Local Government Energy Audit:

Energy Audit Report

Filtration Plant & Garage

Route 29

Trenton, New Jersey 08618

City of Trenton

December 31, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Filtration Plant & Garage.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Filtration Plant & Garage is a 296,551 square foot facility comprised of various space types within two main buildings, which are connected by a walkway. The Filtration Plant has multiple floors which largely contain mechanical space and industrial process areas. The facility includes three floors below ground and three floors above ground at its maximum height. There are also areas of offices and laboratories. The building is connected to the Mechanical Dewatering Facility (MDF) which is three floors. This section also includes office and garage space.

Area	Estimated SQFT
West Filter Building	49,500
East Filter Building	49,500
Head House	44,248
Upflow Clarifier Building	76,359
Head Works and Sludge Storage	17,160
Flocculation and Sedimentation Basins	29,664
Mechanical Dewatering Facilities	30,120
Total	**296,551**

The facility was originally constructed in the 1950's. The filtration plant operates to fill and maintain water level at the reservoir. It brings water in from the river and pumps it to the reservoir. The facility serves about 225,000 customers. The peak capacity of the plant is in the summer months where operation provides between 50 and 58 million gallons per day (MGD). In the winter months, production is about 48 to 55 MGD. The total plant hydraulic capacity is 80 MGD. There have been upgrades to process systems and controls since the plan was first opened. However, the lighting, HVAC systems and process pump motors at the Filtration Plant & Garage mainly consist of aging and inefficient equipment in need of replacement.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 12 measures which together represent an opportunity for Trenton to reduce annual energy costs by roughly $81,878 and annual greenhouse gas emissions by 1,095,259 lbs CO_2e. We estimate that if all measures were implemented, the project would pay for itself in 9.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2a, respectively. Together these measures represent an opportunity to reduce Filtration Plant & Garage's annual energy costs by 8%.

TRC recommends 11 measures which together represent an opportunity for Trenton to reduce annual energy costs by roughly $66,885 and annual greenhouse gas emissions by 827,491 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 8.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2b, respectively. Together these measures represent an opportunity to reduce Filtration Plant & Garage's annual energy costs by 6%.

Figure 1 – Previous 12 Month Utility Costs

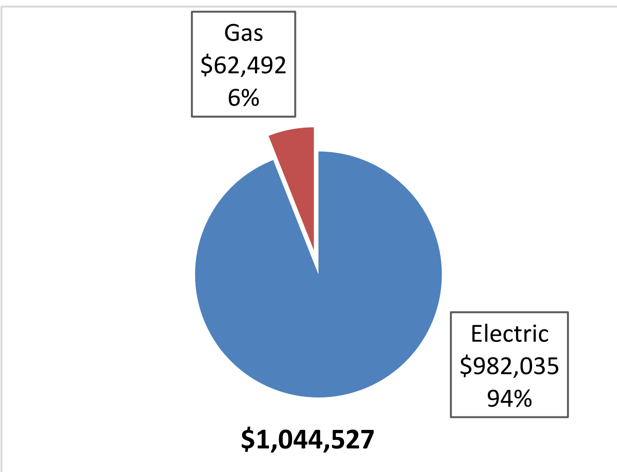


Figure 2a – Potential Post-Implementation Costs (All Evaluated Measures)

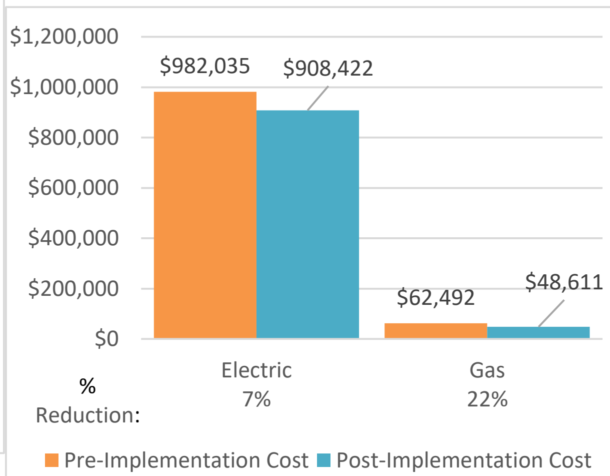
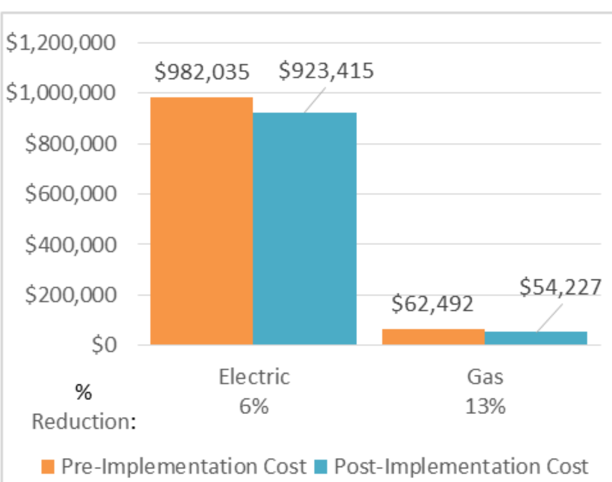


Figure 2b– Potential Post-Implementation Costs (High Priority Measures)



A detailed description of the Filtration Plant & Garage's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**352,685**	**24.7**	**0.0**	**$29,954**	**$226,585**	**$23,540**	**$203,045**	**6.8**	**355,151**
ECM 1	Install LED Fixtures	Yes	229,491	14.6	0.0	$19,491	$193,223	$19,690	$173,533	8.9	231,095
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	20,547	1.6	0.0	$1,745	$6,201	$250	$5,951	3.4	20,690
ECM 3	Retrofit Fixtures with LED Lamps	Yes	102,648	8.5	0.0	$8,718	$27,160	$3,600	$23,560	2.7	103,365
Lighting Control Measures			**68,319**	**5.5**	**0.0**	**$5,803**	**$27,020**	**$3,190**	**$23,830**	**4.1**	**68,797**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	64,524	5.1	0.0	$5,480	$25,080	$3,190	$21,890	4.0	64,975
ECM 5	Install High/Low Lighitng Controls	Yes	3,795	0.4	0.0	$322	$1,940	$0	$1,940	6.0	3,822
Motor Upgrades			**70,474**	**10.2**	**0.0**	**$5,986**	**$60,310**	**$0**	**$60,310**	**10.1**	**70,967**
ECM 6	Premium Efficiency Motors	Yes	70,474	10.2	0.0	$5,986	$60,310	$0	$60,310	10.1	70,967
Variable Frequency Drive (VFD) Measures			**88,214**	**29.3**	**0.0**	**$7,492**	**$66,179**	**$8,400**	**$57,779**	**7.7**	**88,831**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	88,214	29.3	0.0	$7,492	$66,179	$8,400	$57,779	7.7	88,831
Electric Unitary HVAC Measures			**107,035**	**27.9**	**0.0**	**$9,091**	**$119,619**	**$7,154**	**$112,465**	**12.4**	**107,783**
ECM 8	Install High Efficiency Electric AC	Yes	107,035	27.9	0.0	$9,091	$119,619	$7,154	$112,465	12.4	107,783
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**1,131.4**	**$8,265**	**$101,663**	**$6,400**	**$95,263**	**11.5**	**132,474**
ECM 9	Install High Efficiency Furnaces	Yes	0	0.0	1,131.4	$8,265	$101,663	$6,400	$95,263	11.5	132,474
Domestic Water Heating Upgrade			**1,852**	**0.0**	**0.0**	**$157**	**$79**	**$0**	**$79**	**0.5**	**1,865**
ECM 10	Install Low-Flow Domestic Hot Water Devices	Yes	1,852	0.0	0.0	$157	$79	$0	$79	0.5	1,865
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$137**	**$230**	**$0**	**$230**	**1.7**	**1,623**
ECM 11	Vending Machine Control	Yes	1,612	0.0	0.0	$137	$230	$0	$230	1.7	1,623
Custom Measures			**176,527**	**0.0**	**768.7**	**$14,993**	**$200,000**	**$0**	**$200,000**	**13.3**	**267,768**
	Installation of a SCADA Water Management System	No	176,527	0.0	768.7	$14,993	$200,000	$0	$200,000	13.3	267,768
TOTALS			**866,718**	**97.7**	**1,900.1**	**$81,878**	**$801,685**	**$48,684**	**$753,001**	**9.2**	**1,095,259**
TOTALS (High Priority)			**690,191**	**97.7**	**1,131.4**	**$66,885**	**$601,685**	**$48,684**	**$553,001**	**8.3**	**827,491**

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

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

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

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlet when not in use.

Energy Efficient Practices

TRC also identified 15 low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at the Filtration Plant & Garage include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Filtration Plant & Garage. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	333	kW DC STC
Electric Generation	396,727	kWh/yr
Displaced Cost	$34,520	/yr
Installed Cost	$865,800	

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

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

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

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

- SmartStart
- Pay for Performance - Existing Building (P4P EB)
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)
- Demand Response Energy Aggregator

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

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

There is a High Energy Intensity Buildings category in the P4P program that your facility may qualify for. An alternative savings threshold of 4% source energy savings is offered to customers whose annual energy consumption is heavily weighted to process loads. In order to be considered for this alternative savings threshold, the project must be evaluated further.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Hoggarth Stephen	Principal Engineer	hstephen@trentonnj.org	609-989-3615
Sean Semple	Assistant Director of Public Works	ssemple@trentonnj.org	609-989-3823
Bill Mitchell	Plant Superintendent	wmitchell@trentonnj.org	609-989-3640
Designated Representative			
John Martin	Head of Facilities		609-273-8194
TRC Energy Services			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	732-855-0033

2.2 General Site Information

On February 05, 2018, TRC performed an energy audit at the Filtration Plant & Garage located in Trenton, New Jersey. TRC's team met with Greg Adams to review the facility operations and help focus our investigation on specific energy-using systems.

Filtration Plant & Garage is a 296,551 square foot facility comprised of various space types within two main buildings which are connected by a walkway. The filtration plant has multiple floors and mostly comprised of mechanical space and industrial process areas. The facility includes three floors below ground and three floors above ground at its maximum height. There are also areas of offices and laboratories. The building is connected to the Mechanical Dewatering Facility (MDF) which is three floors. This section includes office and garage space.

