
Address	Duke Parkway, Hillsborough, NJ
Heating Fuel	Gas
Cooling System	DX

100000

Existing Building Envelope		
Wall Area	2952	sqft
Wall Conductivity	0.090909091	u Value
Window Area	363	sqft
Window Conductivity	1	u Value
Roof Area	1600	sqft
Roof Conductivity	0.25	u Value
Floor Area	3230	sqft
Volume	38760	cuft

Set Points		
Heating Set Point	65	deg F
Cooling Set Point	90	deg F

Internal Loads		
Lighting Density	0.05	w/sqft
Equipment Density	0.05	w/sqft
Occupancy	2	people
Occupant Sensible Load	150	btu/person
Infiltration	323.0	cfm
Exhaust	25	cfm
Equipment Density	0.02	therms
Building Equipment		
Heating System	198,000	Btuh
Heating Efficiency	82	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Existing Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-12,892	-3,402	-4,698	-20,992
97.5	23	0	1	-7,735	-3,402	-2,819	-13,956
92.5	93	0	1	-2,578	-3,402	-940	-6,920
87.5	237	0	1	2,578	-3,402	940	0
82.5	451	0	1	7,735	-3,402	2,819	0
77.5	693	0	1	12,892	-3,402	4,698	0
72.5	859	0	1	18,049	-3,402	6,577	0
67.5	753	0	1	23,206	-3,402	8,456	0
62.5	734	1	0	2,578	-3,402	940	116
57.5	671	1	0	7,735	-3,402	2,819	7,152
52.5	737	1	0	12,892	-3,402	4,698	14,188
47.5	708	1	0	18,049	-3,402	6,577	21,224
42.5	756	1	0	23,206	-3,402	8,456	28,260
37.5	705	1	0	28,363	-3,402	10,336	35,296
32.5	545	1	0	33,519	-3,402	12,215	42,332
27.5	340	1	0	38,676	-3,402	14,094	49,368
22.5	229	1	0	43,833	-3,402	15,973	56,404
17.5	135	1	0	48,990	-3,402	17,852	63,440
12.5	57	1	0	54,147	-3,402	19,732	70,476
7.5	22	1	0	59,303	-3,402	21,611	77,512
2.5	9	1	0	64,460	-3,402	23,490	84,548
-2.5	2	1	0	69,617	-3,402	25,369	91,584
-7.5	0	1	0	74,774	-3,402	27,248	98,620
Total	8,760	5,650	3,110				

Existing Heating System			Existing Cooling System			Existing Ventilation Cooling		
Output	Usage	Usage	Output	Usage	Usage	Cooling	On Time	Usage
Btuh	Btu	therms	Btuh	Btu	kWh	Btuh	%	kWh
0	0	0	-22,857	-26,891	2	0	100	0
0	0	0	-15,950	-407,616	34	0	100	0
0	0	0	-7,909	-774,253	65	0	100	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
141	103,485	1	0	0	0	0	0	0
8,721	5,852,125	59	0	0	0	0	0	0
17,302	12,751,580	128	0	0	0	0	0	0
25,883	18,324,823	183	0	0	0	0	0	0
34,463	26,054,049	261	0	0	0	0	0	0
43,044	30,345,694	303	0	0	0	0	0	0
51,624	28,135,106	281	0	0	0	0	0	0
60,205	20,469,550	205	0	0	0	0	0	0
68,785	15,751,781	158	0	0	0	0	0	0
77,366	10,444,353	104	0	0	0	0	0	0
85,946	4,898,927	49	0	0	0	0	0	0
94,527	2,079,585	21	0	0	0	0	0	0
103,107	927,964	9	0	0	0	0	0	0
111,688	223,375	2	0	0	0	0	0	0
120,268	0	0	0	0	0	0	0	0
	176,362,396	1,764		-1,208,760	101		11,700	0

System Summary		
Existing	Usage	
System	kWh	therms
Heating	0	1,764
Cooling	101	0
Vent Cooling	0	0
Lighting	1,415	0
Equipment	1,415	175
Total	2,930	1,939

	2,514	1759
	-17%	-10%

Proposed Building Envelope		
Wall Area	2952	sqft
Wall Conductivity	0.090909091	u Value
Window Area	363	sqft
Window Conductivity	1	u Value
Roof Area	1600	sqft
Roof Conductivity	0.038461538	u Value
Floor Area	3230	sqft
Volume	38760	cuft

Set Points		
Heating Set Point	65	deg F
Cooling Set Point	90	deg F

Internal Loads		
Lighting Density	0.05	w/sqft
Equipment Density	0.05	w/sqft
Occupancy	2	people
Occupant Sensible Load	150	btu/person
Infiltration	323.0	cfm
Exhaust	25	cfm
Equipment Density	0.02	therms/sqft
Building Equipment		
Heating System	198,000	Btuh
Heating Efficiency	82	%
Cooling System	20,000	Btuh
Cooling Efficiency	10.5	SEER
Vent Cooling	0	CFM
Vent Power	0	kW

Proposed Load Summaries							
Bin Temp	Bin	Heating	Cooling	Shell Load	Internal Load	Ventilation Load	Combined Load
deg F	Hours			btuh	btuh	btuh	btuh
102.5	1	0	1	-8,661	-3,402	-4,698	-16,762
97.5	23	0	1	-5,197	-3,402	-2,819	-11,418
92.5	93	0	1	-1,732	-3,402	-940	-6,074
87.5	237	0	1	1,732	-3,402	940	-731
82.5	451	0	1	5,197	-3,402	2,819	0
77.5	693	0	1	8,661	-3,402	4,698	0
72.5	859	0	1	12,126	-3,402	6,577	0
67.5	753	0	1	15,590	-3,402	8,456	0
62.5	734	1	0	1,732	-3,402	940	0
57.5	671	1	0	5,197	-3,402	2,819	4,613
52.5	737	1	0	8,661	-3,402	4,698	9,957
47.5	708	1	0	12,126	-3,402	6,577	15,301
42.5	756	1	0	15,590	-3,402	8,456	20,644
37.5	705	1	0	19,055	-3,402	10,336	25,988
32.5	545	1	0	22,519	-3,402	12,215	31,332
27.5	340	1	0	25,984	-3,402	14,094	36,675
22.5	229	1	0	29,448	-3,402	15,973	42,019
17.5	135	1	0	32,913	-3,402	17,852	47,363
12.5	57	1	0	36,377	-3,402	19,732	52,707
7.5	22	1	0	39,842	-3,402	21,611	58,050
2.5	9	1	0	43,306	-3,402	23,490	63,394
-2.5	2	1	0	46,771	-3,402	25,369	68,738
-7.5	0	1	0	50,235	-3,402	27,248	74,081
Total	8,760	5,650	3,110				

Proposed Heating System			Proposed Cooling System			Proposed Ventilation Cooling		
Output	Usage	Usage	Output	Usage	Usage	Cooling	On Time	Usage
Btuh	Btu	therms	Btuh	Btu	kWh	Btuh	%	kWh
0	0	0	-19,156	-22,537	2	0	100	0
0	0	0	-13,049	-333,477	28	0	100	0
0	0	0	-6,942	-679,586	57	0	100	0
0	0	0	-835	-197,873	16	0	100	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
5,626	3,774,921	38	0	0	0	0	0	0
12,143	8,949,047	89	0	0	0	0	0	0
18,659	13,210,751	132	0	0	0	0	0	0
25,176	19,033,036	190	0	0	0	0	0	0
31,693	22,343,349	223	0	0	0	0	0	0
38,209	20,824,130	208	0	0	0	0	0	0
44,726	15,206,885	152	0	0	0	0	0	0
51,243	11,734,614	117	0	0	0	0	0	0
57,760	7,797,542	78	0	0	0	0	0	0
64,276	3,663,749	37	0	0	0	0	0	0
70,793	1,557,446	16	0	0	0	0	0	0
77,310	695,788	7	0	0	0	0	0	0
83,826	167,653	2	0	0	0	0	0	0
90,343	0	0	0	0	0	0	0	0
	128,958,911	1,290		-1,233,473	103		35,400	0

System Summary		
Proposed	Usage	
System	kWh	therms
Heating	0	1,290
Cooling	103	0
Vent Cooling	0	0
Lighting	1,415	0
Equipment	1,415	175
Total	2,932	1,465

Proposed Savings		
Estimated	kWh	therms
Savings	-2	474

Notes:
1. Negative Numbers indicate heat needs to be removed from the space
2. Heating and Cooling columns determine if the building should be heating or cooling
3. Vent Power is the ventilation fan motor horse power.

Existing Envelope						
	Wall 1	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	18	5	4	1	0	
Width (ft)	164	3	3	3	0	
Count	1	17	8	4	0	29
R-value	11	1	1	1	1	
U-value	0.090909	1	1	1	1	1
Area	2952	255	96	12	0	363
	Wall 2	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	1	0	0	0	0	
Width (ft)	0	0	0	0	0	
Count	0	0	0	0	0	0
R-value	1	1	1	1	1	
U-value	1	1	1	1	1	0
Area	0	0	0	0	0	0
Total Wall Area (sqft)		**2952**				
Average U-value		**0.0909091**				
	Roof 1	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	32	0	0	0	0	
Width (ft)	50	0	0	0	0	
Count	1	0	0	0	0	0
R-value	4	1	1	1	1	
U-value	0.25	1	1	1	1	0
Area	1600	0	0	0	0	0
	Roof 2	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	1	0	0	0	0	
Width (ft)	0	0	0	0	0	
Count	0	0	0	0	0	0
R-value	1	1	1	1	1	
U-value	1	1	1	1	1	0
Area	0	0	0	0	0	0
Total Roof Area (sqft)		**1600**				
Average U-value		**0.250**				
Total Window Area (sqft)		**363**				
Average U-value		**1**				

Proposed Envelope						
	Wall 1	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	18	5	4	1	0	
Width (ft)	164	3	3	3	0	
Count	1	17	8	4	0	29
R-value	11	1	1	1	1	
U-value	0.090909091	1	1	1	1	1
Area	2952	255	96	12	0	363
	Wall 2	Window 1	Window 2	Window 3	Window 4	Wall Window Total
Height (ft)	1	0	0	0	0	
Width (ft)	0	0	0	0	0	
Count	0	0	0	0	0	0
R-value	1	1	1	1	1	
U-value	1	1	1	1	1	0
Area	0	0	0	0	0	0
Total Wall Area (sqft)		**2952**				
Average U-value		**0.090909091**				
	Roof 1	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	32	0	0	0	0	
Width (ft)	50	0	0	0	0	
Count	1	0	0	0	0	0
R-value	26	1	1	1	1	
U-value	0.038461538	1	1	1	1	0
Area	1600	0	0	0	0	0
	Roof 2	Window 1	Window 2	Window 3	Window 4	Roof Window Total
Length (ft)	1	0	0	0	0	
Width (ft)	0	0	0	0	0	
Count	0	0	0	0	0	0
R-value	1	1	1	1	1	
U-value	1	1	1	1	1	0
Area	0	0	0	0	0	0
Total Roof Area (sqft)		**1600**				
Average U-value		**0.038**				
Total Window Area (sqft)		**363**				
Average U-value		**1**				

Appendix D

Appendix D - Lighting Schedule

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Cottage 37	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$8.0
Cottage 37	001	Kitchen	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$8.0
Cottage 37	001	Bathroom 1	2 CFL Fixture 50W	2	0	100	0.1	2	2000	200	$16.0
Cottage 37	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$8.0
Cottage 37	001	Storage	2 CFL Fixture 50W	1	0	50	0.05	2	1000	50	$4.0
Cottage 37	001	Linnen Closet	2 CFL Fixture 50W	1	0	50	0.05	15	1000	50	$4.0
Cottage 37	002	Hallway	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
Cottage 37	002	Storage	2 CFL Fixture 50W	1	0	50	0.05	2	1000	50	$4.0
Cottage 37	002	Bathroom 2	1 CFL Fixture 25W	2	0	50	0.05	3	2000	100	$8.0
Cottage 37	002	Bathroom 3	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
Cottage 37	002	Table	2 CFL Fixture 50W	1	0	50	0.05	8	2000	100	$8.0
Cottage 37	002	décor	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0
Cottage 37	000	Basement	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	15	1000	240	$19.2
Cottage 37	000	Stair	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0
Cottage 37	000	Boiler Room	1x8 Fixture w/ 2-T12 Lamps w/ Magnetic Ballasts	1	0	171.2	0.1712	NR	1000	171.2	$13.7
Cottage 37	000	Closet	1X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	0	90	0.09	NR	1000	90	$7.2
Cottage 43	001	Kitchen	2 CFL Fixture 50W	2	0	100	0.1	13	2000	200	$16.0
Cottage 43	001	Rear Entry	1 CFL Fixture 25W	1	0	25	0.025	3	1000	25	$2.0
Cottage 43	001	Office	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0
Cottage 43	001	Office 2	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0
Cottage 43	002	Office 202	2 CFL Fixture 50W	1	0	50	0.05	15	2000	100	$8.0
Cottage 43	002	Office 204	2 CFL Fixture 50W	1	0	50	0.05	11	2000	100	$8.0
Cottage 43	002	Office 205	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$8.0
Cottage 43	002	Bathroom	2 CFL Fixture 50W	1	0	150	0.15	NR	2000	300	$48.0
Cottage 43	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	9	2000	50	$8.0
Cottage 43	002	Stair	2 CFL Fixture 50W	1	0	50	0.05	12	2000	100	$16.0
Cottage 43	000	Basement	1 CFL Fixture 25W	5	0	25	0.025	NR	1000	25	$4.0
Cottage 43	000	Firepump Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	0	50	0.05	25	1000	100	$16.0
House 120	001	Entry	2 CFL Fixture 50W	1	0	100	0.1	8	2000	100	$16.0
House 120	001	Bathroom 1	1 CFL Fixture 25W	3	0	50	0.05	30	2000	100	$16.0
House 120	002	Bedroom 1	300W Incandescent Fixture	1	0	25	0.025	72	2000	25	$4.0
House 120	002	Bedroom 2	300W Incandescent Fixture	1	0	175	0.175	70	2000	175	$28.0
House 120	002	Bathroom 2	65W Incandescent Fixture	2	0	130	0.13	NR	2000	260	$52.0
House 120	002	Bedroom 3	300W Incandescent Fixture	1	0	300	0.3	18	2000	600	$120.0
House 120	002	Bedroom 4	300W Incandescent Fixture	1	0	300	0.3	13	2000	600	$120.0
House 120	001	Dining Room	5 CFL Fixture 25W	1	0	125	0.125	40	2000	250	$50.0
House 120	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$20.0
House 120	001	Kitchen	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	2000	120	$24.0
House 120	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	NR	1000	175	$35.0
Cottage 45	001	Security Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	18	2000	480	$38.4
Cottage 45	001	Breakroom	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	42	2000	240	$19.2
Cottage 45	001	Pantry	1 CFL Fixture 25W	1	0	25	0.025	3	1000	25	$2.0
Cottage 45	001	Server	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	48	2000	720	$57.6
Cottage 45	001	Bathroom	3 CFL Fixture 25W	1	0	75	0.075	38	2000	150	$12.0
Cottage 45	002	Upstairs	2 CFL Fixture 50W	1	0	50	0.05	45	2000	100	$8.0

Appendix D - Lighting Schedule

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Cottage 45	002	Office	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	27	2000	240	$19.2
Cottage 45	002	Locker	2 CFL Fixture 50W	1	0	50	0.05	11	1000	50	$4.0
Cottage 45	002	Storage	3 CFL Fixture 25W	1	0	75	0.075	6	1000	75	$6.0
Cottage 45	002	Telecom	4 CFL Fixture 25W	1	0	100	0.1	18	1000	100	$8.0
Cottage 45	000	Electrical	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	28	1000	120	$9.6
Cottage 45	000	Basement	1 CFL Fixture 25W	6	0	150	0.15	5	1000	150	$12.0
House 52	001	Entry B	100W Incandescent Fixture	2	0	200	0.2	3	2000	400	$72.0
House 52	001	Kitchen B	100W Incandescent Fixture	2	0	200	0.2	NR	2000	400	$72.0
House 52	002	Stair B	150W Incandescent Fixture	1	0	150	0.15	NR	2000	300	$54.0
House 52	002	Master Bath B	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$9.0
House 52	002	Master Bath B	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	2000	120	$21.6
House 52	002	Master Closet B	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$9.0
House 52	002	Bathroom 2 B	1 CFL Fixture 25W	1	0	25	0.025	7	2000	50	$9.0
House 52	002	Bathroom 2 B	300W Incandescent Fixture	2	0	600	0.6	NR	2000	1200	$216.0
House 52	002	Bed 2 B Closet	65W Incandescent Fixture	1	0	65	0.065	NR	1000	65	$11.7
House 52	000	Basement B	1 CFL Fixture 25W	4	0	100	0.1	1	1000	100	$18.0
House 52	000	Basement B	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	1000	60	$10.8
House 52	000	Basement A	1 CFL Fixture 25W	5	0	125	0.125	8	1000	125	$22.5
House 52	001	Entry A	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$18.0
House 52	001	Kitchen A	100W Incandescent Fixture	2	0	200	0.2	17	2000	400	$72.0
House 52	002	Stair A	150W Incandescent Fixture	1	0	150	0.15	8	2000	300	$54.0
House 52	002	Master Bath A	100W Incandescent Fixture	2	0	200	0.2	NR	2000	400	$72.0
House 52	002	Master Bed A	65W Incandescent Fixture	0	0	0	0	10	2000	0	$0.0
House 52	001	Living Rm A	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 52	001	Office A	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 52	002	Bedroom B	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 52	002	Bathroom A	100W Incandescent Fixture	2	0	200	0.2	26	2000	400	$72.0
House 52	002	Bathroom A	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	30	2000	171.2	$30.8
House 59	001	Office	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 59	001	Kitchen	1 CFL Fixture 25W	2	0	50	0.05	22	2000	100	$0.0
House 59	001	Entry	2 CFL Fixture 50W	2	0	100	0.1	NR	2000	200	$0.0
House 59	001	Dining Room	5 CFL Fixture 25W	1	0	125	0.125	20	2000	250	$0.0
House 59	001	Front Office	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 59	002	Hall	2 CFL Fixture 50W	2	0	100	0.1	18	2000	200	$0.0
House 59	002	Office 1	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
House 59	002	Office 2	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 59	002	Office 3	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 59	002	Office 4	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 59	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	10	2000	50	$0.0
House 59	002	Bathroom	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$0.0
House 59	003	Attic	1 CFL Fixture 25W	3	0	75	0.075	3	1000	75	$0.0
House 59	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	7	1000	175	$0.0
House 59	000	Well	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$0.0
House 59	000	Bathroom	1 CFL Fixture 25W	2	0	50	0.05	19	1000	50	$0.0
House 59	000	File	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	NR	1000	120	$0.0
House 59	000	Boiler Room	65W Incandescent Fixture	0	0	0	0	NR	1000	0	$0.0
Shop 70	001	Wood Shop	8' T12 Fixture w/ 2-T12 Lamps	8	0	1816	1.816	33	500	908	$72.6
Shop 70	001	Wood Shop	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	NR	500	42.8	$3.4
Shop 70	001	Wood shop	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	48	500	30	$2.4
Shop 70	002	Attic	1 CFL Fixture 25W	3	0	75	0.075	15	100	7.5	$0.6
Shop 70	001	Research Storage	8' T12 Fixture w/ 2-T12 Lamps	2	0	454	0.454	47	100	45.4	$3.6
House 74	001	Kitchen	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3
House 74	001	Bathroom	150W Incandescent Fixture	1	0	150	0.15	NR	100	15	$3.2
House 74	001	Dining Room	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3
House 74	001	Lliving Room	150W Incandescent Fixture	1	0	150	0.15	NR	100	15	$3.2
House 74	002	Bathroom 1	150W Incandescent Fixture	2	0	300	0.3	NR	100	30	$6.3
House 74	002	Bedroom 1	150W Incandescent Fixture	1	0	150	0.15	12	100	15	$3.2
House 74	002	Bedroom 2	150W Incandescent Fixture	1	0	150	0.15	24	100	15	$3.2
House 74	002	Bedroom 2 closet	150W Incandescent Fixture	1	0	150	0.15	7	100	15	$3.2
House 74	002	Bedroom 3	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3
House 74	002	Bathroom 2	150W Incandescent Fixture	2	0	300	0.3	30	100	30	$6.3
House 74	002	Hallway	150W Incandescent Fixture	2	0	300	0.3	22	100	30	$6.3
House 74	003	Stairway	65W Incandescent Fixture	1	0	65	0.065	16	100	6.5	$1.4
House 74	003	Attic	65W Incandescent Fixture	1	0	65	0.065	25	100	6.5	$1.4
House 74	003	Room	150W Incandescent Fixture	1	0	150	0.15	33	100	15	$3.2
House 74	003	Attic 2	65W Incandescent Fixture	1	0	65	0.065	4	100	6.5	$1.4
House 79	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
House 79	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	22	2000	50	$7.0
House 79	001	Bathroom	2 CFL Fixture 50W	2	0	100	0.1	17	2000	200	$28.0
House 79	001	Hallway	1 CFL Fixture 25W	1	0	25	0.025	4	2000	50	$7.0
House 79	001	Livingroom	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0
House 79	001	Closet	2 CFL Fixture 50W	1	0	50	0.05	16	1000	50	$7.0
House 79	002	Hallway	1 CFL Fixture 25W	1	0	25	0.025	6	2000	50	$7.0
House 79	002	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	9	2000	100	$14.0
House 79	002	Bathroom 2	1 CFL Fixture 25W	1	0	25	0.025	9	2000	50	$7.0
House 79	002	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0
House 79	003	Attic	1 CFL Fixture 25W	3	0	75	0.075	9	1000	75	$10.5
House 79	000	Basement	1 CFL Fixture 25W	4	0	100	0.1	9	1000	100	$14.0
Orchid Range	001	Greenhouse 1	100W Incandescent Fixture	10	0	1000	1	60	2000	2000	$160.0
Orchid Range	001	Greenhouse 2	1 CFL Fixture 25W	2	0	50	0.05	60	2000	100	$8.0
Orchid Range	001	Greenhouse 3	1 CFL Fixture 25W	8	0	200	0.2	60	2000	400	$32.0
Orchid Range	001	Greenhouse 4	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse 5	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse 7	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse 8	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse 9	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse 10	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0
Orchid Range	001	Greenhouse Display	70W CFL Fixture	2	0	140	0.14	60	2000	280	$22.4
Orchid Range	001	Greenhouse Habitat	5 CFL Fixture 25W	12	0	1500	1.5	90	2000	3000	$240.0
Orchid Range	001	Workroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	49	2000	720	$57.6
Orchid Range	001	Greenhouse Entry	1 CFL Fixture 25W	1	0	25	0.025	60	2000	50	$4.0
Orchid Range	001	Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	60	2000	120	$9.6
Orchid Range	001	Eletrical	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	22	1000	240	$19.2
Orchid Range	001	Mechanical Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	1	480	0.48	28	1000	480	$38.4
Orchid Range	001	Bathroom 2	1 CFL Fixture 25W	1	1	25	0.025	25	2000	50	$4.0
Orchid Range	001	Office	2 CFL Fixture 50W	1	1	50	0.05	15	2000	100	$8.0
Orchid Range	001	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	0	96	0.096	29	2000	192	$15.4
Orchid Range	001	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	4	0	128	0.128	32	2000	256	$20.5
Building 56	001	Guard	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	0	480	0.48	43	2000	960	$76.8
Building 56	001	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
Building 56	000	Basement	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	4	1000	60	$4.8
Building 56	000	Basement	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
Building 56	000	Exterior	150W Metal Halide Wall Pack	2	0	378	0.378	NR	1000	378	$30.2
Building 56	001	Exterior	1 CFL Fixture 25W	4	0	100	0.1	NR	1000	100	$8.0
Cottage 35	001	Kitchen	1 CFL Fixture 25W	4	0	100	0.1	4	2000	200	$16.0
Cottage 35	001	Farmers Porch	2 CFL Fixture 50W	1	0	50	0.05	6	1000	50	$4.0
Cottage 35	001	Front Room	2 CFL Fixture 50W	2	0	100	0.1	11	2000	200	$16.0
Cottage 35	002	Hallway	2 CFL Fixture 50W	2	0	100	0.1	8	2000	200	$16.0
Cottage 35	002	Office	2 CFL Fixture 50W	1	0	50	0.05	18	2000	100	$8.0
Cottage 35	002	Boardroom	2 CFL Fixture 50W	1	0	50	0.05	20	2000	100	$8.0
Cottage 35	002	Back Office	2 CFL Fixture 50W	1	0	50	0.05	27	2000	100	$8.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Cottage 35	002	Hallway	1 CFL Fixture 25W	1	0	25	0.025	8	2000	50	$4.0
Cottage 35	002	Bathroom	2 CFL Fixture 50W	1	0	50	0.05	30	2000	100	$8.0
Cottage 35	002	Bathroom	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0
Cottage 35	001	Bathroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
Cottage 35	001	Bathroom 2	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
Building 39 - Farm Barn	002	Conference 2	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	1	360	0.36	16	2000	720	$57.6
Building 39 - Farm Barn	002	Conference 2	LED Par Fixture	11	1	220	0.22	NR	2000	440	$35.2
Building 39 - Farm Barn	002	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	1	96	0.096	NR	2000	192	$15.4
Building 39 - Farm Barn	002	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	5	1	160	0.16	NR	2000	320	$25.6
Building 39 - Farm Barn	002	Janitors Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	1	32	0.032	25	1000	32	$2.6
Building 39 - Farm Barn	002	Mens RR 2	1 CFL Fixture 25W	1	0	25	0.025	17	2000	50	$4.0
Building 39 - Farm Barn	002	Womens RR 2	1 CFL Fixture 25W	1	0	25	0.025	17	2000	50	$4.0
Building 39 - Farm Barn	002	Conference 2M	4 CFL Fixture 25W	6	0	600	0.6	18	2000	1200	$96.0
Building 39 - Farm Barn	002	Office 2M	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	1	64	0.064	11	2000	128	$10.2
Building 39 - Farm Barn	002	Callroom 2M	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	1	64	0.064	28	2000	128	$10.2
Building 39 - Farm Barn	002	Mech Rm. 2M	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	16	1000	240	$19.2
Building 39 - Farm Barn	002	Offices	4' T5 Fixture w/1 T5FO28 Lamp	40	1	1200	1.2	16	2000	2400	$192.0
Building 39 - Farm Barn	002	Conference 2	4' T5 Fixture w/2 T5FO28 Lamps	2	1	120	0.12	24	2000	240	$19.2
Building 39 - Farm Barn	002	Conference 2	LED Par Fixture	6	0	120	0.12	NR	2000	240	$19.2
Building 39 - Farm Barn	001	Mens RR	1 CFL Fixture 25W	2	1	50	0.05	16	2000	100	$8.0
Building 39 - Farm Barn	001	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	0	192	0.192	NR	2000	384	$30.7
Building 39 - Farm Barn	002	Womens RR	1 CFL Fixture 25W	2	1	50	0.05	18	2000	100	$8.0
Building 39 - Farm Barn	002	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	0	192	0.192	NR	2000	384	$30.7
Building 39 - Farm Barn	001	Family Rm	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	1	32	0.032	20	2000	64	$5.1
Building 39 - Farm Barn	001	Family Rm	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
Building 39 - Farm Barn	001	Entry	1 CFL Fixture 25W	4	0	100	0.1	NR	2000	200	$16.0
Building 39 - Farm Barn	001	Mech 118	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	34	1000	360	$28.8
Building 39 - Farm Barn	001	Hall	1 CFL Fixture 25W	3	0	75	0.075	NR	2000	150	$12.0
Building 39 - Farm Barn	001	Display	4' T5 Fixture w/2 T5FO28 Lamps	12	0	720	0.72	NR	2000	1440	$115.2
Building 39 - Farm Barn	001	Display	4' T5 Fixture w/1 T5FO28 Lamp	18	0	540	0.54	30	2000	1080	$86.4
Building 39 - Farm Barn	001	Display	LED Par Fixture	35	0	700	0.7	NR	2000	1400	$112.0
Building 39 - Farm Barn	001	Classroom	LED Par Fixture	8	0	160	0.16	14	2000	320	$25.6
Building 39 - Farm Barn	001	Classroom	4' T5 Fixture w/2 T5FO28 Lamps	8	0	480	0.48	NR	2000	960	$76.8
Building 39 - Farm Barn	001	Classroom	4' T5 Fixture w/1 T5FO28 Lamp	6	0	180	0.18	NR	2000	360	$28.8
Building 39 - Farm Barn	001	AV	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	20	1000	60	$4.8
Building 39 - Farm Barn	001	Mech 121	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	11	1000	120	$9.6
Building 39 - Farm Barn	001	Server	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	14	1000	60	$4.8
Building 39 - Farm Barn	001	114	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
Building 39 - Farm Barn	001	Elec	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	22	1000	60	$4.8
Building 39 - Farm Barn	001	111 Hall	1 CFL Fixture 25W	6	0	150	0.15	330	2000	300	$24.0

