Local Government Energy Audit Report

Woodland Sewer Treatment Plant

January 20, 2022

Prepared for:
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Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities and help prioritize specific measures for implementation. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

TRC reviewed the energy conservation measures and estimates of energy savings for technical accuracy. Actual, achieved energy savings depend on behavioral factors and other uncontrollable variables and, therefore, estimates of final energy savings are not guaranteed. TRC and the New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

TRC bases estimated material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor estimates.

Incentive values provided in this report are estimated based of previously run state efficiency programs. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. Please review all available utility program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state, and federal requirements.

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ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

For the purposes of your LGEA, estimated incentives and rebates are included as placeholders for planning purposes. New Jersey utilities are rolling out their own energy efficiency programs, which your project may be eligible for depending on individual measures, quantities, and size of the building.

In 2018, Governor Murphy signed into law the landmark legislation known as the Clean Energy Act. The law called for a significant overhaul of New Jersey's clean energy systems by building sustainable infrastructure in order to fight climate change and reduce carbon emissions, which will in turn create well-paying local jobs, grow the state's economy, and improve public health while ensuring a cleaner environment for current and future residents.

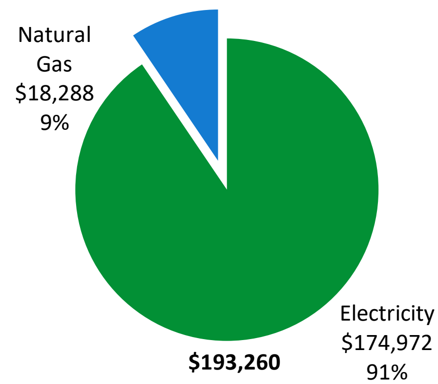
These next generation energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and incentives directly to customers like you. NJCEP will still offer programs for new construction, renewable energy, the Energy Savings Improvement Program (ESIP), and large energy users.

New utility programs are under development. Keep up to date with developments by visiting the NJCEP website.

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Woodland Sewer Treatment Plant. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $193,260 Electricity: 1,636,960 kWh Natural Gas: 20,213 Therms	
ENERGY STAR® Benchmarking Score	14 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

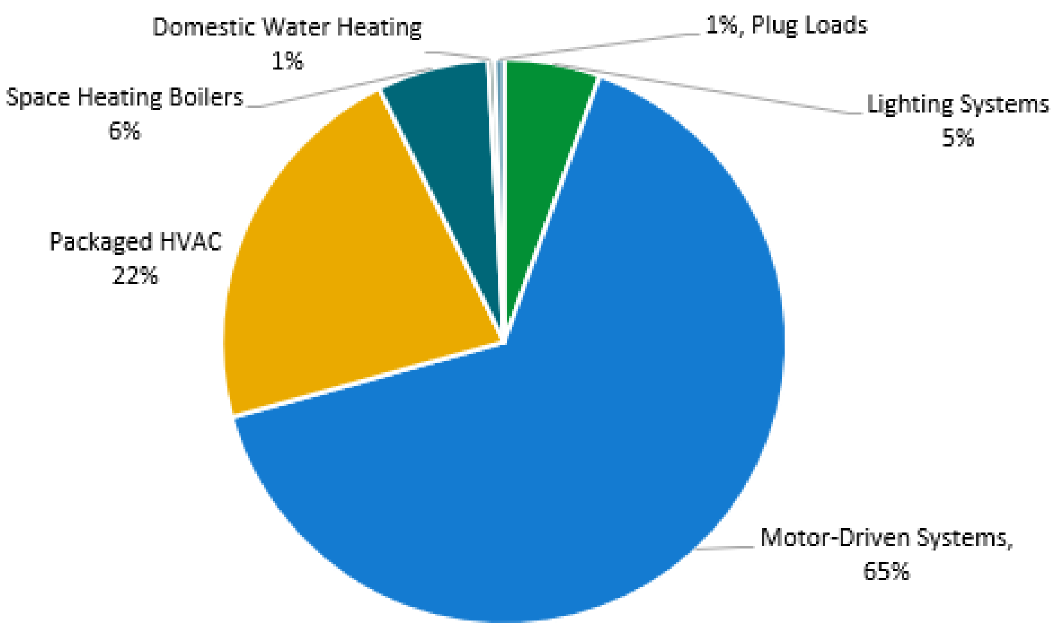


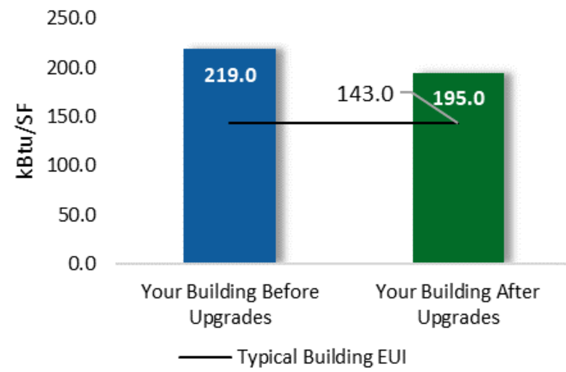
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

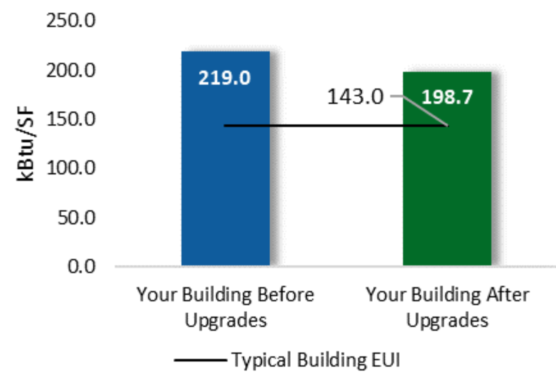
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$196,640
Potential Rebates & Incentives[1]	$14,263
Annual Cost Savings	$24,864
Annual Energy Savings	Electricity: 228,187 kWh Natural Gas: 523 Therms
Greenhouse Gas Emission Savings	118 Tons
Simple Payback	7.3 Years
Site Energy Savings (All Utilities)	11%



Scenario 2: Cost Effective Package[2]

Installation Cost	$148,125
Potential Rebates & Incentives	$11,038
Annual Cost Savings	$22,244
Annual Energy Savings	Electricity: 208,907 kWh Natural Gas: -95 Therms
Greenhouse Gas Emission Savings	105 Tons
Simple Payback	6.2 Years
Site Energy Savings (all utilities)	9%



On-site Generation Potential

Photovoltaic	Medium
Combined Heat and Power	None

[1] Incentives are based on previously run state rebate programs. Contact your utility provider for current program incentives that may apply.