Area	Estimated SQFT
West Filter Building	49,500
East Filter Building	49,500
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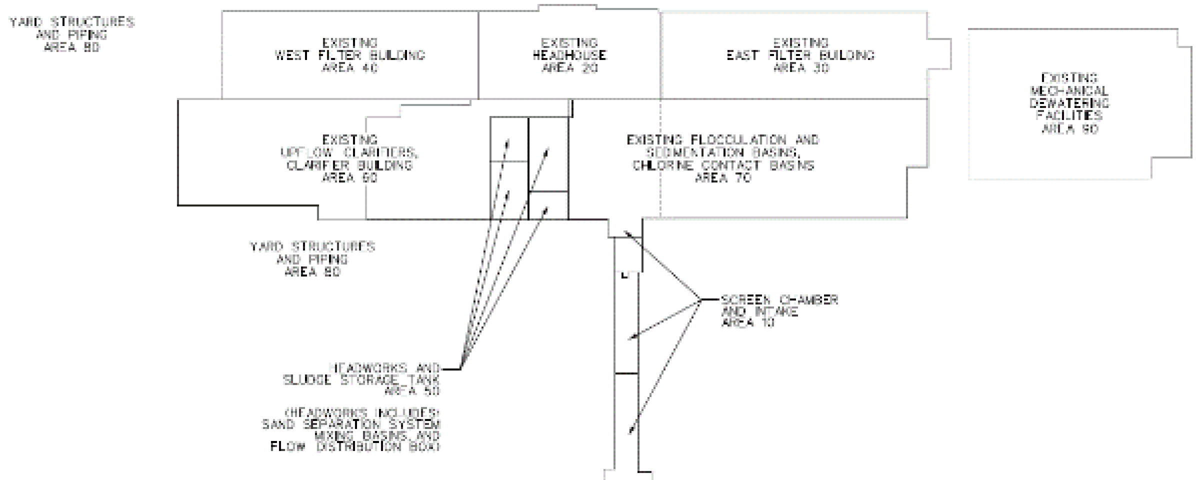
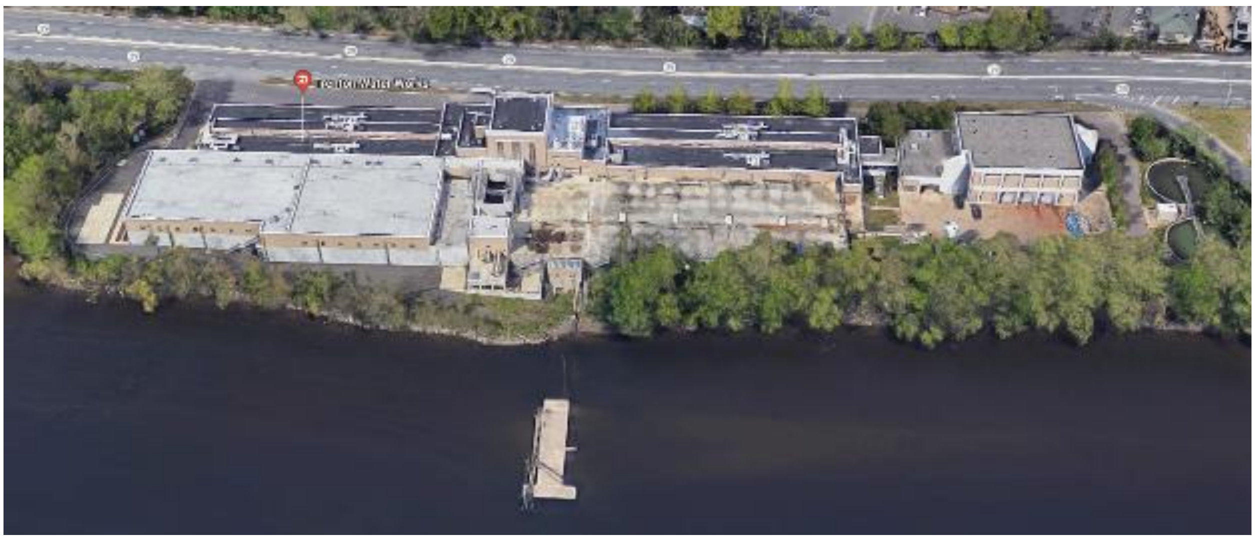
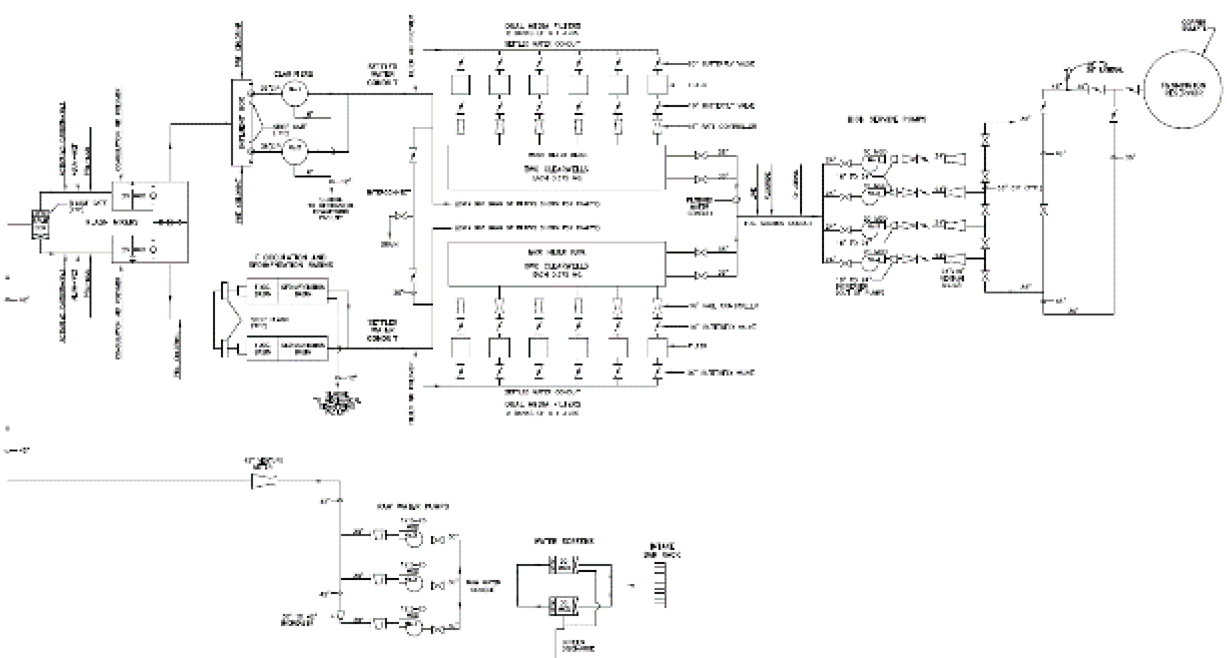
Head Works and Sludge Storage	17,160
Flocculation and Sedimentation Basins	29,664
Mechanical Dewatering Facilities	30,120
Total	**296,551**

The facility was originally constructed in the 1950's. The filtration plant operates to fill and maintain water level at the reservoir. It brings water in from the river and pumps it to the reservoir. The system serves about 225,000 customers. The peak capacity of the plant is in the summer months where operation is between 50 and 58 MGD. The winter months is about 48 to 55 MGD. The total plant hydraulic capacity is 80 MGD. The facility underwent a project in 2011 for pre-treatment and other facility improvements. The plant includes raw water pumps, sand separators, mixing basins, clarifiers, chlorine contact basins, filters and high service pumps.


YARD STRUCTURES AND PIPING AREA 80
EXISTING WEST FILTER BUILDING AREA 40
EXISTING HEADHOUSE AREA 20
EXISTING EAST FILTER BUILDING AREA 30
EXISTING MECHANICAL DEWATERING FACILITIES AREA 90
EXISTING UPFLOW CLARIFIERS, CLARIFIER BUILDING AREA 60
EXISTING FLOCCULATION AND SEDIMENTATION BASINS, CHLORINE CONTACT BASINS AREA 70
YARD STRUCTURES AND PIPING AREA 80
SCREEN CHAMBER AND INTAKE AREA 10
HEADWORKS AND SLUDGE STORAGE TANK AREA 50
(HEADWORKS INCLUDES SAND SEPARATION SYSTEM MIXING BASINS AND FLOW DISTRIBUTION BOX)





Per discussions with facility personnel, the roof was recently replaced and there is currently a project underway to replace all of the HVAC equipment throughout the facility. No information was provided regarding the HVAC replacement project, therefore, our evaluations are based on the existing conditions. According to staff, the major operations/maintenance concern at the facility is the poor indoor air quality. Based on conversations with facility personnel, the majority of cooling/dehumidification systems are not in good operating condition and therefore the plant has corroding issues. The heating systems are also not fully functional and all those that are operating are left on all day and night throughout the winter months. All HVAC equipment is manually turned on and off. Over the last few years the facility has begun to replace general purpose screw in lamps that burn out with new LED lamps. The remainder of the light fixtures are a mix of traditional technologies.

2.3 Building Occupancy

The Filtration Plant is in operation continuously. The offices and laboratories are occupied between Monday and Friday, 7:00 AM to 3:30 PM and only lab operators occupy the building on weekends as needed for emergencies. The average number of occupants during the day is 20. The typical schedule is presented in the table below.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Filtration Plant	Weekday	24/7
Filtration Plant	Weekend	24/7
Office & Labs	Weekday	7:00 AM - 3:30 PM
Office & Labs	Weekend	Lab Operators Only

2.4 Building Envelope

The building has a flat roof that is in good condition. The walls are concrete masonry units with a brick façade. The building has single or double pane windows with metal frames which are in fair condition. There are also glass block windows in the head house. The exterior doors are constructed of aluminum or metal with glass panes and are in good condition. The overhead doors are structural steel and are in fair condition. In general, the building envelope is in fair condition.

2.5 On-Site Generation

The Filtration Plant & Garage does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting is provided mostly by linear fluorescent fixtures with T8 lamps with electronic ballasts. These include U-lamp, 4-foot and 8-foot fixtures. There are a few fixtures that still utilize the old fluorescent technology with T12 lamps and magnetic ballasts. A few areas have LED fixtures. There are many areas with HID fixtures which contain either metal halide or high-pressure sodium lamp fixtures. These are primarily in industrial areas as well as in the Mechanical Dewatering Facility and exterior facility areas. There are general purpose fixtures in basement and mezzanine areas that are lit by compact fluorescent lamps (CFL), incandescent or LED lamps. The majority of the light fixtures are in fair condition, however some fixtures are missing lenses and some lamps were noted to be burned out at the time of the onsite audit. The HID fixtures in the East and West Filter Gallery Level Hallways were observed to be inoperable. Most lighting fixtures throughout the facility are manually controlled by wall switches. The exit signs throughout the building are LED.

Image 1: Interior Linear Fluorescent T8 Light Fixtures

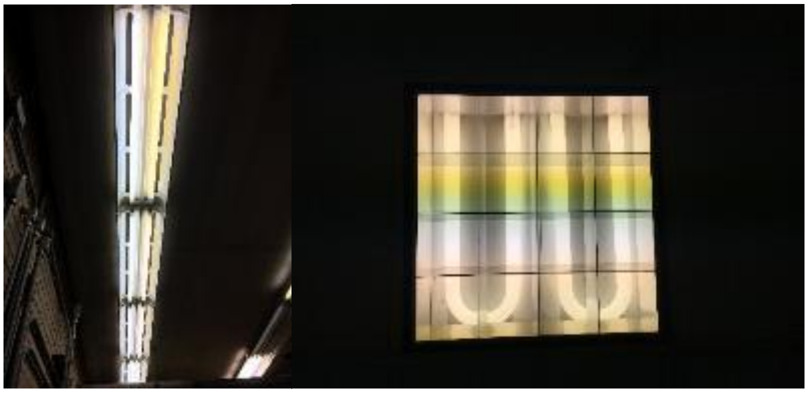


Image 2: Interior Linear Fluorescent T12 Light Fixtures

Image 3: Interior HID Light Fixtures

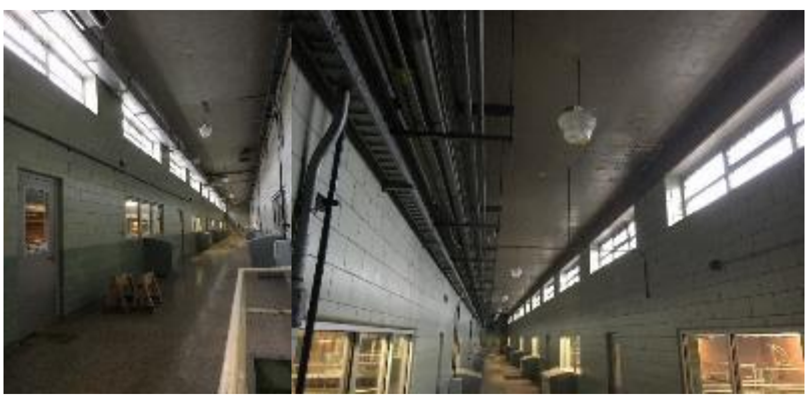


Image 4: East & West Filter Gallery Hallway HID Light Fixtures

Image 5: High Bay HID Lighting in Mechanical Dewatering Facility

The exterior lighting includes building mounted wall pack and flood fixtures, pole mounted shoebox and flood fixtures as well as explosion proof fixtures in high vibration areas. These contain high pressure sodium lamps and ballasts which range in wattage. Exterior light fixtures are controlled by a time clock or photocell controls. Fixtures near high caution areas are on a timeclock and operate between 4:00 PM and 7:00 AM every day.