Appendix D - Lighting Schedule

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 39 - Farm Barn	001	Café	4' T5 Fixture w/2 T5FO28 Lamps	26	0	1560	1.56	NR	2000	3120	$249.6
Building 39 - Farm Barn	001	Cafe	4' T5 Fixture w/1 T5FO28 Lamp	10	0	300	0.3	16	2000	600	$48.0
Building 39 - Farm Barn	001	Café	LED Par Fixture	10	0	200	0.2	NR	2000	400	$32.0
Building 39 - Farm Barn	001	Kitchen	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	1	360	0.36	40	2000	720	$57.6
Building 39 - Farm Barn	001	Lobby	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	24	0	768	0.768	NR	1000	768	$61.4
Building 39 - Farm Barn	001	Lobby	4 CFL Fixture 25W	10	0	1000	1	22	2000	2000	$160.0
Building 39 - Farm Barn	001	Lobby	LED Par Fixture	17	0	340	0.34	NR	2000	680	$54.4
Building 39 - Farm Barn	001	Lobby	LED Par Fixture	2	0	40	0.04	NR	2000	80	$6.4
Building 39 - Farm Barn	001	Lobby Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	26	2000	120	$9.6
Building 39 - Farm Barn	001	Elev. Mach. Room	2 CFL Fixture 50W	1	0	50	0.05	20	1000	50	$4.0
Building 39 - Farm Barn	001	Stairway	1 CFL Fixture 25W	5	0	125	0.125	24	2000	250	$20.0
Building 39 - Farm Barn	001	Elevator	LED Par Fixture	6	0	120	0.12	30	2000	240	$19.2
Building 39 - Farm Barn	002	Stairway	1 CFL Fixture 25W	3	0	75	0.075	10	2000	150	$12.0
Building 39 - Farm Barn	002	Mechanical Room	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	0	300	0.3	10	2000	600	$48.0
Building 39 - Farm Barn	002	Hallway	2 CFL Fixture 50W	8	0	400	0.4	11	2000	800	$64.0
Building 39 - Farm Barn	002	kitchen	2 CFL Fixture 50W	2	0	100	0.1	20	2000	200	$16.0
Building 39 - Farm Barn	002	Conf. Rm	4' T5 Fixture w/2 T5FO28 Lamps	2	0	120	0.12	20	2000	240	$19.2
Building 39 - Farm Barn	002	Conf. Rm	LED Par Fixture	5	0	100	0.1	NR	2000	200	$16.0
Building 39 - Farm Barn	002	Office	4' T5 Fixture w/1 T5FO28 Lamp	46	0	1380	1.38	18	2000	2760	$220.8
Building 39 - Farm Barn	002	Office	4' T5 Fixture w/2 T5FO28 Lamps	2	0	120	0.12	NR	2000	240	$19.2
Building 26 - Conservatory	000	Boiler Room	8' T12 Fixture w/ 2-T12 Lamps	7	0	1589	1.589	6	500	794.5	$63.6
Building 26 - Conservatory	000	Boiler Room	1 CFL Fixture 25W	2	0	50	0.05	NR	500	25	$2.0
Building 26 - Conservatory	000	Breakroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	0	270	0.27	NR	500	135	$10.8
Building 26 - Conservatory	000	Stair	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	4	500	113.5	$9.1
Building 26 - Conservatory	000	Pot Storage	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	500	113.5	$9.1
Building 26 - Conservatory	000	Fountain Tunnel	1 CFL Fixture 25W	4	0	100	0.1	NR	500	50	$4.0
Building 26 - Conservatory	000	electrical room	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	43	500	113.5	$9.1
Building 26 - Conservatory	000	Chemical	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	NR	500	42.8	$3.4
Building 26 - Conservatory	000	Tank Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	500	85.6	$6.8
Building 26 - Conservatory	001	Mens RR	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	80	2000	480	$38.4
Building 26 - Conservatory	001	Potting Shed	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	NR	2000	1362	$109.0
Building 26 - Conservatory	001	Potting Shed	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	13	2000	342.4	$27.4
Building 26 - Conservatory	001	Womens RR	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	0	180	0.18	NR	2000	360	$28.8
Building 26 - Conservatory	001	Office	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	44	2000	720	$57.6
Building 26 - Conservatory	001	Grow Garden	1 CFL Fixture 25W	43	0	1075	1.075	NR	500	537.5	$43.0
Building 26 - Conservatory	001	Grow Lamp	1000W High Bay Fixture	6	0	2748	2.748	NR	500	1374	$109.9
Building 26 - Conservatory	001	Grow Garden	1 CFL Fixture 25W	36	0	900	0.9	NR	500	450	$36.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 26 - Conservatory	001	Grow Lamp	1000W High Bay Fixture	12	0	5496	5.496	NR	500	2748	$219.8
Building 26 - Conservatory	001	Garage	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	21	500	85.6	$6.8
Motorpool	001	Garage	8' T12 Fixture w/ 2-T12 Lamps	12	0	2724	2.724	36	500	1362	$109.0
Motorpool	001	Wash Bay	8' T12 Fixture w/ 2-T12 Lamps	2	1	454	0.454	27	500	227	$18.2
Motorpool	001	Office	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	1	240	0.24	102	2000	480	$38.4
Motorpool	001	Bathroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	1	90	0.09	73	2000	180	$14.4
Motorpool	001	Compressor room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	1	90	0.09	84	500	45	$3.6
Motorpool	001	Exterior	2 CFL Fixture 50W	2	0	100	0.1	NR	1000	100	$8.0
Motorpool	001	Exterior	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2
Motorpool	001	Exterior	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0
PS 05 - Interior	002	209	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	0	608.4	0.6084	24	2160	1314.144	#N/A
House 87	000	Basement	1 CFL Fixture 25W	8	0	200	0.2	10	1000	200	$54.0
House 87	001	Entry	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$27.0
House 87	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	8	2000	100	$27.0
House 87	001	kitchen	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	50.7	0.0507	21	2000	101.4	$27.4
House 87	001	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	12	2000	50	$13.5
House 87	001	Living	4 CFL Fixture 25W	1	0	100	0.1	10	2000	200	$54.0
House 87	002	Stair	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$27.0
House 87	002	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$27.0
House 87	002	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	4	2000	100	$27.0
House 87	002	Bedroom 3	2 CFL Fixture 50W	1	0	50	0.05	6	2000	100	$27.0
House 87	002	Bathroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$27.0
House 87	002	Bathroom 2	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$27.0
House 87	003	room	1 CFL Fixture 25W	7	0	175	0.175	10	2000	350	$94.5
House 47	000	Basement	1 CFL Fixture 25W	18	0	450	0.45	15	1000	450	$36.0
House 47	000	Basement	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	16	1000	240	$19.2
House 47	001	Hall	Circline FC8T9 Fixture	4	0	104	0.104	19	2000	208	$16.6
House 47	001	kitchen	Circline FC8T9 Fixture	2	0	52	0.052	NR	2000	104	$8.3
House 47	001	kitchen	75W Halogen Fixture	4	0	300	0.3	NR	2000	600	$48.0
House 47	001	Living	1 CFL Fixture 25W	5	0	125	0.125	18	2000	250	$20.0
House 47	001	Living	2 CFL Fixture 50W	2	0	100	0.1	6	2000	200	$16.0
House 47	001	Bath	1 CFL Fixture 25W	1	0	25	0.025	6	2000	50	$4.0
House 47	001	Dining	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
House 47	001	office	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0
House 47	001	stair	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
House 47	002	stair	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0
House 47	002	hall	1 CFL Fixture 25W	3	0	75	0.075	12	2000	150	$12.0
House 47	002	Bedroom 1	1 CFL Fixture 25W	1	0	25	0.025	3	2000	50	$4.0
House 47	002	Bathroom 1	1 CFL Fixture 25W	1	0	25	0.025	32	2000	50	$4.0
House 47	002	Bathroom 1	4W CFL Candlabra	6	0	24	0.024	NR	2000	48	$3.8
House 47	002	Bathroom 2	4 CFL Fixture 25W	1	0	100	0.1	54	2000	200	$16.0
House 47	002	Bathroom 2	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
House 47	002	Bedroom 2	65W Incandescent Fixture	0		0	0	NR	2000	0	$0.0
House 47	002	Bedroom 3	1 CFL Fixture 25W	1	0	25	0.025	5	2000	50	$4.0
House 47	002	Bedroom 3 closet	Circline FC8T9 Fixture	2	0	52	0.052	14	1000	52	$4.2
House 47	002	Bathroom 3	2 CFL Fixture 50W	3	0	150	0.15	32	2000	300	$24.0
House 47	003	Storage	3 CFL Fixture 25W	1	0	75	0.075	4	1000	75	$6.0
House 47	003	Storage	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0
House 47	003	Attic	1 CFL Fixture 25W	2	0	50	0.05	1	500	25	$2.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 5 - Pumphouse	001	Pump Room	70W CFL Fixture	10	0	700	0.7	26	2160	1512	$121.0
Building 5 - Pumphouse	001	Office	1 CFL Fixture 25W	1	0	25	0.025	18	2160	54	$4.3
Building 5 - Pumphouse	001	Garage	100W Incandescent Fixture	1	0	100	0.1	2	10	1	$0.1
House 7	001	Kitchen	2 CFL Fixture 50W	3	0	150	0.15	19	2000	300	$24.0
House 7	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 7	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$8.0
House 7	001	Sun Porch	1 CFL Fixture 25W	1	0	25	0.025	23	1000	25	$2.0
House 7	001	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$8.0
House 7	001	Closet 1	2 CFL Fixture 50W	2	0	100	0.1	8	1000	100	$8.0
House 7	001	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$8.0
House 7	001	Closet 2	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
House 7	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	14	1000	175	$14.0
House 8	001	Kitchen	1 CFL Fixture 25W	4	0	100	0.1	7	2000	200	$16.0
House 8	001	Dining Room	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
House 8	001	Entry	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
House 8	001	Hallway	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
House 8	001	Bedroom 1	3 CFL Fixture 25W	1	0	75	0.075	10	2000	150	$12.0
House 8	001	Closet 1	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0
House 8	001	Bedroom 2	3 CFL Fixture 25W	1	0	75	0.075	10	2000	150	$12.0
House 8	001	Closet 2	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
House 8	001	Living Room	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0
House 8	000	Basement	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	18	1000	240	$19.2
House 8	000	Boiler Room	1 CFL Fixture 25W	1	0	25	0.025	5	1000	25	$2.0
House 9	001	Kitchen	2 CFL Fixture 50W	3	0	150	0.15	19	2000	300	$48.0
House 9	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$8.0
House 9	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$16.0
House 9	001	Sun Porch	1 CFL Fixture 25W	1	0	25	0.025	23	1000	25	$4.0
House 9	001	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$16.0
House 9	001	Closet 1	2 CFL Fixture 50W	2	0	100	0.1	8	1000	100	$16.0
House 9	001	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$16.0
House 9	001	Closet 2	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$4.0
House 9	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	14	1000	175	$28.0
House 10	001	Mudroom	1 CFL Fixture 25W	2	0	50	0.05	9	1000	50	$4.0
House 10	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	12	2000	100	$8.0
House 10	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0
House 10	001	Hallway	2 CFL Fixture 50W	1	0	50	0.05	14	1000	50	$4.0
House 10	001	Bathroom	1 CFL Fixture 25W	2	0	50	0.05	24	2000	100	$8.0
House 10	001	Den	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$8.0
House 10	001	Bedroom 1	2 CFL Fixture 50W	1		50	0.05	12	2000	100	$8.0
House 10	002	Bedroom 2	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$8.0
House 10	002	Bedroom 3	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$8.0
House 10	000	Basement	1 CFL Fixture 25W	6	0	150	0.15	5	1000	150	$12.0
Building 12 - Coach Barn	003	Clock Tower	1 CFL Fixture 25W	3	0	75	0.075	4	1000	75	$6.0
Building 12 - Coach Barn	002	Research Offices	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	12	2000	1362	$109.0
Building 12 - Coach Barn	002	HALL	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	0	256.8	0.2568	14	2000	513.6	$41.1
Building 12 - Coach Barn	002	Kitchen	1 CFL Fixture 25W	4	0	100	0.1	NR	2000	200	$16.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 12 - Coach Barn	002	Office 4	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	48	2000	240	$19.2
Building 12 - Coach Barn	002	Office 3	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	NR	2000	240	$19.2
Building 12 - Coach Barn	002	Office 5	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	112	0.112	22	2000	224	$17.9
Building 12 - Coach Barn	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
Building 12 - Coach Barn	002	Bathroom	4W CFL Candlabra	4	0	16	0.016	NR	2000	32	$2.6
Building 12 - Coach Barn	002	Office 1	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	NR	2000	240	$19.2
Building 12 - Coach Barn	001	Restroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
Building 12 - Coach Barn	000	Exterior Wall	150W Metal Halide Wall Pack	9	0	1701	1.701	NR	2000	3402	$272.2
Building 12 - Coach Barn	000	Exterior Entry	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
Building 12 - Coach Barn	002	Loft	1 CFL Fixture 25W	4	0	100	0.1	4	2000	200	$16.0
Building 12 - Coach Barn	002	Loft Entry	1 CFL Fixture 25W	3	0	75	0.075	NR	2000	150	$12.0
Building 12 - Coach Barn	000	Parts	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	6	1000	171.2	$13.7
Building 12 - Coach Barn	000	Parts	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2
Building 12 - Coach Barn	000	Parts	1 CFL Fixture 25W	5	0	125	0.125	NR	1000	125	$10.0
Building 12 - Coach Barn	000	Tile	1 CFL Fixture 25W	2	0	50	0.05	13	1000	50	$4.0
Building 12 - Coach Barn	000	Paint Room	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2
Building 12 - Coach Barn	000	Paint Room	1 CFL Fixture 25W	3	0	75	0.075	NR	1000	75	$6.0
Building 12 - Coach Barn	000	Hall	1 CFL Fixture 25W	3	0	75	0.075	NR	2000	150	$12.0
Building 12 - Coach Barn	000	Hall	8' T12 Fixture w/ 1-T12 Lamp	3	0	336	0.336	NR	2000	672	$53.8
Building 12 - Coach Barn	000	Glass	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	15	1000	227	$18.2
Building 12 - Coach Barn	000	Glass	8' T12 Fixture w/ 1-T12 Lamp	1	0	112	0.112	NR	1000	112	$9.0
Building 12 - Coach Barn	000	Electrical	1 CFL Fixture 25W	3	0	75	0.075	10	1000	75	$6.0
Building 12 - Coach Barn	000	Electrical	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2
Building 12 - Coach Barn	000	Electrical	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	0	342.4	0.3424	NR	1000	342.4	$27.4
Building 12 - Coach Barn	000	Electrical Closet	1 CFL Fixture 25W	3	0	75	0.075	13	1000	75	$6.0
Building 12 - Coach Barn	000	Boiler Room	1 CFL Fixture 25W	2	0	50	0.05	12	1000	50	$4.0
Building 12 - Coach Barn	000	Boiler Room	8' T12 Fixture w/ 1-T12 Lamp	1	0	112	0.112	11	1000	112	$9.0
Building 12 - Coach Barn	000	Wood Shop	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	2000	342.4	$27.4
Building 12 - Coach Barn	000	Wood Shop	8' T12 Fixture w/ 1-T12 Lamp	2	0	224	0.224	NR	2000	448	$35.8

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 12 - Coach Barn	000	Wood Shop	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	2000	454	$36.3
Building 12 - Coach Barn	000	Wood Shop	1 CFL Fixture 25W	4	0	100	0.1	NR	2000	200	$16.0
Building 12 - Coach Barn	001	Conference Room	1 CFL Fixture 25W	51	0	1275	1.275	7	2000	2550	$204.0
Building 12 - Coach Barn	001	Conference Room	LED 20 watt Surface	2	0	40	0.04	NR	2000	80	$6.4
Building 12 - Coach Barn	001	Conference Room	LED Par Fixture	2	0	40	0.04	NR	2000	80	$6.4
Building 12 - Coach Barn	001	Payment Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	1	513.6	0.5136	18	2000	1027.2	$82.2
Building 12 - Coach Barn	001	Lobby	1 CFL Fixture 25W	11	0	275	0.275	33	2000	550	$44.0
Building 12 - Coach Barn	001	Duke Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	2000	342.4	$27.4
Building 12 - Coach Barn	001	Restroom	1 CFL Fixture 25W	2	0	50	0.05	9	2000	100	$8.0
Building 12 - Coach Barn	001	Court	1 CFL Fixture 25W	21	0	525	0.525	NR	2000	1050	$84.0
Building 12 - Coach Barn	001	Court	1 CFL Fixture 25W	28	0	700	0.7	NR	2000	1400	$112.0
Building 12 - Coach Barn	000	Garage	8' T12 Fixture w/ 1-T12 Lamp	3	0	336	0.336	6	2000	672	$53.8
Building 12 - Coach Barn	000	Garage	8' T12 Fixture w/ 2-T12 Lamps	4	0	908	0.908	NR	2000	1816	$145.3
Building 12 - Coach Barn	000	Garage	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$8.0
Building 12 - Coach Barn	000	Wash Station	70W CFL Fixture	4	0	280	0.28	20	2000	560	$44.8
Building 12 - Coach Barn	000	Stables	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	4	2000	1362	$109.0
Building 12 - Coach Barn	000	Stables	1 CFL Fixture 25W	7	0	175	0.175	NR	2000	350	$28.0
House 13	001	Kitchen	Circline FC12T9/FC8T9 Fixture	1	0	62	0.062	13	2000	124	$9.9
House 13	001	Kitchen	1 CFL Fixture 25W	3	0	75	0.075	NR	2000	150	$12.0
House 13	000	Basement	1 CFL Fixture 25W	8	0	200	0.2	6	1000	200	$16.0
House 13	001	Dining Room	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0
House 13	001	Entry	1 CFL Fixture 25W	1	0	25	0.025	3	2000	50	$4.0
House 13	001	Living Room	3 CFL Fixture 25W	1	0	75	0.075	5	2000	150	$12.0
House 13	001	Bedroom 1	1 CFL Fixture 25W	2	0	50	0.05	6	2000	100	$8.0
House 13	001	Bathroom 1	1 CFL Fixture 25W	2	0	50	0.05	5	2000	100	$8.0
House 13	002	Hallway	2 CFL Fixture 50W	1	0	50	0.05	3	1000	50	$4.0
House 13	002	Bedroom 2	1 CFL Fixture 25W	2	0	50	0.05	3	2000	100	$8.0
House 13	002	Bedroom 3	1 CFL Fixture 25W	2	0	50	0.05	19	2000	100	$8.0
House 13	002	Bedroom 4	1 CFL Fixture 25W	2	0	50	0.05	4	2000	100	$8.0
House 13	002	Bathroom 2	2 CFL Fixture 50W	3	0	150	0.15	17	2000	300	$24.0
Shop 18	000	Exterior	150W Metal Halide Wall Pack	2	0	378	0.378	NR	2000	756	$60.5
Shop 18	001	Tool Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	43	2000	342.4	$27.4
Shop 18	001	Shop	8' T12 Fixture w/ 2-T12 Lamps	4	0	908	0.908	33	2000	1816	$145.3
Shop 18	001	Bathroom	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	43	2000	240	$19.2
Shop 18	001	Garage	8' T12 Fixture w/ 2-T12 Lamps	6	0	1362	1.362	22	2000	2724	$217.9

Appendix D - Lighting Schedule

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Shop 18	002	Loft	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$8.0
Shop 18	002	Loft	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	5	2000	1362	$109.0
Garage 19	001	Tractor Storage	8' T12 Fixture w/ 2-T12 Lamps	2	0	454	0.454	37	1000	454	$36.3
Garage 19	001	Garden Shed	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2
Garage 19	001	Garden Shed	1 CFL Fixture 25W	2	0	50	0.05	11	1000	50	$4.0
Garage 19	000	Exterior	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
House 21	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	20	2000	50	$4.0
House 21	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
House 21	001	Kitchen	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1		120	0.12	NR	2000	240	$19.2
House 21	001	Office 1	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	18	2000	480	$38.4
House 21	001	Office 1	1x8 Fixture w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	NR	2000	240	$19.2
House 21	001	Office 2	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	NR	2000	240	$19.2
House 21	001	Office 2	4W CFL Candlabra	4	0	16	0.016	13	2000	32	$2.6
House 21	001	Office 3	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	0	90	0.09	16	2000	180	$14.4
House 21	002	Office 4	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	28	2000	120	$9.6
House 21	002	Office 4	1 CFL Fixture 25W	1	0	25	0.025	30	2000	50	$4.0
House 21	002	Office 5	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	29	2000	240	$19.2
House 21	002	Office 6	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	38	2000	240	$19.2
House 21	002	Office 7	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	0	90	0.09	32	2000	180	$14.4
House 21	002	Office 8	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	43	2000	480	$38.4
House 21	002	Bath 1	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 21	002	Bath 1	4W CFL Candlabra	2	0	8	0.008	NR	2000	16	$1.3
House 21	002	Bath 2	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 21	002	Bath 2	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	2000	120	$9.6
House 21	003	Attic	1 CFL Fixture 25W	3	0	75	0.075	NR	1000	75	$6.0
House 21	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	NR	1000	175	$14.0
House 21	000	Exterior	1 CFL Fixture 25W	4	0	100	0.1	NR	2000	200	$16.0
Building 23	001	Entry	4W CFL Candlabra	10	0	40	0.04	3	2000	80	$6.4
Building 23	001	Bathroom 1	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	1	60	0.06	NR	2000	120	$9.6
Building 23	001	Bathroom 2	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	1	60	0.06	NR	2000	120	$9.6
Building 23	001	Janitor	42W CFL Fixture	1	1	49	0.049	NR	1000	49	$3.9
Building 23	001	Reception	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	0	180	0.18	22	2000	360	$28.8
Building 23	001	Hallway 1	2 CFL Fixture 50W	2	0	100	0.1	NR	2000	200	$16.0

Appendix D - Lighting Schedule

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 23	001	Breakroom	Circline FC12T9/FC8T9 Fixture	4	0	248	0.248	24	2000	496	$39.7
Building 23	001	Office 1	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	1	120	0.12	12	2000	240	$19.2
Building 23	001	Kichenette	2 CFL Fixture 50W	2	1	100	0.1	20	2000	200	$16.0
Building 23	001	Kichenette	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	1	60	0.06	14	2000	120	$9.6
Building 23	001	Hallway 2	1 CFL Fixture 25W	9	0	225	0.225	10	2000	450	$36.0
Building 23	001	Hallway 3	50W Track Lighting	12	0	600	0.6	NR	2000	1200	$96.0
Building 23	001	Men's Bathroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	10	1	320	0.32	22	2000	640	$51.2
Building 23	001	Women's Bathroom	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	11	0	352	0.352	24	2000	704	$56.3
Building 23	001	Conference	2 CFL Fixture 50W	2	1	100	0.1	11	2000	200	$16.0
Building 23	001	Server	2 CFL Fixture 50W	2	0	100	0.1	11	2000	200	$16.0
Building 23	001	Archives 1	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	10	0	507	0.507	15	2000	1014	$81.1
Building 23	001	Office Supply	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	23	2000	120	$9.6
Building 23	001	Archives 2	3 CFL Fixture 25W	2	0	150	0.15	NR	2000	300	$24.0
Building 23	002	Office 2	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	0	480	0.48	37	2000	960	$76.8
Building 23	002	Kitchen	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	105	2000	120	$9.6
Building 23	002	Office 3	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	22	2000	240	$19.2
Building 23	002	Bathroom 2	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$8.0
Building 24	001	Porch	26W CFL Fixture	1	0	26	0.026	NR	2000	52	$4.2
Building 24	001	Entry	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	50	2000	480	$38.4
Building 24	001	Office 1	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	15	2000	480	$38.4
Building 24	001	Kitchenette	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	41	2000	480	$38.4
Building 24	001	Office 2	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	31	2000	480	$38.4
Building 24	002	Stair	1 CFL Fixture 25W	2	0	50	0.05	11	2000	100	$8.0
Building 24	002	Office 3	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	55	2000	480	$38.4
Building 24	002	Closet	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0
Building 24	002	Office 4	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	92	2000	240	$19.2
Building 24	002	Office 5	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	41	2000	240	$19.2
Building 24	002	Stair 2	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	43	2000	120	$9.6
Building 24	002	Server	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	11	2000	171.2	$13.7
Building 24	002	Bathroom 1	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
Building 24	002	Bathroom 1	5 CFL Fixture 25W	1	0	125	0.125	10	2000	250	$20.0

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Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost
Building 24	002	Office 6	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	0	360	0.36	55	2000	720	$57.6
Building 24	002	Bathroom 2	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0
Building 24	001	Office 7	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	26	2000	480	$38.4
Building 24	001	Copy	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	28	2000	240	$19.2
Building 24	000	Basement	1 CFL Fixture 25W	11	0	275	0.275	NR	1000	275	$22.0
Building 24	000	Exterior	150W Metal Halide Wall Pack	3	0	567	0.567	NR	2000	1134	$90.7
House 27	001	entry	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 27	001	kitchen	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
House 27	001	Dining Room	5 CFL Fixture 25W	5	0	625	0.625	NR	2000	1250	$100.0
House 27	002	Bathroom	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0
House 27	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 27	002	Hall	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
House 27	000	Basement	1 CFL Fixture 25W	5	0	125	0.125	NR	1000	125	$10.0
House 29	001	entry	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 29	001	kitchen	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0
House 29	001	Dining Room	5 CFL Fixture 25W	5	0	625	0.625	NR	2000	1250	$100.0
House 29	002	Bathroom	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0
House 29	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0
House 29	002	Hall	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
House 29	000	Basement	1 CFL Fixture 25W	5	0	125	0.125	NR	1000	125	$10.0
House 30	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	4	2000	100	$8.0
House 30	001	Dining Room	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0
House 30	001	Pantry	1 CFL Fixture 25W	1	0	25	0.025	6	1000	25	$2.0
House 30	000	Basement Stairwell	1 CFL Fixture 25W	1	0	25	0.025	4	1000	25	$2.0
House 30	001	Basement	1 CFL Fixture 25W	5	0	125	0.125	11	1000	125	$10.0
House 30	001	Kitchen	26W CFL Fixture	3	0	78	0.078	16	2000	156	$12.5
House 30	002	Bedroom 1	26W CFL Fixture	2	0	52	0.052	NR	2000	104	$8.3
House 30	001	Living Room	65W Incandescent Fixture	0		0	0	NR	2000	0	$0.0
House 30	002	Bedroom 2	65W Incandescent Fixture	0		0	0	NR	2000	0	$0.0
House 30	002	Bedroom 3	26W CFL Fixture	1	0	26	0.026	NR	2000	52	$4.2
House 30	002	Study	26W CFL Fixture	1	0	26	0.026	NR	2000	52	$4.2
House 30	002	Bathroom	26W CFL Fixture	1	0	26	0.026	NR	2000	52	$4.2
House 30	002	Bathroom	4W CFL Candlabra	2	0	8	0.008	NR	2000	16	$1.3

Location	Base Cost	Incentives	Table Cost	Annual Savings	Simple Payback	AROI	IRR	NPV	kWh Savings	Lifetime Savings
Building 5 - Pumphouse	$280	$0	$280	$35	8.1	5.7%	11.7%	$223	432	$643
House 7	$390	$0	$390	$30	12.8	1.1%	4.7%	$53	250	$565
House 8	$90	$0	$90	$10	8.7	4.9%	10.6%	$61	130	$193
House 9	$390	$0	$390	$30	12.8	1.1%	4.7%	$53	130	$565
House 10	$100	$0	$100	$8	12.5	1.3%	5.0%	$17	100	$149
Building 12 - Coach Barn	$7,980	$1,090	$6,890	$590	11.7	1.9%	6.0%	$53	7,371	$10,968
House 13	$108	$0	$108	$11	9.6	3.7%	8.8%	$55	140	$208
Shop 18	$4,118	$275	$3,843	$309	12.4	1.4%	5.1%	$663	3,868	$5,755
Garage 19	$20	$0	$20	$2	12.5	1.3%	5.0%	$3	20	$30
House 21	$1,256	$50	$1,206	$81	15.0	0.0%	2.7%	$32	1,008	$1,500
Building 23	$164	$0	$164	$14	11.4	2.1%	6.3%	$46	180	$268
Building 24	$3,196	$425	$2,771	$206	13.4	0.8%	4.1%	$236	2,581	$3,841
Building 26 - Conservatory	$552	$25	$527	$93	5.7	10.9%	18.5%	$825	1,160	$1,727
House 27	$198	$0	$198	$28	7.1	7.5%	14.1%	$210	350	$521
House 29	$198	$0	$198	$28	7.1	7.5%	14.1%	$210	350	$521
House 30	$40	$0	$40	$3	12.5	1.3%	5.0%	$7	40	$60
Cottage 35	$226	$0	$226	$20	11.3	2.2%	6.5%	$65	250	$372
Cottage 37	$266	$5	$261	$20	12.9	1.1%	4.6%	$34	253	$377
Building 39 - Farm Barn	$854	$0	$854	$88	9.7	3.6%	8.7%	$428	970	$1,637
Cottage 43	$140	$0	$140	$11	12.5	1.3%	5.0%	$23	140	$208
Motorpool	$1,770	$70	$1,700	$349	4.9	13.8%	21.9%	$3,378	4,358	$6,485
Cottage 45	$344	$10	$334	$23	14.2	0.4%	3.3%	$3,378	293	$436
House 47	$214	$0	$214	$20	10.5	2.9%	7.5%	$83	255	$379
House 52	$716	$15	$701	$588	1.2	77.2%	86.9%	$7,866	3,268	$10,941
Building 56	$512	$20	$492	$33	14.8	0.1%	2.8%	$7	416	$619
House 74	$292	$0	$292	$50	5.9	10.3%	17.7%	$430	236	$922
House 79	$212	$0	$212	$24	8.9	4.6%	10.1%	$135	170	$443
House 87	$588	$5	$583	$100	5.8	10.6%	18.0%	$880	372	$1,868
Orchid Range	$498	$0	$498	$176	2.8	28.7%	37.9%	$2,065	2,200	$3,273
House 120	$362	$5	$357	$261	1.4	66.4%	76.0%	$3,444	1,305	$4,854
Total	$26,075	$1,995	$24,080	$3,244	7.4				32,598	$60,328

Location	kW	kWh Savings
Building 5 - Pumphouse	0	432
House 7	0	250
House 8	0	130
House 9	0	130
House 10	0	100
Building 12 - Coach Barn	3	7,371
House 13	0	140
Shop 18	2	3,868
Garage 19	0	20
House 21	1	1,008
Building 23	0	180
Building 24	1	2,581
Building 26 - Conservatory	15	1,160
House 27	0	350
House 29	0	350
House 30	0	40
Cottage 35	1	250
Cottage 37	1	253
Building 39 - Farm Barn	7	970
Cottage 43	0	140
Motorpool	4	4,358
Cottage 45	1	293
House 47	2	255
House 52	3	3,268
Building 56	1	416
House 74	3	236
House 79	0	170
House 87	1	372
Orchid Range	5	2,200
House 120	1	1,305
Total	52	32,598