[2] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**74,250**	**10.5**	**-14**	**$7,809**	**$39,320**	**$4,675**	**$34,645**	**4.4**	**73,118**
ECM 1	Install LED Fixtures	Yes	54,714	6.5	-10	$5,761	$29,599	$3,350	$26,249	4.6	53,971
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	18,386	3.5	-4	$1,927	$8,584	$1,115	$7,469	3.9	18,020
ECM 3	Retrofit Fixtures with LED Lamps	Yes	1,150	0.4	0	$121	$1,137	$210	$927	7.7	1,127
Lighting Control Measures			**3,274**	**0.8**	**-1**	**$343**	**$5,648**	**$1,315**	**$4,333**	**12.6**	**3,209**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,326	0.6	-1	$244	$3,848	$475	$3,373	13.8	2,280
ECM 5	Install High/Low Lighting Controls	Yes	948	0.2	0	$99	$1,800	$840	$960	9.7	929
Motor Upgrades			**24,762**	**7.7**	**0**	**$2,647**	**$44,038**	**$0**	**$44,038**	**16.6**	**24,935**
ECM 6	Premium Efficiency Motors	Yes	24,762	7.7	0	$2,647	$44,038	$0	$44,038	16.6	24,935
Variable Frequency Drive (VFD) Measures			**124,571**	**38.4**	**0**	**$13,315**	**$87,309**	**$6,825**	**$80,484**	**6.0**	**125,442**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	Yes	6,574	3.0	0	$703	$5,375	$1,100	$4,275	6.1	6,619
ECM 8	Install VFDs on Constant Volume (CV) Fans	No	16,323	7.1	0	$1,745	$21,525	$1,675	$19,850	11.4	16,438
ECM 9	Install VFDs on Heating Water Pumps	No	1,739	0.3	0	$186	$6,781	$150	$6,631	35.7	1,751
ECM 10	Install VFDs on Water Supply Pump	Yes	59,668	6.4	0	$6,378	$22,942	$2,800	$20,142	3.2	60,085
ECM 11	Install VFDs on Process Blowers	Yes	40,268	21.7	0	$4,304	$30,686	$1,100	$29,586	6.9	40,550
Unitary HVAC Measures			**1,218**	**0.3**	**0**	**$130**	**$2,131**	**$0**	**$2,131**	**16.4**	**1,226**
ECM 12	Install High Efficiency Heat Pumps	No	1,218	0.3	0	$130	$2,131	$0	$2,131	16.4	1,226
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**62**	**$559**	**$17,899**	**$1,400**	**$16,499**	**29.5**	**7,233**
ECM 13	Install High Efficiency Hot Water Boilers	No	0	0.0	4	$37	$4,097	$400	$3,697	99.2	482
ECM 14	Install High Efficiency Furnaces	No	0	0.0	42	$381	$8,758	$500	$8,258	21.7	4,925
ECM 15	Install Infrared Heaters	No	0	0.0	16	$141	$5,044	$500	$4,544	32.2	1,826
HVAC System Improvements			**0**	**0.0**	**3**	**$28**	**$58**	**$20**	**$38**	**1.4**	**357**
ECM 16	Install Pipe Insulation	Yes	0	0.0	3	$28	$58	$20	$38	1.4	357
Domestic Water Heating Upgrade			**111**	**0.0**	**2**	**$33**	**$57**	**$28**	**$29**	**0.9**	**386**
ECM 17	Install Low-Flow DHW Devices	Yes	111	0.0	2	$33	$57	$28	$29	0.9	386
TOTALS (COST EFFECTIVE MEASURES)			**208,907**	**50.0**	**-9**	**$22,244**	**$148,125**	**$11,038**	**$137,087**	**6.2**	**209,260**
TOTALS (ALL MEASURES)			**228,187**	**57.7**	**52**	**$24,864**	**$196,460**	**$14,263**	**$182,197**	**7.3**	**235,907**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures.**

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- How will the project be funded and/or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

Utility-run energy efficiency programs, such as New Jersey's Clean Energy Programs, give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives ***before*** purchasing materials or starting installation.

For details on these programs please visit New Jersey's Clean Energy Program website or contact your utility provider.

Options from Around the State

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat and Power (CHP)

The CHP program provides incentives for combined heat and power (i.e., cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Successor Solar Incentive Program (SuSI)

New Jersey is committed to supporting solar energy. Solar projects help the state reach the renewable goals outlined in the state's Energy Master Plan. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available, but certified solar projects are able to earn one SREC II (Solar Renewable Energy Certificates II) for each megawatt-hour of solar electricity produced from a qualifying solar facility.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

Large Energy User Program (LEUP)

LEUP designed to promote self-investment in energy efficiency and combined heat and power or fuel cell projects. It incentivizes owners/users of buildings to upgrade or install energy conserving measures in existing buildings to help offset the capital costs associated with the project. The efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Woodland Sewer Treatment Plant. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On September 2, 2021, TRC performed an energy audit at Woodland Sewer Treatment Plant located in Morris Township, New Jersey. TRC met with Mark Howarth to review the facility operations and help focus our investigation on specific energy-using systems.

Woodland Sewer Treatment Plant, located at 35 Florence Avenue, is one of the two sewer treatment plants serving the Township of Morris. The plant was constructed in 1975 with a design capacity of 2 million gallon per day (MGD). Treatment processes consist of primary sedimentation, activated sludge, secondary clarifiers, and ultraviolet disinfection for the final effluent. Residual (sludge) treatment is accomplished by gravity thickening of primary sludge and gravity belt thickening for waste activated sludge, followed by anaerobic digestion.

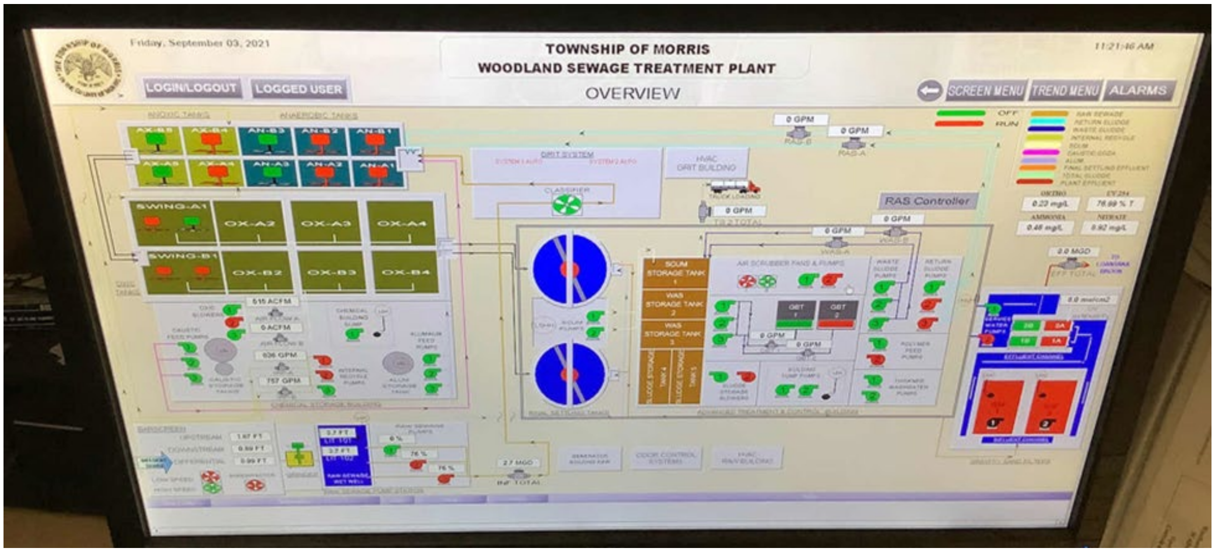
The plant is composed of several buildings including the Main Office, Sand Filter Building, Garage, Grit Building, Chemical Storage Building, Raw Pump House, and OEM/Parks & Recreation building, totaling approximately 34,739 square feet of enclosed area. The Parks and Recreation Building, while not part of treatment operations, is included because it is served by the same master electric meter. The plant has a diesel emergency backup power generator. Diesel is only used for auxiliary power; therefore, diesel consumption is not tracked as a part of this study.

Recent improvements and Facility Concerns

The Township has just replaced most of the rooftop gas-fired force air furnaces and exhaust air fans.

Facility concerns include aging and rebuilt pumps and motors that are beyond their useful life and are in poor condition. Additionally, the Township has expressed interest in replacing the lighting systems with LED sources.

The following plant diagram provides an overview of the plant layout and operations.



Woodland Sewer Treatment Plant

Woodland Sewer Treatment Plant Aerial View

2.2 Building Occupancy

Woodland Sewer Treatment plant operates continuously. The Main Offices building houses offices that are open Monday through Friday during business hours. During a typical day, the facility is occupied by approximately five staff members. Process areas are intermittently occupied, primarily for inspection and maintenance.

Building Name	Weekday/Weekend	Operating Schedule
Woodland Sewer Treatment Plant - Process Equipment	Weekday	12:00 AM -12:00 AM
	Weekend	12:00 AM -12:00 AM
Main Offices	Weekday	7:00 AM - 4:00 PM
	Weekend	Closed
OEM Parks & Recreation	Weekday	7:00 AM - 4:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

Woodland Sewer Treatment Plant is comprised of several buildings constructed of poured concrete and concrete masonry brick units (CMUs) with brick veneer or CMU facades. The building walls are in good condition. Most buildings have flat roof sections, supported with steel trusses and reinforced concrete deck with coverings of gravel ballast or black membranes, and they are in good condition. A small section of the garage has a standing seam metal roofing system.

The windows are double or single glazed and have metal frames with thermal break. The glass-to-frame seals are in good condition. The garage building windows appear in fair condition. Entrance and exterior doors have metal frames and are also in good condition. The OEM building has motorized rollup doors.