Image 6: Exterior Lighting Systems

Process Systems

The process systems throughout the Filtration Plant require the use of motors. Motor electrical consumption is by far the largest end use at the facility. Raw water and high service pumps are the largest industrial motors and are rated for 400 HP and 700 HP respectively. The majority of these are controlled by variable frequency drives. The next largest process pump motors range between 10 HP and 30 HP, used for backwash, sludge transfer, solid handling, sludge storage tanks, sand slurry drains, mixers, filters, vacuum pumps and booster pumps. Some of these process motors are also driven by variable frequency drives. The remainder are constant speed motors. They range in condition and efficiency. The lime pneumatic conveyor machine is equipped with 75 HP motors.

Image 7: Raw Water and High Service Pump Motors

Image 8: Booster Water Pump Motors

Image 9: Vacuum Pump and Solid Handling Pump Motors

Image 10: Variable Frequency Drives

There are some 5 HP motors utilized for drain pumps and in air compressors. The remainder of process system motors are fractional horsepower up to 3 HP and used for sampling, metering, activating, collecting and recirculating. Some of these process motors are also driven by variable frequency drives. The remainder are constant speed motors. They range in condition and efficiency.

Image 11: Various Process System Motors

Image 12: Various Process System Motors

The process systems include controls with stationary monitors as the user interface. These control systems appear to be in good operating condition and utilized by facility personnel. The investigation and evaluation of the current operation of these control systems is beyond the scope of an LGEA audit. However, we recommend performing regular maintenance and operational check outs of these systems and all ancillary equipment.

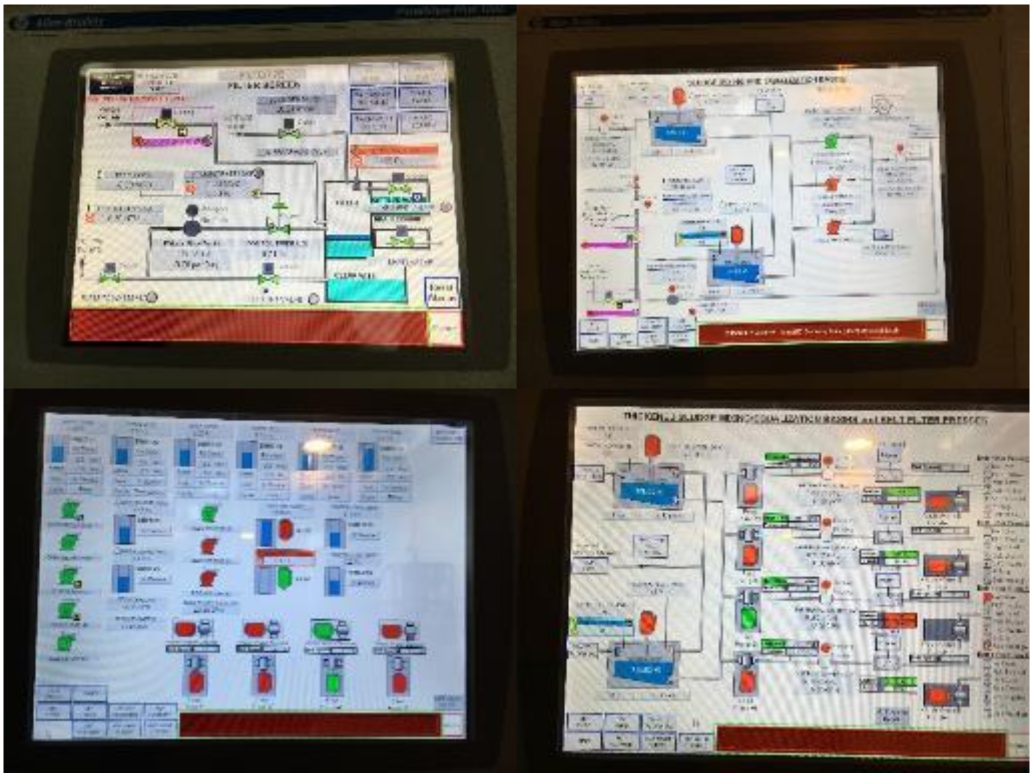


Image 13: Various Process Controls

HVAC Systems & Equipment

The major HVAC system type are gas-fired forced air furnaces. Some are equipped with a cooling coil in a split air-conditioning (AC) configuration with remote outdoor condensing units. These are located on the roof of the Filtration Plant and in mechanical rooms in the Mechanical Dewatering Facility. They are equipped with 5 HP constant speed supply fan motors. The majority of these systems and equipment are in poor condition, and over 20 years old. The ductwork insulation is worn.

Per discussions with facility personnel, there is currently a project underway to replace all of the HVAC equipment throughout the facility. No information was provided for this project and our evaluations are based on the existing conditions. According to staff, the major maintenance concern at the facility is the poor indoor air quality. Per discussions with facility personnel, the cooling/dehumidification systems are not in good operating condition and therefore the plant has corroding issues. The heating systems are also not fully functional and all those that are operating are left on all day and night throughout the winter months. All HVAC equipment is manually controlled with thermostats.

Image 14: Gas Fired Forced Air Furnaces with Remote Condensing Units on Roof of Filtration Plant

Image 15: Ductwork Insulation in Poor Condition

Image 16: Gas Fired Forced Air Furnaces with Remote Condensing Units in MDF

The mechanical space throughout the facility is conditioned by space unit heaters with local manual dial thermostat controls. There are a number of gas-fired and electric unit heaters that vary in condition and are of standard efficiency.

Image 17: Gas Unit Heaters and Local Manual Controls

Image 18: Electric Unit Heaters and Local Manual Controls

Direct Expansion Air Conditioning System (DX)

There are 15 ton direct-expansion (DX) package units with gas fired furnaces located on the roof of the Headworks Building. These units are about 14 years old. These units provide constant air volume with a single 7.5 HP supply fan motor. The units utilize two compressors and a DX coil. The gas fired furnace provides heating as needed. The units are manually controlled by thermostats.

Image 19: Packaged Roof Top Units (RTUs)

Split AC Systems

There are many split air conditioning (AC) systems with remote condensing units which are over 20 years old. These units serve the aforementioned air handling units. Systems are manually controlled by thermostats located in zones.

Image 20: Remote Condensing Units for RTUs

There are also outdoor condensing units which appear to be under ten years old, in fair condition and of standard efficiency. Systems are manually controlled by a thermostat located in the zones.

Image 21: Remote Condensing Units

There are a few split heat pump systems that condition office, labs and lounge areas. These are in good condition, about two years old and are high efficiency. They are controlled by programmable thermostats and are said to be properly scheduled.

Image 22: Split Heat Pump Systems and Controls

Domestic Hot Water Heating Systems

The domestic hot water heating systems include electric storage tank water heaters which are all in good condition and of standard efficiency. They serve restrooms and locker rooms in the facility. They are utilized for hand washing sinks throughout the facility. There are two 120-gallon capacity systems in the main Filtration Plant. There are two 80-gallon capacity systems in the DMF.

Image 23: Domestic Hot Water Systems

Refrigeration

There are a few stand up solid door freezers and refrigerators located in the science labs and lounge areas. These are in fair condition and are of standard efficiency.

Image 24: Refrigeration Equipment

Building Plug Load

The facility plug loads include general office and café equipment. There are roughly 18 computer work stations in office areas in the building. There are also a few portable electric unit heaters. There is a refrigerated drink machine located in the hallway near the office and lab area. This does not currently have controls.

Image 25: Plug Load Equipment

2.7 Water-Using Systems

There are restrooms throughout this facility. A sampling of restrooms found that majority of faucets are rated for 2.2 gallons per minute (gpm) or higher.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

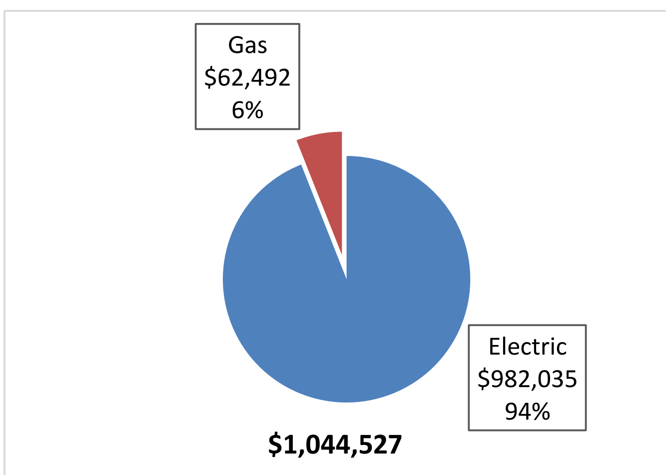
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Filtration Plant & Garage		
Fuel	**Usage**	**Cost**
Electricity	11,562,530 kWh	$982,035
Natural Gas	85,544 Therms	$62,492
Total		**$1,044,527**

The current annual energy cost for this facility is $1,044,527 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.085/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electric demand charges. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 9 - Electric Usage & Demand

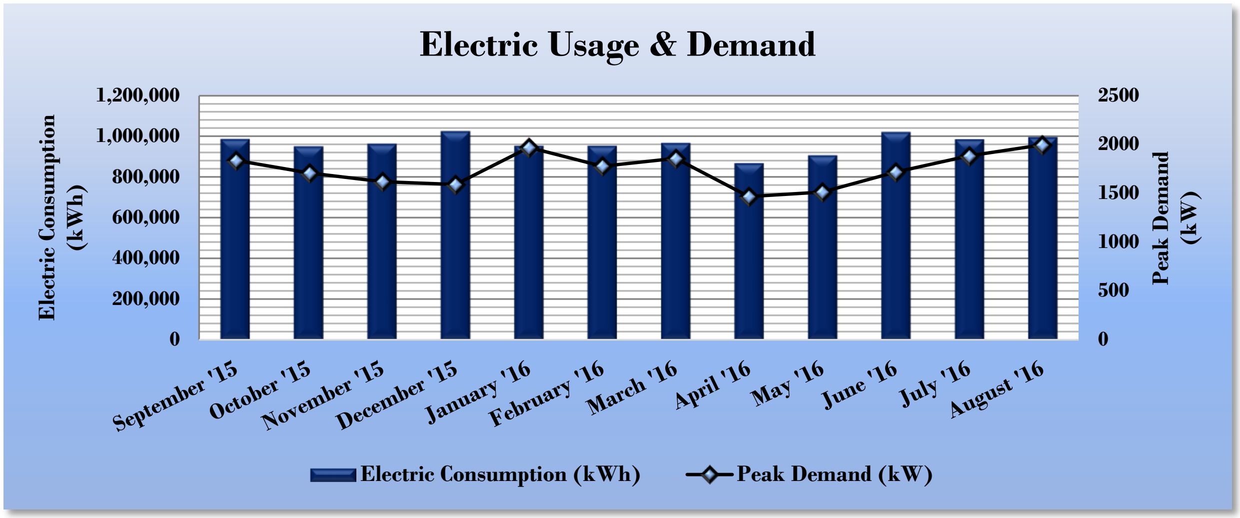


Figure 10 - Electric Usage & Demand

Electric Billing Data for Filtration Plant & Garage					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
10/2/15	30	985,440	1,836		$87,440
11/2/15	31	949,603	1,708		$82,022
12/4/15	32	962,080	1,617		$74,633
1/5/16	32	1,023,945	1,589		$69,702
2/3/16	29	952,006	1,970		$74,679
3/4/16	30	952,231	1,778		$69,146
4/5/16	32	966,382	1,857		$65,949
5/4/16	29	866,976	1,466		$68,309
6/3/16	30	905,733	1,511		$83,787
7/5/16	32	1,020,140	1,715		$94,129
8/3/16	29	983,330	1,882		$102,905
9/1/16	29	994,664	1,995		$109,334
Totals	**365**	**11,562,530**	**1995**	**$0**	**$982,035**
Annual	**365**	**11,562,530**	**1995**	**$0**	**$982,035**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.731/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 11 - Natural Gas Usage