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
Building 5 - Pumphouse	001	Pump Room	70W CFL Fixture	10	0	700	0.7	26	2160	1512	$121.0	50W LED Fixture	10	500	0.5	2160	2160	1080	1080	None Proposed	0	0.2	432	34.6	$0.0	$10.0	$18.0	$0.0	$0.0	$18.0	$10.0	$28.0	$180.0	$100.0	$280.0	$0
House 7	001	Kitchen	2 CFL Fixture 50W	3	0	150	0.15	19	2000	300	$24.0	2 screw-in LED 40W	3	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	4.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$36.0	$24.0	$60.0	$0
House 7	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 7	001	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 7	001	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 8	001	Dining Room	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 8	001	Bedroom 1	3 CFL Fixture 25W	1	0	75	0.075	10	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 8	001	Bedroom 2	3 CFL Fixture 25W	1	0	75	0.075	10	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 8	001	Living Room	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0	4 screw-in LED 80W	1	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
House 9	001	Kitchen	2 CFL Fixture 50W	3	0	150	0.15	19	2000	300	$48.0	2 screw-in LED 40W	3	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	9.6	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$60.0	$60.0	$120.0	$0
House 9	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$8.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.6	$0.0	$10.0	$20.0	$0.0	$0.0	$20.0	$10.0	$30.0	$20.0	$10.0	$30.0	$0
House 9	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
House 9	001	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
House 9	001	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
House 10	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	12	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 10	001	Living Room	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 10	001	Den	2 CFL Fixture 50W	1	0	50	0.05	10	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 10	001	Bedroom 1	2 CFL Fixture 50W	1		50	0.05	12	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 10	002	Bedroom 3	2 CFL Fixture 50W	1	0	50	0.05	16	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Building 12 - Coach Barn	002	Research Offices	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	12	2000	1362	$109.0	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	304.2	0.3042	2000	1400	608.4	425.88	Ceiling Mounted Occupancy Sensor	1	0.3768	936.12	74.9	$65.1	$105.0	$93.0	$193.0	$86.5	$93.0	$170.1	$263.1	$365.5	$703.3	$1,068.8	$35
Building 12 - Coach Barn	002	HALL	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	0	256.8	0.2568	14	2000	513.6	$41.1	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	3	102	0.102	2000	2000	204	204	None Proposed	0	0.1548	309.6	24.8	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$60.0	$192.0	$252.0	$30
Building 12 - Coach Barn	000	Exterior Wall	150W Metal Halide Wall Pack	9	0	1701	1.701	NR	2000	3402	$272.2	Replace 150W Fixture with 90W LED Fixture	9	810	0.81	2000	2000	1620	1620	None Proposed	0	0.891	1782	142.6	$0.0	$200.0	$65.0	$0.0	$0.0	$65.0	$200.0	$265.0	$585.0	$1,800.0	$2,385.0	$900
Building 12 - Coach Barn	000	Exterior Entry	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Building 12 - Coach Barn	000	Wood Shop	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	2000	342.4	$27.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	2000	2000	136	136	None Proposed	0	0.1032	206.4	16.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Building 12 - Coach Barn	000	Wood Shop	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	2000	454	$36.3	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	101.4	0.1014	2000	2000	202.8	202.8	None Proposed	0	0.1256	251.2	20.1	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$93.0	$170.1	$263.1	$0
Building 12 - Coach Barn	001	Conference Room	1 CFL Fixture 25W	51	0	1275	1.275	7	2000	2550	$204.0	1 screw-in LED 20W	51	1020	1.02	2000	1400	2040	1428	Ceiling Mounted Occupancy Sensor	1	0.255	1122	89.8	$0.0	$8.0	$10.0	$193.0	$86.5	$10.0	$8.0	$18.0	$596.5	$601.0	$1,197.5	$35
Building 12 - Coach Barn	001	Payment Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	1	513.6	0.5136	18	2000	1027.2	$82.2	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	2000	2000	408	408	None Proposed	0	0.3096	619.2	49.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$60
Building 12 - Coach Barn	001	Duke Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	2000	342.4	$27.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	2000	2000	136	136	None Proposed	0	0.1032	206.4	16.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Building 12 - Coach Barn	000	Garage	8' T12 Fixture w/ 2-T12 Lamps	4	0	908	0.908	NR	2000	1816	$145.3	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	405.6	0.4056	2000	2000	811.2	811.2	None Proposed	0	0.5024	1004.8	80.4	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$372.0	$680.4	$1,052.4	$0
Building 12 - Coach Barn	000	Wash Station	70W CFL Fixture	4	0	280	0.28	20	2000	560	$44.8	50W LED Fixture	4	200	0.2	2000	2000	400	400	None Proposed	0	0.08	160	12.8	$0.0	$10.0	$18.0	$0.0	$0.0	$18.0	$10.0	$28.0	$72.0	$40.0	$112.0	$0
Building 12 - Coach Barn	000	Stables	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	4	2000	1362	$109.0	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	304.2	0.3042	2000	2000	608.4	608.4	None Proposed	0	0.3768	753.6	60.3	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$279.0	$510.3	$789.3	$0
House 13	001	Dining Room	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0	5 screw-in LED 100W	1	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	4.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$18.0	$8.0	$26.0	$0
House 13	001	Living Room	3 CFL Fixture 25W	1	0	75	0.075	5	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 13	002	Bathroom 2	2 CFL Fixture 50W	3	0	150	0.15	17	2000	300	$24.0	2 screw-in LED 40W	3	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	4.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$36.0	$24.0	$60.0	$0
Shop 18	000	Exterior	150W Metal Halide Wall Pack	2	0	378	0.378	NR	2000	756	$60.5	Replace 150W Fixture with 90W LED Fixture	2	180	0.18	2000	2000	360	360	None Proposed	0	0.198	396	31.7	$0.0	$200.0	$65.0	$0.0	$0.0	$65.0	$200.0	$265.0	$130.0	$400.0	$530.0	$200
Shop 18	001	Tool Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	43	2000	342.4	$27.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	2000	2000	136	136	None Proposed	0	0.1032	206.4	16.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Shop 18	001	Shop	8' T12 Fixture w/ 2-T12 Lamps	4	0	908	0.908	33	2000	1816	$145.3	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	405.6	0.4056	2000	2000	811.2	811.2	None Proposed	0	0.5024	1004.8	80.4	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$372.0	$680.4	$1,052.4	$0
Shop 18	001	Garage	8' T12 Fixture w/ 2-T12 Lamps	6	0	1362	1.362	22	2000	2724	$217.9	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	608.4	0.6084	2000	2000	1216.8	1216.8	None Proposed	0	0.7536	1507.2	120.6	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$558.0	$1,020.6	$1,578.6	$0
Shop 18	002	Loft	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	5	2000	1362	$109.0	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	304.2	0.3042	2000	2000	608.4	608.4	None Proposed	0	0.3768	753.6	60.3	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$279.0	$510.3	$789.3	$0
Garage 19	000	Exterior	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 21	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 21	001	Kitchen	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1		120	0.12	NR	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
House 21	001	Office 1	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	18	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
House 21	001	Office 2	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	NR	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
House 21	001	Office 3	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	0	90	0.09	16	2000	180	$14.4	Remove Ballast, Install 3-17W LED Tube Retrofit Bulbs	1	51	0.051	2000	2000	102	102	None Proposed	0	0.039	78	6.2	$24.0	$60.0	$22.0	$0.0	$0.0	$22.0	$84.0	$106.0	$22.0	$84.0	$106.0	$15
House 21	002	Office 5	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	29	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
House 21	002	Office 6	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	38	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
House 21	002	Office 7	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	0	90	0.09	32	2000	180	$14.4	Remove Ballast, Install 3-17W LED Tube Retrofit Bulbs	1	51	0.051	2000	2000	102	102	None Proposed	0	0.039	78	6.2	$24.0	$60.0	$22.0	$0.0	$0.0	$22.0	$84.0	$106.0	$22.0	$84.0	$106.0	$15
House 21	002	Office 8	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	43	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 23	001	Hallway 1	2 CFL Fixture 50W	2	0	100	0.1	NR	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Building 23	001	Kichenette	2 CFL Fixture 50W	2	1	100	0.1	20	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Building 23	001	Server	2 CFL Fixture 50W	2	0	100	0.1	11	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Building 23	001	Archives 2	3 CFL Fixture 25W	2	0	150	0.15	NR	2000	300	$24.0	3 screw-in LED 60W	2	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	4.8	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$28.0	$16.0	$44.0	$0
Building 24	001	Entry	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	50	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	001	Office 1	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	15	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	001	Kitchenette	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	41	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	001	Office 2	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	31	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	002	Office 3	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	55	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	002	Server	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	11	2000	171.2	$13.7	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	2000	68	68	None Proposed	0	0.0516	103.2	8.3	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 24	002	Bathroom 1	5 CFL Fixture 25W	1	0	125	0.125	10	2000	250	$20.0	5 screw-in LED 100W	1	100	0.1	2000	1400	200	140	Automatic Wall Switch Occupancy Sensor	1	0.025	110	8.8	$0.0	$8.0	$18.0	$63.5	$45.0	$18.0	$8.0	$26.0	$63.0	$71.5	$134.5	$0
Building 24	002	Office 6	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	3	0	360	0.36	55	2000	720	$57.6	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	3	204	0.204	2000	2000	408	408	None Proposed	0	0.156	312	25.0	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$72.0	$312.0	$384.0	$60
Building 24	002	Bathroom 2	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0	5 screw-in LED 100W	1	100	0.1	2000	1400	200	140	Automatic Wall Switch Occupancy Sensor	1	0.025	110	8.8	$0.0	$8.0	$18.0	$63.5	$45.0	$18.0	$8.0	$26.0	$63.0	$71.5	$134.5	$0
Building 24	001	Office 7	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	26	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Building 24	001	Copy	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	28	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
Building 24	000	Exterior	150W Metal Halide Wall Pack	3	0	567	0.567	NR	2000	1134	$90.7	Replace 150W Fixture with 90W LED Fixture	3	270	0.27	2000	2000	540	540	None Proposed	0	0.297	594	47.5	$0.0	$200.0	$65.0	$0.0	$0.0	$65.0	$200.0	$265.0	$195.0	$600.0	$795.0	$300
House 27	001	kitchen	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 27	001	Dining Room	5 CFL Fixture 25W	5	0	625	0.625	NR	2000	1250	$100.0	5 screw-in LED 100W	5	500	0.5	2000	2000	1000	1000	None Proposed	0	0.125	250	20.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$90.0	$40.0	$130.0	$0
House 27	002	Bathroom	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0	5 screw-in LED 100W	1	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	4.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$18.0	$8.0	$26.0	$0
House 27	002	Hall	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 29	001	kitchen	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 29	001	Dining Room	5 CFL Fixture 25W	5	0	625	0.625	NR	2000	1250	$100.0	5 screw-in LED 100W	5	500	0.5	2000	2000	1000	1000	None Proposed	0	0.125	250	20.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$90.0	$40.0	$130.0	$0
House 29	002	Bathroom	5 CFL Fixture 25W	1	0	125	0.125	NR	2000	250	$20.0	5 screw-in LED 100W	1	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	4.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$18.0	$8.0	$26.0	$0
House 29	002	Hall	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 30	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	4	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 30	001	Dining Room	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
Cottage 37	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 37	001	Bathroom 1	2 CFL Fixture 50W	2	0	100	0.1	2	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Cottage 37	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 37	002	Bathroom 3	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
Cottage 37	002	Table	2 CFL Fixture 50W	1	0	50	0.05	8	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 37	002	décor	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 37	000	Boiler Room	1x8 Fixture w/ 2-T12 Lamps w/ Magnetic Ballasts	1	0	171.2	0.1712	NR	1000	171.2	$13.7	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	1000	1000	68	68	None Proposed	0	0.1032	103.2	8.3	$24.0	$80.0	$20.0	$0.0	$0.0	$20.0	$104.0	$124.0	$20.0	$104.0	$124.0	$20
Cottage 43	001	Kitchen	2 CFL Fixture 50W	2	0	100	0.1	13	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Cottage 43	001	Office	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 43	001	Office 2	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 43	002	Office 202	2 CFL Fixture 50W	1	0	50	0.05	15	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 43	002	Office 204	2 CFL Fixture 50W	1	0	50	0.05	11	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 43	002	Office 205	2 CFL Fixture 50W	1	0	50	0.05	13	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 43	002	Bathroom	2 CFL Fixture 50W	1	0	150	0.15	NR	2000	300	$48.0	2 screw-in LED 40W	3	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	9.6	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$60.0	$60.0	$120.0	$0
Cottage 43	002	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	9	2000	50	$8.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.6	$0.0	$10.0	$20.0	$0.0	$0.0	$20.0	$10.0	$30.0	$20.0	$10.0	$30.0	$0
Cottage 43	002	Stair	2 CFL Fixture 50W	1	0	50	0.05	12	2000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
Cottage 43	000	Firepump Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	0	50	0.05	25	1000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
House 120	001	Bathroom 1	1 CFL Fixture 25W	3	0	50	0.05	30	2000	100	$16.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.2	$0.0	$20.0	$20.0	$0.0	$0.0	$20.0	$20.0	$40.0	$20.0	$20.0	$40.0	$0
House 120	002	Bathroom 2	65W Incandescent Fixture	2	0	130	0.13	NR	2000	260	$52.0	Replace 65W Incandescent Fixture with 13W CFL	2	26	0.026	2000	2000	52	52	None Proposed	0	0.104	208	41.6	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$8.0	$12.5	$20.5	$0
House 120	002	Bedroom 3	300W Incandescent Fixture	1	0	300	0.3	18	2000	600	$120.0	Replace 300W Incandescent Fixture with 65W CFL	1	65	0.065	2000	2000	130	130	None Proposed	0	0.235	470	94.0	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$4.0	$39.0	$43.0	$0
House 120	002	Bedroom 4	300W Incandescent Fixture	1	0	300	0.3	13	2000	600	$120.0	Replace 300W Incandescent Fixture with 65W CFL	1	65	0.065	2000	2000	130	130	None Proposed	0	0.235	470	94.0	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$4.0	$39.0	$43.0	$0
House 120	001	Dining Room	5 CFL Fixture 25W	1	0	125	0.125	40	2000	250	$50.0	5 screw-in LED 100W	1	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	10.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$18.0	$8.0	$26.0	$0
House 120	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$20.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	4.0	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 120	001	Kitchen	2X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	2000	120	$24.0	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	2000	68	68	None Proposed	0	0.026	52	10.4	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
House 120	000	Basement	1 CFL Fixture 25W	7	0	175	0.175	NR	1000	175	$35.0	1 screw-in LED 20W	7	140	0.14	1000	1000	140	140	None Proposed	0	0.035	35	7.0	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$70.0	$56.0	$126.0	$0
Cottage 45	001	Breakroom	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	42	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
Cottage 45	001	Bathroom	3 CFL Fixture 25W	1	0	75	0.075	38	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
Cottage 45	002	Upstairs	2 CFL Fixture 50W	1	0	50	0.05	45	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 45	002	Office	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	1	0	120	0.12	27	2000	240	$19.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	2000	2000	136	136	None Proposed	0	0.052	104	8.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
Cottage 45	002	Storage	3 CFL Fixture 25W	1	0	75	0.075	6	1000	75	$6.0	3 screw-in LED 60W	1	60	0.06	1000	1000	60	60	None Proposed	0	0.015	15	1.2	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
Cottage 45	002	Telecom	4 CFL Fixture 25W	1	0	100	0.1	18	1000	100	$8.0	4 screw-in LED 80W	1	80	0.08	1000	1000	80	80	None Proposed	0	0.02	20	1.6	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
House 52	001	Entry B	100W Incandescent Fixture	2	0	200	0.2	3	2000	400	$72.0	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	2000	2000	100	100	None Proposed	0	0.15	300	54.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 52	001	Kitchen B	100W Incandescent Fixture	2	0	200	0.2	NR	2000	400	$72.0	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	2000	2000	100	100	None Proposed	0	0.15	300	54.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 52	002	Stair B	150W Incandescent Fixture	1	0	150	0.15	NR	2000	300	$54.0	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	2000	2000	50	50	None Proposed	0	0.125	250	45.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 52	002	Master Bath B	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$9.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 52	002	Master Bath B	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	2000	120	$21.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	2000	68	68	None Proposed	0	0.026	52	9.4	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
House 52	002	Master Closet B	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$9.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 52	002	Bathroom 2 B	1 CFL Fixture 25W	1	0	25	0.025	7	2000	50	$9.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
House 52	002	Bathroom 2 B	300W Incandescent Fixture	2	0	600	0.6	NR	2000	1200	$216.0	Replace 300W Incandescent Fixture with 65W CFL	2	130	0.13	2000	2000	260	260	None Proposed	0	0.47	940	169.2	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$8.0	$77.9	$85.9	$0
House 52	002	Bed 2 B Closet	65W Incandescent Fixture	1	0	65	0.065	NR	1000	65	$11.7	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	1000	1000	13	13	None Proposed	0	0.052	52	9.4	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$4.0	$6.3	$10.3	$0
House 52	000	Basement B	1 CFL Fixture 25W	4	0	100	0.1	1	1000	100	$18.0	1 screw-in LED 20W	4	80	0.08	1000	1000	80	80	None Proposed	0	0.02	20	3.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
House 52	000	Basement B	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	NR	1000	60	$10.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	1000	1000	34	34	None Proposed	0	0.026	26	4.7	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
House 52	000	Basement A	1 CFL Fixture 25W	5	0	125	0.125	8	1000	125	$22.5	1 screw-in LED 20W	5	100	0.1	1000	1000	100	100	None Proposed	0	0.025	25	4.5	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$50.0	$40.0	$90.0	$0
House 52	001	Entry A	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$18.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	3.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 52	001	Kitchen A	100W Incandescent Fixture	2	0	200	0.2	17	2000	400	$72.0	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	2000	2000	100	100	None Proposed	0	0.15	300	54.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 52	002	Stair A	150W Incandescent Fixture	1	0	150	0.15	8	2000	300	$54.0	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	2000	2000	50	50	None Proposed	0	0.125	250	45.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 52	002	Master Bath A	100W Incandescent Fixture	2	0	200	0.2	NR	2000	400	$72.0	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	2000	2000	100	100	None Proposed	0	0.15	300	54.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 52	002	Bathroom A	100W Incandescent Fixture	2	0	200	0.2	26	2000	400	$72.0	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	2000	2000	100	100	None Proposed	0	0.15	300	54.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 52	002	Bathroom A	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	30	2000	171.2	$30.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	2000	68	68	None Proposed	0	0.0516	103.2	18.6	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
House 74	001	Kitchen	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3	Replace 300W Incandescent Fixture with 65W CFL	1	65	0.065	100	100	6.5	6.5	None Proposed	0	0.235	23.5	4.9	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$4.0	$39.0	$43.0	$0
House 74	001	Bathroom	150W Incandescent Fixture	1	0	150	0.15	NR	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	001	Dining Room	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3	Replace 300W Incandescent Fixture with 65W CFL	1	65	0.065	100	100	6.5	6.5	None Proposed	0	0.235	23.5	4.9	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$4.0	$39.0	$43.0	$0
House 74	001	Living Room	150W Incandescent Fixture	1	0	150	0.15	NR	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	002	Bathroom 1	150W Incandescent Fixture	2	0	300	0.3	NR	100	30	$6.3	Replace 150W Incandescent Fixture with 25W CFL	2	50	0.05	100	100	5	5	None Proposed	0	0.25	25	5.3	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 74	002	Bedroom 1	150W Incandescent Fixture	1	0	150	0.15	12	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	002	Bedroom 2	150W Incandescent Fixture	1	0	150	0.15	24	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	002	Bedroom 2 closet	150W Incandescent Fixture	1	0	150	0.15	7	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	002	Bedroom 3	300W Incandescent Fixture	1	0	300	0.3	NR	100	30	$6.3	Replace 300W Incandescent Fixture with 65W CFL	1	65	0.065	100	100	6.5	6.5	None Proposed	0	0.235	23.5	4.9	$0.0	$39.0	$4.0	$0.0	$0.0	$4.0	$39.0	$43.0	$4.0	$39.0	$43.0	$0
House 74	002	Bathroom 2	150W Incandescent Fixture	2	0	300	0.3	30	100	30	$6.3	Replace 150W Incandescent Fixture with 25W CFL	2	50	0.05	100	100	5	5	None Proposed	0	0.25	25	5.3	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 74	002	Hallway	150W Incandescent Fixture	2	0	300	0.3	22	100	30	$6.3	Replace 150W Incandescent Fixture with 25W CFL	2	50	0.05	100	100	5	5	None Proposed	0	0.25	25	5.3	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$8.0	$14.0	$22.0	$0
House 74	003	Stairway	65W Incandescent Fixture	1	0	65	0.065	16	100	6.5	$1.4	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	100	100	1.3	1.3	None Proposed	0	0.052	5.2	1.1	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$4.0	$6.3	$10.3	$0
House 74	003	Attic	65W Incandescent Fixture	1	0	65	0.065	25	100	6.5	$1.4	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	100	100	1.3	1.3	None Proposed	0	0.052	5.2	1.1	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$4.0	$6.3	$10.3	$0
House 74	003	Room	150W Incandescent Fixture	1	0	150	0.15	33	100	15	$3.2	Replace 150W Incandescent Fixture with 25W CFL	1	25	0.025	100	100	2.5	2.5	None Proposed	0	0.125	12.5	2.6	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$4.0	$7.0	$11.0	$0
House 74	003	Attic 2	65W Incandescent Fixture	1	0	65	0.065	4	100	6.5	$1.4	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	100	100	1.3	1.3	None Proposed	0	0.052	5.2	1.1	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$4.0	$6.3	$10.3	$0
House 79	001	Kitchen	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	2.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 79	001	Kitchen	1 CFL Fixture 25W	1	0	25	0.025	22	2000	50	$7.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 79	001	Bathroom	2 CFL Fixture 50W	2	0	100	0.1	17	2000	200	$28.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	5.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
House 79	001	Hallway	1 CFL Fixture 25W	1	0	25	0.025	4	2000	50	$7.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 79	001	Livingroom	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	2.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 79	001	Closet	2 CFL Fixture 50W	1	0	50	0.05	16	1000	50	$7.0	2 screw-in LED 40W	1	40	0.04	1000	1000	40	40	None Proposed	0	0.01	10	1.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 79	002	Hallway	1 CFL Fixture 25W	1	0	25	0.025	6	2000	50	$7.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 79	002	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	9	2000	100	$14.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	2.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 79	002	Bathroom 2	1 CFL Fixture 25W	1	0	25	0.025	9	2000	50	$7.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	1.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 79	002	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$14.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	2.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Orchid Range	001	Greenhouse 1	100W Incandescent Fixture	10	0	1000	1	60	2000	2000	$160.0	Replace 100W Incandescent Fixture with 25W CFL	10	250	0.25	2000	2000	500	500	None Proposed	0	0.75	1500	120.0	$0.0	$7.0	$4.0	$0.0	$0.0	$4.0	$7.0	$11.0	$40.0	$70.0	$110.0	$0
Orchid Range	001	Greenhouse 2	1 CFL Fixture 25W	2	0	50	0.05	60	2000	100	$8.0	1 screw-in LED 20W	2	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
Orchid Range	001	Greenhouse 3	1 CFL Fixture 25W	8	0	200	0.2	60	2000	400	$32.0	1 screw-in LED 20W	8	160	0.16	2000	2000	320	320	None Proposed	0	0.04	80	6.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$80.0	$64.0	$144.0	$0
Orchid Range	001	Greenhouse 4	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse 5	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse 7	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse 8	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse 9	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse 10	1 CFL Fixture 25W	4	0	100	0.1	60	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Orchid Range	001	Greenhouse Display	70W CFL Fixture	2	0	140	0.14	60	2000	280	$22.4	50W LED Fixture	2	100	0.1	2000	2000	200	200	None Proposed	0	0.04	80	6.4	$0.0	$10.0	$18.0	$0.0	$0.0	$18.0	$10.0	$28.0	$36.0	$20.0	$56.0	$0
Orchid Range	001	Greenhouse Habitat	5 CFL Fixture 25W	12	0	1500	1.5	90	2000	3000	$240.0	5 screw-in LED 100W	12	1200	1.2	2000	2000	2400	2400	None Proposed	0	0.3	600	48.0	$0.0	$8.0	$18.0	$0.0	$0.0	$18.0	$8.0	$26.0	$216.0	$96.0	$312.0	$0
Orchid Range	001	Workroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	49	2000	720	$57.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	2000	2000	408	408	None Proposed	0	0.156	312	25.0	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$60
Orchid Range	001	Greenhouse Entry	1 CFL Fixture 25W	1	0	25	0.025	60	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Orchid Range	001	Bathroom	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	60	2000	120	$9.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	1400	68	47.6	Automatic Wall Switch Occupancy Sensor	1	0.026	72.4	5.8	$24.0	$40.0	$20.0	$63.5	$45.0	$20.0	$64.0	$84.0	$65.0	$127.5	$192.5	$10
Orchid Range	001	Eletrical	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	22	1000	240	$19.2	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	4	136	0.136	1000	1000	136	136	None Proposed	0	0.104	104	8.3	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$80.0	$256.0	$336.0	$40
Orchid Range	001	Mechanical Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	8	1	480	0.48	28	1000	480	$38.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	8	272	0.272	1000	1000	272	272	None Proposed	0	0.208	208	16.6	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$160.0	$512.0	$672.0	$80
Orchid Range	001	Bathroom 2	1 CFL Fixture 25W	1	1	25	0.025	25	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	1400	40	28	Automatic Wall Switch Occupancy Sensor	1	0.005	22	1.8	$0.0	$8.0	$10.0	$63.5	$45.0	$10.0	$8.0	$18.0	$55.0	$71.5	$126.5	$0
Orchid Range	001	Office	2 CFL Fixture 50W	1	1	50	0.05	15	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Orchid Range	001	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	0	96	0.096	29	2000	192	$15.4	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	3	51	0.051	2000	1400	102	71.4	Ceiling Mounted Occupancy Sensor	1	0.045	120.6	9.6	$24.0	$20.0	$18.0	$193.0	$86.5	$18.0	$44.0	$62.0	$140.5	$325.0	$465.5	$50
Orchid Range	001	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	4	0	128	0.128	32	2000	256	$20.5	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	4	68	0.068	2000	1400	136	95.2	Ceiling Mounted Occupancy Sensor	1	0.06	160.8	12.9	$24.0	$20.0	$18.0	$193.0	$86.5	$18.0	$44.0	$62.0	$158.5	$369.0	$527.5	$55
Building 56	001	Guard	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	0	480	0.48	43	2000	960	$76.8	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	4	272	0.272	2000	2000	544	544	None Proposed	0	0.208	416	33.3	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$96.0	$416.0	$512.0	$80
Building 56	001	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	1400	40	28	Automatic Wall Switch Occupancy Sensor	1	0.005	22	1.8	$0.0	$8.0	$10.0	$63.5	$45.0	$10.0	$8.0	$18.0	$55.0	$71.5	$126.5	$0
Building 56	000	Basement	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	4	1000	60	$4.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	1000	1000	34	34	None Proposed	0	0.026	26	2.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 56	000	Basement	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0	1 screw-in LED 20W	1	20	0.02	1000	1000	20	20	None Proposed	0	0.005	5	0.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Building 56	000	Exterior	150W Metal Halide Wall Pack	2	0	378	0.378	NR	1000	378	$30.2	Replace 150W Fixture with 90W LED Fixture	2	180	0.18	1000	1000	180	180	None Proposed	0	0.198	198	15.8	$0.0	$200.0	$65.0	$0.0	$0.0	$65.0	$200.0	$265.0	$130.0	$400.0	$530.0	$200
Building 56	001	Exterior	1 CFL Fixture 25W	4	0	100	0.1	NR	1000	100	$8.0	1 screw-in LED 20W	4	80	0.08	1000	1000	80	80	None Proposed	0	0.02	20	1.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Cottage 35	001	Kitchen	1 CFL Fixture 25W	4	0	100	0.1	4	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Cottage 35	001	Farmers Porch	2 CFL Fixture 50W	1	0	50	0.05	6	1000	50	$4.0	2 screw-in LED 40W	1	40	0.04	1000	1000	40	40	None Proposed	0	0.01	10	0.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	001	Front Room	2 CFL Fixture 50W	2	0	100	0.1	11	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Cottage 35	002	Hallway	2 CFL Fixture 50W	2	0	100	0.1	8	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Cottage 35	002	Office	2 CFL Fixture 50W	1	0	50	0.05	18	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	002	Boardroom	2 CFL Fixture 50W	1	0	50	0.05	20	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	002	Back Office	2 CFL Fixture 50W	1	0	50	0.05	27	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	002	Hallway	1 CFL Fixture 25W	1	0	25	0.025	8	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Cottage 35	002	Bathroom	2 CFL Fixture 50W	1	0	50	0.05	30	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	002	Bathroom	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0	4 screw-in LED 80W	1	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
Cottage 35	001	Bathroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$8.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Cottage 35	001	Bathroom 2	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
Building 39 - Farm Barn	002	Conference 2	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	1	360	0.36	16	2000	720	$57.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	2000	2000	408	408	None Proposed	0	0.156	312	25.0	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$60
Building 39 - Farm Barn	002	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	3	1	96	0.096	NR	2000	192	$15.4	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	3	51	0.051	2000	2000	102	102	None Proposed	0	0.045	90	7.2	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$54.0	$132.0	$186.0	$15