Main Offices Building Wall & Roof

Grit & Chemical Storage Buildings

Garage


OEM, Park, & Recreation Building


Window & Exterior Door - Main Office Building

2.4 Lighting Systems

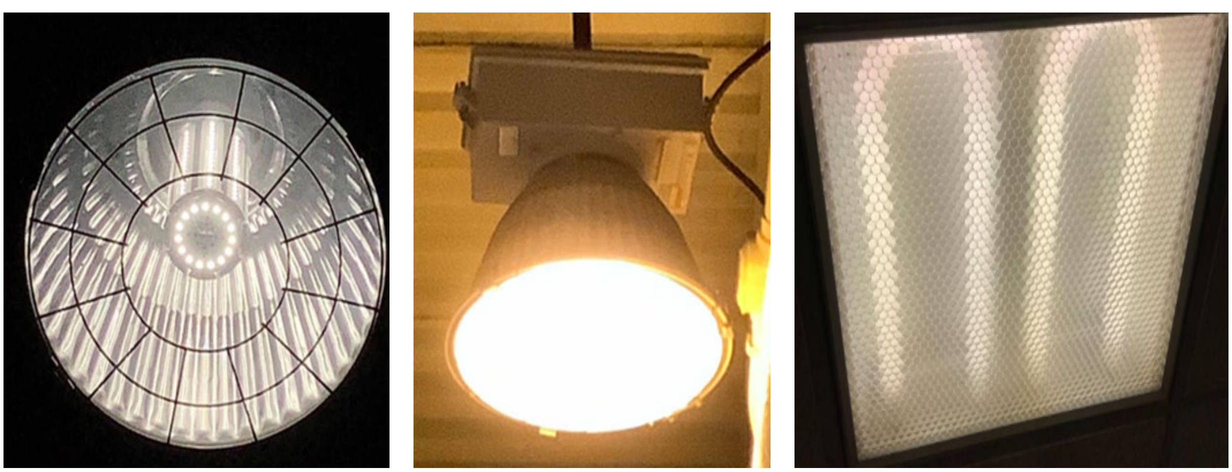
The primary interior lighting system uses linear fluorescent T12 lamps. There are also several 28-Watt T5 fixtures. Additionally, there are some high-pressure sodium (HPS), linear fluorescent T8, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts, and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 2- or 3-lamp, 4- or 8-foot-long troffer, recessed, or surface mounted fixtures and 2-foot fixtures with U-bend linear tube lamps. The Parks & Recreation building storage areas are lit with a mix of linear fluorescent T5 and LED linear tubes. The Grit Building electrical room is also lit with linear T5 tubes. HPS fixtures illuminate spaces including the mechanical and belt rooms in the Main Office Building, the Sand Filter laboratories, and portions of the Chemical Storage Building basement. A few fluorescent fixtures in the Main Office Building, Sand Filter Building, Garage, and Chemical Storage Building have been retrofit with LED linear tubes. Most remaining plant main areas are illuminated exclusively with linear fluorescent T12 fixtures or in combination with LED, HPS or T5 fixtures.

Light fixtures are in fair and good condition, and interior lighting levels were generally sufficient. Exit signs use LED sources. Lighting fixtures in the Main Office building are controlled by occupancy sensors and manual wall switches. Fixtures in the Chemical Building control and blower rooms are controlled by occupancy sensors. Light fixtures in other areas are controlled by manual wall switches.

Exterior lighting is provided by wall packs, recessed and pole mounted fixtures with high intensity discharge (HID) or LED lamps. Most exterior fixtures are controlled by photocells; only a few are controlled by a timer or manual wall switch.

Linear T12 Fixtures



LED Corn Bulb, HID, & U-Bend T12 Fixture

8-Foot Linear T12, 4-Foot T5, & LED Exit Sign

Exterior Fixtures

2.5 Air Handling Systems

Unitary Electric HVAC Equipment

The main office is cooled by a 5-ton split system air conditioning (AC) unit that is in good condition. The dining room is air conditioned by a 1.3 ton window AC. The break room and foreman office of the OEM building are cooled and heated by separate through-the-wall heat pumps with internal controls. They appear in fair condition and have been evaluated for replacement.

Goodman Split AC & Through the Wall Heat Pump

Unitary Heating Equipment

Areas heated by suspended gas fired unit heaters and controlled by a room thermostat are listed below:

Building	Areas Served	Qty	Capacity (MBh)	Manufacturer	Condition
Main Office	Belt Room	2	80	Reznor	New
Main Office	Boiler Room	2	60	Reznor	Good
Sand Filter	Sand Filter Room	1	80	Reznor	New
Garage	Storage Room	1	62.25	Reznor	Good
Garage	Garage	2	62.25	Reznor	Good
Maintenance Shop	Maintenance Shop	1	62.25	Reznor	Good
Chemical Storage	Basement	1	62.25	Reznor	New
OEM/Parks	Storage Room	1	80	Reznor	Fair

Supplemental heat is provided by electric resistance heaters, controlled by local thermostats as listed in the table below.

Building	Areas Served	Qty	Capacity (kW)	Manufacturer	Condition
Raw Pump House	Electrical Room	1	3	Qmark	Good
Grit Building	Electrical Room	1	3	Qmark	Good
Grit Building	Laboratory	1	5	Dayton	Good
Chemical Storage	Restroom	1	4	UNK	Good

Gas-Fired & Electric Resistance Heaters

Gas-Fired Unit Heater & Local Thermostat

Packaged Units

Main Office Building areas are served with a new 8.5-ton roof mounted packaged unit (RTU-1). The unit is equipped with a 162 MBh gas-fired heating section and an economizer. Heated and/or cooled air is distributed through ducts to variable air volume (VAV) terminals concealed above the ceilings. The unit is controlled by a programmable thermostat.

Two new 640 MBh Reznor roof mounted air furnaces (HVU1 and HVU-2) have just been installed, serving the sand filter and belt thickener areas of the Main Office Building. The units have efficiency ratings of 80%. They are controlled by programmable thermostats.

The Grit Building and the Raw Pump House are each served by a two-stage heating roof mounted Heatco gas-fired furnace. They are controlled by programmable thermostats. The unit located in the Raw Pump House serves the pump room and appears in fair condition. It has been evaluated for replacement.

Refer to the table below for additional information about these units.

Unit ID	Location	Areas Served	Cooling Capacity (Ton)	Heating Capacity (MBh)	Condition
RTU-1	Roof – Main Office Bldg	Main Offices	8.5	162	New
HVU-1	Roof – Main Office Bldg	Belt Thickener Room	N/A	640	New
HVU-1	Roof – Sand Filter Bldg	Sand Filter Room	N/A	640	New
N/A	Roof – Grit Bldg	Grit Bldg	N/A	480	Good
N/A	Roof – Raw Pump House	Pump Room	N/A	480	Fair

RTU-1

New Reznor & Two Stage Heatco Heating Furnace

2.6 General Exhaust Air System

Air is exhausted from process areas via roof mounted exhaust fans and a fume hood with motors ranging in size from 0.1 hp to 3 hp. The fume hood serves the laboratory. The exhaust fans were part of the major heating equipment upgrade and are in good condition. They are controlled via thermostats.

Exhaust Fan & Fan Controls

2.7 Heating Hot Water Systems

Three Triangle Tube 379 MBh condensing hot water boilers serve the Main Office Building heating load. The burners are fully modulated with a nominal efficiency of 95%. The boilers are configured in an automate lead-lag control scheme through a Tekmar boiler control system that also provides outdoor reset based on temperature setpoints. Installed in 2008, they are in good condition.

The hydronic distribution is provided by a two-pipe, heating-only system. Heating hot water is circulated to fin tube radiators by two 1.5 hp constant flow hot water pumps.

A Crown Boiler 112 MBh non-condensing hot water boiler serves the OEM/Parks & Recreation Building heating load. The burner is non modulating, with a nominal efficiency of 80%. The boiler is 22 years old and is in poor condition. It has been evaluated for replacement. Heating hot water is circulated to fin tube radiators by two 0.8 hp constant flow hot water pumps that also are in poor condition.

Condensing Hot Water Boilers

1.5 hp Hot Water Pumps


Non-Condensing Hot Water Boiler & 0.8 hp Hot Water Pumps

2.8 Domestic Hot Water

Hot water for the Main Office Building is produced by a 50 gallon, 42 MBh Rheem gas-fired storage water heater. The OEM/Parks & Recreation Building uses a 40 gallon, 32 MBh A. O Smith gas-fired storage water heater. Each water heater has an efficiency of 80% and appears in good condition. Domestic hot water pipes are partially insulated.

Hot water for the chemical storage building is produced by a 5-gallon 3 kW A. O. Smith electric storage water heater that is in good condition.


50 & 40 Gallon Storage Tank Water Heaters

2.9 Plug Load and Vending Machines

Most of the plant plug load equipment is in the main office and OEM/Parks & Recreation buildings. There are approximately four computer workstations throughout the plant. Plug loads also include printers, copier, microwaves, toasters, and small and residential refrigerators.