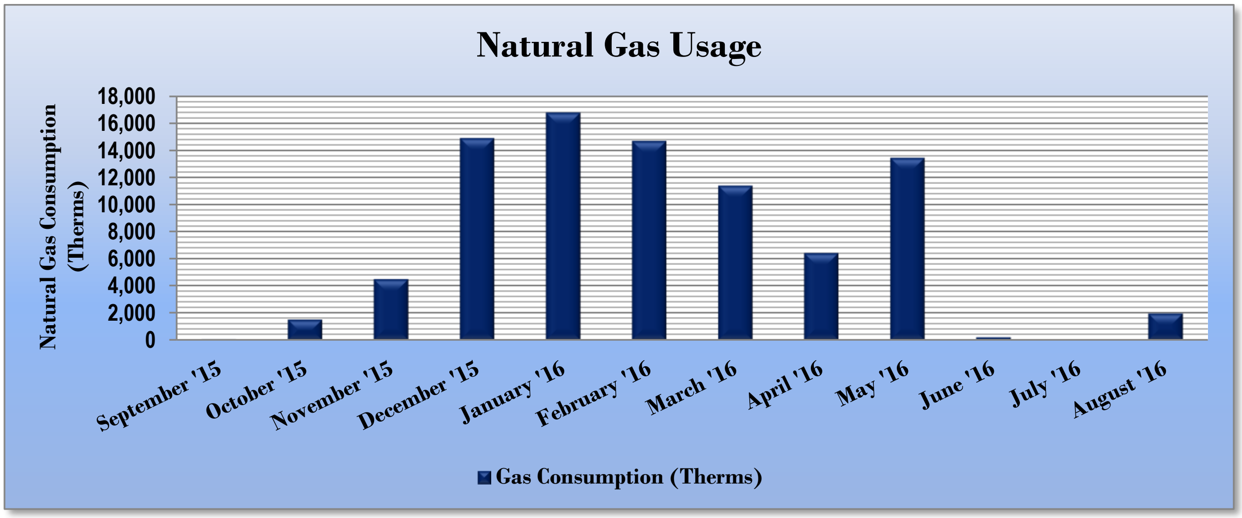


Figure 12 - Natural Gas Usage

Gas Billing Data for Filtration Plant & Garage			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
10/2/15	30	35	$340
11/2/15	31	1,503	$2,662
12/4/15	32	4,491	$5,105
1/6/16	33	14,877	$11,560
2/3/16	28	16,778	$12,321
3/7/16	33	14,685	$10,807
4/5/16	29	11,377	$6,871
5/4/16	29	6,421	$3,554
6/3/16	30	13,443	$7,215
7/7/16	34	194	$424
8/4/16	28	10	$327
9/2/16	29	1,964	$1,477
Totals	**366**	**85,778**	**$62,663**
Annual	**365**	**85,544**	**$62,492**

3.4 Benchmarking

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

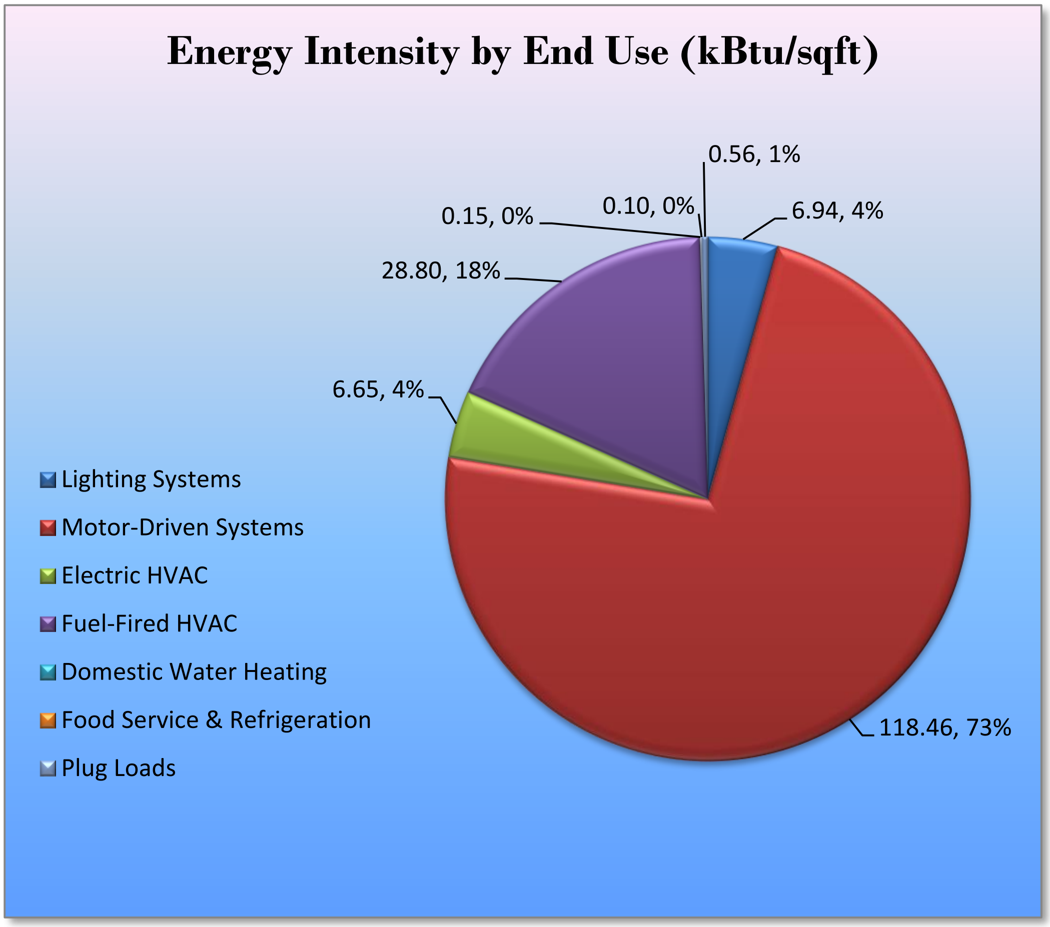
Water/Wastewater treatment plants are benchmarked differently because energy use is related to the process and not the building area. The ENERGY STAR® score for wastewater treatment plants applies to primary, secondary, and advanced treatment facilities, but does not apply to drinking water treatment or distribution utilities. ENERGY STAR® benchmarking for water treatment facilities generally requires input information related to Average Influent Flow (MGD), Average Influent BOD (mg/l), Average Effluent BOD (mg/l), Plant Design Flow Rate (MGD), and whether there is a fixed film trickle filtration process or nutrient removal. Some of this information was not readily available to TRC at the time of the audit.

Therefore, the facility was not benchmarked.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 13 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Filtration Plant & Garage regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 14 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**352,685**	**24.7**	**0.0**	**$29,954.42**	**$226,584.84**	**$23,540.00**	**$203,044.84**	**6.8**	**355,151**
ECM 1	Install LED Fixtures	229,491	14.6	0.0	$19,491.21	$193,223.47	$19,690.00	$173,533.47	8.9	231,095
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	20,547	1.6	0.0	$1,745.08	$6,201.00	$250.00	$5,951.00	3.4	20,690
ECM 3	Retrofit Fixtures with LED Lamps	102,648	8.5	0.0	$8,718.13	$27,160.36	$3,600.00	$23,560.36	2.7	103,365
Lighting Control Measures		**68,319**	**5.5**	**0.0**	**$5,802.52**	**$27,020.00**	**$3,190.00**	**$23,830.00**	**4.1**	**68,797**
ECM 4	Install Occupancy Sensor Lighting Controls	64,524	5.1	0.0	$5,480.17	$25,080.00	$3,190.00	$21,890.00	4.0	64,975
ECM 5	Install High/Low Lighitng Controls	3,795	0.4	0.0	$322.35	$1,940.00	$0.00	$1,940.00	6.0	3,822
Motor Upgrades		**70,474**	**10.2**	**0.0**	**$5,985.55**	**$60,309.67**	**$0.00**	**$60,309.67**	**10.1**	**70,967**
ECM 6	Premium Efficiency Motors	70,474	10.2	0.0	$5,985.55	$60,309.67	$0.00	$60,309.67	10.1	70,967
Variable Frequency Drive (VFD) Measures		**88,214**	**29.3**	**0.0**	**$7,492.27**	**$66,178.90**	**$8,400.00**	**$57,778.90**	**7.7**	**88,831**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	88,214	29.3	0.0	$7,492.27	$66,178.90	$8,400.00	$57,778.90	7.7	88,831
Electric Unitary HVAC Measures		**107,035**	**27.9**	**0.0**	**$9,090.73**	**$119,618.94**	**$7,154.00**	**$112,464.94**	**12.4**	**107,783**
ECM 8	Install High Efficiency Electric AC	107,035	27.9	0.0	$9,090.73	$119,618.94	$7,154.00	$112,464.94	12.4	107,783
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,131.4**	**$8,265.25**	**$101,663.45**	**$6,400.00**	**$95,263.45**	**11.5**	**132,474**
ECM 9	Install High Efficiency Furnaces	0	0.0	1,131.4	$8,265.25	$101,663.45	$6,400.00	$95,263.45	11.5	132,474
Domestic Water Heating Upgrade		**1,852**	**0.0**	**0.0**	**$157.26**	**$78.87**	**$0.00**	**$78.87**	**0.5**	**1,865**
ECM 10	Install Low-Flow Domestic Hot Water Devices	1,852	0.0	0.0	$157.26	$78.87	$0.00	$78.87	0.5	1,865
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$136.90**	**$230.00**	**$0.00**	**$230.00**	**1.7**	**1,623**
ECM 11	Vending Machine Control	1,612	0.0	0.0	$136.90	$230.00	$0.00	$230.00	1.7	1,623
Custom Measures		**176,527**	**0.0**	**768.7**	**$14,992.87**	**$200,000.00**	**$0.00**	**$200,000.00**	**13.3**	**267,768**
ECM 12	Installation of a SCADA Water Management System	176,527	0.0	768.7	$14,992.87	$200,000.00	$0.00	$200,000.00	13.3	267,768
TOTALS		**866,718**	**97.7**	**1,900.1**	**$81,877.77**	**$801,684.67**	**$48,684.00**	**$753,000.67**	**9.2**	**1,095,259**

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 15 below.