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
Building 39 - Farm Barn	002	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	5	1	160	0.16	NR	2000	320	$25.6	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	5	85	0.085	2000	2000	170	170	None Proposed	0	0.075	150	12.0	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$90.0	$220.0	$310.0	$25
Building 39 - Farm Barn	002	Janitors Closet	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	1	32	0.032	25	1000	32	$2.6	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	1	17	0.017	1000	1000	17	17	None Proposed	0	0.015	15	1.2	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$18.0	$44.0	$62.0	$5
Building 39 - Farm Barn	002	Mens RR 2	1 CFL Fixture 25W	1	0	25	0.025	17	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Building 39 - Farm Barn	002	Womens RR 2	1 CFL Fixture 25W	1	0	25	0.025	17	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Building 39 - Farm Barn	002	Conference 2M	4 CFL Fixture 25W	6	0	600	0.6	18	2000	1200	$96.0	4 screw-in LED 80W	6	480	0.48	2000	2000	960	960	None Proposed	0	0.12	240	19.2	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$96.0	$48.0	$144.0	$0
Building 39 - Farm Barn	002	Office 2M	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	1	64	0.064	11	2000	128	$10.2	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	2	34	0.034	2000	2000	68	68	None Proposed	0	0.03	60	4.8	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$36.0	$88.0	$124.0	$10
Building 39 - Farm Barn	002	Callroom 2M	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	2	1	64	0.064	28	2000	128	$10.2	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	2	34	0.034	2000	2000	68	68	None Proposed	0	0.03	60	4.8	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$36.0	$88.0	$124.0	$10
Building 39 - Farm Barn	002	Mech Rm. 2M	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	16	1000	240	$19.2	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	4	136	0.136	1000	1000	136	136	None Proposed	0	0.104	104	8.3	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$80.0	$256.0	$336.0	$40
Building 39 - Farm Barn	001	Mens RR	1 CFL Fixture 25W	2	1	50	0.05	16	2000	100	$8.0	1 screw-in LED 20W	2	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
Building 39 - Farm Barn	001	Mens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	0	192	0.192	NR	2000	384	$30.7	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	6	102	0.102	2000	2000	204	204	None Proposed	0	0.09	180	14.4	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$108.0	$264.0	$372.0	$30
Building 39 - Farm Barn	002	Womens RR	1 CFL Fixture 25W	2	1	50	0.05	18	2000	100	$8.0	1 screw-in LED 20W	2	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	1.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
Building 39 - Farm Barn	002	Womens RR	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	6	0	192	0.192	NR	2000	384	$30.7	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	6	102	0.102	2000	2000	204	204	None Proposed	0	0.09	180	14.4	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$108.0	$264.0	$372.0	$30
Building 39 - Farm Barn	001	Family Rm	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	1	32	0.032	20	2000	64	$5.1	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	1	17	0.017	2000	2000	34	34	None Proposed	0	0.015	30	2.4	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$18.0	$44.0	$62.0	$5
Building 39 - Farm Barn	001	Family Rm	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Building 39 - Farm Barn	001	Entry	1 CFL Fixture 25W	4	0	100	0.1	NR	2000	200	$16.0	1 screw-in LED 20W	4	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Building 39 - Farm Barn	001	Mech 118	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	34	1000	360	$28.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	1000	1000	204	204	None Proposed	0	0.156	156	12.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$60
Building 39 - Farm Barn	001	Hall	1 CFL Fixture 25W	3	0	75	0.075	NR	2000	150	$12.0	1 screw-in LED 20W	3	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$30.0	$24.0	$54.0	$0
Building 39 - Farm Barn	001	AV	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	20	1000	60	$4.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	1000	1000	34	34	None Proposed	0	0.026	26	2.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 39 - Farm Barn	001	Mech 121	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	0	120	0.12	11	1000	120	$9.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	1000	1000	68	68	None Proposed	0	0.052	52	4.2	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Building 39 - Farm Barn	001	Server	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	14	1000	60	$4.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	1000	1000	34	34	None Proposed	0	0.026	26	2.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 39 - Farm Barn	001	114	1 CFL Fixture 25W	1	0	25	0.025	NR	1000	25	$2.0	1 screw-in LED 20W	1	20	0.02	1000	1000	20	20	None Proposed	0	0.005	5	0.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
Building 39 - Farm Barn	001	Elec	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	22	1000	60	$4.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	1000	1000	34	34	None Proposed	0	0.026	26	2.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 39 - Farm Barn	001	111 Hall	1 CFL Fixture 25W	6	0	150	0.15	330	2000	300	$24.0	1 screw-in LED 20W	6	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	4.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$60.0	$48.0	$108.0	$0
Building 39 - Farm Barn	001	Kitchen	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	1	360	0.36	40	2000	720	$57.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	2000	2000	408	408	None Proposed	0	0.156	312	25.0	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$60
Building 39 - Farm Barn	001	Lobby	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	24	0	768	0.768	NR	1000	768	$61.4	Remove Ballast, Install 1-17W LED Tube Retrofit Bulbs	24	408	0.408	1000	1000	408	408	None Proposed	0	0.36	360	28.8	$24.0	$20.0	$18.0	$0.0	$0.0	$18.0	$44.0	$62.0	$432.0	$1,056.0	$1,488.0	$120
Building 39 - Farm Barn	001	Lobby	4 CFL Fixture 25W	10	0	1000	1	22	2000	2000	$160.0	4 screw-in LED 80W	10	800	0.8	2000	2000	1600	1600	None Proposed	0	0.2	400	32.0	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$160.0	$80.0	$240.0	$0
Building 39 - Farm Barn	001	Lobby Office	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	60	0.06	26	2000	120	$9.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	2000	2000	68	68	None Proposed	0	0.026	52	4.2	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 39 - Farm Barn	001	Elev. Mach. Room	2 CFL Fixture 50W	1	0	50	0.05	20	1000	50	$4.0	2 screw-in LED 40W	1	40	0.04	1000	1000	40	40	None Proposed	0	0.01	10	0.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
Building 39 - Farm Barn	001	Stairway	1 CFL Fixture 25W	5	0	125	0.125	24	2000	250	$20.0	1 screw-in LED 20W	5	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	4.0	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$50.0	$40.0	$90.0	$0
Building 39 - Farm Barn	001	Elevator	LED Par Fixture	6	0	120	0.12	30	2000	240	$19.2	None Proposed.	6	120	0.12	2000	2000	240	240	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0
Building 39 - Farm Barn	002	Stairway	1 CFL Fixture 25W	3	0	75	0.075	10	2000	150	$12.0	1 screw-in LED 20W	3	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$30.0	$24.0	$54.0	$0
Building 39 - Farm Barn	002	Mechanical Room	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	5	0	300	0.3	10	2000	600	$48.0	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	5	170	0.17	2000	2000	340	340	None Proposed	0	0.13	260	20.8	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$100.0	$320.0	$420.0	$50
Building 39 - Farm Barn	002	Hallway	2 CFL Fixture 50W	8	0	400	0.4	11	2000	800	$64.0	2 screw-in LED 40W	8	320	0.32	2000	2000	640	640	None Proposed	0	0.08	160	12.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$96.0	$64.0	$160.0	$0
Building 39 - Farm Barn	002	kitchen	2 CFL Fixture 50W	2	0	100	0.1	20	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Building 26 - Conservatory	000	Boiler Room	8' T12 Fixture w/ 2-T12 Lamps	7	0	1589	1.589	6	500	794.5	$63.6	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	7	476	0.476	500	500	238	238	None Proposed	0	1.113	556.5	44.5	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$168.0	$728.0	$896.0	$140
Building 26 - Conservatory	000	Boiler Room	1 CFL Fixture 25W	2	0	50	0.05	NR	500	25	$2.0	1 screw-in LED 20W	2	40	0.04	500	500	20	20	None Proposed	0	0.01	5	0.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
Building 26 - Conservatory	000	Breakroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	3	0	270	0.27	NR	500	135	$10.8	Remove Ballast, Install 3-17W LED Tube Retrofit Bulbs	3	153	0.153	500	500	76.5	76.5	None Proposed	0	0.117	58.5	4.7	$24.0	$60.0	$22.0	$0.0	$0.0	$22.0	$84.0	$106.0	$66.0	$252.0	$318.0	$45
Building 26 - Conservatory	000	Stair	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	4	500	113.5	$9.1	Replace T12 Fixture With (2) 36W Linear Panel LED Fixtures	1	72	0.072	500	500	36	36	None Proposed	0	0.155	77.5	6.2	$460.0	$0.0	$130.0	$0.0	$0.0	$130.0	$460.0	$590.0	$130.0	$460.0	$590.0	$0

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
Building 26 - Conservatory	000	Pot Storage	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	500	113.5	$9.1	Replace T12 Fixture With (2) 36W Linear Panel LED Fixtures	1	72	0.072	500	500	36	36	None Proposed	0	0.155	77.5	6.2	$460.0	$0.0	$130.0	$0.0	$0.0	$130.0	$460.0	$590.0	$130.0	$460.0	$590.0	$0
Building 26 - Conservatory	000	Fountain Tunnel	1 CFL Fixture 25W	4	0	100	0.1	NR	500	50	$4.0	1 screw-in LED 20W	4	80	0.08	500	500	40	40	None Proposed	0	0.02	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$40.0	$32.0	$72.0	$0
Building 26 - Conservatory	000	electrical room	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	43	500	113.5	$9.1	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	500	500	34	34	None Proposed	0	0.159	79.5	6.4	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
Building 26 - Conservatory	000	Chemical	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	0	85.6	0.0856	NR	500	42.8	$3.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	1	34	0.034	500	500	17	17	None Proposed	0	0.0516	25.8	2.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$20.0	$64.0	$84.0	$10
Building 26 - Conservatory	000	Tank Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	NR	500	85.6	$6.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	500	500	34	34	None Proposed	0	0.1032	51.6	4.1	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Building 26 - Conservatory	001	Mens RR	2X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	2	0	240	0.24	80	2000	480	$38.4	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	2000	1400	272	190.4	Ceiling Mounted Occupancy Sensor	1	0.104	289.6	23.2	$24.0	$80.0	$24.0	$193.0	$86.5	$24.0	$104.0	$128.0	$134.5	$401.0	$535.5	$75
Building 26 - Conservatory	001	Potting Shed	8' T12 Fixture w/ 2-T12 Lamps	3	0	681	0.681	NR	2000	1362	$109.0	Replace T12 Fixture With (2) 36W Linear Panel LED Fixtures	3	216	0.216	2000	2000	432	432	None Proposed	0	0.465	930	74.4	$460.0	$0.0	$130.0	$0.0	$0.0	$130.0	$460.0	$590.0	$390.0	$1,380.0	$1,770.0	$0
Building 26 - Conservatory	001	Potting Shed	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	13	2000	342.4	$27.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	2	68	0.068	2000	2000	136	136	None Proposed	0	0.1032	206.4	16.5	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$40.0	$128.0	$168.0	$20
Building 26 - Conservatory	001	Womens RR	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	3	0	180	0.18	NR	2000	360	$28.8	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	3	102	0.102	2000	1400	204	142.8	Ceiling Mounted Occupancy Sensor	1	0.078	217.2	17.4	$24.0	$40.0	$20.0	$193.0	$86.5	$20.0	$64.0	$84.0	$146.5	$385.0	$531.5	$65
Building 26 - Conservatory	001	Office	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	6	0	360	0.36	44	2000	720	$57.6	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	6	204	0.204	2000	2000	408	408	Ceiling Mounted Occupancy Sensor	0	0.156	312	25.0	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$120.0	$384.0	$504.0	$95
Building 26 - Conservatory	001	Grow Garden	1 CFL Fixture 25W	43	0	1075	1.075	NR	500	537.5	$43.0	1 screw-in LED 20W	43	860	0.86	500	500	430	430	None Proposed	0	0.215	107.5	8.6	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$430.0	$344.0	$774.0	$0
Building 26 - Conservatory	001	Grow Lamp	1000W High Bay Fixture	6	0	2748	2.748	NR	500	1374	$109.9	Replace 1000W Fixture with Dual 264W LED High Bay Fixtures	6	3168	3.168	500	500	1584	1584	None Proposed	0	-0.42	-210	-16.8	$0.0	$970.0	$274.0	$0.0	$0.0	$274.0	$970.0	$1,244.0	$1,644.0	$5,820.0	$7,464.0	$0
Building 26 - Conservatory	001	Grow Garden	1 CFL Fixture 25W	36	0	900	0.9	NR	500	450	$36.0	1 screw-in LED 20W	36	720	0.72	500	500	360	360	None Proposed	0	0.18	90	7.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$360.0	$288.0	$648.0	$0
Building 26 - Conservatory	001	Grow Lamp	1000W High Bay Fixture	12	0	5496	5.496	NR	500	2748	$219.8	Replace 1000W Fixture with Dual 264W LED High Bay Fixtures	12	6336	6.336	500	500	3168	3168	None Proposed	0	-0.84	-420	-33.6	$0.0	$970.0	$274.0	$0.0	$0.0	$274.0	$970.0	$1,244.0	$3,288.0	$11,640.0	$14,928.0	$0
Building 26 - Conservatory	001	Garage	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	0	171.2	0.1712	21	500	85.6	$6.8	Replace T12 Bulbs With 32W T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	101.4	0.1014	500	500	50.7	50.7	None Proposed	0	0.0698	34.9	2.8	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0	$0
Motorpool	001	Garage	8' T12 Fixture w/ 2-T12 Lamps	12	0	2724	2.724	36	500	1362	$109.0	Replace T12 Fixture With (2) 36W Linear Panel LED Fixtures	12	864	0.864	500	500	432	432	None Proposed	0	1.86	930	74.4	$460.0	$0.0	$130.0	$0.0	$0.0	$130.0	$460.0	$590.0	$1,560.0	$5,520.0	$7,080.0	$0
Motorpool	001	Wash Bay	8' T12 Fixture w/ 2-T12 Lamps	2	1	454	0.454	27	500	227	$18.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	2	136	0.136	500	500	68	68	None Proposed	0	0.318	159	12.7	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$48.0	$208.0	$256.0	$40
Motorpool	001	Office	2X2 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	1	240	0.24	102	2000	480	$38.4	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	4	136	0.136	2000	2000	272	272	None Proposed	0	0.104	208	16.6	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$80.0	$256.0	$336.0	$40
Motorpool	001	Bathroom	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	1	90	0.09	73	2000	180	$14.4	Remove Ballast, Install 3-17W LED Tube Retrofit Bulbs	1	51	0.051	2000	2000	102	102	None Proposed	0	0.039	78	6.2	$24.0	$60.0	$22.0	$0.0	$0.0	$22.0	$84.0	$106.0	$22.0	$84.0	$106.0	$15
Motorpool	001	Compressor room	2X4 Fixtures w/ 3-T8 Lamps w/ Electronic Ballasts	1	1	90	0.09	84	500	45	$3.6	Remove Ballast, Install 3-17W LED Tube Retrofit Bulbs	1	51	0.051	500	500	25.5	25.5	None Proposed	0	0.039	19.5	1.6	$24.0	$60.0	$22.0	$0.0	$0.0	$22.0	$84.0	$106.0	$22.0	$84.0	$106.0	$15
Motorpool	001	Exterior	2 CFL Fixture 50W	2	0	100	0.1	NR	1000	100	$8.0	2 screw-in LED 40W	2	80	0.08	1000	1000	80	80	None Proposed	0	0.02	20	1.6	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
Motorpool	001	Exterior	8' T12 Fixture w/ 2-T12 Lamps	1	0	227	0.227	NR	1000	227	$18.2	Remove Ballast, Install 4-17W LED Tube Retrofit Bulbs	1	68	0.068	1000	1000	68	68	None Proposed	0	0.159	159	12.7	$24.0	$80.0	$24.0	$0.0	$0.0	$24.0	$104.0	$128.0	$24.0	$104.0	$128.0	$20
Motorpool	001	Exterior	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0	1 screw-in LED 20W	2	40	0.04	1000	1000	40	40	None Proposed	0	0.01	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
PS 05 - Interior	002	209	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	12	0	608.4	0.6084	24	2160	1314.144	#N/A	Replace T8 Fixture with 36W Linear Panel LED Fixture	12	432	0.432	2160	2160	933.12	933.12	None Proposed	0	0.1764	381.024	#N/A	$230.0	$0.0	$65.0	$0.0	$0.0	$65.0	$230.0	$295.0	$780.0	$2,760.0	$3,540.0	$0
House 87	000	Basement	1 CFL Fixture 25W	8	0	200	0.2	10	1000	200	$54.0	1 screw-in LED 20W	8	160	0.16	1000	1000	160	160	None Proposed	0	0.04	40	10.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$80.0	$64.0	$144.0	$0
House 87	001	Entry	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$27.0	1 screw-in LED 20W	2	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
House 87	001	Entry	2 CFL Fixture 50W	1	0	50	0.05	8	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	001	kitchen	1X4 Suspended Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	1	0	50.7	0.0507	21	2000	101.4	$27.4	Replace T8 Fixture with 36W Linear Panel LED Fixture	1	36	0.036	2000	2000	72	72	None Proposed	0	0.0147	29.4	7.9	$230.0	$0.0	$65.0	$0.0	$0.0	$65.0	$230.0	$295.0	$65.0	$230.0	$295.0	$0
House 87	001	Bathroom	1 CFL Fixture 25W	1	0	25	0.025	12	2000	50	$13.5	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	2.7	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 87	001	Living	4 CFL Fixture 25W	1	0	100	0.1	10	2000	200	$54.0	4 screw-in LED 80W	1	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	10.8	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
House 87	002	Stair	2 CFL Fixture 50W	1	0	50	0.05	3	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	002	Bedroom 1	2 CFL Fixture 50W	1	0	50	0.05	5	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	002	Bedroom 2	2 CFL Fixture 50W	1	0	50	0.05	4	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	002	Bedroom 3	2 CFL Fixture 50W	1	0	50	0.05	6	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	002	Bathroom 2	2 CFL Fixture 50W	1	0	50	0.05	NR	2000	100	$27.0	2 screw-in LED 40W	1	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$12.0	$8.0	$20.0	$0
House 87	002	Bathroom 2	1 CFL Fixture 25W	2	0	50	0.05	NR	2000	100	$27.0	1 screw-in LED 20W	2	40	0.04	2000	2000	80	80	None Proposed	0	0.01	20	5.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
House 87	003	room	1 CFL Fixture 25W	7	0	175	0.175	10	2000	350	$94.5	1 screw-in LED 20W	7	140	0.14	2000	2000	280	280	None Proposed	0	0.035	70	18.9	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$70.0	$56.0	$126.0	$0
House 47	000	Basement	1 CFL Fixture 25W	18	0	450	0.45	15	1000	450	$36.0	1 screw-in LED 20W	18	360	0.36	1000	1000	360	360	None Proposed	0	0.09	90	7.2	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$180.0	$144.0	$324.0	$0

Appendix D - Lighting Upgrades

Building	Floor	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Occupancy Sensor	Existing Fixture Watts	Existing kW	Approximate Measured Lighting Level (footcandles) "NR" - Not Recorded	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Qty of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total	Total Incentive
House 47	000	Basement	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	4	0	240	0.24	16	1000	240	$19.2	Remove Ballast, Install 2-17W LED Tube Retrofit Bulbs	4	136	0.136	1000	1000	136	136	None Proposed	0	0.104	104	8.3	$24.0	$40.0	$20.0	$0.0	$0.0	$20.0	$64.0	$84.0	$80.0	$256.0	$336.0	$40
House 47	001	Hall	Circline FC8T9 Fixture	4	0	104	0.104	19	2000	208	$16.6	LED Surface Fixture 15W	4	60	0.06	2000	2000	120	120	None Proposed	0	0.044	88	7.0	$60.0	$0.0	$45.0	$0.0	$0.0	$45.0	$60.0	$105.0	$180.0	$240.0	$420.0	$0
House 47	001	kitchen	Circline FC8T9 Fixture	2	0	52	0.052	NR	2000	104	$8.3	LED Surface Fixture 15W	2	30	0.03	2000	2000	60	60	None Proposed	0	0.022	44	3.5	$60.0	$0.0	$45.0	$0.0	$0.0	$45.0	$60.0	$105.0	$90.0	$120.0	$210.0	$0
House 47	001	kitchen	75W Halogen Fixture	4	0	300	0.3	NR	2000	600	$48.0	None Proposed.	4	300	0.3	2000	2000	600	600	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0
House 47	001	Living	1 CFL Fixture 25W	5	0	125	0.125	18	2000	250	$20.0	1 screw-in LED 20W	5	100	0.1	2000	2000	200	200	None Proposed	0	0.025	50	4.0	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$50.0	$40.0	$90.0	$0
House 47	001	Living	2 CFL Fixture 50W	2	0	100	0.1	6	2000	200	$16.0	2 screw-in LED 40W	2	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$24.0	$16.0	$40.0	$0
House 47	001	Bath	1 CFL Fixture 25W	1	0	25	0.025	6	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 47	001	Dining	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 47	001	office	65W Incandescent Fixture	0	0	0	0	NR	2000	0	$0.0	Replace 65W Incandescent Fixture with 13W CFL	0	0	0	2000	2000	0	0	None Proposed	0	0	0	0.0	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$0.0	$0.0	$0.0	$0
House 47	001	stair	3 CFL Fixture 25W	1	0	75	0.075	NR	2000	150	$12.0	3 screw-in LED 60W	1	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 47	002	stair	4 CFL Fixture 25W	1	0	100	0.1	NR	2000	200	$16.0	4 screw-in LED 80W	1	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
House 47	002	hall	1 CFL Fixture 25W	3	0	75	0.075	12	2000	150	$12.0	1 screw-in LED 20W	3	60	0.06	2000	2000	120	120	None Proposed	0	0.015	30	2.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$30.0	$24.0	$54.0	$0
House 47	002	Bedroom 1	1 CFL Fixture 25W	1	0	25	0.025	3	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 47	002	Bathroom 1	1 CFL Fixture 25W	1	0	25	0.025	32	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 47	002	Bathroom 1	4W CFL Candlabra	6	0	24	0.024	NR	2000	48	$3.8	None Proposed	6	78	0.078	2000	2000	156	156	None Proposed	0	-0.054	-108	-8.6	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0
House 47	002	Bathroom 2	4 CFL Fixture 25W	1	0	100	0.1	54	2000	200	$16.0	4 screw-in LED 80W	1	80	0.08	2000	2000	160	160	None Proposed	0	0.02	40	3.2	$0.0	$8.0	$16.0	$0.0	$0.0	$16.0	$8.0	$24.0	$16.0	$8.0	$24.0	$0
House 47	002	Bathroom 2	1 CFL Fixture 25W	1	0	25	0.025	NR	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 47	002	Bedroom 2	65W Incandescent Fixture	0		0	0	NR	2000	0	$0.0	Replace 65W Incandescent Fixture with 13W CFL	0	0	0	2000	2000	0	0	None Proposed	0	0	0	0.0	$0.0	$6.3	$4.0	$0.0	$0.0	$4.0	$6.3	$10.3	$0.0	$0.0	$0.0	$0
House 47	002	Bedroom 3	1 CFL Fixture 25W	1	0	25	0.025	5	2000	50	$4.0	1 screw-in LED 20W	1	20	0.02	2000	2000	40	40	None Proposed	0	0.005	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$10.0	$8.0	$18.0	$0
House 47	002	Bedroom 3 closet	Circline FC8T9 Fixture	2	0	52	0.052	14	1000	52	$4.2	LED Surface Fixture 15W	2	30	0.03	1000	1000	30	30	None Proposed	0	0.022	22	1.8	$60.0	$0.0	$45.0	$0.0	$0.0	$45.0	$60.0	$105.0	$90.0	$120.0	$210.0	$0
House 47	002	Bathroom 3	2 CFL Fixture 50W	3	0	150	0.15	32	2000	300	$24.0	2 screw-in LED 40W	3	120	0.12	2000	2000	240	240	None Proposed	0	0.03	60	4.8	$0.0	$8.0	$12.0	$0.0	$0.0	$12.0	$8.0	$20.0	$36.0	$24.0	$60.0	$0
House 47	003	Storage	3 CFL Fixture 25W	1	0	75	0.075	4	1000	75	$6.0	3 screw-in LED 60W	1	60	0.06	1000	1000	60	60	None Proposed	0	0.015	15	1.2	$0.0	$8.0	$14.0	$0.0	$0.0	$14.0	$8.0	$22.0	$14.0	$8.0	$22.0	$0
House 47	003	Storage	1 CFL Fixture 25W	2	0	50	0.05	NR	1000	50	$4.0	1 screw-in LED 20W	2	40	0.04	1000	1000	40	40	None Proposed	0	0.01	10	0.8	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0
House 47	003	Attic	1 CFL Fixture 25W	2	0	50	0.05	1	500	25	$2.0	1 screw-in LED 20W	2	40	0.04	500	500	20	20	None Proposed	0	0.01	5	0.4	$0.0	$8.0	$10.0	$0.0	$0.0	$10.0	$8.0	$18.0	$20.0	$16.0	$36.0	$0

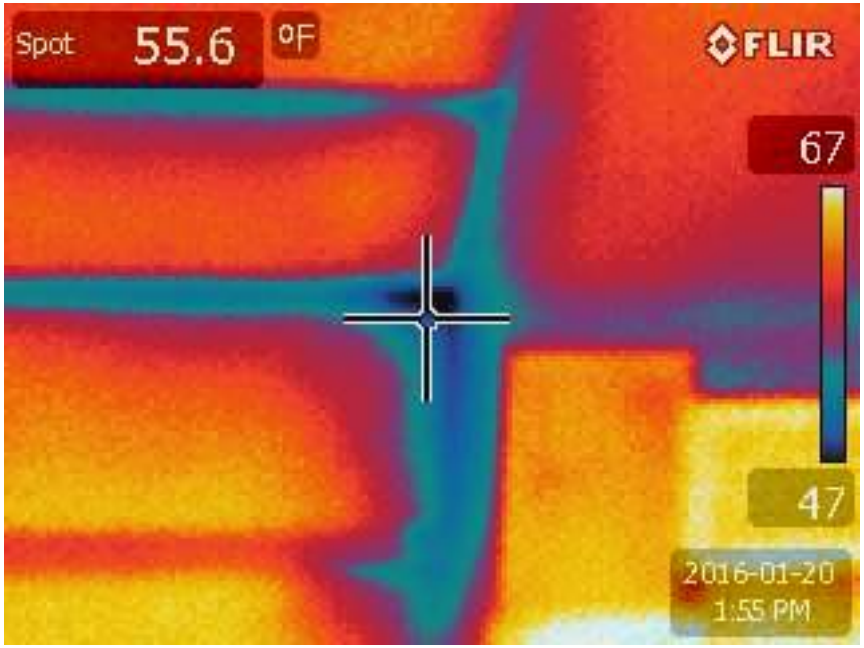
Appendix E

IR Analysis

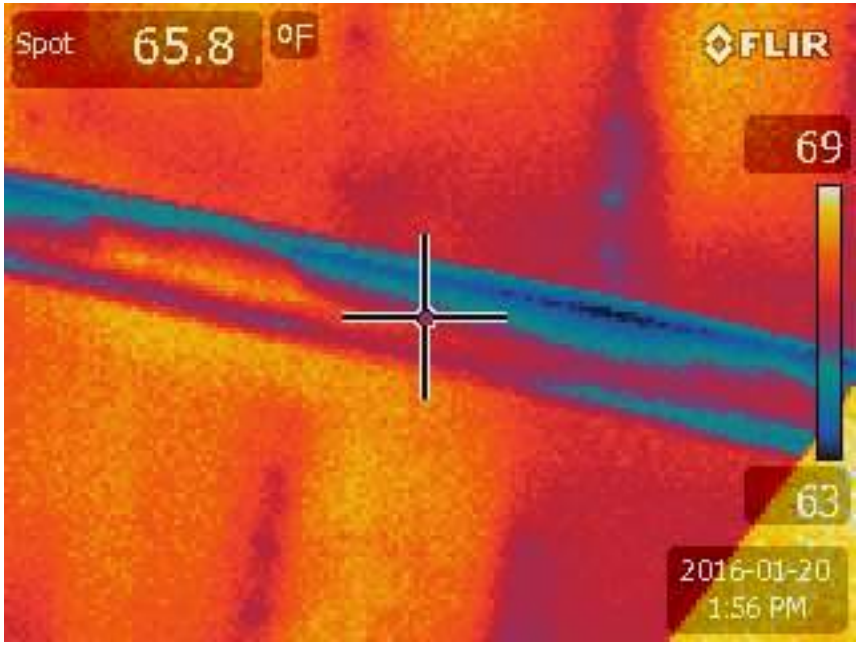
Farm Barn

Date: January 20, 2016

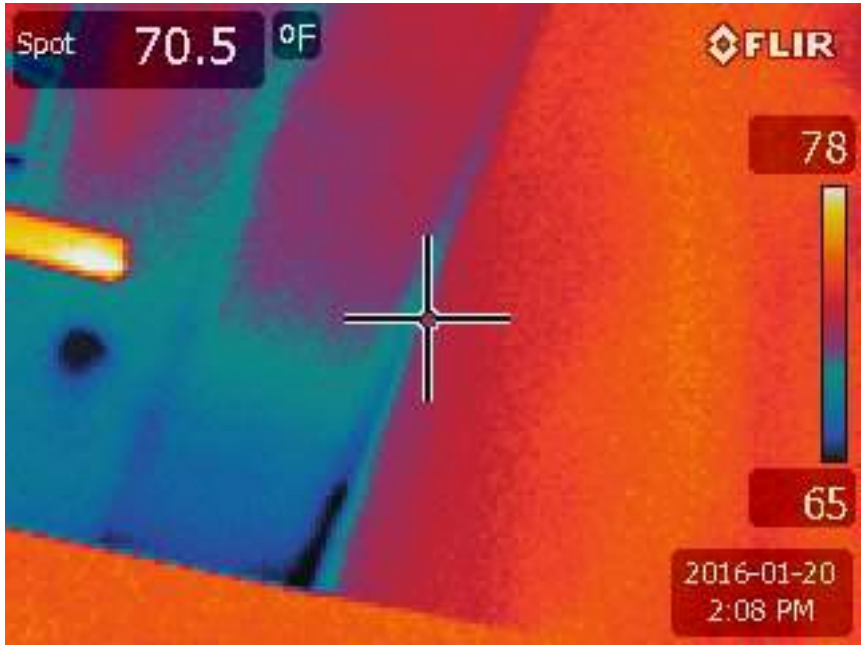
Outdoor Temp: 25°F



Cold Spot created where boards meet drywall

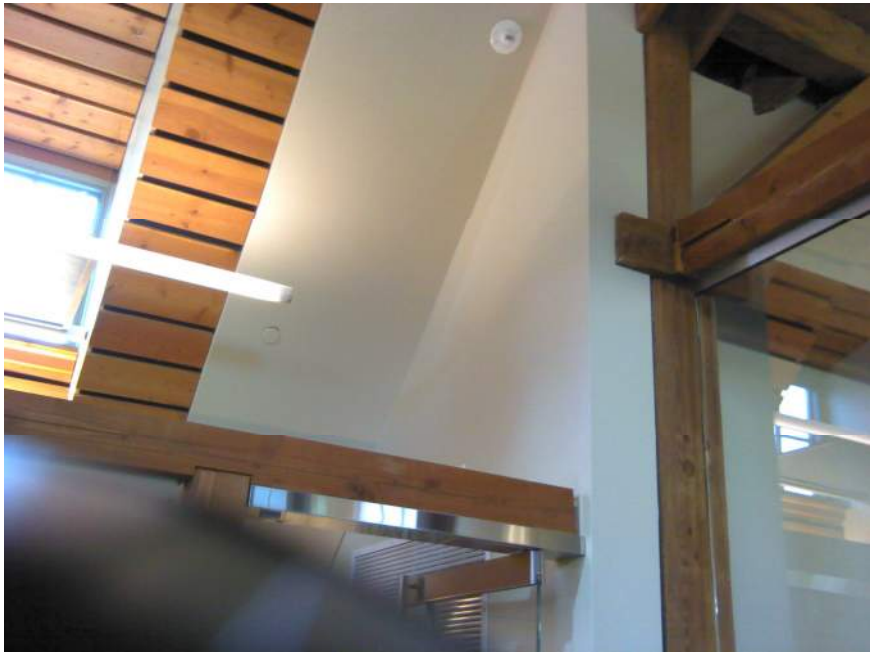


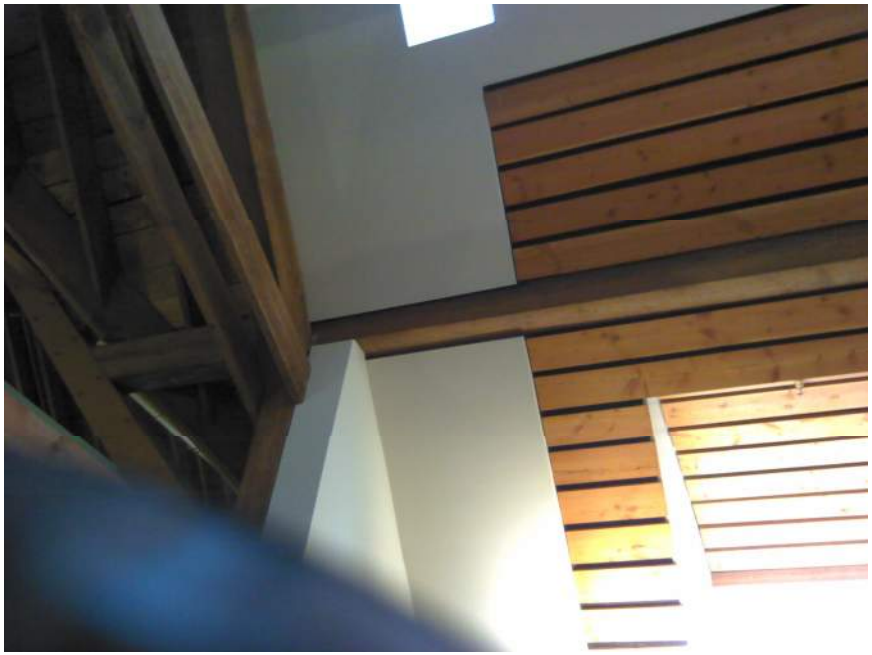
Structural beam conducting cold and source of infiltration

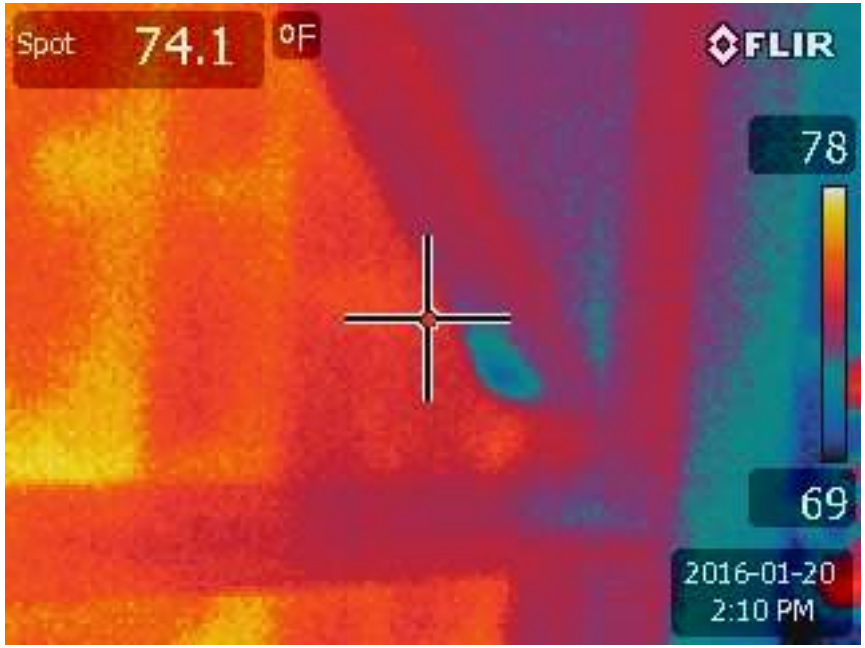


Cold spot sprinkler, hot spot light fixture.