Copier & Residential Style Refrigerator

2.10 Water-Using Systems

There are few restrooms with toilets, urinals, and sinks. Some faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.5 gpf. The break room has a sink with faucet flow rated at 2.5 gpm or higher.

Sinks

2.11 Process Equipment (Blowers, Motors, Pumps)

Motors account for approximately 90% of the calculated electrical energy use. Virtually all the motor load is associated with the treatment process. The primary process loads are outlined below.

The Chemical Storage Building houses three 125 hp blowers. The main blower (#2) is a positive displacement blower, and the motor is equipped with variable speed drive. The other two blowers (#1 & #3) are backup blowers and are used only when maintaining the main positive displacement blower. The blowers are typically used to provide aeration in activated sludge and to promote aerobic digestion. The blowers supply air to the aeration tanks, providing oxygen needed for metabolizing organic compounds in the tanks. The diffusers use tiny bubbles of air to efficiently dissolve oxygen into the tanks. The motors are in good condition.

The main office building houses two 60 hp sludge storage blowers. The main blower (#2) is a positive displacement blower, and the motor is equipped with variable speed drive. Blower #1 is a backup blower and is used only when maintaining the main positive displacement blower. They are used for anaerobic digestion. The blower #1 motor appears in fair condition and has been evaluated for replacement.

Additionally, the main office building houses various pumps including three 25 hp variable flow return activated sludge pumps (P1, P2, & P3), three 20 hp variable flow thickener feed pumps (P1, P2, & P3), two 5 hp variable flow waste activated sludge pumps (P1, P2, & P3), and two 5 hp constant flow scrubber recycling pumps (P1 & P2). Return activated sludge pump #3 is used as a backup pump. Thickener feed pump #2 runs approximately three hours per week to load the truck, while pumps #1 and #3 run six hours twice a week, one at a time. One of the three waste activated sludge pumps runs 5.5 minutes every hour, and one of the scrubber recycle pumps runs continuously. All the return activated sludge, scrubber recycling, and waste activated sludge pump motors are in poor condition and have been evaluated for replacement. There are two thickener belts each equipped with a 3 hp pump and a 1 hp air compressor.

The Sand Filter Building houses two 25 hp service water pumps mainly used for the water treatment process. Pump #2 motor appears in fair condition and has been evaluated for replacement. There are two sand filter tanks each equipped with six small submersible pumps.

The Raw Pump Building houses three 65 hp variable flow raw water pumps (P1, P2, & P3). The pumps were not accessible during the site visit. Pumps run in a lead-lag fashion continuously, one at a time. According to site personnel, pump motors have been previously rebuilt. They have been evaluated for replacement. There are also two 3 hp bar screen pumps and a BioAir® odor and emission control system.

The Grit Building includes grit chambers designed to reduce the velocity of the flow of sewage to eliminate the grit materials such as sand, ash and clinkers, and inert, inorganic materials. The equipment includes a BioAir® odor and emission control system and a 1.5 hp grit screen bar pump.

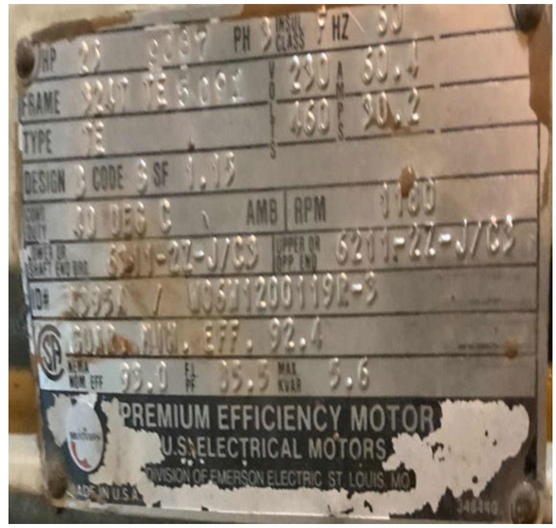
The Chemical Storage Building contains three 20 hp variable flow internal recycling pumps (P1, P2, & P3), with pump #3 being used as a backup pump. The pump motors appear in poor condition have been evaluated for replacement.

Exterior locations include two clarifiers, each equipped with a 0.5 hp pump and eight anoxic tanks with two 4 hp submersible mixing pumps. Additionally, there are four anoxic and six anaerobic tanks with six 8.3 hp submersible mixing pumps.

Other than upgrades to existing motors, we did not review or recommend potential process improvements. Please see general guidelines at the end of Section 4. We recommend that process adjustments and control strategies be evaluated by those with specialized wastewater experience.


125 hp Blowers #1 & 2

60 hp Blowers

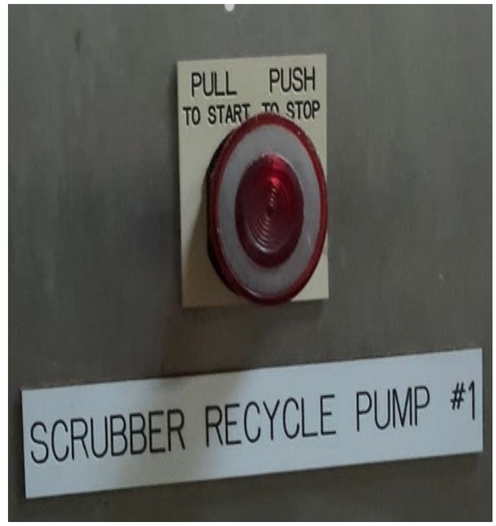


Return Activated Sludge Pump #2

Thickener Feed Pump #2

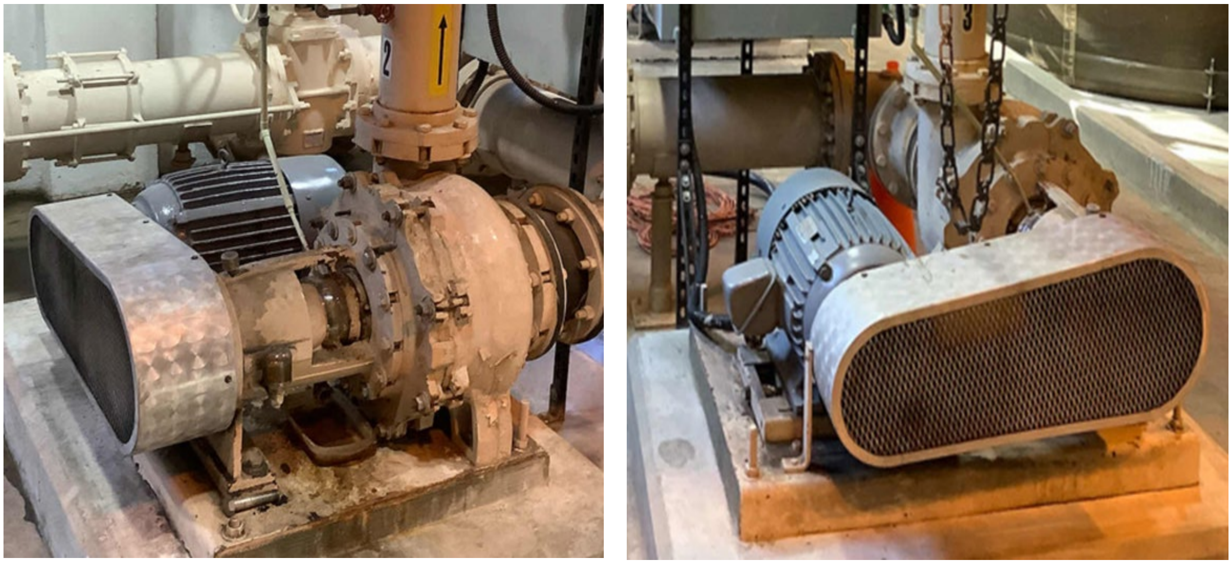
Waste Activated Sludge Pump #3

Thickener Belt



Scrubber Recycle Pump #1

25 hp Service Water Pumps

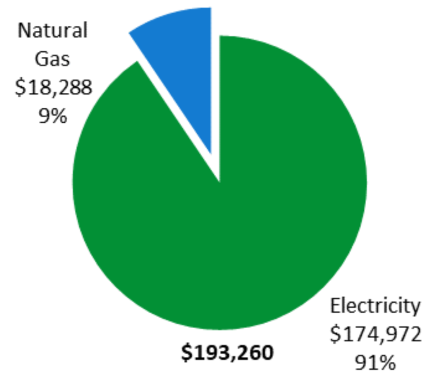


Internal Recycle Pump #2 & #3

3 Energy Use and Costs

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	1,636,960 kWh	$174,972
Natural Gas	20,213 Therms	$18,288
Total		**$193,260**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency, and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