Figure 15 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**352,685**	**24.7**	**0.0**	**$29,954.42**	**$226,584.84**	**$23,540.00**	**$203,044.84**	**6.8**	**355,151**
ECM 1	Install LED Fixtures	229,491	14.6	0.0	$19,491.21	$193,223.47	$19,690.00	$173,533.47	8.9	231,095
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	20,547	1.6	0.0	$1,745.08	$6,201.00	$250.00	$5,951.00	3.4	20,690
ECM 3	Retrofit Fixtures with LED Lamps	102,648	8.5	0.0	$8,718.13	$27,160.36	$3,600.00	$23,560.36	2.7	103,365

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	196,246	14.6	0.0	$16,667.70	$155,172.87	$15,925.00	$139,247.87	8.4	197,618
Exterior	33,244	0.0	0.0	$2,823.51	$38,050.61	$3,765.00	$34,285.61	12.1	33,477

Measure Description

We recommend replacing existing fixtures containing metal halide and high-pressure sodium lamp fixtures with new high-performance LED light fixtures. This measure also includes the replacement of a few linear fluorescent fixtures observed in poor condition with new high performance, reduced wattage LED fixtures. Fixtures for replacement include wall mounted fixtures, low-bay fixtures, high-bay fixtures, ambient 4-foot fixtures throughout interior applications. These also include wall pack fixtures, outdoor pole mounted area light fixtures, and building mounted flood fixtures throughout exterior applications. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and much longer than traditional HID technologies.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	20,547	1.6	0.0	$1,745.08	$6,201.00	$250.00	$5,951.00	3.4	20,690
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent T12 fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	102,648	8.5	0.0	$8,718.13	$27,160.36	$3,600.00	$23,560.36	2.7	103,365
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent and linear fluorescent T8 fixtures with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and more than ten times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**68,319**	**5.5**	**0.0**	**$5,802.52**	**$27,020.00**	**$3,190.00**	**$23,830.00**	**4.1**	**68,797**
ECM 4	Install Occupancy Sensor Lighting Controls	64,524	5.1	0.0	$5,480.17	$25,080.00	$3,190.00	$21,890.00	4.0	64,975
ECM 5	Install High/Low Lighitng Controls	3,795	0.4	0.0	$322.35	$1,940.00	$0.00	$1,940.00	6.0	3,822

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
64,524	5.1	0.0	$5,480.17	$25,080.00	$3,190.00	$21,890.00	4.0	64,975

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in various mechanical spaces, industrial areas, laboratories, offices and locker rooms. This facility has 24/7 operation and all lights are left on a significant portion of the time. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend that lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,795	0.4	0.0	$322.35	$1,940.00	$0.00	$1,940.00	6.0	3,822

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Areas evaluated as part of this measure include hallways, west and east side filter gallery, breezeway and the lobby entrance of the mechanical dewatering facility.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches. Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Motor Upgrades

Our recommendations for motor upgrade measures are summarized in Figure 17 below.

Figure 17 - Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**70,474**	**10.2**	**0.0**	**$5,986**	**$60,310**	**$0**	**$60,310**	**10.1**	**70,967**
ECM 6	Premium Efficiency Motors	70,474	10.2	0.0	$5,986	$60,310	$0	$60,310	10.1	70,967

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
70,474	10.2	0.0	$5,985.55	$60,309.67	$0.00	$60,309.67	10.1	70,967

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

The motors included within this measure evaluation are as follows:

- Booster Pumps
- Super-pulsator Vacuum Pumps
- Vacuum Pumps
- Booster Pumps
- Sludge Pumps
- Sludge Transfer Pumps
- Thickener Pumps
- Raw Water Sampling Pump
- Chlorine Sampling Pumps
- Settled Water Sampling Pump
- Lime Pneumatic Conveyor
- HVAC Unit Supply Fan Motors

It should be noted that there are several very old motors, many of which appear to be specialty low RPM motors (motor rpm was covered on most nameplates during the data collection). We did an initial estimate of savings for replacing the motors with new high efficiency motors. However, we recommend consulting an electrical contractor or ESCO (energy savings company) to determine the actual motor load, required replacement motor size and efficiency, motor speed and determine if VFDs should be used to set (or vary) the desired operating speed.

Note that the HVAC upgrade now underway will likely impact this scope of this projects. If not currently in the plan, we recommend that selected available replacement HVAC equipment will be furnished with premium high efficiency motors.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**88,214**	**29.3**	**0.0**	**$7,492.27**	**$66,178.90**	**$8,400.00**	**$57,778.90**	**7.7**	**88,831**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	88,214	29.3	0.0	$7,492.27	$66,178.90	$8,400.00	$57,778.90	7.7	88,831

ECM 7: Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
88,214	29.3	0.0	$7,492.27	$66,178.90	$8,400.00	$57,778.90	7.7	88,831

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert constant-volume, single-zone air handling systems into a variable-air-volume (VAV) systems. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

The applications included within this measure evaluation are as follows:

- Eighteen (18) HVAC Unit Supply Fan Motors
- Two (2) RTU Supply Fan Motors

It should be noted that this measure is interactive with other energy conservation measures. ECMs 6 through 9, as they pertain to HVAC systems and equipment, may be thought of as a package. They are represented separately in order to support prioritization of ECMs and provide a way to consider different improvement types associated with roof top equipment.

There may be an opportunity for additional applications for VFDs, beyond the supply fan motors for HVAC systems and equipment. However, we recommend consulting an electrical contractor or ESCO (energy savings company) to determine the actual motor load, required replacement motor size and efficiency, motor speed and determine if VFDs should be used to set (or vary) the desired operating speed. It should be noted that there are several very old motors, many of which appear to be specialty low RPM motors (motor rpm was covered on most nameplates during the data collection).

4.1.5 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 19 below.

Figure 19 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**107,035**	**27.9**	**0.0**	**$9,090.73**	**$119,618.94**	**$7,154.00**	**$112,464.94**	**12.4**	**107,783**
ECM 8	Install High Efficiency Electric AC	107,035	27.9	0.0	$9,090.73	$119,618.94	$7,154.00	$112,464.94	12.4	107,783

ECM 8: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
107,035	27.9	0.0	$9,090.73	$119,618.94	$7,154.00	$112,464.94	12.4	107,783

Measure Description

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

The measure includes the evaluation of upgrading the following electric cooling equipment:

- Two (2) Packaged AC serving the Headworks
- Outdoor Condensing Unit which serves the Split AC System for the West End Side
- Outdoor Condensing Unit which serves the Split AC System for the West End Center
- Outdoor Condensing Unit which serves the Split AC System for the West End Street
- Outdoor Condensing Unit which serves the Split AC System for the West End River
- Outdoor Condensing Unit which serves the Split AC System for the East End Side
- Outdoor Condensing Unit which serves the Split AC System for the East End Center
- Outdoor Condensing Unit which serves the Split AC System for the East End Street
- Outdoor Condensing Unit which serves the Split AC System for the East End River
- Outdoor Condensing Unit which serves the Split AC System for the East End
- Outdoor Condensing Unit which serves the Split AC System for the HVAC Units
- Outdoor Condensing Unit which serves the Split AC System for the HVAC Units
- Outdoor Condensing Unit which serves the Split AC System for the Hut

4.1.6 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 20 below.

Figure 20 - Summary of Gas-Fired Heating Replacement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,131.4**	**$8,265.25**	**$101,663.45**	**$6,400.00**	**$95,263.45**	**11.5**	**132,474**
ECM 9	Install High Efficiency Furnaces	0	0.0	1,131.4	$8,265.25	$101,663.45	$6,400.00	$95,263.45	11.5	132,474

ECM 9: Install High Efficiency Furnaces

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	1,131.4	$8,265.25	$101,663.45	$6,400.00	$95,263.45	11.5	132,474

Measure Description

We recommend replacing existing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

The measure includes the evaluation of upgrading the following gas forced air heating equipment:

- Furnace serving the West End Side
- Furnace serving the West End Center
- Furnace serving the West End Street
- Furnace serving the West End River
- Furnace serving the East End Side
- Furnace serving the East End Center
- Furnace serving the East End Street
- Furnace serving the East End River
- Furnace serving the East End
- Furnace serving the Sub Level Mechanical Space
- Furnace serving the Mechanical Dewatering Facility
- Furnace serving the Mechanical Dewatering Facility
- Furnace serving the Mechanical Dewatering Facility
- Furnace serving the Headworks
- Furnace serving the Headworks

4.1.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 21 below.

Figure 21 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**1,852**	**0.0**	**0.0**	**$157.26**	**$78.87**	**$0.00**	**$78.87**	**0.5**	**1,865**
ECM 10	Install Low-Flow Domestic Hot Water Devices	1,852	0.0	0.0	$157.26	$78.87	$0.00	$78.87	0.5	1,865

ECM 10: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,852	0.0	0.0	$157.26	$78.87	$0.00	$78.87	0.5	1,865

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.8 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 22 below.

Figure 22 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$137**	**$230**	**$0**	**$230**	**1.7**	**1,623**
ECM 11	Vending Machine Control	1,612	0.0	0.0	$137	$230	$0	$230	1.7	1,623

ECM 11: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$136.90	$230.00	$0.00	$230.00	1.7	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use of the refrigerated drink machine. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.2 ECM Evaluated and Recommended for Further Study

The measure below has been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in the measure description section.

Figure 21 – Summary of Measure Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures	**176,527**	**0.0**	**768.7**	**$14,992.87**	**$200,000.00**	**$0.00**	**$200,000.00**	**13.3**	**267,768**
Installation of a SCADA Water Management System	176,527	0.0	768.7	$14,992.87	$200,000.00	$0.00	$200,000.00	13.3	267,768

<u>Installation of a SCADA Water Management System</u>

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
176,527	0.0	768.7	$14,992.87	$200,000.00	$0.00	$200,000.00	13.3	267,768

Measure Description

We did an initial screening of the installation of a SCADA Water Management System. This is a high-level estimate of savings and costs. The cost estimate is based on case studies and industry technical papers. Costs for systems vary based on the size and scope but usually range between $10k and $100k. For conservative high-level evaluation, we estimate costs to be higher than this spectrum, which would include a front end, programming, design and additional control points. It should be noted that this measure requires a higher level of investigation. Design level details should be evaluated in order to determine the feasibility, including measure energy and economic results, of implementation.

Reasons for not Recommending as High Priority

At a high-level screening, this measure cannot be justified solely based on energy savings. This measure screening is therefore provided for demonstration purposes only. If after further study the measure still predicts a long payback, the measure may be implemented as more of a capital improvement project that may be rolled into a large comprehensive project under an Energy Savings Improvement Project (ESIP). The payback threshold for a comprehensive project under an ESIP is 15 years.

4.3 ECMs Recommended for Further Investigation

HVAC Ductwork Repairs and Insulation

Description

We recommend evaluating the installation of duct insulation for roof top equipment. Distribution system losses are dependent on supply air temperature, indoor space temperature setpoints, the size of the distribution system, current condition/effectiveness of existing insulation and thermally insulating R-value of proposed insulation. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to outdoor condition, when the insulation has been removed from some areas, system efficiency can be significantly reduced.