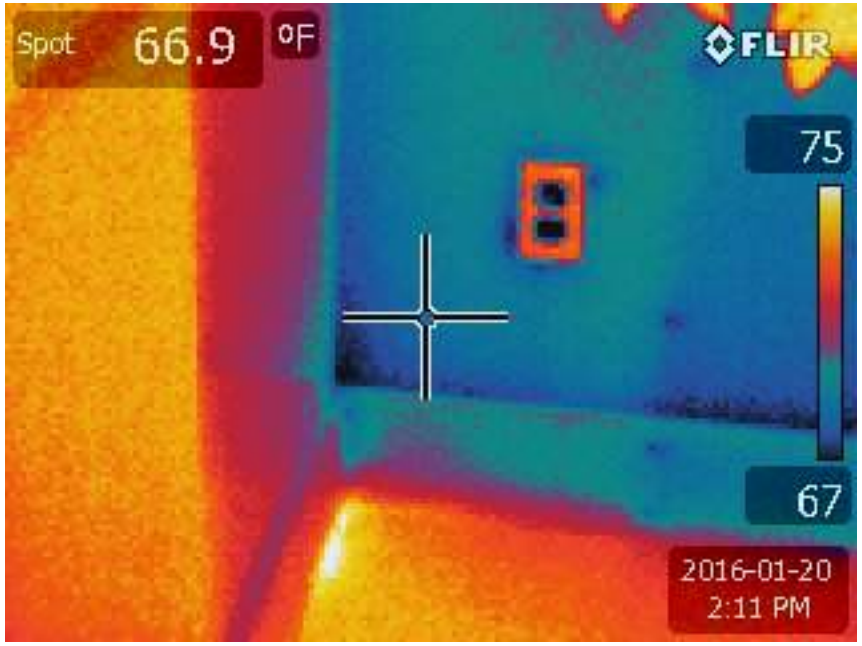
Exposed Timers colder than drywall



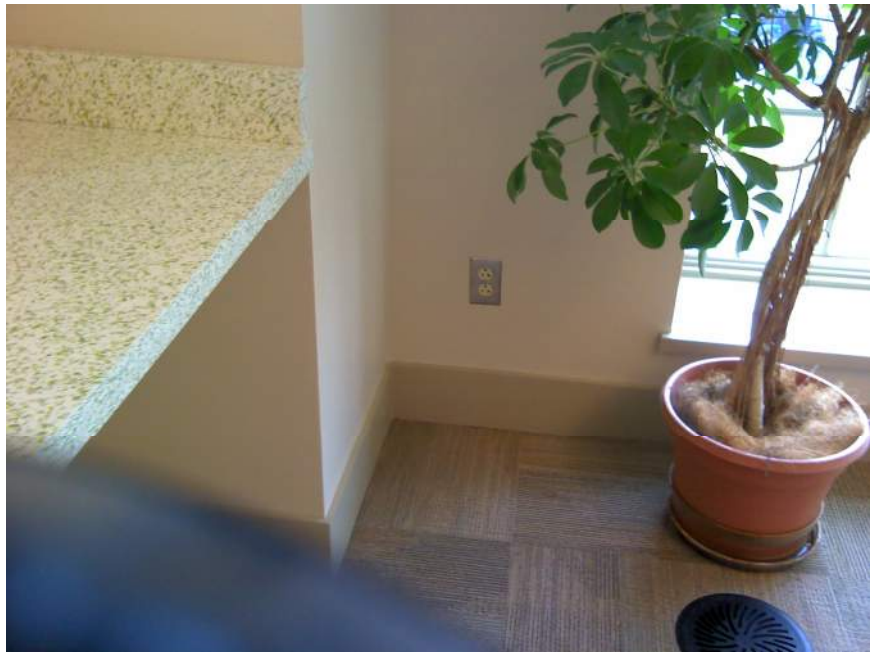


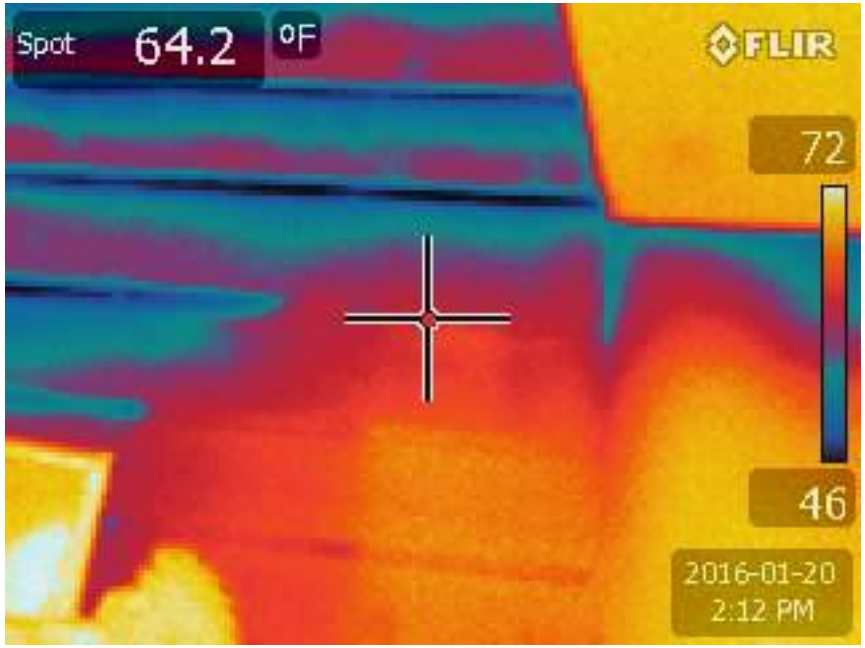


Cold spots where structure meets exterior wall.

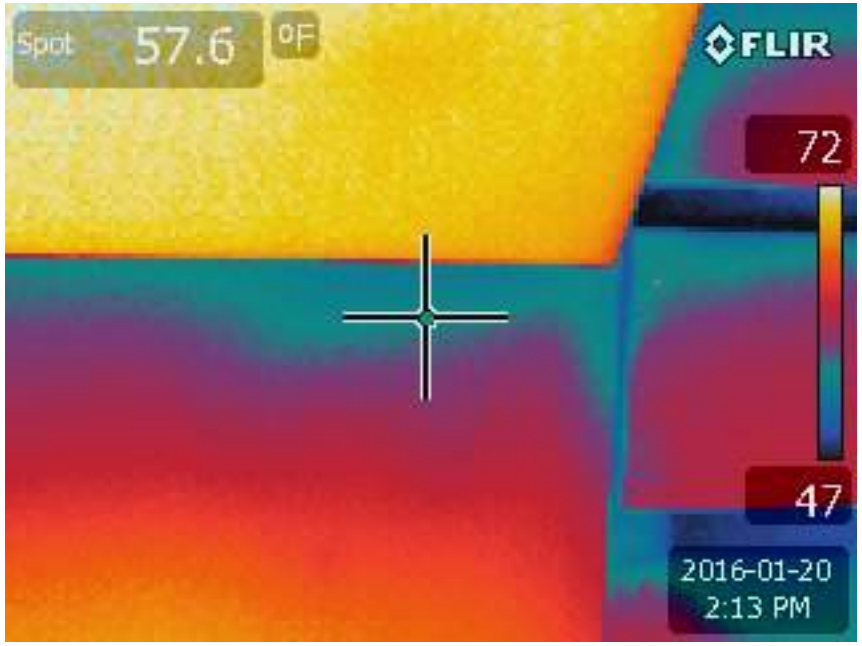


Exterior wall is colder than floor and interior wall. The cold outlet is consistent with air movement. Sealing outlet box could reduce infiltration.

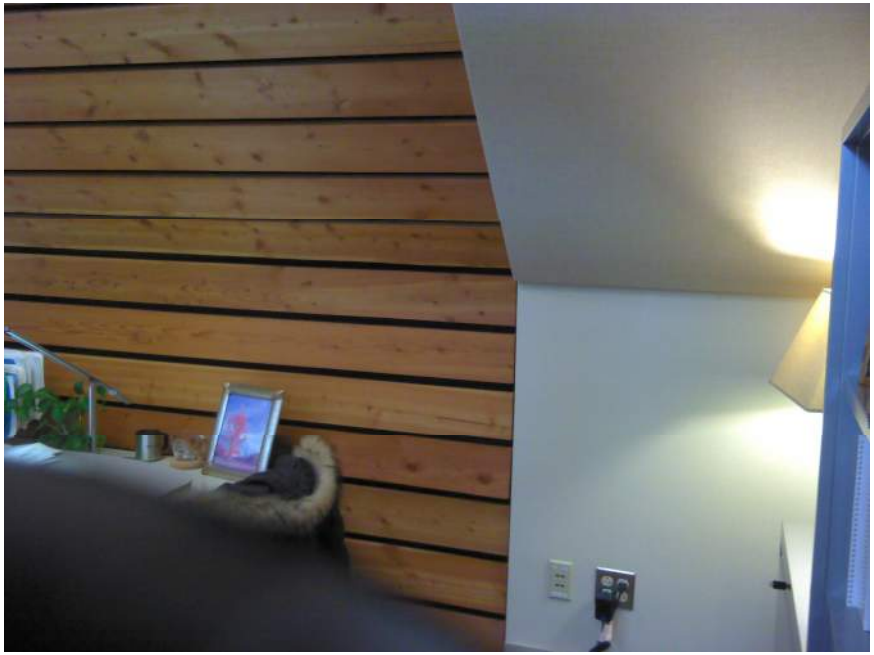


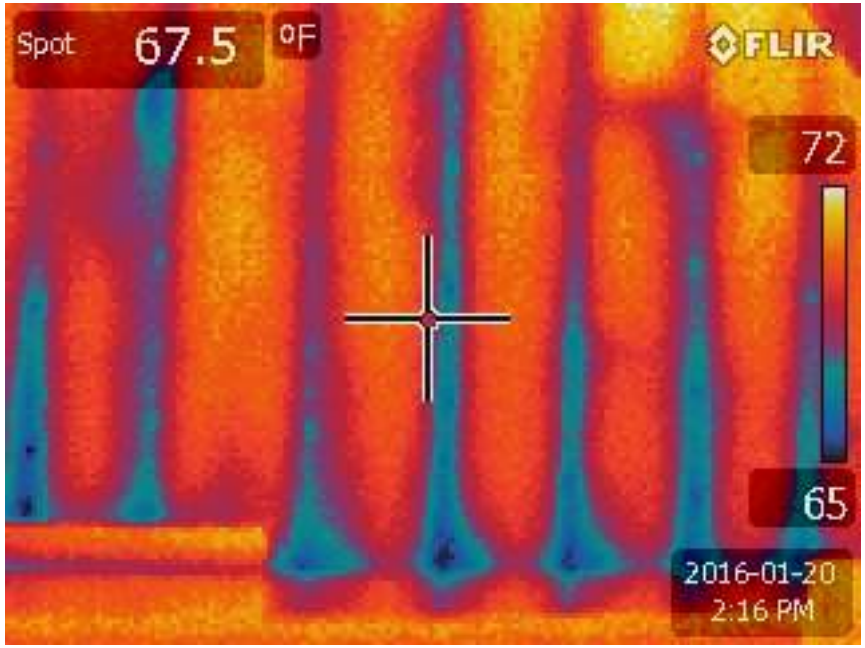


Cold spots between boards of wall

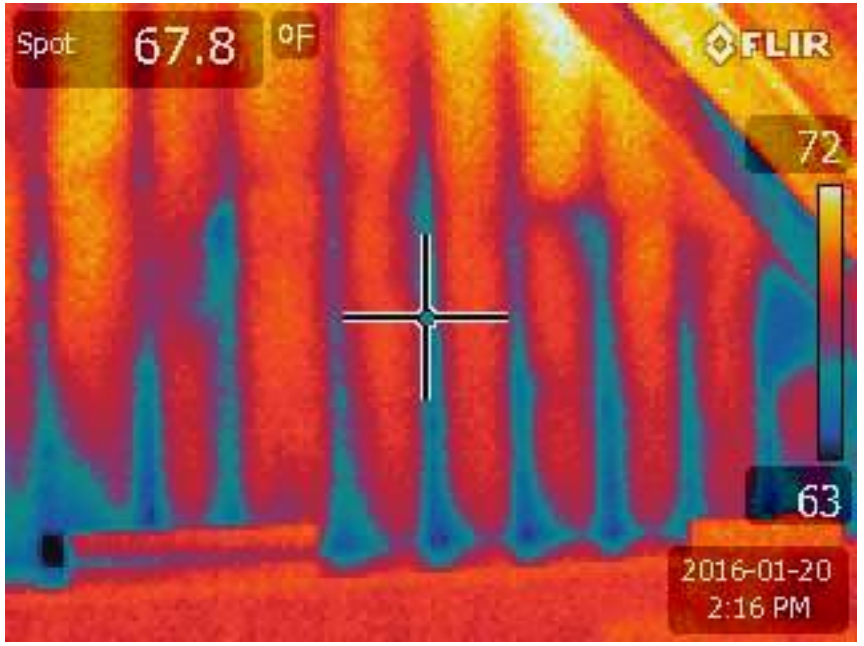


Cold spots between boards of wall

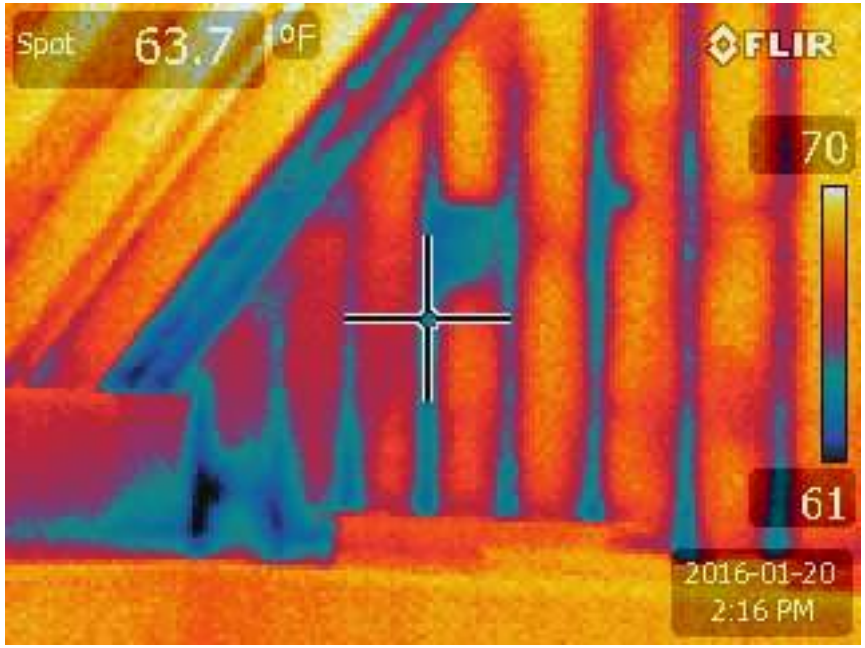




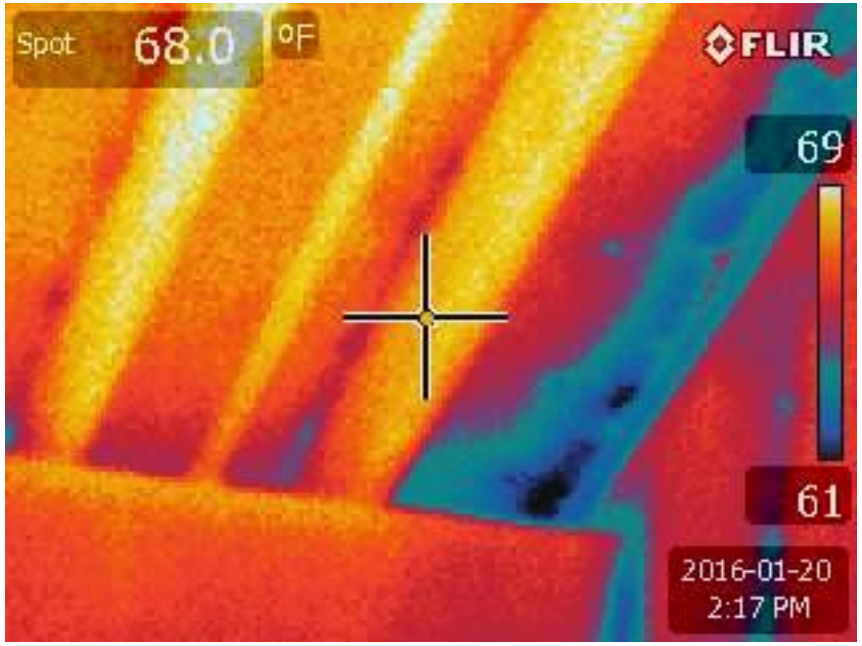
The cold spots are consistent with thermal bridging. Vertical cold spots assumed to be from steel studs.



Large blue voids are assumed to be due to ineffective or missing insulation.



Cold spots on wood decking. Cold areas have evidence of water damage. Poor insulation could cause condensation.



Water damage could be caused by water intrusion which would also show up as cold surface temperature.

Appendix F

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
AC	Building 23	W Bath	Bard	Tag Not Visible	2000	9.5 EER	2 Tonnes	W Bath	15	
AC	Building 23	M Bath	Bard	Tag Not Visible	2000	9.5 EER	2 Tonnes	M Bath	15	
AC	Building 23	Server Room	Bard	Tag Not Visible	2000	9.5 EER	2 Tonnes	Server Room	15	
AC Condenser	Building 23	Outside	Gibson	Tag Faded	2000	~11 EER	unknown	Outside	19	
AC RTU	Building 23	Upstairs Offices	-	Tag Faded	2000	~11 EER	unknown	Upstairs Offices	15	
AC Condenser	Building 23	Outside	Sanyo	C2432A	1999	~11 EER	24 MBH	Offices	19	
AC Condenser	Building 23	Archives	Goodman	CKL30-1	2000	~11 EER	2.5 Tonnes	Archives	19	
RTU	Building 23	Roof	-	Tag Faded	2000	~11 EER	unknown	Entry	15	
Central Air	Building 23	Roof	York	DBPMT060AA	2000	~10 EER	60 MBH	Conf Room	19	
HW Boiler	Building 23	Basement	Burnham	207NC-TE12	1998	~80%	199 MBH	Heat	15	
AC	Building 23	Roof	Goodman	A3600	2000	~11 EER	unknown	Break Room	19	
Electric Water Heater	Building 23	Basement	Whirlpool	EE3J50RD045V	2009	-	50 Gallons	DHW	15	4500 BTU/HR
AC Compressor	Building 24	Outside	Goodman	CKL36-1	1996	~10 EER	3 Tonnes	Upstair Cool	19	
AC Compressor	Building 24	Outside	Goodman	CK42-1C	1996	~9.5 EER	4.5 Tonnes	Downstair cool	19	
AHU Split	Building 24	Attic	Not Visible	-	1996	~10 EER	3 Tonnes	Upstair Cool	15	
AC Furnace	Building 24	Basement	Goodman	-	1996	~9.5 EER	4.5 Tonnes	Downstair cool	15	100 MBH Heat
Nat Gas Water Heater	Building 24	Basement	Bradford White	MI40T6EN12	2000	~80%	40 Gallons	DHW	15	40,000 BTU/HR
Nat Gas Heat	Building 27	Basement	Burnham	206NC-TEI2	1998	80.3%	164 MBH	Heat	35	
Window AC	Building 27	Upstairs	Fedders	A2Q08F2BG	1988	8.3 EER	7.5 MBH	Cooling	10	
Electric Water Heater	Building 27	Basement	Rheem	81V52D	2003	-	4.5kW	DHW	15	
Nat Gas Heat	Building 29	Basement	Burnham	206NC-TEI2	1998	80.3%	164 MBH	Heat	35	
Window AC	Building 29	Upstairs	Fedders	A2Q08F2BG	1988	8.3 EER	7.5 MBH	Cooling	10	
Electric Water Heater	Building 29	Basement	Rheem	81V52D	2003	-	50 Gallons	DHW	15	4.5kW
Electric Heater	Building 30	kitchen	TBI	-	2010	-	1.5kW	Kitchen	10	1.2 kW
Boiler	Building 30	Basement	Burnham	206NC-TEI2	1998	80.3%	164 MBH	Heat	35	
Electric Water Heater	Building 30	Basement	Rheem	81V-80D	Jun-05	-	80 Gallons	DHW	15	4.5kW
Unit Heater	Building 43	Basement	TPI	F2F5105N	2010	-	5kW	Heat	13	
Unit Heater	Building 43	Basement	TPI	F2F5105N	2010	-	5kW	Heat	13	
Steam Boiler	Building 43	Basement	Williamson	GSA-175-NIP	1998	~80%	175 MBH	Heat	30	
Window AC	Building 43	Upstairs	GE	Not Visible	2005	10.5 EER	15-18MBH	Cooling	10	
Nat Gas Water Heater	Building 43	Basement	Bradford White	MI5036EN10	2002	~80%	40 MBH	DHW	15	
Ductless Split HP	Building 45	First Floor	York	DHPM24NWM42Q1A	2013	~14 EER	21.4 MBH	Security	15	
Window AC	Building 45	Upstairs	Friedrich	CP12F10	2010	10.8 EER	13MBH	Storage	10	
Return Fan	Building 45	Basement	Greenheck	QEI-16-I-20	2012	86.50%	-	Server Room	20	2 HP
Return Fan	Building 45	Basement	Greenheck	QEI-16-I-20	2012	86.50%	-	Server Room	20	2 HP
CRAQ	Building 45	Basement	Emerson		2012	~12 EER	50 kW	Server Room	15	
AC	Building 45	Basement	Space PAK	ESP4860V	2010	~10 EER	48 MBH	Upstairs	15	1 HP
AC	Building 45	Basement	Space PAK	ESP4860V	2010	~10 EER	48 MBH	Breadroom	15	1 HP
Unit Heater	Building 45	Basement	TPI	F2F5105N	2012	-	5kW	Basement	15	
Steam Boiler	Building 45	Basement	Burnham	PIN75NCME2	1998	80.9%	210 MBH	Heat	25	
Condenser	Building 45	Outside	York	YCJD60541S1C	2012	-	-	spacePAK	15	
Condenser	Building 45	Outside	York	YCJD60541S1C	2012	-	-	spacePAK	15	
Dry Cooler	Building 45	Outside	Liebert	TCDV251-Y	2012	-	50 kW	CRAQ	20	
Emergency Generator	Building 45	Outside	-		1998	-	75 kW	Security	20	75kW
Nat Gas Water Heater	Building 45	Basement	Bradford White	MI50L6FBN7	2005	~80%	40 MBH	DHW	15	
Window AC	Building 56	First Floor	Frigidaire	FAM157Q1A1	2006	10.7 EER	15 MBH	Cooling	10	
Baseboard Heater	Building 56	First Floor	-	Tag Gone	2000	-	500W	Bathroom	10	
Unit Heater	Building 56	Basement	DR Heater	DR966	2010	-	6kW	Basement	13	
Electric Water Heater	Building 56	Basement	-	Tag Not Visible	2000	-	5 Gallon	DHW	15	1.5 kW

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
Window AC	House 7	Bedroom	Frigidaire	FAA067A1	2010	10.7 EER	6,000 BTU/HR	Cooling	10	
Window AC	House 7	Bedroom	Quasar	HQ2061FH	1995	8.5 EER	8,000 BTU/HR	Cooling	10	
Steam Boiler	House 7	Basement	Burnham	IN-5	2010	80%	140,000 BTU/HR	Heating	30	
Nat Gas Water Heater	House 7	Basement	Bradford White	MI403T6EN12	1995	80%	40 Gallons	DHW	15	40 MBH
Window AC	Cottage 8	Bedroom	Frigidaire	LRA087AT7	2013	10.8 EER	8000 BTU/HR	Cooling	10	
Window AC	Cottage 8	Bedroom	Frigidaire	LRA087AT8	2013	10.8 EER	8000 BTU/HR	Cooling	10	
Steam Boiler	Cottage 8	Basement	Burnham	PIN5SNC-ME2	1998	80%	140,000 BTU/HR	Heating	30	
Nat Gas Water Heater	Cottage 8	Basement	Bradford White	MI403T6EN12	1996	80.00%	40 Gallons	DHW	15	40 MBH
Electric Baseboard	Cottage 10	Second Floor	-	No Tag	2000	-	1.5 kW	Heating	10	1.5kW
Condensing Furnace	Cottage 10	Basement	Gibson	No Tag	2000	88%	100,000 BTU/HR	Heating	15	
Window AC	Cottage 10	Bedroom	Quasar	HQ2051NH	2000	8.0EER	5,000 BTU/HR	Cooling	10	
Electric Water Heater	Cottage 10	Basement	Bradford White	MI65R6DS13	2013	-	65 Gallon	DHW	15	4.5kW
Nat Gas Boiler	House 13	Basement	Burnham	P207AWNV	1991	80%	198,000 BTU/HR	Heating	30	
Electric Heater x2	House 13	Bedroom	No Tag	No Tag	2005	-	1 kW	Heating	10	(2) 1kW
Electric Heater	House 13	Bathroom	No Tag	No Tag	2005	-	500 W	Heating	10	500W
Nat Gas Water Heater	House 13	Basement	Bradford White	M1XR504T6EN10	1996	80%	40 Gallons	DHW	15	65 MBH
AC	House 21	Attic	Gibson	GB3BM060K	2004	~11 EER	5 tons	Cooling	15	
Steam Boiler	House 21	Basement	Burnham	IN9	2013	82%	280 MBH	Heating	30	SN:
AC Condenser	House 21	Outside	Nordyne	JS3ED048K	2004	~11 EER	4 tons	Cooling	20	
Gas Pilot Water Heater	House 21	Basement	Bradford White	MI5036EN10	2009	80%	50 Gallons	DHW	15	40 MBH
Window AC	Cottage 35	Office	GE	AGN10ABG1	2008	9.8 EER	10MBH	Cooling	10	
Unit Heater	Cottage 35	Basement	TPI	F2F5105N	2002	-	5kW	Heating	13	
Steam Boiler	Cottage 35	Basement	Burnham	PIN7SNC-ME2	2012	80.9%	210 MBH	Heating	30	SN: 65310181
Nat Gas Water Heater	Cottage 35	Basement	Bradford White	MI50L6FBN	2006	80%	40 MBH	DHW	15	
Steam Boiler	Cottage 37	Basement	Burnham	PIN7SNC-ME2	2011	80.9%	210 MBH	Heating	30	
Unit Heater	Cottage 37	Basement	TPI Taskmaster	F2F5105N	2000	-	5kW	Heating	13	
Nat Gas Water Heater	Cottage 37	Basement	Bradford White	MI50L6FBN	2005	80%	40 MBH	DHW	15	
Window AC	House 52 A	Second Floor	Soleus	SG-WAC-15ESE-C	2004	~10.7 EER	15 MBH	A	10	
Oil Fired HW Boiler	House 52 A	Basement	Burnham	V8H3W	2015	85.0%	125 MBH	A	35	
Electric Water Heater	House 52 A	Basement	Whirlpool	E2F30HD035V	2005	-	30 Gallons	A	15	3.5kW
Window AC	House 52 B	Second Floor	FrigidAire	FRA052XT7	2004	9.7	5 MBH	B	10	
Oil Fired HW Boiler	House 52 B	Basement	Weil-McLain	WGO3	2004	80.0%		B	35	
Electric Water Heater	House 52 B	Basement	Whirlpool	E2F40RD045V	2005	-	40 Gallons	B	15	4.5kW
Window AC	House 59	First Floor	Fedders	A7QD8F2A	2005	2005	8MBH	Cooling	10	
Window AC	House 59	First Floor	FrigidAire	LRA074T7	2007	10.7	6.5MBH	Cooling	10	
Window AC	House 59	First Floor	FrigidAire	LRA074T7	2007	10.7	6.5MBH	Cooling	10	
Window AC	House 59	First Floor	LG	LW5012	2005	9.7	5MBH	Cooling	10	
Window AC	House 59	Second Floor	LG	LW5012	2005	9.7	5MBH	Cooling	10	
Window AC	House 59	Second Floor	LG	LW5012	2005	9.7	5MBH	Cooling	10	
Window AC	House 59	Second Floor	LG	LW5012	2005	9.7	5MBH	Cooling	10	
Window AC	House 59	Second Floor	GE	AQP08AAM1	1997	9.7	5MBH	Cooling	10	
Oil Steam Boiler	House 59	Basement	Burnham	PV74WC-TBWn	1998	80%	156MBH	Heat	30	
Gas Pilot Water Heater	House 59	Basement	Whirlpool	L40T61-343	2011	80%	40 Gallons	DHW	15	83 MBH