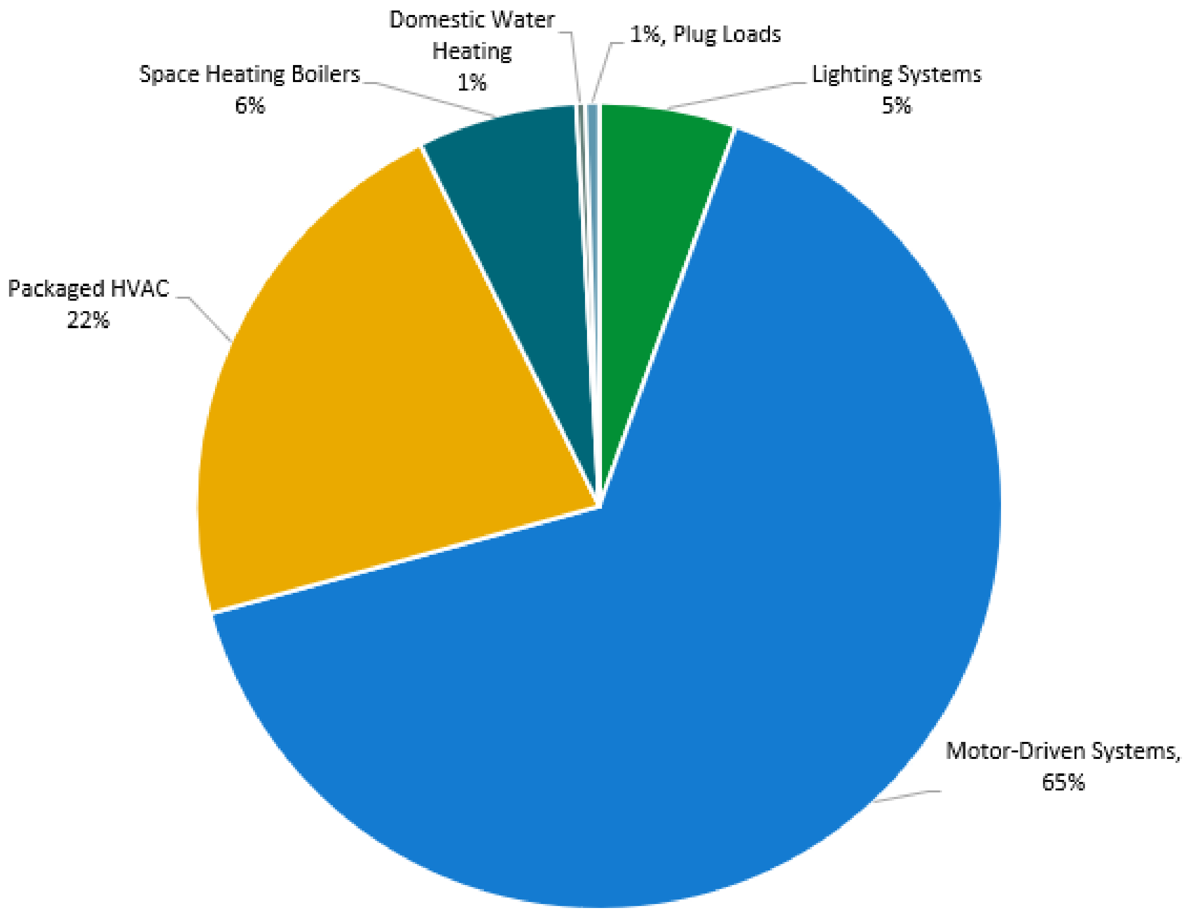
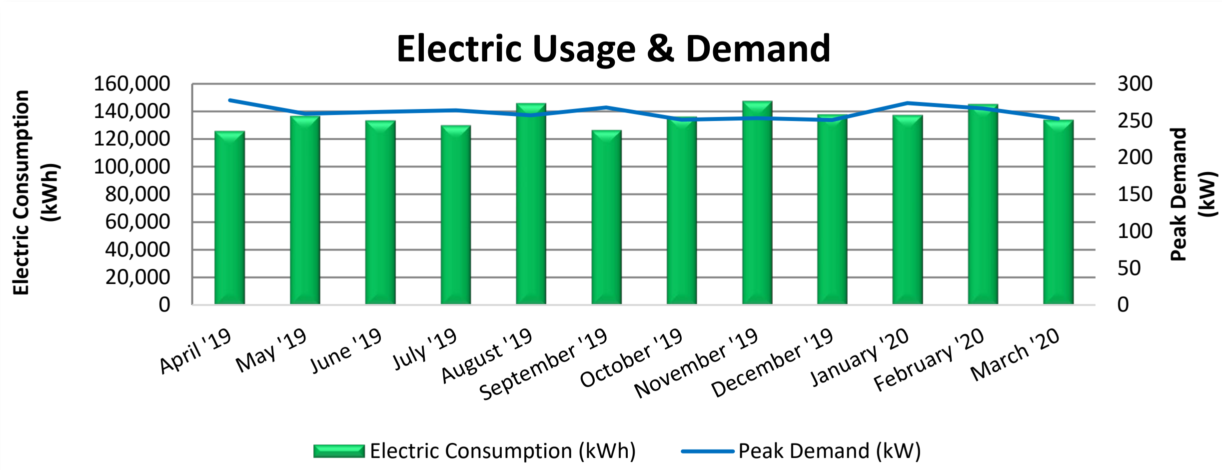


Figure 4 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary.



Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
5/13/19	27	125,920	278	$9,323	$13,498
6/14/19	32	136,800	260	$9,467	$13,830
7/16/19	32	133,440	262	$9,561	$14,678
8/14/19	29	130,080	264	$9,631	$14,380
9/16/19	33	145,920	257	$10,804	$15,872
10/15/19	29	126,720	268	$9,382	$13,955
11/14/19	30	136,320	251	$10,093	$14,800
12/16/19	32	147,520	253	$10,922	$15,674
1/15/20	30	137,920	251	$10,211	$14,471
2/13/20	29	137,440	274	$10,176	$14,526
3/16/20	32	145,120	266	$10,744	$15,212
4/15/20	30	133,760	252	$9,903	$14,076
Totals	**365**	**1,636,960**	**278**	**$120,217**	**$174,972**
Annual	**365**	**1,636,960**	**278**	**$120,217**	**$174,972**

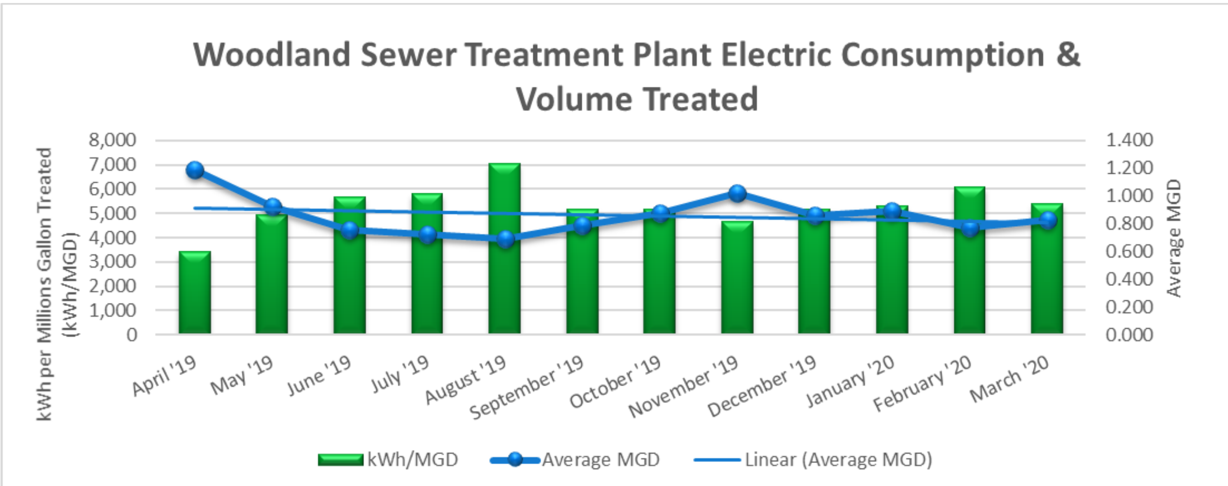
Notes:

- Peak demand of 278 kW occurred in April '19.
- Average demand over the past 12 months was 261 kW.
- The average electric cost over the past 12 months was $0.107/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

Electric Consumption vs. Volume Treated:

Wastewater treatment plant operators maintain records of daily volumes of treated wastewater flow, measured in terms of MGD. One way to measure energy efficiency in wastewater plants is to compare the amount of treated water, in MGD, with the amount of energy required for that treatment.