While this measure is typically cost effective, there may be significant initial costs due to potential asbestos concerns. This would greatly impact the payback period. We therefore recommend that this be investigated further and implemented as more of a capital improvement than a high priority energy savings measure. We recommend that if and when the facility consults an ESCO (energy savings company) to investigate HVAC upgrades further, they also investigate the potential and feasibility of installation of ductwork insulation or full replacement.

Install Infrared Heaters

Measure Description

We recommend evaluating the replacement of general space unit heaters with low-intensity infrared heating units (the flame is enclosed rather than an open flame on a ceramic or metal surface). Forced air furnaces heat all of the air in the space served, which is inefficient for large volume spaces with relatively few occupants, areas with high ceilings, or areas with high outside air infiltration. Infrared heaters heat object surfaces directly, including the occupants of the space, rather than heating large volumes of air. So, occupants feel comfortable, but energy costs are significantly reduced. Infrared heaters also heat the floor which then re-radiates the heat. As a result, infrared heaters are more effective and efficient at maintaining occupant comfort for certain space types.

Install Occupancy-Controlled Thermostats

Measure Description

We recommend evaluating the replacement of manual thermostats with occupancy-controlled thermostats. Many types of facilities use manually controlled thermostats set by occupants to regulate temperature within the facility, or in certain areas. An occupancy controlled-thermostat is a thermostat paired with a sensor and/or door detector to identify movement and determine if a room is occupied or unoccupied. If occupancy is sensed by the sensor, the thermostat goes into an occupied mode and enables programmed temperature setpoint. If no occupancy is sensed, the thermostat switches to unoccupied mode after a set period of time. By reducing heating temperature setpoint when the space is occupied, the operation of the electric unit heaters may be reduced while still maintaining reasonable space temperatures for building usage at all times. Occupancy controlled thermostats provide energy savings by reducing heating energy usage when rooms are unoccupied. Minimum temperatures for an unoccupied building could be set back to 45-55°F until the space is occupied and only then should the temperature setpoint be increased to 70°F.

5 ENERGY EFFICIENT PRACTICES

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

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5% - 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas / carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.7 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

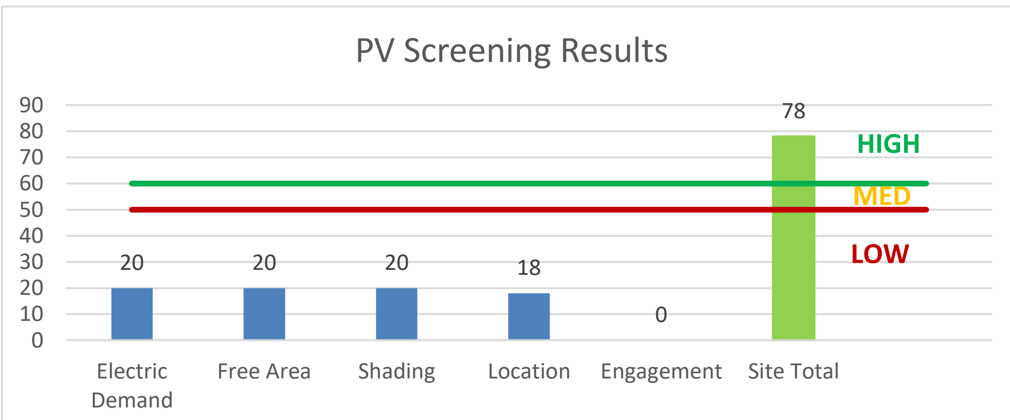
6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the facility may be feasible. If Filtration Plant & Garage is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	333	kW DC STC
Electric Generation	396,727	kWh/yr
Displaced Cost	$34,520	/yr
Installed Cost	$865,800	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

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

6.2 Combined Heat and Power

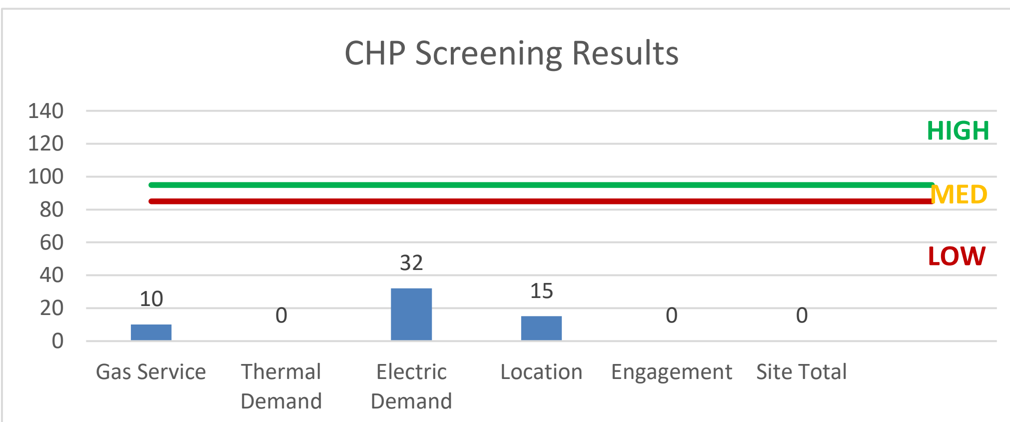
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

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

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

Due to the low or infrequent thermal load, there is no potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

Figure 24 - Combined Heat and Power Screening



7 Demand Response

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

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

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

We believe there is sufficient potential for Demand Response at the Filtration Plant & Garage.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 25 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x			x		
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x			x		
ECM 3	Retrofit Fixtures with LED Lamps	x			x		
ECM 4	Install Occupancy Sensor Lighting Controls	x			x		
ECM 5	Install High/Low Lighitng Controls				x		
ECM 6	Premium Efficiency Motors				x		
ECM 7	Install VFDs on Constant Volume (CV) HVAC	x			x		
ECM 8	Install High Efficiency Electric AC				x		
ECM 9	Install High Efficiency Furnaces	x			x		
ECM 10	Install Low-Flow Domestic Hot Water Devices	x			x		
ECM 11	Vending Machine Control				x		

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

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Please note that the scope of work presented in this audit report does not quite meet the requirements of the P4P program as outlined above. However, due to the size of the facility and existing conditions, it may be considered a High Energy Intensity Building which requires 4% of source energy savings to qualify with lighting contributing to less than 50% of these claimed savings. Should claimed savings be scaled down to meet those requirements at a later point in time, for example through further evaluation or the modeling process, this facility could potentially meet the requirements necessary to participate in the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors (“Partners”). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.4 Energy Savings Improvement Program

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

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

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

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

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

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

8.5 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (DR) program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other program information.

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

See Section 7 for additional information.

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Sub Level	13	Metal Halide: (1) 400W Lamp	None	458	8,760	Fixture Replacement	Yes	13	LED - Fixtures: Low-Bay	Occupancy Sensor	137	6,132	2.97	41,236	0.0	$3,502.27	$18,997.08	$2,020.00	4.85
Mechanical Sub Level	14	High-Pressure Sodium: (1) 400W Lamp	None	465	8,760	Fixture Replacement	Yes	14	LED - Fixtures: Low-Bay	Occupancy Sensor	140	6,132	3.37	46,809	0.0	$3,975.63	$20,416.85	$2,170.00	4.59
Mechanical Sub Level	2	Incandescent: Screw in Lamp	None	100	8,760	Relamp	Yes	2	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	14	6,132	0.12	1,644	0.0	$139.59	$107.51	$45.00	0.45
AHU Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.16	2,279	0.0	$193.60	$621.00	$95.00	2.72
West Side Sub Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Low-Bay	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$3,109.55	$335.00	17.68
West Side Sub Level	11	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	11	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	38	6,132	0.73	10,162	0.0	$863.06	$4,567.45	$1,135.00	3.98
West Side Sub Level	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Fixture Replacement	Yes	1	LED - Fixtures: Other	Occupancy Sensor	29	6,132	0.03	380	0.0	$32.27	$564.48	$40.00	16.25
West Side Mezzanine Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Low-Bay	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$3,109.55	$335.00	17.68
West Side Mezzanine Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$1,051.35	$235.00	5.20
West Side Mezzanine Level	1	LED Screw-In Lamps: Screw in Lamp	None	18	8,760	None	Yes	1	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	18	6,132	0.00	49	0.0	$4.18	$0.00	$35.00	-8.38
West Side Filter Gallary Level	0	Metal Halide: (1) 250W Lamp	None	295	3,094	Fixture Replacement	Yes	6	LED - Fixtures: High-Bay	High/Low Control	89	2,166	-0.24	-1,203	0.0	-$102.16	$8,255.60	$900.00	-72.00
West Side Filter Room	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.59	8,183	0.0	$695.00	$2,061.00	$330.00	2.49
West Side Filter Room	12	Linear Fluorescent - T8: 8' T8 (59W) - 2L	None	110	8,760	Relamp	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,132	0.44	6,057	0.0	$514.40	$1,700.00	$35.00	3.24
West Side Filter Room	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.59	8,183	0.0	$695.00	$2,061.00	$330.00	2.49
West Side Filter Room	12	Linear Fluorescent - T8: 8' T8 (59W) - 2L	None	110	8,760	Relamp	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,132	0.44	6,057	0.0	$514.40	$1,700.00	$35.00	3.24
East Side Sub Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Low-Bay	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$2,839.55	$335.00	15.96
East Side Sub Level	11	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	11	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	38	6,132	0.73	10,162	0.0	$863.06	$4,567.45	$1,135.00	3.98
East Side Sub Level	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Fixture Replacement	Yes	1	LED - Fixtures: Other	Occupancy Sensor	29	6,132	0.03	380	0.0	$32.27	$564.48	$40.00	16.25
East Side Mezzanine Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Low-Bay	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$3,109.55	$335.00	17.68
East Side Mezzanine Level	2	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	38	6,132	0.13	1,848	0.0	$156.92	$1,051.35	$235.00	5.20
East Side Mezzanine Level	1	LED Screw-In Lamps: Screw in Lamp	None	18	8,760	None	Yes	1	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	18	6,132	0.00	49	0.0	$4.18	$0.00	$35.00	-8.38
East Side Filter Gallary Level	0	Metal Halide: (1) 250W Lamp	None	295	3,094	Fixture Replacement	Yes	6	LED - Fixtures: High-Bay	High/Low Control	89	2,166	-0.24	-1,203	0.0	-$102.16	$8,255.60	$900.00	-72.00
East Side Filter Room	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.59	8,183	0.0	$695.00	$2,061.00	$330.00	2.49
East Side Filter Room	12	Linear Fluorescent - T8: 8' T8 (59W) - 2L	None	110	8,760	Relamp	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,132	0.44	6,057	0.0	$514.40	$1,700.00	$35.00	3.24
East Side Filter Room	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.59	8,183	0.0	$695.00	$2,061.00	$330.00	2.49