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
Electric Board Heater	House 74	Third Floor	N/A	-	1980	-	1.5kW	Heat	10	
Electric Board Heater	House 74	Third Floor	N/A	-	1980	-	2kW	Heat	10	
Steam Boiler	House 74	Basement	Cover Missing	-	1970	Disconnected	N/A	Not Used	30	non-operational
Gas Water Heater	House 74	Basement	State	-	1970	Disconnected	N/A	Not Used	15	non-operational
Bathroom Heater	House 79	Second Floor	No Tag	-	2000	-	500W	Heat	10	
Oil Heat	House 79	Basement	Burnham	MPO-IQ115-TL	2013	87.0%	101MBH	Heat	30	
Electric Water Heater	House 79	Basement	Whirlpool	EE2H50RD045V	2004	-	4.5kW	DHW	15	
Propane Hot Water Boiler	House 120	Basement	Weil McLain	CGI-7 PIL	2010	~80%	200 MBH	Heat	30	
Electric Water Heater	House 120	Basement	Bradford White	M250T6DS-1NCWW	2013	-	4.5 kW	DHW	15	
AC Condenser	House 87	Outside	Goodman	CKL361E	1996	10.7 EER	3 tonnes	Cooling	20	
Boiler	House 87	Basement	Weil McLain	Atmosphere LP	1996	~80%	400MBH	Heating	30	
Electric Water Heater	House 87	Basement	Bradford White	M280R6DS-1NCWW	2007	~80%	80 Gallons	DHW	15	4.5 kW
Gas Boiler	House 47	Basement	Burnham	P207BWNV	1998	80.4%	198 MBH	Heat	30	
ACU	House 47	Basement	Lennox	CB29M-31-1P	2003	~12 EER	29 MBH	Cool	15	
Furnace	House 47	Basement	Lennox	G26Q3-75-6	2003	92.30%	75 MBH Heat/2.5 ton cool	Heat/Cool	18	
ACU	House 47	Attic	Lennox	CB29M-5HP	2003	~12 EER	29 MBH	Cool	15	
Nat Gas Pilot	House 47	Basement	Bradford White	MI75S6EN12	1998	~80%	75Gallons	DHW	15	76 MBH

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
Electric Heater	Shop 18	Bathroom	No Tag	No Tag	2010	-	2kW	heat	10	
AC	Shop 18	Tool Room	White Westing	Not Visible	2010	8.9 EER	6,000 BTU//HR	Cooling	10	
Condensing Heat	Shop 18	Attic	Gibson	Tag Not Visible	2010	~90%	100,000 BTU/HR	Heat	20	x2
Electric Water Heater	Shop 18	Garage	Bradford White	Tag Not Visible	2010	-	8 Gallons	DHW	15	2kW
Unit Heater	Shop 70	Storage	Reznor	XL-75	1970s	80.0%	75MBH	Heat	13	
AC	Shop 70	Storage	Carrier	77ATB008101	1990	8.7 EER	8MBH	Cooling	10	
Unit Heater	Shop 70	Wood Shop	Modine	PD100AA0111	2000	~80%	100MBH	Heat	13	
Electric Baseboard	Motor Pool	Bathroom	No Tag	No Tag	1996	-	500W	Heat	10	
Electric Water Heater	Motor Pool	Garage	Bradford White	Not Visible	1996	-	10	DHW	15	fair condition
Gas Water Heater	Motor Pool	Wash Bay	Bradford White	MI403T6EN12	1996	~80%	40	Wash Water	15	40 MBH - pilot

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
Electric Unit Heat	Greenhouse	Boiler-room	Modine	HER 200B.3301	2012	-	68 MBH	Heat	13	x2 (20kW)
Water Heater	Greenhouse	Boiler-room	Noritz	N-1321 MASME	2008	92%	380 MBH	DHW	15	x3
Gas Space Heater	Greenhouse	Greenhouse	WackaNeuso	H1400 HDG	2009	86%	325 MBH	Heat	13	x2
Unit Heater	Orchid Range	Basement	Modine	-	2011	-	500-1000 BTU	Heat	13	
Boiler	Orchid Range	Basement	Burnham	203WILTEI1	2011	82.60%	62,000 BTU/HR	Office Heat	25	
Modulex Boiler x2	Orchid Range	Basement	Aerco	MLX EXT 802	2011	90.00%	802. MBH	Grow areas	30	x2
Electric Unit Heat	Orchid Range	Boiler-room	Berko	Not Visible	2011	-	5kW	Boiler Room	10	
Water Boiler x2	Orchid Range	Boiler-room	Aerco	MLX EXT 962	2011	90.00%	865.8 MBH	Grow areas	35	x2
Nat Gas Water Heater	Orchid Range	Basement	A.O. Smith	BT65200	2011	~80%	65 Gallons	DHW	15	65 MBH
Baseboard Heater	Well Pump Comm. Garden	Shed	TPI	H2920-0965W/DS2D20-096W	2010	-	2kW	Heat	10	
Gas Fired Unit Heater	Pump House	Gallery	Carrier	46723229	1970	~80%	230 MBH	Heat	13	

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
WHP-1	Farm Barn	118	FHP	WW240-4CSN	2012	3.8 COP	240 MBH	Heated Slab		Water to Water
P-1A	Farm Barn	118	B+G	1510	2012	Not Visible	Not Visible	Heated Slab		Radiant Slab
P-1B	Farm Barn	118	B+G	1510	2012	Not Visible	Not Visible	Heated Slab		Radiant Slab
GTHP-1	Farm Barn	118	FHP	EC120-VTC	2012	3.2 COP	10 tons	1 flr east		Water to Air
RF-1	Farm Barn	118	Greenheck	QEI-18-1-10	2012	82.5%	1HP	1 flr east		
GTHP-2	Farm Barn	118	FHP	EC096-VTC	2012	3.4 COP	8 tons	2nd conf	19	Water to Air
RF-2	Farm Barn	118	Greenheck	QEI-18-1-10	2012	82.5%	1HP	2nd conf	20	
GTHP-3	Farm Barn	118	FHP	EC151-4VTC	2012	3.8 COP	12.5 tons	2nd East	19	Water to Air
RF-3	Farm Barn	118	Greenheck	QEI-18-1-10	2012	82.5%	1HP	2nd East	20	
P-2	Farm Barn	118	B+G	1510	2012	93.6%	25 HP	GHP	20	300 GPM 14 ft
P-2A	Farm Barn	118	B+G	1510	2012	93.6%	25 HP	GHP	20	300 GPM 14 ft
UH	Farm Barn	118	Trane	UHEC-033-DACA	2012	-	3 kW	Mech Room	13	
UH	Farm Barn	Sprinkler	Trane	UHEC-033-DACA	2012	-	3 kW	Mech Room	13	
GTHP-10	Farm Barn	Sprinkler	FHP	EC0964VTC	2012	3.4 COP	75 MBH	Classroom	19	Water to Air
RF-10	Farm Barn	121	Not Visible	not visible	2012	-	not visible	Classroom	20	
AC-4	Farm Barn	118	Not Visible	not visible	2012	not visible	not visible	Server	19	Water to Air
EF	Farm Barn	Kitchen	Not Visible	not visible	2012	-	not visible	Cooking	20	
GTHP-7	Farm Barn	Mev 215	FHP	EC151-4VTC	2012	3.8 COP	12.5 tons	2fl west	19	Water to Air
RF-7	Farm Barn	Mev 215	Greenheck	-	2012	-	1 HP	2fl west	20	
GTHP-6	Farm Barn	Mev 215	FHP	EC096-4VTC	2012	3.4 COP	8 tons	lobby	19	Water to Air
RF-6	Farm Barn	Mev 215	Greenheck	-	2012	-	-	lobby	20	
GTHP-8	Farm Barn	Mev 215	FHP	ES018-2VTC	2012	3.9 COP	1.5 tons	elec room	19	Water to Air
EF-8	Farm Barn	Mev 215	Greenheck	-	2012	-	-	elec room	20	
GTHP-5	Farm Barn	Mev 215	FHP	EC151-4VTC	2012	3.8 COP	12.5 tons	1fl west	19	Water to Air
RF-5	Farm Barn	Mev 215	Greenheck	-	2012	-	1 HP	1fl west	20	
GTHP-9	Farm Barn	Conf 304	FHP	EC096-4HZC	2012	3.4 COP	8 tons	conf	19	Water to Air
RF-9	Farm Barn	Conf 304	Greenheck	not visible	2012	-	1 HP	conf	20	
Electric Water Heater	Farm Barn	Entry Janitor	AO Smith	DEN 52 110	2013	-	50 gallons	DHW	15	9000W

Duke Farms
Equipment List

Designation	Building	Location	Manufacturer/ Model/Type	Manufacturer/ Model/Type	Date	Efficiency	Capacity	Serves	ASHRAE Expected Life	Remarks
Gas Boilers x2	Coach Barn	Basement	Burnham	807B-WI	1980	~80%	275 MBH each	Heat	35	
Air Conditioner	Coach Barn	2nd Floor	Intl Comfort	N2A060AHA	2008	~11 EER	5 tons	Museam	15	
Electric Baseboard x 2	Coach Barn	2nd Floor	No Tag	No Tag	1980	-	2kW	Office	10	
Water Heater	Coach Barn	Basement	Bradford White	MI40T6EN12	1990s	~80%	40 Gal	DHW	15	Gas Pilot Stages/40 MBH

Appendix G

	Fixture Type	Shower		Sink			Toilet		Urinal		Slop Sink	
Building	Room	Qty	GPM	Qty	Control	GPM	Qty	GPF	Qty	GPF	Qty	GPM
House 7	Kitchen			1	M	2.2						
House 7	Bathroom	1	-	1	M	2.0	1	-				
Cottage 8	Kitchen			1	M	2.2						
Cottage 8	Bathroom	1	-	1	M	2.0	1	-				
Cottage 8	Basement				-		1	1.6			1	No
Cottage 10	Kitchen			1	M	2.2						
Cottage 10	Bathroom	1	2.5	1	M	2.0	1	1.6				
Cottage 10	Basement				-						1	No
Coach Barn	Restroom 1			1	M	no	1	1.6				
Coach Barn	Kitchen 2			1	M	no						
Coach Barn	Bathroom 2	1	1.5	1	M	no	1	1.6				
Coach Barn	Bathroom 1			1	M	0.5	2	1.6	1	-		
House 13	Kitchen			1	M	2.2						
House 13	Basement				-						1	-
House 13	Bedroom	1	2.5	1	M	2.2	1	1.6				
House 13	Upstairs Bathroom	2	2.5	2	M	no	2	1.6				
18 Shop	Area 1				-						1	-
18 Shop	Bathroom	1	2.5	1	M	2.2	1	1.6	1	1.0		
House 21	Kitchen			1	-	no						
House 21	Bathroom 2	1	2.5	1	1.5	1.5	1	1.6				
House 21	Bathroom 1	1	2.5	1	1.5	1.5	1	1.6				
Building 23	Unisex Bathroom 1			1	A	2.0	1	1.6				
Building 23	Unisex Bathroom 1			1	A	2.0	1	1.6				
Building 23	Male Bathroom 1			4	A	1.0	2	1.6	3	1.0		
Building 23	Female Bathroom 1			5	A	1.0	6	1.0				
Building 23	Kitchen 1			1	M	2.2						
Building 23	Kitchen 2			1	M	2.2						
Building 23	Bathroom 2			1	M	2.2	1	1.6				
House 24	Kitchen			1	M	2.2						
House 24	Bathroom 1			1	M	2.2	1	1.5				
House 24	Bathroom 2	1	-	1	M	2.2	1	1.5				
Building 29	Kitchen			1	M	2.2						
Building 29	Bathroom	1	-	1	M	no	1	5.0				
Building 30	Kitchen			1	M	2.2						
Building 30	Kitchen Bath			1	M	2.2	1	1.6				
Building 30	Basement				-						1	no
Building 30	Upstairs Bathroom	1	2.5	1	M	2.2	1	1.6				
Orchid Range 32	Bathroom 1	1	2.5	1	A	1.5	1	1.3				
Orchid Range 32	Kitchen 1			1	M	2.2					1	2.0
Orchid Range 32	Bathroom 2	1	2.5	1	M	2.0	1	1.8				
Orchid Range 32	Outside Women's			3	A	0.5	3	1.3				
Orchid Range 32	Outside Men's			2	A	0.5	1	1.3	2	0.0		
Cottage 35	Kitchen			1	M	no						
Cottage 35	Bathroom 1			1	A	-	1	1.6				
Cottage 35	Bathroom 2			1	M	2.0	1	1.6				
Cottage 37	Kitchen			1	M	2.2						
Cottage 37	Bathroom 1			1	A	1.5	1	1.3				
Cottage 37	Bathroom 2	1	2.5	1	M	2.0	1	1.6				
Building 43	Kitchen			1	M	2.2						
Building 43	Bathroom 1	1	-	1	A	1.5	1	1.3				
Building 43	Bathroom 2	1	2.5	1	M	2.0	1	1.6				
Cottage 45	Bathroom 1			1	A	1.5	1	1.3				
Cottage 45	Kitchen			1	M	2.2	1	1.6				
Cottage 45	Locker-room			1	M	1.5						
House 52 A	Kitchen			1	M	1.5						
House 52 A	Bathroom 2	1	2.5	1	M	2.2	1	2.6				
House 52 A	Bathroom 2	1	2.5	1	M	no	1	1.6				
House 52 B	Kitchen			1	M	no						
House 52 B	Bathroom	1	2.5	1	M	2.0	1	1.8				
Building 56 Gate House	Bathroom			1	M	-	1	-				
House 59	Kitchen			1	M	2.2						
House 59	Bathroom 2	1	2.5	1	M	2.2	1	1.6				
House 59	Basement				-						1	no
House 59	Bathroom 0	1	2.5	1	M	2.2	1	1.6				
House 74	Bathroom 1			1	M	no	1	5.0				
House 74	Kitchen 1			1	M	2.2						
House 74	Bathroom 2	1	2.5	1	M	2.2	1	5.0				
House 74	Bathroom 2	1	-	1	M	2.2	1	5.0				
House 79	Kitchen			1	M	2.2						

House 79	Bathroom 1	1	2.5	1	M	2.2	1	1.6				
House 79	Bathroom 2	1	2.5	1	M	2.2	1	1.6				
House 120	Bathroom 1	1	2.5	1	M	2.2	1	1.3				
House 120	Kitchen			1	M	2.2						
House 120	Bathroom 2	1	2.5	1	M	2.2	1	1.6				
House 87	Bathroom 1	1	2.5	1	M	2.0	1	1.6				
House 87	Bathroom 2	1	2.5	1	M	2.0	1	1.6				
House 87	Basement				-						1	no
Farm Barn 39	Men's 2			1	A	1.5	2	1.3	1	0.0		
Farm Barn 39	Janitor 2				-						1	no
Farm Barn 39	Women's 2			3	A	1.5	3	1.3				
Farm Barn 39	Men's 1			3	A	1.5	2	1.3	1	0.0		
Farm Barn 39	Women's 1			3	A	1.5	3	1.3				
Farm Barn 39	Family 1			1	A	1.5	1	1.3				
Conservatory 26	Men's			1	M	2.2	1	1.6	1	1.5		
Conservatory 26	Women's			2	M	2.0	2	1.6				
House 47	Bathroom 1			1	M	2.0	1	1.6				
House 47	Bathroom 1	1	2.5	1	M	2.2	1	1.6				
House 47	Bathroom 2	1	2.5	1	M	2.2	1	3.5				
House 47	Bathroom 2	1	2.5	2	M	-	1	1.6				

Appendix H

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 12 - Coach Barn : Condesing Boiler Installation									
1	Demolition of Oil Boiler (275,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 275 MBH, 93% AFUE	1	Ea	$ 8,500.00	$ 8,500.00	1	Ea	$ 980.00	$ 980.00	$ 9,480.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				9,167.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$ 11,892.30
MARKUP % =	$ 0.15
MARKUP =	$ 1,783.85
SUB-TOTAL w/ OH & P =	$ 13,676.15
CONTINGENCY % =	0.25
CONTINGENCY =	$ 3,419.04
BUDGET COST ESTIMATE =	$ 17,095.18

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
6. Estimate assumes associated systems are available and in good working order. This includes existing chimney and venting, combustion air, floor drains, electrical and local controls.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 13: Condesing Boiler Installation									
1	Demolition of Oil Boiler (200,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 200 MBH, 93% AFUE	1	Ea	$ 5,500.00	$ 5,500.00	1	Ea	$ 980.00	$ 980.00	$ 6,480.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				6,167.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,892.30
MARKUP % =	$	0.15
MARKUP =	$	1,333.85
SUB-TOTAL w/ OH & P =	$	10,226.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,556.54
BUDGET COST ESTIMATE =	$	12,782.68

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 23: Condesing Boiler Installation									
1	Demolition of Oil Boiler (200,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 200 MBH, 93% AFUE	1	Ea	$ 5,500.00	$ 5,500.00	1	Ea	$ 980.00	$ 980.00	$ 6,480.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				6,167.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,892.30
MARKUP % =	$	0.15
MARKUP =	$	1,333.85
SUB-TOTAL w/ OH & P =	$	10,226.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,556.54
BUDGET COST ESTIMATE =	$	12,782.68

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
6. Estimate assumes associated systems are available and in good working order. This includes existing chimney and venting, combustion air, floor drains, electrical and local controls.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 27: Condesing Boiler Installation									
1	Demolition of Oil Boiler (165,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 165 MBH, 93% AFUE	1	Ea	$ 5,000.00	$ 5,000.00	1	Ea	$ 980.00	$ 980.00	$ 5,980.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				5,667.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,392.30
MARKUP % =	$	0.15
MARKUP =	$	1,258.85
SUB-TOTAL w/ OH & P =	$	9,651.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,412.79
BUDGET COST ESTIMATE =	$	12,063.93

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
6. Estimate assumes associated systems are available and in good working order. This includes existing chimney and venting, combustion air, floor drains, electrical and local controls.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 29: Condesing Boiler Installation									
1	Demolition of Oil Boiler (165,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 165 MBH, 93% AFUE	1	Ea	$ 5,000.00	$ 5,000.00	1	Ea	$ 980.00	$ 980.00	$ 5,980.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				5,667.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,392.30
MARKUP % =	$	0.15
MARKUP =	$	1,258.85
SUB-TOTAL w/ OH & P =	$	9,651.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,412.79
BUDGET COST ESTIMATE =	$	12,063.93

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
6. Estimate assumes associated systems are available and in good working order. This includes existing chimney and venting, combustion air, floor drains, electrical and local controls.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 30: Condesing Boiler Installation									
1	Demolition of Oil Boiler (164,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 165 MBH, 93% AFUE	1	Ea	$ 5,000.00	$ 5,000.00	1	Ea	$ 980.00	$ 980.00	$ 5,980.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				5,667.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,392.30
MARKUP % =	$	0.15
MARKUP =	$	1,258.85
SUB-TOTAL w/ OH & P =	$	9,651.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,412.79
BUDGET COST ESTIMATE =	$	12,063.93

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 47: Condesing Boiler Installation									
1	Demolition of Oil Boiler (200,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 200 MBH, 93% AFUE	1	Ea	$ 5,500.00	$ 5,500.00	1	Ea	$ 980.00	$ 980.00	$ 6,480.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				6,167.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$	8,892.30
MARKUP % =	$	0.15
MARKUP =	$	1,333.85
SUB-TOTAL w/ OH & P =	$	10,226.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,556.54
BUDGET COST ESTIMATE =	$	12,782.68

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Created By **B. Bilodeau**
Reviewed By **B. McLean**

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 120: Condesing Boiler Installation									
1	Demolition of Oil Boiler (200,000 BTUH)	1	Ea	$ -		1	Ea	$ 1,100.00	$ 1,100.00	$ 1,100.00
2	Condensing Boiler, 200 MBH, 93% AFUE	1	Ea	$ 5,500.00	$ 5,500.00	1	Ea	$ 980.00	$ 980.00	$ 6,480.00
3	3" PVC Venting	40	L.F.	$ 13.00	$ 520.00	10	L.F.	$ 21.00	$ 210.00	$ 730.00
4	1/2" steel pipe	10	L.F.	$ 2.90	$ 29.00	10	L.F.	$ 9.75	$ 97.50	$ 126.50
5	Hot water pipe removal	20	L.F.	$ -	$ -	20	L.F.	$ 3.04	$ 60.80	$ 60.80
6	1 1/2" steel pipe	20	L.F.	$ 5.90	$ 118.00	20	L.F.	$ 13.85	$ 277.00	$ 395.00
	Subtotal				6,167.00				2,725.30	

Cost data obtained from RSMeans CostWorks 2015 and vendor pricing.

SUBTOTAL =	$ 8,892.30
MARKUP % =	$ 0.15
MARKUP =	$ 1,333.85
SUB-TOTAL w/ OH & P =	$ 10,226.15
CONTINGENCY % =	0.25
CONTINGENCY =	$ 2,556.54
BUDGET COST ESTIMATE =	$ 12,782.68

Notes:
1. Bonds not included in estimate.
2. Escalation not included in estimate.
3. CDM has no control over the cost of labor, materials, equipment, services furnished or market conditions.
4. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
5. Estimates do not include site conditions that may be required as part of the project. These may include abatement, remediation, or structural work.
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CDMSmith

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Duke Farms Foundation
Estimate by: BB
Checked by: BRM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 5 - Pumphouse									
1	Lighting Upgrades	1	ea.	$ 100.00	$ 100.00	1	ea.	$ 180.00	$ 180.00	$ 280.00
	Subtotal				$ 100.00				$ 180.00	

SUBTOTAL =	$	280.00
MARKUP % =	$	0.15
MARKUP =	$	42.00
SUB-TOTAL w/ OH & P =	$	322.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	80.50
BUDGET COST ESTIMATE =	$	402.50

Notes:
1. CDMSmith has no control over the cost of labor, materials, equipment, services furnished or market conditions.
2. CDMSmith does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 7									
1	Lighting Upgrades	1	ea.	$ 178.00	$ 178.00	1	ea.	$ 212.00	$ 212.00	$ 390.00
	Subtotal				$ 178.00				$ 212.00	

SUBTOTAL =	$	390.00
MARKUP % =	$	0.15
MARKUP =	$	58.50
SUB-TOTAL w/ OH & P =	$	448.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	112.13
BUDGET COST ESTIMATE =	$	560.63

Notes:
1. CDMSmith has no control over the cost of labor, materials, equipment, services furnished or market conditions.
2. CDMSmith does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.

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CDMSmith

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Duke Farms Foundation
Estimate by: BB
Checked by: BRM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 8									
1	Lighting Upgrades	1	ea.	$ 278.00	$ 278.00	1	ea.	$ 392.00	$ 392.00	$ 670.00
	Subtotal				$ 278.00				$ 392.00	

SUBTOTAL =	$ 670.00
MARKUP % =	$ 0.15
MARKUP =	$ 100.50
SUB-TOTAL w/ OH & P =	$ 770.50
CONTINGENCY % =	0.25
CONTINGENCY =	$ 192.63
BUDGET COST ESTIMATE =	$ 963.13

Notes:
1. CDMSmith has no control over the cost of labor, materials, equipment, services furnished or market conditions.
2. CDMSmith does not guarantee that this opinion will not vary from actual cost, or contractor's bids.
3. Bonds not included in estimate.
4. Escalation not included in estimate.

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 9									
1	Lighting Upgrades	1	ea.	$ 178.00	$ 178.00	1	ea.	$ 212.00	$ 212.00	$ 390.00
	Subtotal				$ 178.00				$ 212.00	

SUBTOTAL =	$ 390.00
MARKUP % =	$ 0.15
MARKUP =	$ 58.50
SUB-TOTAL w/ OH & P =	$ 448.50
CONTINGENCY % =	0.25
CONTINGENCY =	$ 112.13
BUDGET COST ESTIMATE =	$ 560.63

Notes:
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3. Bonds not included in estimate.
4. Escalation not included in estimate.

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CDMSmith

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Duke Farms Foundation
Estimate by: BB
Checked by: BRM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 10									
1	Lighting Upgrades	1	ea.	$ 40.00	$ 40.00	1	ea.	$ 60.00	$ 60.00	$ 100.00
	Subtotal				$ 40.00				$ 60.00	

SUBTOTAL =	$ 100.00
MARKUP % =	$ 0.15
MARKUP =	$ 15.00
SUB-TOTAL w/ OH & P =	$ 115.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 28.75
BUDGET COST ESTIMATE =	$ 143.75

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 12 - Coach Barn									
1	Lighting Upgrades	1	ea.	$ 40.00	$ 40.00	1	ea.	$ 60.00	$ 60.00	$ 100.00
	Subtotal				$ 40.00				$ 60.00	

SUBTOTAL =	$ 100.00
MARKUP % =	$ 0.15
MARKUP =	$ 15.00
SUB-TOTAL w/ OH & P =	$ 115.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 28.75
BUDGET COST ESTIMATE =	$ 143.75

Notes:
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 13									
1	Lighting Upgrades	1	ea.	$ 40.00	$ 40.00	1	ea.	$ 68.00	$ 68.00	$ 108.00
	Subtotal				$ 40.00				$ 68.00	

SUBTOTAL =	$	108.00
MARKUP % =	$	0.15
MARKUP =	$	16.20
SUB-TOTAL w/ OH & P =	$	124.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	31.05
BUDGET COST ESTIMATE =	$	155.25

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Shop 18									
1	Lighting Upgrades	1	ea.	$ 2,739.30	$ 2,739.30	1	ea.	$ 1,379.00	$ 1,379.00	$ 4,118.30
	Subtotal				$ 2,739.30				$ 1,379.00	

SUBTOTAL =	$	4,118.30
MARKUP % =	$	0.15
MARKUP =	$	617.75
SUB-TOTAL w/ OH & P =	$	4,736.05
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,184.01
BUDGET COST ESTIMATE =	$	5,920.06

Notes:
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4. Escalation not included in estimate.

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Garage 19									
1	Lighting Upgrades	1	ea.	$ 2,779.30	$ 2,779.30	1	ea.	$ 1,447.00	$ 1,447.00	$ 4,226.30
	Subtotal				$ 2,779.30				$ 1,447.00	

SUBTOTAL =	$	4,226.30
MARKUP % =	$	0.15
MARKUP =	$	633.95
SUB-TOTAL w/ OH & P =	$	4,860.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,215.06
BUDGET COST ESTIMATE =	$	6,075.31

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 21									
1	Lighting Upgrades	1	ea.	$ 1,008.00	$ 1,008.00	1	ea.	$ 248.00	$ 248.00	$ 1,256.00
	Subtotal				$ 1,008.00				$ 248.00	

SUBTOTAL =	$	1,256.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	314.00
BUDGET COST ESTIMATE =	$	1,570.00

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 23									
1	Lighting Upgrades	1	ea.	$ 64.00	$ 64.00	1	ea.	$ 100.00	$ 100.00	$ 164.00
	Subtotal				$ 64.00				$ 100.00	

SUBTOTAL =	$ 164.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 41.00
BUDGET COST ESTIMATE =	$ 205.00

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 24									
1	Lighting Upgrades	1	ea.	$ 1,072.00	$ 1,072.00	1	ea.	$ 348.00	$ 348.00	$ 1,420.00
	Subtotal				$ 1,072.00				$ 348.00	

SUBTOTAL =	$ 1,420.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 355.00
BUDGET COST ESTIMATE =	$ 1,775.00

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 27									
1	Lighting Upgrades	1	ea.	$ 64.00	$ 64.00	1	ea.	$ 134.00	$ 134.00	$ 198.00
	Subtotal				$ 64.00				$ 134.00	

SUBTOTAL =	$ 198.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 49.50
BUDGET COST ESTIMATE =	$ 247.50

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 30									
1	Lighting Upgrades	1	ea.	$ 16.00	$ 16.00	1	ea.	$ 24.00	$ 24.00	$ 40.00
	Subtotal				$ 16.00				$ 24.00	

SUBTOTAL =	$ 40.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 10.00
BUDGET COST ESTIMATE =	$ 50.00

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Location: Duke Farms Foundation
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Cottage 37									
1	Lighting Upgrades	1	ea.	$ 160.00	$ 160.00	1	ea.	$ 106.00	$ 106.00	$ 266.00
	Subtotal				$ 160.00				$ 106.00	

SUBTOTAL =	$	266.00
MARKUP % =	$	0.15
MARKUP =	$	39.90
SUB-TOTAL w/ OH & P =	$	305.90
CONTINGENCY % =		0.25
CONTINGENCY =	$	76.48
BUDGET COST ESTIMATE =	$	382.38

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 39 - Farm Barn									
1	Lighting Upgrades	1	ea.	$ 4,890.00	$ 4,890.00	1	ea.	$ 2,378.00	$ 2,378.00	$ 7,268.00
	Subtotal				$ 4,890.00				$ 2,378.00	

SUBTOTAL =	$	7,268.00
MARKUP % =	$	0.15
MARKUP =	$	1,090.20
SUB-TOTAL w/ OH & P =	$	8,358.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,089.55
BUDGET COST ESTIMATE =	$	10,447.75

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Cottage 43									
1	Lighting Upgrades	1	ea.	$ 5,050.00	$ 5,050.00	1	ea.	$ 2,484.00	$ 2,484.00	$ 7,534.00
	Subtotal				$ 5,050.00				$ 2,484.00	

SUBTOTAL =	$	7,534.00
MARKUP % =	$	0.15
MARKUP =	$	1,130.10
SUB-TOTAL w/ OH & P =	$	8,664.10
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,166.03
BUDGET COST ESTIMATE =	$	10,830.13

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Motorpool									
1	Lighting Upgrades	1	ea.	$ 6,288.00	$ 6,288.00	1	ea.	$ 1,800.00	$ 1,800.00	$ 8,088.00
	Subtotal				$ 6,288.00				$ 1,800.00	

SUBTOTAL =	$	8,088.00
MARKUP % =	$	0.15
MARKUP =	$	1,213.20
SUB-TOTAL w/ OH & P =	$	9,301.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,325.30
BUDGET COST ESTIMATE =	$	11,626.50

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4. Escalation not included in estimate.

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 120									
1	Lighting Upgrades	1	ea.	$ 226.40	$ 226.40	1	ea.	$ 136.00	$ 136.00	$ 362.40
	Subtotal				$ 226.40				$ 136.00	

SUBTOTAL =	$	362.40
MARKUP % =	$	0.15
MARKUP =	$	54.36
SUB-TOTAL w/ OH & P =	$	416.76
CONTINGENCY % =		0.25
CONTINGENCY =	$	104.19
BUDGET COST ESTIMATE =	$	520.95

Notes:
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4. Escalation not included in estimate.