We drew a comparison for your site based on the utility bills and on production records supplied by plant operators. The solid line (blue) corresponds to the average treated monthly flow (Volume Treated). The bar graph (green) represents the amount of electricity used in a given month to process the flow.

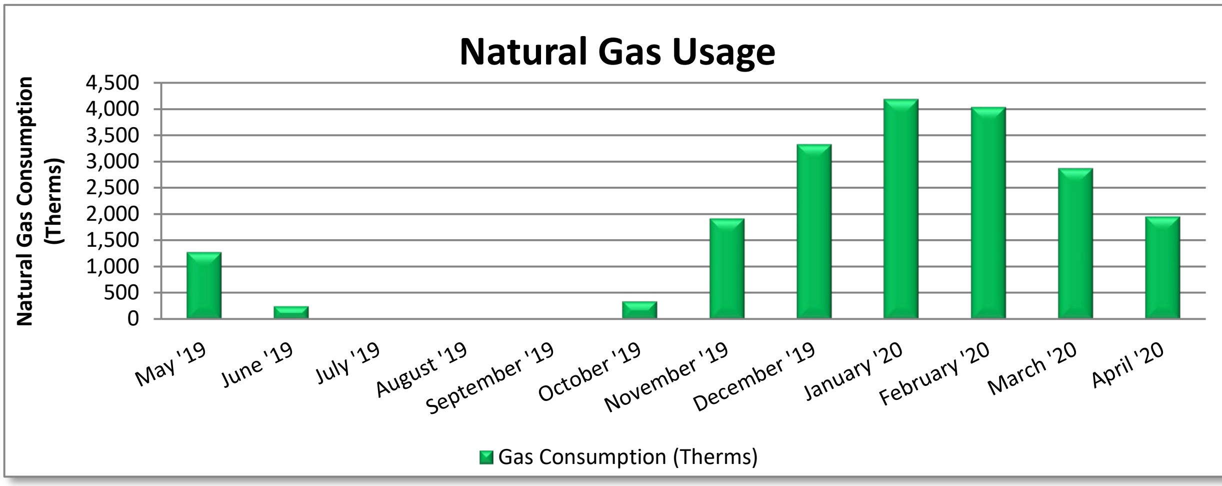


We reviewed the historical MGD data and electrical consumption and noted that "kWh per Million Gallons" stayed relatively constant throughout the year, averaging approximately 5,300 kWh/MGD. We noted that kWh/MGD was mainly flat, exhibiting a slight downward trend during the period data despite some variance in both volume and electric consumption. This trend may be a result of adjustments in the plant operations or due to equipment upgrades which have been implemented over the past year.

It is recommended that plant operations be reviewed in a systematic way. Further details are provided at the end of Section 4.

3.2 Natural Gas

PSE&G delivers natural gas under rate class General Service Gas Heating.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/20/19	30	1,278	$1,008
6/19/19	30	251	$317
7/22/19	33	15	$193
8/20/19	29	15	$192
9/18/19	29	19	$194
10/17/19	29	342	$414
11/15/19	29	1,921	$1,957
12/18/19	33	3,339	$3,072
1/21/20	34	4,198	$3,645
2/19/20	29	4,048	$3,395
3/19/20	29	2,880	$2,495
4/20/20	32	1,963	$1,457
Totals	**366**	**20,268**	**$18,338**
Annual	**365**	**20,213**	**$18,288**

Notes:

- The average gas cost for the past 12 months is $0.905/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy, and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	14

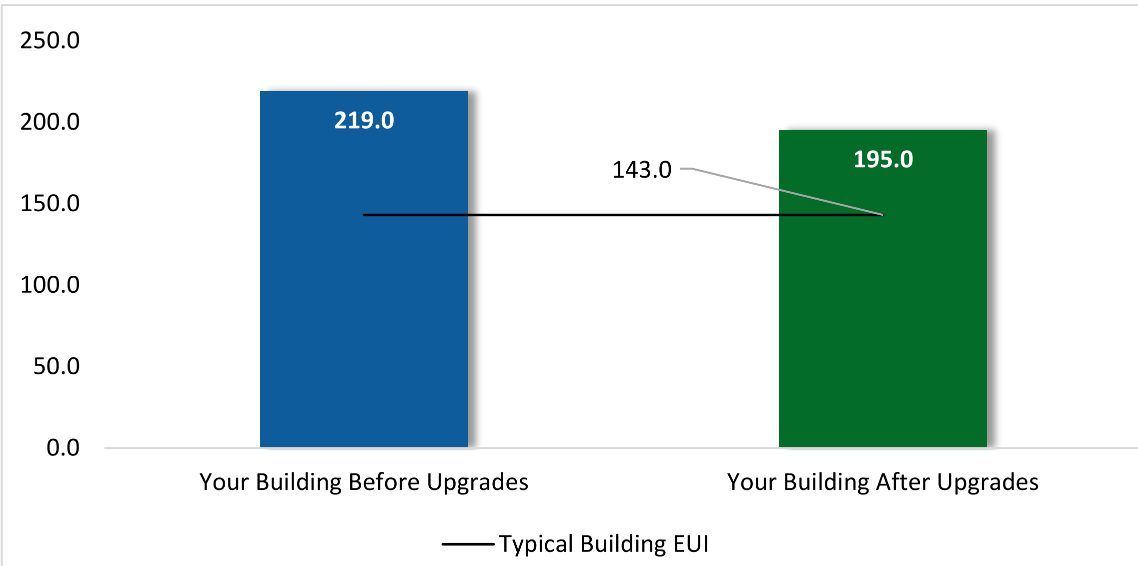


Figure 5 - Energy Use Intensity Comparison[3]

For wastewater treatment plants, the EUI is the total source energy use of the property divided by the average influent flow (in gallons per day). This facility was benchmarked by comparison to other wastewater treatment plants, and performs at, or below the national average.

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager account for your facility, and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

Free online training is available to help you use ENERGY STAR Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

For more information on ENERGY STAR and Portfolio Manager, visit their website.