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
East Side Filter Room	12	Linear Fluorescent - T8: 8' T8 (59W) - 2L	None	110	8,760	Relamp	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	6,132	0.44	6,057	0.0	$514.40	$1,700.00	$35.00	3.24
Head House Hallway	7	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,760	Relamp & Reballast	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,132	0.31	4,317	0.0	$366.69	$1,019.00	$70.00	2.59
Operator's Lab	4	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,000	None	No	4	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Operator's Lab	7	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,000	None	No	7	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women's Restroom	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	6,000	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.04	422	0.0	$35.88	$233.00	$10.00	6.22
Men's Restroom	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	6,000	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.04	422	0.0	$35.88	$233.00	$10.00	6.22
Entrance Lobby Stairs	4	LED - Fixtures: Fuel Pump Canopy	None	18	8,760	None	No	4	LED - Fixtures: Fuel Pump Canopy	None	18	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference Room Locked	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.16	1,561	0.0	$132.60	$416.80	$80.00	2.54
West Lab Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	8,760	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	6,132	0.08	1,140	0.0	$96.80	$420.40	$30.00	4.03
Lab	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.12	1,171	0.0	$99.45	$341.60	$65.00	2.78
Lab	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	6,000	0.03	309	0.0	$26.23	$75.20	$15.00	2.29
Lab	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.16	1,561	0.0	$132.60	$416.80	$80.00	2.54
Lab	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.37	3,513	0.0	$298.35	$792.80	$155.00	2.14
Lab Locked	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.16	1,561	0.0	$132.60	$416.80	$80.00	2.54
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,760	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	6,132	0.08	1,140	0.0	$96.80	$420.40	$30.00	4.03
Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.33	3,122	0.0	$265.20	$717.60	$140.00	2.18
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.16	1,561	0.0	$132.60	$416.80	$80.00	2.54
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.04	390	0.0	$33.15	$191.20	$15.00	5.32
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.05	520	0.0	$44.20	$233.00	$20.00	4.82
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.03	260	0.0	$22.10	$174.50	$10.00	7.44
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.05	520	0.0	$44.20	$233.00	$40.00	4.37
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.16	1,561	0.0	$132.60	$416.80	$80.00	2.54
Stairs	4	LED - Fixtures: Fuel Pump Canopy	None	18	8,760	None	No	4	LED - Fixtures: Fuel Pump Canopy	None	18	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
2nd Floor Line Area	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$115.00	2.72
Polymer Area	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$115.00	2.72

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Potassium Perm Area	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.19	2,356	0.0	$200.08	$679.50	$105.00	2.87
Mechanical Shop	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.16	2,019	0.0	$171.50	$621.00	$95.00	3.07
Storage	2	Metal Halide: (1) 250W Lamp	Wall Switch	295	7,760	Fixture Replacement	Yes	2	LED - Fixtures: Low-Bay	Occupancy Sensor	89	5,432	0.30	3,756	0.0	$319.00	$3,109.55	$335.00	8.70
Tank Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.27	3,365	0.0	$285.83	$855.00	$135.00	2.52
Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$80.00	2.88
Mechanical Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$115.00	2.72
3rd Floor Tank Room	4	Incandescent: Screw in Lamp	None	100	7,760	Relamp	Yes	4	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	14	5,432	0.24	2,912	0.0	$247.31	$485.01	$55.00	1.74
Head House Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	8,760	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	6,132	0.08	1,140	0.0	$96.80	$350.40	$30.00	3.31
Men's Locker Room	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,200	0.15	1,456	0.0	$123.70	$649.20	$35.00	4.97
Men's Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.05	520	0.0	$44.20	$117.00	$55.00	1.40
Men's Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.08	781	0.0	$66.30	$420.40	$65.00	5.36
Lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	6,000	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,200	0.19	1,832	0.0	$155.60	$650.53	$115.00	3.44
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.05	520	0.0	$44.20	$387.00	$20.00	8.30
Women's Locker Room	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,200	0.15	1,456	0.0	$123.70	$649.20	$35.00	4.97
Women's Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.05	520	0.0	$44.20	$387.00	$55.00	7.51
Women's Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	6,000	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,200	0.08	781	0.0	$66.30	$150.40	$65.00	1.29
Breezeway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,132	0.16	2,279	0.0	$193.60	$551.00	$60.00	2.54
Super Posater Room	14	High-Pressure Sodium: (1) 100W Lamp	None	138	7,760	Fixture Replacement	Yes	42	LED - Fixtures: Other	Occupancy Sensor	41	5,432	0.48	5,864	0.0	$498.04	$24,788.16	$350.00	49.07
Electric Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.19	2,356	0.0	$200.08	$679.50	$105.00	2.87
Pump Room	7	High-Pressure Sodium: (1) 100W Lamp	Wall Switch	138	7,760	Fixture Replacement	Yes	7	LED - Fixtures: Other	Occupancy Sensor	41	5,432	0.50	6,175	0.0	$524.43	$4,221.36	$70.00	7.92
Stairs	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.06	902	0.0	$76.60	$175.50	$30.00	1.90
Sludge Room	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.44	5,385	0.0	$457.33	$1,476.00	$230.00	2.72
Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,760	0.02	266	0.0	$22.62	$58.50	$10.00	2.14
Electric Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$115.00	2.72
Electric Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.11	1,346	0.0	$114.33	$504.00	$75.00	3.75

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Electric Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.22	2,692	0.0	$228.66	$738.00	$115.00	2.72
Entry to MDF	4	Metal Halide: (1) 100W Lamp	None	128	8,760	Fixture Replacement	Yes	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	38	6,132	0.27	3,695	0.0	$313.84	$1,778.71	$400.00	4.39
Entry to MDF	1	High-Pressure Sodium: (1) 100W Lamp	None	138	8,760	Fixture Replacement	Yes	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	41	6,132	0.07	996	0.0	$84.57	$444.68	$100.00	4.08
Electric Room	12	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	8,760	Relamp & Reballast	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	6,132	0.53	7,401	0.0	$628.61	$1,674.00	$155.00	2.42
Lobby of MDF	4	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	8,760	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	6,132	0.13	1,782	0.0	$151.35	$668.00	$0.00	4.41
Lobby of MDF	9	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	8,760	Relamp & Reballast	Yes	9	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	6,132	0.29	4,009	0.0	$340.54	$1,253.00	$0.00	3.68
Closet	1	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	6,000	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	6,000	0.03	243	0.0	$20.67	$117.00	$0.00	5.66
Electric Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.19	1,821	0.0	$154.70	$679.50	$105.00	3.71
Mechanical Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	6,000	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.16	1,561	0.0	$132.60	$621.00	$95.00	3.97
Control Room Office	10	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	6,000	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,200	0.32	3,051	0.0	$259.16	$1,440.00	$35.00	5.42
Women's Restroom	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	6,000	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,200	0.06	610	0.0	$51.83	$504.00	$0.00	9.72
Men's Restroom	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	6,000	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,200	0.06	610	0.0	$51.83	$504.00	$0.00	9.72
Polymer Area	8	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	7,760	Fixture Replacement	Yes	8	LED - Fixtures: High-Bay	Occupancy Sensor	140	5,432	1.92	23,695	0.0	$2,012.45	$12,500.80	$1,480.00	5.48
Dumpster Garage	5	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	7,760	Fixture Replacement	Yes	5	LED - Fixtures: High-Bay	Occupancy Sensor	140	5,432	1.20	14,809	0.0	$1,257.78	$7,813.00	$925.00	5.48
Mechanical Room	3	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	7,760	Fixture Replacement	Yes	3	LED - Fixtures: High-Bay	Occupancy Sensor	140	5,432	0.72	8,886	0.0	$754.67	$4,687.80	$555.00	5.48
Basement of MDF	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	7,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,432	0.71	8,750	0.0	$743.15	$2,331.00	$365.00	2.65
Basement of MDF	4	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	7,760	Fixture Replacement	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	140	5,432	0.96	11,847	0.0	$1,006.23	$6,250.40	$740.00	5.48
Basement of MDF	4	Compact Fluorescent: Screw in Lamp	Wall Switch	23	7,760	Relamp	Yes	4	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	14	5,432	0.03	426	0.0	$36.19	$485.01	$0.00	13.40
Electric Room	10	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	7,760	Fixture Replacement	Yes	10	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	5,432	0.44	5,464	0.0	$464.04	$3,615.33	$485.00	6.75
Machine Room	10	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	7,760	Fixture Replacement	Yes	10	LED - Fixtures: High-Bay	Occupancy Sensor	140	5,432	2.40	29,618	0.0	$2,515.56	$15,626.00	$1,850.00	5.48
Office	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	6,000	None	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,200	0.03	326	0.0	$27.66	$116.00	$0.00	4.19
Stairs	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	8,760	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.15	2,150	0.0	$182.61	$468.00	$40.00	2.34
MDF Exterior Hut	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,000	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	29	4,000	0.08	491	0.0	$41.69	$669.07	$90.00	13.89
MDF Exterior Hut	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,000	Fixture Replacement	No	4	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	29	4,000	0.15	982	0.0	$83.38	$1,338.13	$180.00	13.89
Sand Seperator Building	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,000	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.06	412	0.0	$34.98	$175.50	$30.00	4.16

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Various	50	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	50	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Entrance Overhang	2	High-Pressure Sodium: (1) 50W Lamp	None	66	5,475	Fixture Replacement	No	2	LED - Fixtures: Fuel Pump Canopy	None	20	5,475	-0.03	-228	0.0	-$19.34	$1,960.00	$200.00	-90.98
Intake Area	3	High-Pressure Sodium: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	3	LED - Fixtures: Other	None	89	4,380	-0.17	-1,216	0.0	-$103.30	$846.72	$15.00	-8.05
Clarifier Building Roof	13	High-Pressure Sodium: (1) 150W Lamp	None	188	4,380	Fixture Replacement	No	13	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	56	4,380	-0.48	-3,316	0.0	-$281.65	$5,078.80	$1,300.00	-13.42
Clarifier Building Roof	6	High-Pressure Sodium: (1) 150W Lamp	None	188	4,380	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	56	4,380	-0.22	-1,531	0.0	-$129.99	$11,717.96	$600.00	-85.53
Clarifier Building Roof	2	High-Pressure Sodium: (1) 150W Lamp	None	188	4,380	Fixture Replacement	No	2	LED - Fixtures: Other	None	56	4,380	-0.07	-510	0.0	-$43.33	$564.48	$10.00	-12.80
MDF Building	6	High-Pressure Sodium: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	6	LED - Fixtures: Other	None	89	4,380	-0.35	-2,432	0.0	-$206.60	$1,693.44	$30.00	-8.05
MDF Building	4	High-Pressure Sodium: (1) 150W Lamp	None	188	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	56	4,380	-0.15	-1,020	0.0	-$86.66	$1,562.71	$400.00	-13.42
Driveway	2	High-Pressure Sodium: (1) 250W Lamp	None	295	5,475	Fixture Replacement	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	89	5,475	-0.12	-1,014	0.0	-$86.08	$3,905.99	$200.00	-43.05
MDF Exterior Hut	1	High-Pressure Sodium: (1) 250W Lamp	None	295	5,475	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	89	5,475	-0.06	-507	0.0	-$43.04	$1,952.99	$100.00	-43.05
MDF Exterior Hut	3	High-Pressure Sodium: (1) 250W Lamp	None	295	5,475	Fixture Replacement	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	89	5,475	-0.17	-1,520	0.0	-$129.12	$5,858.98	$300.00	-43.05
Filtration Plant	6	High-Pressure Sodium: (1) 100W Lamp	None	138	4,380	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	41	4,380	-0.16	-1,121	0.0	-$95.17	$2,344.06	$600.00	-18.33
Filtration Plant	2	High-Pressure Sodium: (1) 100W Lamp	None	138	4,380	Fixture Replacement	No	2	LED - Fixtures: Other	None	41	4,380	-0.05	-374	0.0	-$31.72	$564.48	$10.00	-17.48