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Cottage 45									
1	Lighting Upgrades	1	ea.	$ 6,514.40	$ 6,514.40	1	ea.	$ 1,936.00	$ 1,936.00	$ 8,450.40
	Subtotal				$ 6,514.40				$ 1,936.00	

SUBTOTAL =	$	8,450.40
MARKUP % =	$	0.15
MARKUP =	$	1,267.56
SUB-TOTAL w/ OH & P =	$	9,717.96
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,429.49
BUDGET COST ESTIMATE =	$	12,147.45

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 47									
1	Lighting Upgrades	1	ea.	$ 1,096.00	$ 1,096.00	1	ea.	$ 924.00	$ 924.00	$ 2,020.00
	Subtotal				$ 1,096.00				$ 924.00	

SUBTOTAL =	$	2,020.00
MARKUP % =	$	0.15
MARKUP =	$	303.00
SUB-TOTAL w/ OH & P =	$	2,323.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	580.75
BUDGET COST ESTIMATE =	$	2,903.75

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3. Bonds not included in estimate.
4. Escalation not included in estimate.

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 52									
1	Lighting Upgrades	1	ea.	$ 464.15	$ 464.15	1	ea.	$ 252.00	$ 252.00	$ 716.15
	Subtotal				$ 464.15				$ 252.00	

SUBTOTAL =	$	716.15
MARKUP % =	$	0.15
MARKUP =	$	107.42
SUB-TOTAL w/ OH & P =	$	823.57
CONTINGENCY % =		0.25
CONTINGENCY =	$	205.89
BUDGET COST ESTIMATE =	$	1,029.47

Notes:
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4. Escalation not included in estimate.

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CDMSmith

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Duke Farms Foundation
Estimate by: BB
Checked by: BRM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 59									
1	Lighting Upgrades	1	ea.	$ 1,560.15	$ 1,560.15	1	ea.	$ 1,176.00	$ 1,176.00	$ 2,736.15
	Subtotal				$ 1,560.15				$ 1,176.00	

SUBTOTAL =	$	2,736.15
MARKUP % =	$	0.15
MARKUP =	$	410.42
SUB-TOTAL w/ OH & P =	$	3,146.57
CONTINGENCY % =		0.25
CONTINGENCY =	$	786.64
BUDGET COST ESTIMATE =	$	3,933.22

Notes:
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4. Escalation not included in estimate.
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 74									
1	Lighting Upgrades	1	ea.	$ 219.60	$ 219.60	1	ea.	$ 72.00	$ 72.00	$ 291.60
	Subtotal				$ 219.60				$ 72.00	

SUBTOTAL =	$	291.60
CONTINGENCY % =		0.25
CONTINGENCY =	$	72.90
BUDGET COST ESTIMATE =	$	364.50

Notes:
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3. Bonds not included in estimate.
4. Escalation not included in estimate.
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Location: Duke Farms Foundation
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 79									
1	Lighting Upgrades	1	ea.	$ 219.60	$ 219.60	1	ea.	$ 72.00	$ 72.00	$ 291.60
	Subtotal				$ 219.60				$ 72.00	

SUBTOTAL =	$ 291.60
CONTINGENCY % =	0.25
CONTINGENCY =	$ 72.90
BUDGET COST ESTIMATE =	$ 364.50

Notes:
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4. Escalation not included in estimate.
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	House 87									
1	Lighting Upgrades	1	ea.	$ 446.00	$ 446.00	1	ea.	$ 353.00	$ 353.00	$ 799.00
	Subtotal				$ 446.00				$ 353.00	

SUBTOTAL =	$ 799.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 199.75
BUDGET COST ESTIMATE =	$ 998.75

Notes:
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4. Escalation not included in estimate.
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Orchid Range									
1	Lighting Upgrades	1	ea.	$ 2,519.00	$ 2,519.00	1	ea.	$ 1,433.00	$ 1,433.00	$ 3,952.00
	Subtotal				$ 2,519.00				$ 1,433.00	

SUBTOTAL =	$ 3,952.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 988.00
BUDGET COST ESTIMATE =	$ 4,940.00

Notes:
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4. Escalation not included in estimate.
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Reservoir Well Pump									
1	Lighting Upgrades	1	ea.	$ 2,965.00	$ 2,965.00	1	ea.	$ 1,786.00	$ 1,786.00	$ 4,751.00
	Subtotal				$ 2,965.00				$ 1,786.00	

SUBTOTAL =	$ 4,751.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 1,187.75
BUDGET COST ESTIMATE =	$ 5,938.75

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 56									
1	Lighting Upgrades	1	ea.	$ 991.50	$ 991.50	1	ea.	$ 351.00	$ 351.00	$ 1,342.50
	Subtotal				$ 991.50				$ 351.00	

SUBTOTAL =	$ 1,342.50
CONTINGENCY % =	0.25
CONTINGENCY =	$ 335.63
BUDGET COST ESTIMATE =	$ 1,678.13

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Cottage 35									
1	Lighting Upgrades	1	ea.	$ 991.50	$ 991.50	1	ea.	$ 351.00	$ 351.00	$ 1,342.50
	Subtotal				$ 991.50				$ 351.00	

SUBTOTAL =	$ 1,342.50
CONTINGENCY % =	0.25
CONTINGENCY =	$ 335.63
BUDGET COST ESTIMATE =	$ 1,678.13

Notes:
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Building 26 - Conservatory									
1	Lighting Upgrades	1	ea.	$ 23,174.00	$ 23,174.00	1	ea.	$ 7,321.00	$ 7,321.00	$ 30,495.00
	Subtotal				$ 23,174.00				$ 7,321.00	

SUBTOTAL =	$	30,495.00
MARKUP % =	$	0.15
MARKUP =	$	4,574.25
SUB-TOTAL w/ OH & P =	$	35,069.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	8,767.31
BUDGET COST ESTIMATE =	$	43,836.56

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4. Escalation not included in estimate.

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Appendix I

IRR, NPV, AROI

Inflation Rate: **3%**

Lighting Upgrades **Building 5 - Pumphouse**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($280.0)**
1	**$34.6**
2	$35.6
3	$36.7
4	$37.8
5	$38.9
6	$40.1
7	$41.3
8	$42.5
9	$43.8
10	$45.1
11	$46.4
12	$47.8
13	$49.3
14	$50.8
15	$52.3
IRR	11.7%
NPV	$223.3
AROI	5.7%

Lighting Upgrades **House 9**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($390.0)**
1	**$30.4**
2	$31.3
3	$32.3
4	$33.2
5	$34.2
6	$35.2
7	$36.3
8	$37.4
9	$38.5
10	$39.7
11	$40.9
12	$42.1
13	$43.3
14	$44.6
15	$46.0
IRR	4.7%
NPV	$52.7
AROI	1.1%

Lighting Upgrades **House 13**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($108.0)**
1	**$11.2**
2	$11.5
3	$11.9
4	$12.2
5	$12.6
6	$13.0
7	$13.4
8	$13.8
9	$14.2
10	$14.6
11	$15.1
12	$15.5
13	$16.0
14	$16.4
15	$16.9
IRR	8.8%
NPV	$55.1
AROI	3.7%

Lighting Upgrades **House 7**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($390.0)**
1	**$30.4**
2	$31.3
3	$32.3
4	$33.2
5	$34.2
6	$35.2
7	$36.3
8	$37.4
9	$38.5
10	$39.7
11	$40.9
12	$42.1
13	$43.3
14	$44.6
15	$46.0
IRR	4.7%
NPV	$52.7
AROI	1.1%

Lighting Upgrades **House 10**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($100.0)**
1	**$8.0**
2	$8.2
3	$8.5
4	$8.7
5	$9.0
6	$9.3
7	$9.6
8	$9.8
9	$10.1
10	$10.4
11	$10.8
12	$11.1
13	$11.4
14	$11.7
15	$12.1
IRR	5.0%
NPV	$16.5
AROI	1.3%

Lighting Upgrades **Shop 18**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($3,843.3)**
1	**$309.4**
2	$318.7
3	$328.3
4	$338.1
5	$348.3
6	$358.7
7	$369.5
8	$380.6
9	$392.0
10	$403.7
11	$415.9
12	$428.3
13	$441.2
14	$454.4
15	$468.1
IRR	5.1%
NPV	$663.1
AROI	1.4%

Lighting Upgrades **House 8**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($90.0)**
1	**$10.4**
2	$10.7
3	$11.0
4	$11.4
5	$11.7
6	$12.1
7	$12.4
8	$12.8
9	$13.2
10	$13.6
11	$14.0
12	$14.4
13	$14.8
14	$15.3
15	$15.7
IRR	10.6%
NPV	$61.5
AROI	4.9%

Lighting Upgrades **Building 12 - Coach Barn**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($6,890.1)**
1	**$589.7**
2	$607.4
3	$625.6
4	$644.4
5	$663.7
6	$683.6
7	$704.1
8	$725.3
9	$747.0
10	$769.4
11	$792.5
12	$816.3
13	$840.8
14	$866.0
15	$892.0
IRR	6.0%
NPV	$1,697.8
AROI	1.9%

Lighting Upgrades **Garage 19**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($20.0)**
1	**$1.6**
2	$1.6
3	$1.7
4	$1.7
5	$1.8
6	$1.9
7	$1.9
8	$2.0
9	$2.0
10	$2.1
11	$2.2
12	$2.2
13	$2.3
14	$2.3
15	$2.4
IRR	5.0%
NPV	$3.3
AROI	1.3%

IRR, NPV, AROI

Inflation Rate: **3%**

Lighting Upgrades House 21		**Lighting Upgrades House 27**	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow
0	**($1,206.0)**	0	**($198.0)**
1	**$80.6**	1	**$28.0**
2	$83.1	2	$28.8
3	$85.6	3	$29.7
4	$88.1	4	$30.6
5	$90.8	5	$31.5
6	$93.5	6	$32.5
7	$96.3	7	$33.4
8	$99.2	8	$34.4
9	$102.2	9	$35.5
10	$105.2	10	$36.5
11	$108.4	11	$37.6
12	$111.6	12	$38.8
13	$115.0	13	$39.9
14	$118.4	14	$41.1
15	$122.0	15	$42.4
IRR	2.7%	IRR	14.1%
NPV	($31.6)	NPV	$209.8
AROI	0.0%	AROI	7.5%
Lighting Upgrades Building 23		**Lighting Upgrades House 29**	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow
0	**($164.0)**	0	**($198.0)**
1	**$14.4**	1	**$28.0**
2	$14.8	2	$28.8
3	$15.3	3	$29.7
4	$15.7	4	$30.6
5	$16.2	5	$31.5
6	$16.7	6	$32.5
7	$17.2	7	$33.4
8	$17.7	8	$34.4
9	$18.2	9	$35.5
10	$18.8	10	$36.5
11	$19.4	11	$37.6
12	$19.9	12	$38.8
13	$20.5	13	$39.9
14	$21.1	14	$41.1
15	$21.8	15	$42.4
IRR	6.3%	IRR	14.1%
NPV	$45.7	NPV	$209.8
AROI	2.1%	AROI	7.5%
Lighting Upgrades Building 24		**Lighting Upgrades House 30**	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow
0	**($2,771.0)**	0	**($40.0)**
1	**$206.5**	1	**$3.2**
2	$212.7	2	$3.3
3	$219.1	3	$3.4
4	$225.6	4	$3.5
5	$232.4	5	$3.6
6	$239.4	6	$3.7
7	$246.6	7	$3.8
8	$254.0	8	$3.9
9	$261.6	9	$4.1
10	$269.4	10	$4.2
11	$277.5	11	$4.3
12	$285.8	12	$4.4
13	$294.4	13	$4.6
14	$303.2	14	$4.7
15	$312.3	15	$4.8
IRR	4.1%	IRR	5.0%
NPV	$236.2	NPV	$6.6
AROI	0.8%	AROI	1.3%

ECM	Building 5 - Pumphouse	House 9	House 13	House 21	House 30
Assumed Inflation (Gas)	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)					
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$34.56	$30.40	$11.20	$80.64	$3.20
Assumed Average Useful Life (Years)	15	15	15	15	15
Lifetime Savings	**$642.78**	**$565.41**	**$208.31**	**$1,499.82**	**$59.52**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$34.56	$30.40	$11.20	$80.64	$3.20
2	$35.60	$31.31	$11.54	$83.06	$3.30
3	$36.66	$32.25	$11.88	$85.55	$3.39
4	$37.76	$33.22	$12.24	$88.12	$3.50
5	$38.90	$34.22	$12.61	$90.76	$3.60
6	$40.06	$35.24	$12.98	$93.48	$3.71
7	$41.27	$36.30	$13.37	$96.29	$3.82
8	$42.50	$37.39	$13.77	$99.18	$3.94
9	$43.78	$38.51	$14.19	$102.15	$4.05
10	$45.09	$39.67	$14.61	$105.22	$4.18
11	$46.45	$40.86	$15.05	$108.37	$4.30
12	$47.84	$42.08	$15.50	$111.62	$4.43
13	$49.27	$43.34	$15.97	$114.97	$4.56
14	$50.75	$44.64	$16.45	$118.42	$4.70
15	$52.28	$45.98	$16.94	$121.98	$4.84

ECM	House 7	House 10	Shop 18	Building 23	House 27
Assumed Inflation (Gas)	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)					
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$30.40	$8.00	$309.44	$14.40	$28.00
Assumed Average Useful Life (Years)	15	15	15	15	15
Lifetime Savings	**$565.41**	**$148.79**	**$5,755.25**	**$267.82**	**$520.77**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$30.40	$8.00	$309.44	$14.40	$28.00
2	$31.31	$8.24	$318.72	$14.83	$28.84
3	$32.25	$8.49	$328.28	$15.28	$29.71
4	$33.22	$8.74	$338.13	$15.74	$30.60
5	$34.22	$9.00	$348.28	$16.21	$31.51
6	$35.24	$9.27	$358.73	$16.69	$32.46
7	$36.30	$9.55	$369.49	$17.19	$33.43
8	$37.39	$9.84	$380.57	$17.71	$34.44
9	$38.51	$10.13	$391.99	$18.24	$35.47
10	$39.67	$10.44	$403.75	$18.79	$36.53
11	$40.86	$10.75	$415.86	$19.35	$37.63
12	$42.08	$11.07	$428.34	$19.93	$38.76
13	$43.34	$11.41	$441.19	$20.53	$39.92
14	$44.64	$11.75	$454.42	$21.15	$41.12
15	$45.98	$12.10	$468.06	$21.78	$42.35

ECM	House 8	Building 12 - Coach Barn	Garage 19	Building 24	House 29
Assumed Inflation (Gas)	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)					
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$10.40	$589.71	$1.60	$206.50	$28.00
Assumed Average Useful Life (Years)	15	15	15	15	15
Lifetime Savings	**$193.43**	**$10,967.88**	**$29.76**	**$3,840.60**	**$520.77**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$10.40	$589.71	$1.60	$206.50	$28.00
2	$10.71	$607.40	$1.65	$212.69	$28.84
3	$11.03	$625.62	$1.70	$219.07	$29.71
4	$11.36	$644.39	$1.75	$225.64	$30.60
5	$11.71	$663.72	$1.80	$232.41	$31.51
6	$12.06	$683.63	$1.85	$239.39	$32.46
7	$12.42	$704.14	$1.91	$246.57	$33.43
8	$12.79	$725.26	$1.97	$253.96	$34.44
9	$13.17	$747.02	$2.03	$261.58	$35.47
10	$13.57	$769.43	$2.09	$269.43	$36.53
11	$13.98	$792.52	$2.15	$277.51	$37.63
12	$14.40	$816.29	$2.21	$285.84	$38.76
13	$14.83	$840.78	$2.28	$294.41	$39.92
14	$15.27	$866.00	$2.35	$303.25	$41.12
15	$15.73	$891.98	$2.42	$312.34	$42.35

ECM	Cottage 37	Motorpool	House 47	Cottage 35	House 87	Building 26 - Conservatory
Assumed Inflation (Gas)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)						
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$20.26	$126.68	$51.20	$24.80	$94.34	$199.96
Assumed Average Useful Life (Years)	15	15	15	15	15	15
Lifetime Savings	**$376.74**	**$2,356.11**	**$952.26**	**$461.25**	**$1,754.58**	**$3,719.04**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$20.26	$126.68	$51.20	$24.80	$94.34	$199.96
2	$20.86	$130.48	$52.74	$25.54	$97.17	$205.96
3	$21.49	$134.39	$54.32	$26.31	$100.08	$212.14
4	$22.13	$138.43	$55.95	$27.10	$103.09	$218.50
5	$22.80	$142.58	$57.63	$27.91	$106.18	$225.06
6	$23.48	$146.86	$59.35	$28.75	$109.36	$231.81
7	$24.19	$151.26	$61.14	$29.61	$112.64	$238.76
8	$24.91	$155.80	$62.97	$30.50	$116.02	$245.93
9	$25.66	$160.47	$64.86	$31.42	$119.50	$253.30
10	$26.43	$165.29	$66.80	$32.36	$123.09	$260.90
11	$27.22	$170.25	$68.81	$33.33	$126.78	$268.73
12	$28.04	$175.35	$70.87	$34.33	$130.59	$276.79
13	$28.88	$180.62	$73.00	$35.36	$134.50	$285.10
14	$29.75	$186.03	$75.19	$36.42	$138.54	$293.65
15	$30.64	$191.61	$77.44	$37.51	$142.69	$302.46

ECM	Building 39 - Farm Barn	House 120	House 52	House 74	Orchid Range	Building 56
Assumed Inflation (Gas)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)						
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$307.68	$261.00	$588.28	$49.58	$283.98	$54.96
Assumed Average Useful Life (Years)	15	15	15	15	15	15
Lifetime Savings	**$5,722.51**	**$4,854.32**	**$10,941.29**	**$922.15**	**$5,281.79**	**$1,022.20**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$307.68	$261.00	$588.28	$49.58	$283.98	$54.96
2	$316.91	$268.83	$605.92	$51.07	$292.50	$56.61
3	$326.42	$276.89	$624.10	$52.60	$301.28	$58.31
4	$336.21	$285.20	$642.83	$54.18	$310.32	$60.06
5	$346.30	$293.76	$662.11	$55.80	$319.63	$61.86
6	$356.69	$302.57	$681.97	$57.48	$329.22	$63.71
7	$367.39	$311.65	$702.43	$59.20	$339.09	$65.63
8	$378.41	$321.00	$723.51	$60.98	$349.26	$67.59
9	$389.76	$330.63	$745.21	$62.81	$359.74	$69.62
10	$401.45	$340.55	$767.57	$64.69	$370.53	$71.71
11	$413.50	$350.76	$790.59	$66.63	$381.65	$73.86
12	$425.90	$361.29	$814.31	$68.63	$393.10	$76.08
13	$438.68	$372.12	$838.74	$70.69	$404.89	$78.36
14	$451.84	$383.29	$863.90	$72.81	$417.04	$80.71
15	$465.39	$394.79	$889.82	$75.00	$429.55	$83.13

ECM	Cottage 43	Cottage 45	House 79	#REF!	#REF!	#REF!
Assumed Inflation (Gas)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas)						
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$11.20	$23.44	$23.80	$0.00	$0.00	$0.00
Assumed Average Useful Life (Years)	15	15	15	15	15	15
Lifetime Savings	**$208.31**	**$435.96**	**$442.65**	**$0.00**	**$0.00**	**$0.00**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$11.20	$23.44	$23.80	$0.00	$0.00	$0.00
2	$11.54	$24.14	$24.51	$0.00	$0.00	$0.00
3	$11.88	$24.87	$25.25	$0.00	$0.00	$0.00
4	$12.24	$25.61	$26.01	$0.00	$0.00	$0.00
5	$12.61	$26.38	$26.79	$0.00	$0.00	$0.00
6	$12.98	$27.17	$27.59	$0.00	$0.00	$0.00
7	$13.37	$27.99	$28.42	$0.00	$0.00	$0.00
8	$13.77	$28.83	$29.27	$0.00	$0.00	$0.00
9	$14.19	$29.69	$30.15	$0.00	$0.00	$0.00
10	$14.61	$30.58	$31.05	$0.00	$0.00	$0.00
11	$15.05	$31.50	$31.99	$0.00	$0.00	$0.00
12	$15.50	$32.45	$32.94	$0.00	$0.00	$0.00
13	$15.97	$33.42	$33.93	$0.00	$0.00	$0.00
14	$16.45	$34.42	$34.95	$0.00	$0.00	$0.00
15	$16.94	$35.46	$36.00	$0.00	$0.00	$0.00

IRR, NPV, AROI

Inflation Rate: **3%**

Lighting Upgrades **Cottage 37**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($377.4)**
1	**$20.3**
2	$20.9
3	$21.5
4	$22.1
5	$22.8
6	$23.5
7	$24.2
8	$24.9
9	$25.7
10	$26.4
11	$27.2
12	$28.0
13	$28.9
14	$29.7
15	$30.6
IRR	(0.0%)
NPV	($82.4)
AROI	(1.3%)

Lighting Upgrades **Motorpool**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($11,581.5)**
1	**$126.7**
2	$130.5
3	$134.4
4	$138.4
5	$142.6
6	$146.9
7	$151.3
8	$155.8
9	$160.5
10	$165.3
11	$170.2
12	$175.4
13	$180.6
14	$186.0
15	$191.6
IRR	(14.8%)
NPV	($9,736.6)
AROI	(5.6%)

Lighting Upgrades **House 47**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($2,883.8)**
1	**$51.2**
2	$52.7
3	$54.3
4	$55.9
5	$57.6
6	$59.4
7	$61.1
8	$63.0
9	$64.9
10	$66.8
11	$68.8
12	$70.9
13	$73.0
14	$75.2
15	$77.4
IRR	(10.9%)
NPV	($2,138.1)
AROI	(4.9%)

Lighting Upgrades **Building 39 - Farm Barn**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($10,032.8)**
1	**$307.7**
2	$316.9
3	$326.4
4	$336.2
5	$346.3
6	$356.7
7	$367.4
8	$378.4
9	$389.8
10	$401.5
11	$413.5
12	$425.9
13	$438.7
14	$451.8
15	$465.4
IRR	(6.0%)
NPV	($5,552.0)
AROI	(3.6%)

Lighting Upgrades **House 120**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($516.0)**
1	**$261.0**
2	$268.8
3	$276.9
4	$285.2
5	$293.8
6	$302.6
7	$311.6
8	$321.0
9	$330.6
10	$340.5
11	$350.8
12	$361.3
13	$372.1
14	$383.3
15	$394.8
IRR	53.5%
NPV	$3,285.0
AROI	43.9%

Lighting Upgrades **House 52**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($1,014.5)**
1	**$588.3**
2	$605.9
3	$624.1
4	$642.8
5	$662.1
6	$682.0
7	$702.4
8	$723.5
9	$745.2
10	$767.6
11	$790.6
12	$814.3
13	$838.7
14	$863.9
15	$889.8
IRR	60.9%
NPV	$7,552.7
AROI	51.3%

Lighting Upgrades **Cottage 43**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($201.3)**
1	**$11.2**
2	$11.5
3	$11.9
4	$12.2
5	$12.6
6	$13.0
7	$13.4
8	$13.8
9	$14.2
10	$14.6
11	$15.1
12	$15.5
13	$16.0
14	$16.4
15	$16.9
IRR	0.4%
NPV	($38.1)
AROI	(1.1%)

Lighting Upgrades **Cottage 45**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($484.5)**
1	**$23.4**
2	$24.1
3	$24.9
4	$25.6
5	$26.4
6	$27.2
7	$28.0
8	$28.8
9	$29.7
10	$30.6
11	$31.5
12	$32.4
13	$33.4
14	$34.4
15	$35.5
IRR	(1.2%)
NPV	($143.1)
AROI	(1.8%)

Lighting Upgrades **Building 26 - Conservatory**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($43,621.6)**
1	**$200.0**
2	$206.0
3	$212.1
4	$218.5
5	$225.1
6	$231.8
7	$238.8
8	$245.9
9	$253.3
10	$260.9
11	$268.7
12	$276.8
13	$285.1
14	$293.6
15	$302.5
IRR	(21.0%)
NPV	($40,709.5)
AROI	(6.2%)

IRR, NPV, AROI

Inflation Rate: **3%**

Lighting Upgrades **Cottage 35**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($483.0)**
1	**$24.8**
2	$25.5
3	$26.3
4	$27.1
5	$27.9
6	$28.7
7	$29.6
8	$30.5
9	$31.4
10	$32.4
11	$33.3
12	$34.3
13	$35.4
14	$36.4
15	$37.5
IRR	(0.5%)
NPV	($121.8)
AROI	(1.5%)

Lighting Upgrades **House 87**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($1,148.6)**
1	**$94.3**
2	$97.2
3	$100.1
4	$103.1
5	$106.2
6	$109.4
7	$112.6
8	$116.0
9	$119.5
10	$123.1
11	$126.8
12	$130.6
13	$134.5
14	$138.5
15	$142.7
IRR	5.4%
NPV	$225.3
AROI	1.5%

Lighting Upgrades **House 74**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($419.2)**
1	**$49.6**
2	$51.1
3	$52.6
4	$54.2
5	$55.8
6	$57.5
7	$59.2
8	$61.0
9	$62.8
10	$64.7
11	$66.6
12	$68.6
13	$70.7
14	$72.8
15	$75.0
IRR	11.0%
NPV	$302.9
AROI	5.2%

Lighting Upgrades **Orchid Range**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($5,441.0)**
1	**$284.0**
2	$292.5
3	$301.3
4	$310.3
5	$319.6
6	$329.2
7	$339.1
8	$349.3
9	$359.7
10	$370.5
11	$381.7
12	$393.1
13	$404.9
14	$417.0
15	$429.6
IRR	(0.3%)
NPV	($1,305.3)
AROI	(1.4%)

Lighting Upgrades **House 79**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($304.8)**
1	**$23.8**
2	$24.5
3	$25.2
4	$26.0
5	$26.8
6	$27.6
7	$28.4
8	$29.3
9	$30.1
10	$31.1
11	$32.0
12	$32.9
13	$33.9
14	$35.0
15	$36.0
IRR	4.7%
NPV	$41.9
AROI	1.1%

Lighting Upgrades **Building 56**	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	**($1,684.8)**
1	**$55.0**
2	$56.6
3	$58.3
4	$60.1
5	$61.9
6	$63.7
7	$65.6
8	$67.6
9	$69.6
10	$71.7
11	$73.9
12	$76.1
13	$78.4
14	$80.7
15	$83.1
IRR	(5.4%)
NPV	($884.5)
AROI	(3.4%)

ECM	Building 22 - Motorpool Condensing Boiler	Building 23 Condensing Boiler	House 47 Condensing Boiler	House 29 Condensing Boiler	House 30 Condensing Boiler	House 13 Condensing Boiler
Assumed Inflation (Gas, Oil)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas, Oil)	$147.21	$226.00	$130.78	$17.69	$147.21	$290.01
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Maintence Cost Savings	$500.00	$500.00	$500.00	$500.00	$500.00	$500.00
Assumed Average Useful Life (Years)	20	20	20	20	20	20
Lifetime Savings	**$13,576.85**	**$15,491.15**	**$9,761.66**	**$9,378.86**	**$13,576.85**	**$17,046.39**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$647.21	$726.00	$630.78	$517.69	$647.21	$790.01
2	$650.16	$730.52	$633.40	$518.05	$650.16	$795.81
3	$653.16	$735.13	$636.07	$518.41	$653.16	$801.72
4	$656.22	$739.83	$638.79	$518.78	$656.22	$807.76
5	$659.35	$744.63	$641.56	$519.15	$659.35	$813.91
6	$662.53	$749.52	$644.39	$519.54	$662.53	$820.19
7	$665.78	$754.51	$647.28	$519.93	$665.78	$826.59
8	$669.10	$759.60	$650.23	$520.32	$669.10	$833.13
9	$672.48	$764.79	$653.23	$520.73	$672.48	$839.79
10	$675.93	$770.09	$656.30	$521.15	$675.93	$846.58
11	$679.45	$775.49	$659.42	$521.57	$679.45	$853.52
12	$683.04	$781.00	$662.61	$522.00	$683.04	$860.59
13	$686.70	$786.62	$665.86	$522.44	$686.70	$867.80
14	$690.43	$792.35	$669.18	$522.89	$690.43	$875.15
15	$694.24	$798.20	$672.56	$523.35	$694.24	$882.66
16	$698.13	$804.16	$676.02	$523.81	$698.13	$890.31
17	$702.09	$810.25	$679.54	$524.29	$702.09	$898.12
18	$706.13	$816.45	$683.13	$524.78	$706.13	$906.08
19	$710.25	$822.78	$686.79	$525.27	$710.25	$914.20
20	$714.46	$829.24	$690.52	$525.78	$714.46	$922.48
21						
22						
23						
24						

ECM	House 27 Condensing Boiler	Building 12 - Coach Barn Condensing Boiler	House 120 Condensing Boiler	Cottage 45 Condensing Boiler	Garage 19 Condensing Boiler	House 21 Condensing Boiler
Assumed Inflation (Gas, Oil)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas, Oil)	$89.06	$1,030.48	$ 474.62	-$1,318.26	$0.00	-$1,538.26
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Maintence Cost Savings	$500.00	$500.00	$500.00	$1,318.26	$0.00	$1,538.26
Assumed Average Useful Life (Years)	20	20	20	20	20	20
Lifetime Savings	**$12,163.85**	**$25,320.48**	**$21,532.10**	**-$5,665.05**	**$0.00**	**-$3,527.87**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$589.06	$1,530.48	$974.62	$0.00	$0.00	$0.00
2	$590.84	$1,551.09	$984.12	-$26.37	$0.00	-$30.77
3	$592.65	$1,572.11	$993.80	-$53.26	$0.00	-$62.15
4	$594.51	$1,593.55	$1,003.67	-$80.69	$0.00	-$94.15
5	$596.40	$1,615.42	$1,013.75	-$108.67	$0.00	-$126.80
6	$598.33	$1,637.73	$1,024.02	-$137.21	$0.00	-$160.10
7	$600.29	$1,660.49	$1,034.50	-$166.31	$0.00	-$194.07
8	$602.30	$1,683.70	$1,045.19	-$196.01	$0.00	-$228.72
9	$604.34	$1,707.37	$1,056.10	-$226.29	$0.00	-$264.06
10	$606.43	$1,731.52	$1,067.22	-$257.18	$0.00	-$300.10
11	$608.56	$1,756.15	$1,078.56	-$288.69	$0.00	-$336.87
12	$610.73	$1,781.27	$1,090.13	-$320.83	$0.00	-$374.37
13	$612.95	$1,806.90	$1,101.94	-$353.61	$0.00	-$412.63
14	$615.20	$1,833.03	$1,113.98	-$387.05	$0.00	-$451.64
15	$617.51	$1,859.69	$1,126.26	-$421.16	$0.00	-$491.44
16	$619.86	$1,886.89	$1,138.78	-$455.94	$0.00	-$532.04
17	$622.26	$1,914.63	$1,151.56	-$491.43	$0.00	-$573.44
18	$624.70	$1,942.92	$1,164.59	-$527.62	$0.00	-$615.68
19	$627.20	$1,971.78	$1,177.88	-$564.54	$0.00	-$658.75
20	$629.74	$2,001.21	$1,191.44	-$602.20	$0.00	-$702.69
21						
22						
23						
24						