4 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements and provide information about the cost effectiveness of those improvements. Most energy conservation measures have received preliminary analysis of feasibility, which identifies expected ranges of savings. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on previously run state rebate programs. New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website. Some measures and proposed upgrades may be eligible for higher incentives than those shown below.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**74,250**	**10.5**	**-14**	**$7,809**	**$39,320**	**$4,675**	**$34,645**	**4.4**	**73,118**
ECM 1	Install LED Fixtures	Yes	54,714	6.5	-10	$5,761	$29,599	$3,350	$26,249	4.6	53,971
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	18,386	3.5	-4	$1,927	$8,584	$1,115	$7,469	3.9	18,020
ECM 3	Retrofit Fixtures with LED Lamps	Yes	1,150	0.4	0	$121	$1,137	$210	$927	7.7	1,127
Lighting Control Measures			**3,274**	**0.8**	**-1**	**$343**	**$5,648**	**$1,315**	**$4,333**	**12.6**	**3,209**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,326	0.6	-1	$244	$3,848	$475	$3,373	13.8	2,280
ECM 5	Install High/Low Lighting Controls	Yes	948	0.2	0	$99	$1,800	$840	$960	9.7	929
Motor Upgrades			**24,762**	**7.7**	**0**	**$2,647**	**$44,038**	**$0**	**$44,038**	**16.6**	**24,935**
ECM 6	Premium Efficiency Motors	Yes	24,762	7.7	0	$2,647	$44,038	$0	$44,038	16.6	24,935
Variable Frequency Drive (VFD) Measures			**124,571**	**38.4**	**0**	**$13,315**	**$87,309**	**$6,825**	**$80,484**	**6.0**	**125,442**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	Yes	6,574	3.0	0	$703	$5,375	$1,100	$4,275	6.1	6,619
ECM 8	Install VFDs on Constant Volume (CV) Fans	No	16,323	7.1	0	$1,745	$21,525	$1,675	$19,850	11.4	16,438
ECM 9	Install VFDs on Heating Water Pumps	No	1,739	0.3	0	$186	$6,781	$150	$6,631	35.7	1,751
ECM 10	Install VFDs on Water Supply Pump	Yes	59,668	6.4	0	$6,378	$22,942	$2,800	$20,142	3.2	60,085
ECM 11	Install VFDs on Process Blowers	Yes	40,268	21.7	0	$4,304	$30,686	$1,100	$29,586	6.9	40,550
Unitary HVAC Measures			**1,218**	**0.3**	**0**	**$130**	**$2,131**	**$0**	**$2,131**	**16.4**	**1,226**
ECM 12	Install High Efficiency Heat Pumps	No	1,218	0.3	0	$130	$2,131	$0	$2,131	16.4	1,226
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**62**	**$559**	**$17,899**	**$1,400**	**$16,499**	**29.5**	**7,233**
ECM 13	Install High Efficiency Hot Water Boilers	No	0	0.0	4	$37	$4,097	$400	$3,697	99.2	482
ECM 14	Install High Efficiency Furnaces	No	0	0.0	42	$381	$8,758	$500	$8,258	21.7	4,925
ECM 15	Install Infrared Heaters	No	0	0.0	16	$141	$5,044	$500	$4,544	32.2	1,826
HVAC System Improvements			**0**	**0.0**	**3**	**$28**	**$58**	**$20**	**$38**	**1.4**	**357**
ECM 16	Install Pipe Insulation	Yes	0	0.0	3	$28	$58	$20	$38	1.4	357
Domestic Water Heating Upgrade			**111**	**0.0**	**2**	**$33**	**$57**	**$28**	**$29**	**0.9**	**386**
ECM 17	Install Low-Flow DHW Devices	Yes	111	0.0	2	$33	$57	$28	$29	0.9	386
TOTALS			**228,187**	**57.7**	**52**	**$24,864**	**$196,460**	**$14,263**	**$182,197**	**7.3**	**235,907**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 6 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**74,250**	**10.5**	**-14**	**$7,809**	**$39,320**	**$4,675**	**$34,645**	**4.4**	**73,118**
ECM 1	Install LED Fixtures	54,714	6.5	-10	$5,761	$29,599	$3,350	$26,249	4.6	53,971
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	18,386	3.5	-4	$1,927	$8,584	$1,115	$7,469	3.9	18,020
ECM 3	Retrofit Fixtures with LED Lamps	1,150	0.4	0	$121	$1,137	$210	$927	7.7	1,127
Lighting Control Measures		**3,274**	**0.8**	**-1**	**$343**	**$5,648**	**$1,315**	**$4,333**	**12.6**	**3,209**
ECM 4	Install Occupancy Sensor Lighting Controls	2,326	0.6	-1	$244	$3,848	$475	$3,373	13.8	2,280
ECM 5	Install High/Low Lighting Controls	948	0.2	0	$99	$1,800	$840	$960	9.7	929
Motor Upgrades		**24,762**	**7.7**	**0**	**$2,647**	**$44,038**	**$0**	**$44,038**	**16.6**	**24,935**
ECM 6	Premium Efficiency Motors	24,762	7.7	0	$2,647	$44,038	$0	$44,038	16.6	24,935
Variable Frequency Drive (VFD) Measures		**106,509**	**31.0**	**0**	**$11,385**	**$59,003**	**$5,000**	**$54,003**	**4.7**	**107,254**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	6,574	3.0	0	$703	$5,375	$1,100	$4,275	6.1	6,619
ECM 10	Install VFDs on Water Supply Pump	59,668	6.4	0	$6,378	$22,942	$2,800	$20,142	3.2	60,085
ECM 11	Install VFDs on Process Blowers	40,268	21.7	0	$4,304	$30,686	$1,100	$29,586	6.9	40,550
HVAC System Improvements		**0**	**0.0**	**3**	**$28**	**$58**	**$20**	**$38**	**1.4**	**357**
ECM 16	Install Pipe Insulation	0	0.0	3	$28	$58	$20	$38	1.4	357
Domestic Water Heating Upgrade		**111**	**0.0**	**2**	**$33**	**$57**	**$28**	**$29**	**0.9**	**386**
ECM 17	Install Low-Flow DHW Devices	111	0.0	2	$33	$57	$28	$29	0.9	386
TOTALS		**208,907**	**50.0**	**-9**	**$22,244**	**$148,125**	**$11,038**	**$137,087**	**6.2**	**209,260**

* - All incentives presented in this table are included as placeholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

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

Figure 7 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**74,250**	**10.5**	**-14**	**$7,809**	**$39,320**	**$4,675**	**$34,645**	**4.4**	**73,118**
ECM 1	Install LED Fixtures	54,714	6.5	-10	$5,761	$29,599	$3,350	$26,249	4.6	53,971
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	18,386	3.5	-4	$1,927	$8,584	$1,115	$7,469	3.9	18,020
ECM 3	Retrofit Fixtures with LED Lamps	1,150	0.4	0	$121	$1,137	$210	$927	7.7	1,127

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources is proposed, we suggest converting all of a specific lighting type (e.g., linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Install LED Fixtures

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected building areas: interior HPS fixtures in Main Office Building, Sand Filter Building, and Chemical Storage Building; exterior HID fixtures.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and, therefore, do not need to be replaced as often.

Affected building areas: all areas with fluorescent fixtures with T12 tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent T5 and T8 lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies. Be sure to specify replacement lamps that are compatible with existing dimming controls, where applicable. In some circumstances, you may need to upgrade your dimming system for optimum performance.

This measure saves energy by installing LEDs, which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected Building Areas: T5 fixtures in OEM/Parks & Recreation building, Main Office Building (T8 in belt room and stair #3), and Raw Pump House electrical room.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**3,274**	**0.8**	**-1**	**$343**	**$5,648**	**$1,315**	**$4,333**	**12.6**	**3,209**
ECM 4	Install Occupancy Sensor Lighting Controls	2,326	0.6	-1	$244	$3,848	$475	$3,373	13.8	2,280
ECM 5	Install High/Low Lighting Controls	948	0.2	0	$99	$1,800	$840	$960	9.7	929

Lighting controls reduce energy use by turning off or lowering lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 4: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected Building Areas: garage, storage rooms, break room, and foreman office.

ECM 5: Install High/Low Lighting Controls

Install 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.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety code requirements for egress. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be considered when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage must be provided to ensure that lights turn on in each area as occupants approach the area.

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected Building Areas: stairs and corridor.

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**24,762**	**7.7**	**0**	**$2,647**	**$44,038**	**$0**	**$44,038**	**16.6**	**24,935**
ECM 6	Premium Efficiency Motors	24,762	7.7	0	$2,647	$44,038	$0	$44,038	16.6	24,935

ECM 6: Premium Efficiency Motors

Replace standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

Affected Motors: process equipment motors.

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Pump Room	Return Activated Sludge Pumps #1& 2	2	Process Pump	25.0	Process Pump
Pump Room	Return Activated Sludge Pump #3	1	Process Pump	25.0	Process Pump
Multipurpose Belt Room	Scrubber Recycle Pump #1 & #2	2	Process Pump	5.0	Process Pump
Multipurpose Belt Room	Scrubber Suction Fan #1 & 2	2	Exhaust Fan	3.0	Exhaust Fan
Pump Room	Waste Activated Sludge Pump #1,2,3	3	Process Pump	5.0	Process Pump
First Floor	Bar Screen Pump	1	Process Pump	3.0	Process Pump
Basement Pump Room	Raw Pumps	3	Process Pump	65.0	Process Pump
Basement	Internal Recycle Pump #1 & #2	2	Process Pump	20.0	Process Blower
Boiler Room	Heating System	2	Heating Hot Water Pump	0.8	Heating Hot Water Pump

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**124,571**	**38.4**	**0**	**$13,315**	**$87,309**	**$6,825**	**$80,484**	**6.0**	**125,442**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	6,574	3.0	0	$703	$5,375	$1,100	$4,275	6.1	6,619
ECM 8	Install VFDs on Constant Volume (CV) Fans	16,323	7.1	0	$1,745	$21,525	$1,675	$19,850	11.4	16,438
ECM 9	Install VFDs on Heating Water Pumps	1,739	0.3	0	$186	$6,781	$150	$6,631	35.7	1,751
ECM 10	Install VFDs on Water Supply Pump	59,668	6.4	0	$6,378	$22,942	$2,800	$20,142	3.2	60,085
ECM 11	Install VFDs on Process Blowers	40,268	21.7	0	$4,304	$30,686	$1,100	$29,586	6.9	40,550

VFDs control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

ECM 7: Install VFD on VAV Fans

Replace existing air volume control devices on variable volume fans, such as inlet vanes and variable pitch fan blades, with VFDs. Inlet guide vanes and variable pitch fan blades are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device will be removed or permanently disabled, and the control signal will be redirected to the VFD to determine proper fan motor speed.