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Filtration Plant	Raw Water Pumps	3	Water Supply Pump	400.0	96.2%	Yes	3,942	No	96.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	High Service Pumps	3	Water Supply Pump	700.0	96.2%	Yes	3,942	No	96.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	High Service Pumps	1	Water Supply Pump	700.0	96.2%	No	3,942	No	96.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Booster Pumps	2	Process Pump	15.0	91.0%	Yes	4,380	Yes	93.0%	No		0.23	1,390	0.0	$118.05	$3,693.44	$0.00	31.29
Filtration Plant	Sludge Storage Tank Pumps	2	Process Pump	15.0	92.4%	Yes	5,329	No	92.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Sand Slurry Drain Pumps	2	Process Pump	15.0	92.4%	No	5,329	No	92.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Superpulsator Vaccum Pumps	6	Process Pump	10.0	87.1%	No	5,329	Yes	91.7%	No		1.43	10,268	0.0	$872.06	$8,061.30	$0.00	9.24
Filtration Plant	Superpulsator Drain Pumps	2	Process Pump	5.0	89.5%	No	5,329	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Vaccum Pumps	6	Process Pump	10.0	87.1%	Yes	5,329	Yes	91.7%	No		1.14	8,214	0.0	$697.65	$8,061.30	$0.00	11.55
Filtration Plant	Vaccum Pumps	4	Process Pump	0.3	74.0%	No	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Polymer Pumps	5	Process Pump	1.5	81.2%	No	3,650	No	81.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Tank Feed Pumps	4	Process Pump	1.0	75.5%	Yes	5,329	No	75.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Filter Pumps	2	Process Pump	25.0	93.0%	Yes	5,329	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Booster Pumps	2	Process Pump	15.0	91.7%	No	2,920	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Booster Pumps	2	Process Pump	20.0	88.4%	No	5,329	Yes	93.0%	No		0.94	6,749	0.0	$573.25	$4,495.46	$0.00	7.84
Filtration Plant	Pnuematic System	2	Air Compressor	0.5	74.0%	No	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Backwash Pumps	2	Process Pump	30.0	93.0%	Yes	5,329	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Sludge Pumps	3	Process Pump	5.0	87.5%	No	5,329	Yes	89.5%	No		0.16	1,142	0.0	$97.01	$2,763.18	$0.00	28.48
Filtration Plant	Sludge Transfer Pumps	2	Process Pump	20.0	91.0%	No	5,329	Yes	93.0%	No		0.39	2,818	0.0	$239.38	$5,031.86	$0.00	21.02
Filtration Plant	Thickener Pumps	2	Process Pump	1.0	81.2%	No	5,329	Yes	85.5%	No		0.05	367	0.0	$31.18	$948.12	$0.00	30.41

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Filtration Plant	Air Compressors	2	Air Compressor	5.0	89.5%	No	4,957	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Raw Water Sampling Pump	1	Process Pump	2.0	82.2%	No	5,329	Yes	86.5%	No		0.05	363	0.0	$30.82	$532.17	$0.00	17.27
Filtration Plant	Chlorine Sampling Pumps	2	Process Pump	1.0	81.2%	No	5,329	Yes	85.5%	No		0.05	367	0.0	$31.18	$948.12	$0.00	30.41
Filtration Plant	Settled Water Sampling Pump	1	Process Pump	1.0	81.2%	No	5,329	Yes	85.5%	No		0.03	184	0.0	$15.59	$474.06	$0.00	30.41
Filtration Plant	Chloride Metering Pumps	3	Process Pump	0.5	74.0%	Yes	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Solids Handling Pumps	2	Process Pump	15.0	92.5%	No	4,380	No	92.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Mixers	4	Process Pump	15.0	92.5%	No	4,380	No	92.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Elevator Motors Assumed	2	Other	30.0	80.0%	No	365	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Storage Dust Collector	1	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Storage Activator	1	Process Pump	1.5	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Storage Silo Motors	3	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Pneumatic Conveyor	2	Process Pump	75.0	88.4%	No	5,329	Yes	95.0%	No		4.92	35,435	0.0	$3,009.56	$10,894.00	$0.00	3.62
Filtration Plant	Lime Silo Pulse Jet Collector	2	Process Pump	2.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Tank Bin Activators	2	Process Pump	1.5	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Volumetric Feeder	2	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slaker Mixers	2	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Grit Classifiers	2	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Aging Tank Mixers	2	Process Pump	0.5	74.0%	No	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Water Softeners	2	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Permanganate Tank Mixer	1	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Filtration Plant	Blanket Polymer Blenders	5	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Transfer Pumps	2	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Metering Pump	1	Process Pump	2.0	88.4%	Yes	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Metering Pump	1	Process Pump	1.0	88.4%	Yes	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Metering Pump	2	Process Pump	0.3	74.0%	Yes	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Lime Slurry Grit Classifier Recirculation Pumps	2	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Permanganate Transfer Pumps	2	Process Pump	1.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Permanganate Metering Pumps	4	Process Pump	1.0	88.4%	Yes	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Blanket Polymer Drum Pumps	2	Process Pump	3.0	88.4%	No	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Chemical Metering Pumps	4	Process Pump	0.5	74.0%	Yes	5,329	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Chemical Metering Pumps	2	Process Pump	2.0	88.4%	Yes	5,329	No	88.4%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	Air Compressors	2	Air Compressor	7.5	91.0%	No	4,957	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	HVAC Unit Fan Motors	18	Supply Fan	5.0	87.5%	No	2,745	Yes	89.5%	Yes	18	26.06	76,536	0.0	$6,500.43	$73,371.96	$7,200.00	10.18
Filtration Plant	Gas & Electric Unit Heater Fan Motors	30	Supply Fan	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant	RTU Supply Fan Motors	2	Supply Fan	7.5	91.0%	No	3,391	No	91.0%	Yes	2	4.13	14,855	0.0	$1,261.67	$7,213.60	$1,200.00	4.77

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof - HV 1A	West End Side	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 2A	West End Center	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.64	2,441	0.0	$207.34	$3,740.55	$230.00	16.93
Roof - HV 3A	West End Street	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 4A	West End River	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 5A	East End Side	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 6A	East End Center	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.64	2,441	0.0	$207.34	$3,740.55	$230.00	16.93
Roof - HV 7A	East End Street	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 8A	East End River	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof - HV 9A	East End	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	1.27	4,882	0.0	$414.67	$7,481.10	$460.00	16.93
Roof AC-1A	Headworks	1	Packaged AC	15.00		Yes	1	Packaged AC	15.00		11.50		No	1.95	7,464	0.0	$633.96	$20,907.75	$1,185.00	31.11
Roof AC-2A	Headworks	1	Packaged AC	15.00		Yes	1	Packaged AC	15.00		11.50		No	1.95	7,464	0.0	$633.96	$20,907.75	$1,185.00	31.11
Outdoor near Entrance	Office Split Systems	1	Split-System AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outdoor near Back	Office Split Systems	1	Split-System AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outdoor of MDF	HVAC Units	3	Split-System AC	5.00		Yes	1	Split-System AC	4.00		14.00		No	10.14	38,877	0.0	$3,301.94	$5,984.88	$368.00	1.70
Outdoor of MDF	HVAC Units	1	Split-System AC	5.00		Yes	1	Split-System AC	4.00		14.00		No	1.85	7,085	0.0	$601.76	$5,984.88	$368.00	9.33
Outdoor of MDF	Hut	1	Split-System AC	5.00		Yes	1	Split-System AC	4.00		14.00		No	1.85	7,085	0.0	$601.76	$5,984.88	$368.00	9.33
Filtration Plant	Electriic Unit Heaters	10	Electric Forced Air Furnace		17.07	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Filtration Plant & DMF	Baseboard Electriic Unit Heaters	4	Electric Resistance Heat		10.24	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof - HV 1A	West End Side	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 2A	West End Center	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 3A	West End Street	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 4A	West End River	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 5A	East End Side	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 6A	East End Center	1	Furnace	237.00	Yes	1	Furnace	237.00	95.00%	AFUE	0.00	0	67.6	$493.68	$5,369.79	$400.00	10.07
Roof - HV 7A	East End Street	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 8A	East End River	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Roof - HV 9A	East End	1	Furnace	300.00	Yes	1	Furnace	300.00	95.00%	AFUE	0.00	0	85.5	$624.91	$6,797.20	$400.00	10.24
Sub Level	Unknown	1	Furnace	320.00	Yes	1	Furnace	320.00	95.00%	AFUE	0.00	0	91.2	$666.57	$7,250.35	$400.00	10.28
Filtration Plant	Gas Unit Heaters	20	Warm Air Unit Heater	50.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Mechanical Dewatering Facility	1	Furnace	120.00	Yes	1	Furnace	120.00	95.00%	AFUE	0.00	0	22.6	$165.15	$2,718.88	$400.00	14.04
Mechanical Room	Mechanical Dewatering Facility	2	Furnace	320.00	Yes	2	Furnace	320.00	95.00%	AFUE	0.00	0	120.6	$880.83	$14,500.69	$800.00	15.55
Outdoor	Mechanical Dewatering Facility	1	Furnace	320.00	Yes	1	Furnace	320.00	95.00%	AFUE	0.00	0	60.3	$440.41	$7,250.35	$400.00	15.55
Roof	Headworks	1	Furnace	225.00	Yes	1	Furnace	225.00	95.00%	AFUE	0.00	0	42.4	$309.67	$5,097.90	$400.00	15.17
Roof	Headworks	1	Furnace	225.00	Yes	1	Furnace	225.00	95.00%	AFUE	0.00	0	42.4	$309.67	$5,097.90	$400.00	15.17

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Restrooms & Locker Rooms	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Super Posator Room	Restrooms & Locker Rooms	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Dewatering Mechanical Facility (DMF)	2	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	9	Faucet Aerator (Lavatory)	2.20	1.00	0.00	1,515	0.0	$128.67	$64.53	$0.00	0.50
Restrooms	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	337	0.0	$28.59	$14.34	$0.00	0.50

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Science Lab	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Science Lab	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lounge	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	**Quantity**	**Equipment Description**	**Energy Rate (W)**	**ENERGY STAR Qualified?**
Filtration Plant & DMF	18	Computer	120.0	
Filtration Plant & DMF	4	Printer	250.0	
Filtration Plant & DMF	4	Electric Baseboard	1,500.0	
Filtration Plant & DMF	2	Portable Electic Unit Heaters	1,500.0	
Filtration Plant & DMF	1	Coffee Machine	900.0	
Filtration Plant & DMF	1	Microwave	1,500.0	
Filtration Plant & DMF	4	TV	120.0	
Filtration Plant & DMF	2	Mini Fridge	260.0	
Filtration Plant & DMF	1	Misc Equipment	4,000.0	
Filtration Plant & DMF	1	Oven & Toaster	2,500.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	**Quantity**	**Vending Machine Type**	**Install Controls?**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Hallway	1	Refrigerated	Yes	0.00	1,612	0.0	$136.90	$230.00	$0.00	1.68

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Filtration Plant & Garage

Primary Property Type: Wastewater Treatment Plant
Gross Floor Area (ft²): 296,550
Built: 1959

For Year Ending: September 30, 2016
Date Generated: October 01, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Filtration Plant & Garage John Fitch Way Trenton, New Jersey 08611	City of Trenton 319 East State Street Trenton, NJ 08618 (___)___-_____	Hoggarth Stephen 319 East State Street Trenton, NJ 08618 6099893615 hstephen@trentonnj.org

Property ID: 5992171

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
162 kBtu/ft²

Source EUI
402.9 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	8,577,800 (18%)
Electric - Grid (kBtu)	39,451,348 (82%)

National Median Comparison

National Median Site EUI ()	N/A
National Median Source EUI ()	N/A
% Diff from National Median Source EUI	N/A%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	4,452

Signature & Stamp of Verifying Professional

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

Signature: ____________________Date: __________

Licensed Professional

____ ________
,
(___)____-_____
____

Professional Engineer Stamp
(if applicable)