ECM	House 47 Condensing Boiler
Assumed Inflation (Gas, Oil)	2%
Initial Yearly Savings (Gas, Oil)	$0.00
Assumed Inflation (Electricity)	3%
Initial Yearly Savings (Electricity)	$0.00
Annual Maintence Cost Savings	$1,320.00
Assumed Average Useful Life (Years)	20
Lifetime Savings	**$26,400.00**

Year	Annual Savings
1	$1,320.00
2	$1,320.00
3	$1,320.00
4	$1,320.00
5	$1,320.00
6	$1,320.00
7	$1,320.00
8	$1,320.00
9	$1,320.00
10	$1,320.00
11	$1,320.00
12	$1,320.00
13	$1,320.00
14	$1,320.00
15	$1,320.00
16	$1,320.00
17	$1,320.00
18	$1,320.00
19	$1,320.00
20	$1,320.00

IRR, NPV, AROI - HVAC ECRMS

Building 22 - Motorpool Condensing Boiler		Building 23 Condensing Boiler		House 47 Condensing Boiler		House 29 Condensing Boiler		House 30 Condensing Boiler	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($6,000.00)	0	($11,782.00)	0	($11,782.00)	0	($11,063.00)	0	($11,063.00)
1	$647.21	1	$726.00	1	$630.78	1	$517.69	1	$647.21
2	$650.16	2	$730.52	2	$633.40	2	$518.05	2	$650.16
3	$653.16	3	$735.13	3	$636.07	3	$518.41	3	$653.16
4	$656.22	4	$739.83	4	$638.79	4	$518.78	4	$656.22
5	$659.35	5	$744.63	5	$641.56	5	$519.15	5	$659.35
6	$662.53	6	$749.52	6	$644.39	6	$519.54	6	$662.53
7	$665.78	7	$754.51	7	$647.28	7	$519.93	7	$665.78
8	$669.10	8	$759.60	8	$650.23	8	$520.32	8	$669.10
9	$672.48	9	$764.79	9	$653.23	9	$520.73	9	$672.48
10	$675.93	10	$770.09	10	$656.30	10	$521.15	10	$675.93
11	$679.45	11	$775.49	11	$659.42	11	$521.57	11	$679.45
12	$683.04	12	$781.00	12	$662.61	12	$522.00	12	$683.04
13	$686.70	13	$786.62	13	$665.86	13	$522.44	13	$686.70
14	$690.43	14	$792.35	14	$669.18	14	$522.89	14	$690.43
15	$694.24	15	$798.20	15	$672.56	15	$523.35	15	$694.24
16	$698.13	16	$804.16	16	$676.02	16	$523.81	16	$698.13
17	$702.09	17	$810.25	17	$679.54	17	$524.29	17	$702.09
18	$706.13	18	$816.45	18	$683.13	18	$524.78	18	$706.13
19	$710.25	19	$822.78	19	$686.79	19	$525.27	19	$710.25
20	$714.46	20	$829.24	20	$690.52	20	$525.78	20	$714.46
IRR	9.25%	IRR	2.70%	IRR	1.07%	IRR	-0.55%	IRR	2.00%
NPV	$4,048.31	NPV	($337.07)	NPV	($2,024.93)	NPV	($3,310.62)	NPV	($1,014.69)
AROI	6.62%	AROI	-0.50%	AROI	-1.31%	AROI	0.51%	AROI	1.68%

House 13 Condensing Boiler		House 27 Condensing Boiler		Building 12 - Coach Barn Condensing Boiler		House 120 Condensing Boiler		Cottage 45 Condensing Boiler	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($11,782.00)	0	($11,063.00)	0	($16,095.00)	0	($11,782.00)	0	($6,564.40)
1	$790.01	1	$589.06	1	$1,530.48	1	$974.62	1	$0.00
2	$795.81	2	$590.84	2	$1,551.09	2	$984.12	2	-$26.37
3	$801.72	3	$592.65	3	$1,572.11	3	$993.80	3	-$53.26
4	$807.76	4	$594.51	4	$1,593.55	4	$1,003.67	4	-$80.69
5	$813.91	5	$596.40	5	$1,615.42	5	$1,013.75	5	-$108.67
6	$820.19	6	$598.33	6	$1,637.73	6	$1,024.02	6	-$137.21
7	$826.59	7	$600.29	7	$1,660.49	7	$1,034.50	7	-$166.31
8	$833.13	8	$602.30	8	$1,683.70	8	$1,045.19	8	-$196.01
9	$839.79	9	$604.34	9	$1,707.37	9	$1,056.10	9	-$226.29
10	$846.58	10	$606.43	10	$1,731.52	10	$1,067.22	10	-$257.18
11	$853.52	11	$608.56	11	$1,756.15	11	$1,078.56	11	-$288.69
12	$860.59	12	$610.73	12	$1,781.27	12	$1,090.13	12	-$320.83
13	$867.80	13	$612.95	13	$1,806.90	13	$1,101.94	13	-$353.61
14	$875.15	14	$615.20	14	$1,833.03	14	$1,113.98	14	-$387.05
15	$882.66	15	$617.51	15	$1,859.69	15	$1,126.26	15	-$421.16
16	$890.31	16	$619.86	16	$1,886.89	16	$1,138.78	16	-$455.94
17	$898.12	17	$622.26	17	$1,914.63	17	$1,151.56	17	-$491.43
18	$906.08	18	$624.70	18	$1,942.92	18	$1,164.59	18	-$527.62
19	$914.20	19	$627.20	19	$1,971.78	19	$1,177.88	19	-$564.54
20	$922.48	20	$629.74	20	$2,001.21	20	$1,191.44	20	-$602.20
IRR	3.70%	IRR	0.91%	IRR	8.40%	IRR	6.32%	IRR	#NUM!
NPV	$797.59	NPV	($2,045.58)	NPV	$9,610.70	NPV	$4,070.24	NPV	($10,320.42)
AROI	2.54%	AROI	0.32%	AROI	4.51%	AROI	3.27%	AROI	-5.00%

Garage 19 Condensing Boiler		House 21 Condensing Boiler		House 47 Condensing Boiler	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($6,564.40)	0	($6,564.40)	0	($6,564.40)
1	$726.00	1	$726.00	1	$726.00
2	$730.52	2	$730.52	2	$730.52
3	$735.13	3	$735.13	3	$735.13
4	$739.83	4	$739.83	4	$739.83
5	$744.63	5	$744.63	5	$744.63
6	$749.52	6	$749.52	6	$749.52
7	$754.51	7	$754.51	7	$754.51
8	$759.60	8	$759.60	8	$759.60
9	$764.79	9	$764.79	9	$764.79
10	$770.09	10	$770.09	10	$770.09
11	$775.49	11	$775.49	11	$775.49
12	$781.00	12	$781.00	12	$781.00
13	$786.62	13	$786.62	13	$786.62
14	$792.35	14	$792.35	14	$792.35
15	$798.20	15	$798.20	15	$798.20
16	$804.16	16	$804.16	16	$804.16
17	$810.25	17	$810.25	17	$810.25
18	$816.45	18	$816.45	18	$816.45
19	$822.78	19	$822.78	19	$822.78
20	$829.24	20	$829.24	20	$829.24
IRR	9.77%	IRR	9.77%	IRR	9.77%
NPV	$4,880.53	NPV	$4,880.53	NPV	$4,880.53
AROI	6.06%	AROI	6.06%	AROI	6.06%

ECM	Cottage 43 Steam Boiler	Cottage 45 Steam Boiler	House 9 Steam Boiler	House 7 Steam Boiler	House 8 Steam Boiler
Assumed Inflation (Gas, Oil)	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas, Oil)	$34.97	$35.38	$23.87	$27.11	$22.51
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Maintence Cost Savings	$400.00	$200.00	$100.00	$100.00	$140.00
Assumed Average Useful Life (Years)	24	24	24	24	24
Lifetime Savings	**$10,663.94**	**$1,076.24**	**$412.80**	**$2,380.49**	**$4,044.83**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$434.97	$35.38	$23.87	$127.11	$162.51
2	$435.67	$36.08	$24.35	$127.65	$162.96
3	$436.39	$36.81	$24.83	$128.21	$163.42
4	$437.11	$37.54	$25.33	$128.77	$163.89
5	$437.86	$38.29	$25.84	$129.34	$164.37
6	$438.61	$39.06	$26.35	$129.93	$164.85
7	$439.39	$39.84	$26.88	$130.53	$165.35
8	$440.17	$40.64	$27.42	$131.14	$165.86
9	$440.98	$41.45	$27.97	$131.76	$166.38
10	$441.80	$42.28	$28.53	$132.40	$166.90
11	$442.63	$43.12	$29.10	$133.05	$167.44
12	$443.48	$43.99	$29.68	$133.71	$167.99
13	$444.35	$44.87	$30.27	$134.38	$168.55
14	$445.24	$45.76	$30.88	$135.07	$169.12
15	$446.15	$46.68	$31.50	$135.77	$169.70
16	$447.07	$47.61	$32.13	$136.49	$170.30
17	$448.01	$48.57	$32.77	$137.22	$170.90
18	$448.97	$49.54	$33.42	$137.96	$171.52
19	$449.95	$50.53	$34.09	$138.72	$172.15
20	$450.95	$51.54	$34.77	$139.49	$172.79
21	$451.97	$52.57	$35.47	$140.28	$173.45
22	$453.01	$53.62	$36.18	$141.09	$174.12
23	$454.07	$54.69	$36.90	$141.91	$174.80
24	$455.15	$55.79	$37.64	$142.75	$175.50

IRR, NPV, AROI - HVAC ECRMS

Cottage 43 Steam Boiler		Cottage 45 Steam Boiler		House 9 Steam Boiler		House 7 Steam Boiler		House 8 Steam Boiler	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($23,520.00)	0	($15,700.00)	0	($8,700.00)	0	($8,700.00)	0	($11,700.00)
1	$434.97	1	$35.38	1	$23.87	1	$127.11	1	$162.51
2	$435.67	2	$36.08	2	$24.35	2	$127.65	2	$162.96
3	$436.39	3	$36.81	3	$24.83	3	$128.21	3	$163.42
4	$437.11	4	$37.54	4	$25.33	4	$128.77	4	$163.89
5	$437.86	5	$38.29	5	$25.84	5	$129.34	5	$164.37
6	$438.61	6	$39.06	6	$26.35	6	$129.93	6	$164.85
7	$439.39	7	$39.84	7	$26.88	7	$130.53	7	$165.35
8	$440.17	8	$40.64	8	$27.42	8	$131.14	8	$165.86
9	$440.98	9	$41.45	9	$27.97	9	$131.76	9	$166.38
10	$441.80	10	$42.28	10	$28.53	10	$132.40	10	$166.90
11	$442.63	11	$43.12	11	$29.10	11	$133.05	11	$167.44
12	$443.48	12	$43.99	12	$29.68	12	$133.71	12	$167.99
13	$444.35	13	$44.87	13	$30.27	13	$134.38	13	$168.55
14	$445.24	14	$45.76	14	$30.88	14	$135.07	14	$169.12
15	$446.15	15	$46.68	15	$31.50	15	$135.77	15	$169.70
16	$447.07	16	$47.61	16	$32.13	16	$136.49	16	$170.30
17	$448.01	17	$48.57	17	$32.77	17	$137.22	17	$170.90
18	$448.97	18	$49.54	18	$33.42	18	$137.96	18	$171.52
19	$449.95	19	$50.53	19	$34.09	19	$138.72	19	$172.15
20	$450.95	20	$51.54	20	$34.77	20	$139.49	20	$172.79
21	$451.97	21	$52.57	21	$35.47	21	$140.28	21	$173.45
22	$453.01	22	$53.62	22	$36.18	22	$141.09	22	$174.12
23	$454.07	23	$54.69	23	$36.90	23	$141.91	23	$174.80
24	$455.15	24	$55.79	24	$37.64	24	$142.75	24	$175.50
IRR	-5.52%	IRR	-26.10%	IRR	-24.92%	IRR	-6.68%	IRR	-7.12%
NPV	($16,015.70)	NPV	($15,218.38)	NPV	($8,375.03)	NPV	($6,440.50)	NPV	($8,859.10)
AROI	-2.32%	AROI	-6.44%	AROI	-6.39%	AROI	-2.71%	AROI	-2.78%

ECM	House 7 Smart Thermostat	House 8 Smart Thermostat	House 9 Smart Thermostat	House 10 Smart Thermostat	House 13 Smart Thermostat	House 27 Smart Thermostat
Assumed Inflation (Gas, Oil)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas, Oil)	$166.73	$138.44	$146.80	$55.52	$111.17	$34.14
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Maintence Cost Savings	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Assumed Average Useful Life (Years)	15	15	15	15	15	15
Lifetime Savings	**$2,883.30**	**$2,394.14**	**$2,538.73**	**$960.20**	**$1,922.49**	**$590.37**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$166.73	$138.44	$146.80	$55.52	$111.17	$34.14
2	$170.06	$141.21	$149.74	$56.63	$113.39	$34.82
3	$173.46	$144.04	$152.73	$57.77	$115.66	$35.52
4	$176.93	$146.92	$155.79	$58.92	$117.97	$36.23
5	$180.47	$149.85	$158.90	$60.10	$120.33	$36.95
6	$184.08	$152.85	$162.08	$61.30	$122.74	$37.69
7	$187.76	$155.91	$165.32	$62.53	$125.19	$38.45
8	$191.52	$159.03	$168.63	$63.78	$127.70	$39.21
9	$195.35	$162.21	$172.00	$65.06	$130.25	$40.00
10	$199.26	$165.45	$175.44	$66.36	$132.86	$40.80
11	$203.24	$168.76	$178.95	$67.68	$135.51	$41.61
12	$207.31	$172.14	$182.53	$69.04	$138.22	$42.45
13	$211.45	$175.58	$186.18	$70.42	$140.99	$43.30
14	$215.68	$179.09	$189.91	$71.83	$143.81	$44.16
15	$219.99	$182.67	$193.70	$73.26	$146.69	$45.05

ECM	House 29 Smart Thermostat	House 30 Smart Thermostat	House 47 Smart Thermostat	House 52 Smart Thermostat	House 79 Smart Thermostat	House 87 Smart Thermostat
Assumed Inflation (Gas, Oil)	2%	2%	2%	2%	2%	2%
Initial Yearly Savings (Gas, Oil)	$6.78	$169.29	$150.40	$501.76	$459.29	$143.52
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Maintence Cost Savings	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Assumed Average Useful Life (Years)	15	15	15	15	15	15
Lifetime Savings	**$117.29**	**$2,927.65**	**$2,600.91**	**$8,677.21**	**$7,942.76**	**$2,481.95**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$6.78	$169.29	$150.40	$501.76	$459.29	$143.52
2	$6.92	$172.68	$153.41	$511.80	$468.48	$146.39
3	$7.06	$176.13	$156.48	$522.03	$477.85	$149.32
4	$7.20	$179.66	$159.60	$532.48	$487.41	$152.30
5	$7.34	$183.25	$162.80	$543.12	$497.15	$155.35
6	$7.49	$186.91	$166.05	$553.99	$507.10	$158.46
7	$7.64	$190.65	$169.37	$565.07	$517.24	$161.63
8	$7.79	$194.46	$172.76	$576.37	$527.58	$164.86
9	$7.95	$198.35	$176.22	$587.90	$538.14	$168.16
10	$8.11	$202.32	$179.74	$599.65	$548.90	$171.52
11	$8.27	$206.37	$183.34	$611.65	$559.88	$174.95
12	$8.43	$210.49	$187.00	$623.88	$571.07	$178.45
13	$8.60	$214.70	$190.74	$636.36	$582.50	$182.02
14	$8.77	$219.00	$194.56	$649.08	$594.15	$185.66
15	$8.95	$223.38	$198.45	$662.07	$606.03	$189.37

ECM	House 120 Smart Thermostat
Assumed Inflation (Gas, Oil)	2%
Initial Yearly Savings (Gas, Oil)	$181.94
Assumed Inflation (Electricity)	3%
Initial Yearly Savings (Electricity)	$0.00
Annual Maintence Cost Savings	$0.00
Assumed Average Useful Life (Years)	15
Lifetime Savings	**$3,146.35**

Year	Annual Savings
1	$181.94
2	$185.58
3	$189.29
4	$193.08
5	$196.94
6	$200.88
7	$204.89
8	$208.99
9	$213.17
10	$217.43
11	$221.78
12	$226.22
13	$230.74
14	$235.36
15	$240.06

IRR, NPV, AROI - HVAC ECRMS

House 7 Smart Thermostat		House 8 Smart Thermostat		House 9 Smart Thermostat		House 10 Smart Thermostat		House 13 Smart Thermostat	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($300.00)	0	($300.00)	0	($600.00)	0	$0.00	0	$0.00
1	$166.73	1	$138.44	1	$146.80	1	$55.52	1	$111.17
2	$170.06	2	$141.21	2	$149.74	2	$56.63	2	$113.39
3	$173.46	3	$144.04	3	$152.73	3	$57.77	3	$115.66
4	$176.93	4	$146.92	4	$155.79	4	$58.92	4	$117.97
5	$180.47	5	$149.85	5	$158.90	5	$60.10	5	$120.33
6	$184.08	6	$152.85	6	$162.08	6	$61.30	6	$122.74
7	$187.76	7	$155.91	7	$165.32	7	$62.53	7	$125.19
8	$191.52	8	$159.03	8	$168.63	8	$63.78	8	$127.70
9	$195.35	9	$162.21	9	$172.00	9	$65.06	9	$130.25
10	$199.26	10	$165.45	10	$175.44	10	$66.36	10	$132.86
11	$203.24	11	$168.76	11	$178.95	11	$67.68	11	$135.51
12	$207.31	12	$172.14	12	$182.53	12	$69.04	12	$138.22
13	$211.45	13	$175.58	13	$186.18	13	$70.42	13	$140.99
14	$215.68	14	$179.09	14	$189.91	14	$71.83	14	$143.81
15	$219.99	15	$182.67	15	$193.70	15	$73.26	15	$146.69
IRR	57.49%	IRR	47.97%	IRR	25.36%	IRR	#NUM!	IRR	#NUM!
NPV	$1,969.81	NPV	$1,584.73	NPV	$1,398.56	NPV	$755.89	NPV	$1,513.44
AROI	51.41%	AROI	39.48%	AROI	17.80%	AROI	#DIV/0!	AROI	#DIV/0!

House 27 Smart Thermostat		House 29 Smart Thermostat		House 30 Smart Thermostat		House 47 Smart Thermostat	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	$0.00	0	$0.00	0	$0.00	0	$0.00
1	$34.14	1	$6.78	1	$169.29	1	$150.40
2	$34.82	2	$6.92	2	$172.68	2	$153.41
3	$35.52	3	$7.06	3	$176.13	3	$156.48
4	$36.23	4	$7.20	4	$179.66	4	$159.60
5	$36.95	5	$7.34	5	$183.25	5	$162.80
6	$37.69	6	$7.49	6	$186.91	6	$166.05
7	$38.45	7	$7.64	7	$190.65	7	$169.37
8	$39.21	8	$7.79	8	$194.46	8	$172.76
9	$40.00	9	$7.95	9	$198.35	9	$176.22
10	$40.80	10	$8.11	10	$202.32	10	$179.74
11	$41.61	11	$8.27	11	$206.37	11	$183.34
12	$42.45	12	$8.43	12	$210.49	12	$187.00
13	$43.30	13	$8.60	13	$214.70	13	$190.74
14	$44.16	14	$8.77	14	$219.00	14	$194.56
15	$45.05	15	$8.95	15	$223.38	15	$198.45
IRR	#NUM!	IRR	#NUM!	IRR	#NUM!	IRR	#NUM!
NPV	$464.76	NPV	$92.34	NPV	$2,304.73	NPV	$2,047.51
AROI	#DIV/0!	AROI	#DIV/0!	AROI	#DIV/0!	AROI	#DIV/0!

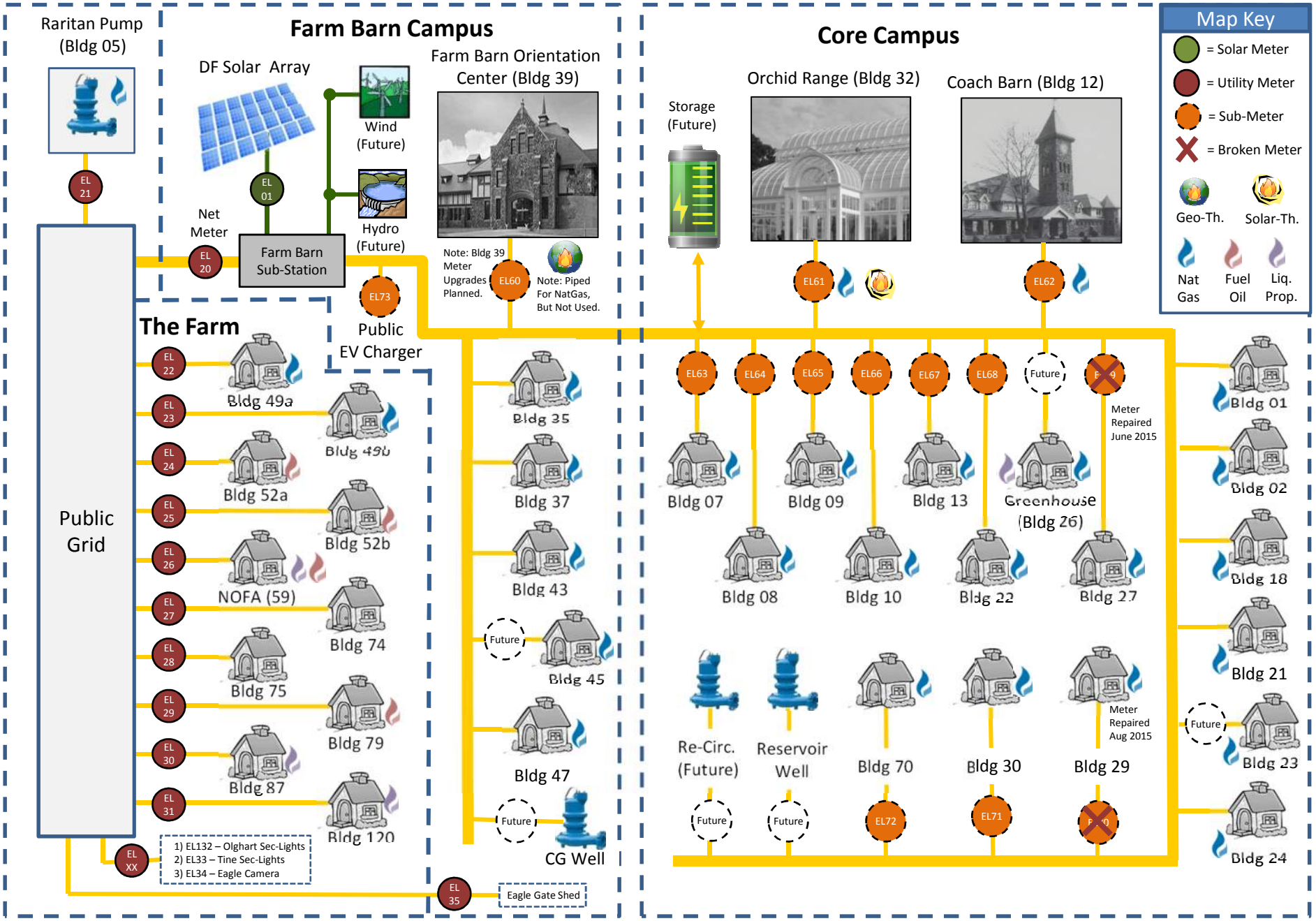
House 52 Smart Thermostat		House 79 Smart Thermostat		House 87 Smart Thermostat		House 120 Smart Thermostat	
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($1,800.00)	0	($300.00)	0	($600.00)	0	($600.00)
1	$501.76	1	$138.44	1	$138.44	1	$138.44
2	$511.80	2	$141.21	2	$141.21	2	$141.21
3	$522.03	3	$144.04	3	$144.04	3	$144.04
4	$532.48	4	$146.92	4	$146.92	4	$146.92
5	$543.12	5	$149.85	5	$149.85	5	$149.85
6	$553.99	6	$152.85	6	$152.85	6	$152.85
7	$565.07	7	$155.91	7	$155.91	7	$155.91
8	$576.37	8	$159.03	8	$159.03	8	$159.03
9	$587.90	9	$162.21	9	$162.21	9	$162.21
10	$599.65	10	$165.45	10	$165.45	10	$165.45
11	$611.65	11	$168.76	11	$168.76	11	$168.76
12	$623.88	12	$172.14	12	$172.14	12	$172.14
13	$636.36	13	$175.58	13	$175.58	13	$175.58
14	$649.08	14	$179.09	14	$179.09	14	$179.09
15	$662.07	15	$182.67	15	$182.67	15	$182.67
IRR	29.06%	IRR	47.97%	IRR	23.81%	IRR	23.81%
NPV	$5,030.92	NPV	$1,584.73	NPV	$1,284.73	NPV	$1,284.73
AROI	22.88%	AROI	41.15%	AROI	18.07%	AROI	18.07%

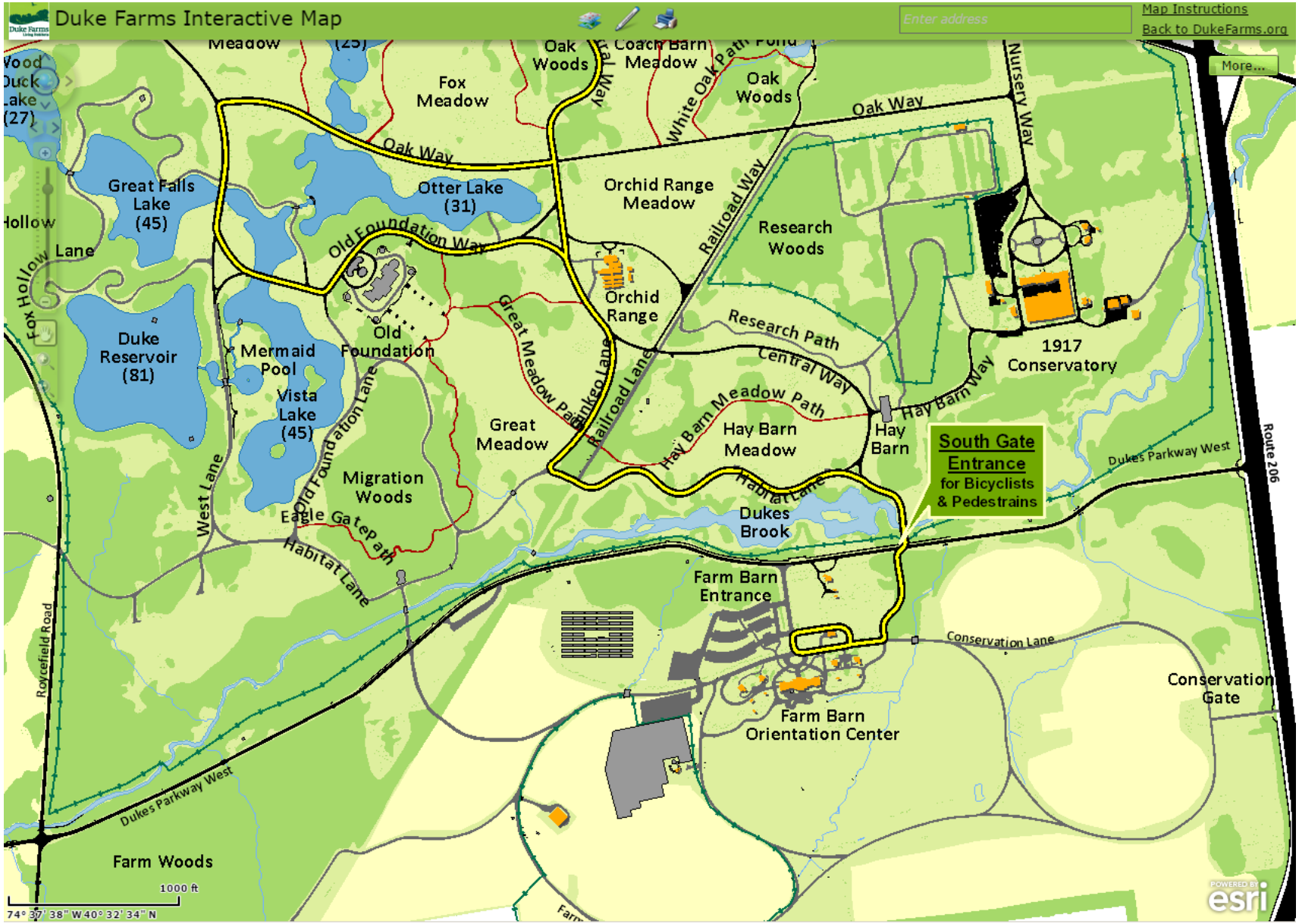
Duke Farms Wind Power Upgrade	
Year	Cash Flow
0	($151,000.0)
1	$4,426.7
2	$4,569.8
3	$4,716.2
4	$4,866.1
5	$5,019.6
6	$5,176.7
7	$5,337.5
8	$5,502.2
9	$5,670.8
10	$5,843.5
11	$6,020.3
12	$6,201.3
13	$6,386.7
14	$6,576.5
15	$6,770.9
16	$6,969.9
17	$7,173.8
18	$7,382.5
19	$7,596.3
20	$7,815.3
21	$8,039.5
22	$8,269.2
23	$8,504.4
24	$8,745.3
IRR	0.12%
NPV	($47,043.08)
AROI	-1.24%

Appendix J

Ver 3.0 (as of January, 2015)

Energy Map Of Duke Farms




Duke Farms Interactive Map
Enter address
Map Instructions
Back to DukeFarms.org
More...
Meadow
(25)
Oak Woods
Coach Barn Meadow
Fox Meadow
White Oak Path
Oak Woods
Nursery Way
Oak Way
Oak Way
Great Falls Lake (45)
Otter Lake (31)
Orchid Range Meadow
Railroad Way
Research Woods
Old Foundation Way
Orchid Range
Research Path
Central Way
1917 Conservatory
Fox Hollow Lane
Duke Reservoir (81)
Mermaid Pool
Old Foundation
Great Meadow Path
Ginkgo Lane
Railroad Lane
Vista Lake (45)
Great Meadow
Hay Barn Meadow Path
Hay Barn Way
Hay Barn
South Gate Entrance for Bicyclists & Pedestrains
Dukes Parkway West
Route 206
West Lane
Old Foundation Lane
Migration Woods
Eagle Gate Path
Habitat Lane
Habitat Lane
Dukes Brook
Farm Barn Entrance
Conservation Lane
Conservation Gate
Farm Barn Orientation Center
Roycefield Road
Dukes Parkway West
Farm Woods
1000 ft
74° 37' 38" W 40° 32' 34" N
esri