Energy savings result from using a more efficient control device to regulate the air flow provided by the fan. Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally requires less maintenance than mechanical air volume control devices.

Affected Unit: Main office (RTU-1).

ECM 8: Install VFDs on Constant Volume (CV) Fans

We evaluated Installing VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. 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 signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

VAV system controls should not raise the supply air temperature at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low (e.g., 55°F) until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected Units: Main Office Building (HVU-1, HVU-2) and belt room ventilation fan. Raw Pump House: pump room furnace.

ECM 9: Install VFDs on Heating Water Pumps

We evaluated installing variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils, and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution, they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected Pumps: Main Office Building, 1.5 hp heating hot water pumps.

ECM 10: Install VFDs on Water Supply Pump

Install VFDs to control 25 hp water supply pumps. Since water supply systems become an open system whenever and end-use valve or fixture is opened, the VFD will need to be controlled to maintain sufficient pressure in the distribution system to deliver water to the furthest point in the system.

Energy savings result from reducing the pump speed during low demand periods. Ensure that your control system includes the sensors and inputs required to optimize water flow in your water supply.

Affected Pumps: Water supply, Sand Filler Building.

ECM 11: Install VFDs on Process Blowers

Install VFD to control 60 hp (pump #1) process blower. In most cases sensors will be required to trigger adjustments to blower speed. Aeration blowers for water treatment ponds, for example, typically require dissolved oxygen sensors in order to optimize blower operation while maintaining the required oxygen level. The blower speed will have to be controlled to maintain any minimum fixed head requirement for the system. Be sure your process blower control strategy incorporates the proper sensor inputs in order to have a fully functional control system.

Energy savings result from reducing the process blower speed (and power) when conditions allow for reduced air flow.

Affected Motors: Main Office Building (Process blower #1), Raw Pump House (10 hp process blower).

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**1,218**	**0.3**	**0**	**$130**	**$2,131**	**$0**	**$2,131**	**16.4**	**1,226**
ECM 12	Install High Efficiency Heat Pumps	1,218	0.3	0	$130	$2,131	$0	$2,131	16.4	1,226

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the unitary HVAC is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 12: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system, and a higher HSPF rating indicates more efficient heating mode. 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 heating and cooling loads, and the estimated annual operating hours.

Affected Units: Two heat pumps at the OEM/Parks & Recreation Building.

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**62**	**$559**	**$17,899**	**$1,400**	**$16,499**	**29.5**	**7,233**
ECM 13	Install High Efficiency Hot Water Boilers	0	0.0	4	$37	$4,097	$400	$3,697	99.2	482
ECM 14	Install High Efficiency Furnaces	0	0.0	42	$381	$8,758	$500	$8,258	21.7	4,925
ECM 15	Install Infrared Heaters	0	0.0	16	$141	$5,044	$500	$4,544	32.2	1,826

ECM 13: Install High Efficiency Hot Water Boiler

We evaluated replacing the older inefficient OEM/Parks & Recreation building hot water boiler with high efficiency hot water boiler. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers, rather than one or two large boilers, will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boiler has a long payback and may not be justifiable based simply on energy considerations. However, the boiler has reached the end of its normal useful life. Typically, the marginal cost of purchasing high efficiency boiler can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boiler that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boiler.

ECM 14: Install High Efficiency Furnaces

We evaluated replacing 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.

Note: these units produce acidic condensate that require proper drainage.

Affected Units: Two stage heating furnaces serving the Raw Pump House.

ECM 15: Install Infrared Heaters

We evaluated replacing gas-fired unit heater with low-intensity infrared heating units with an enclosed flame, rather than an open flame on a ceramic or metal surface.

Gas-fired unit heater 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 objects and surfaces directly, including the occupants of the space, rather than heating large volumes of air. 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 at significantly lower cost for certain space types.

Affected Building Areas: OEM/Parks & Recreation building storage room.

4.7 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**3**	**$28**	**$58**	**$20**	**$38**	**1.4**	**357**
ECM 16	Install Pipe Insulation	0	0.0	3	$28	$58	$20	$38	1.4	357

ECM 16: Install Pipe Insulation

Install insulation on domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: Domestic hot water piping.

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**111**	**0.0**	**2**	**$33**	**$57**	**$28**	**$29**	**0.9**	**386**
ECM 17	Install Low-Flow DHW Devices	111	0.0	2	$33	$57	$28	$29	0.9	386

ECM 17: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low-flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.9 Wastewater Process Energy Considerations

"Electricity constitutes between 25 and 40 percent of a typical wastewater treatment plant's (WWTP's) operating budget,"[4] and process motors and blowers often consume 75% or more of the energy used in plant operations. Regardless of your plant's size and treatment processes there are fundamental ways to approach operations, controls, retrofits, and planned upgrades to ensure reliable operations that match energy use to your production requirements.

Energy Management

Strategic investments in improved plant efficiency require organizational commitment and a partnership between stakeholders including management, engineers, operators, and the public. The Public Service Commission of Wisconsin, for example, offers the following outline for an Energy Management Plan:

1. Establish an organizational commitment
2. Assemble and initiate an energy team
3. Develop a baseline of facility energy use
4. Develop equipment energy use profiles
5. Identify & assess project opportunities
6. Prioritize implementation opportunities
7. Develop and implement the plan
8. Track and report progress
9. Continually update the plan and achieve energy management goals[5]

Baseline Measurements

A process improvement plan begins with collecting information and establishing a baseline. In Section 3.0, we provided a graph comparing monthly electricity consumption and production records (kWh per million gallons treated). This energy baseline can help you understand the relative efficiency of the plant over time and in consideration of seasonal variations. A daily baseline can be established to determine how energy use varies with diurnal flow; such a correlation requires real-time data for both power and flow. Measurement tools includes smart meters, SCADA systems, and sub metering approaches.

Assess and Identify

After determining how energy is spent, consider system changes (equipment or operations) that reduce energy consumption or power demand. Also consider renewable energy opportunities that can displace purchased energy. Calculate the costs and savings for proposed measures. Opportunities can be categorized by process area or funding approach and should take into consideration the existing equipment condition and expected life.

Prioritize, Implement, Track and Report

Evaluate costs and benefits of proposed changes and prioritize the opportunities. An Energy Management Plan should reflect the priorities of the stakeholders and be effectively executed to realize energy benefits. Preferred implementation strategies may vary depending on measure and scope. Tracking and reporting mechanisms should be put in place to report results.

[4]Statewide Assessment of Energy Use by the Municipal Water and Wastewater Sector - New York State Energy Research and Development Authority, November 2008.

[5] Energy Best Practices Guide: Water & Wastewater Industry, Public Service Commission of Wisconsin, 2020

Example: Best Practices

The following table developed by Wisconsin "Focus on Energy" shows the typical energy savings and payback periods for a variety of wastewater process measures and best practices, grouped by category. As described above, a well-executed Energy Management Plan will lead you to the fundamental measures applicable to your site conditions. There is no one measure or mix of measures that is appropriate for every facility. Measures should not be implemented in isolation since there are often interactive effects that will impact the overall savings of the combined measures.

Process	Best Practices Measure	Typical Energy Savings of unit of process (%)	Typical Payback (Years)
Operations	Operational Flexibility	10 – 25	< 2
	Staging of Treatment Capacity	10 – 30	< 2
	Manage for Seasonal/Tourist Peaks Variable	Variable	4 – 6
	Flexible Sequencing of Basin Use	15 – 40	2 – 5
	Cover Basins to Reduce Freezing and Aerosol or Odor Emissions	Variable	Variable
	Reduce Fresh Water Consumption through Final Effluent Recycling	10 – 50	2 – 3
Aeration	Optimize Aeration System	30 – 70	3 – 7
	Fine Bubble Aeration	20 – 75	1 – 5
	Variable Blower Air Flow Rate	15 – 50	<3
	Dissolved Oxygen Control	20 – 50	2 – 3
	Cascade Aeration	Variable	Variable
	Aerobic Digestion Options	20 – 50	Variable
	Blower Technology Options	10 – 25	1 – 7
	Assess Aeration System Configuration	Variable	Variable
Sludge and Biosolids	Improve Solids Capture in Dissolved Air Flotation (DAF)	Variable	Variable
	Evaluate Replacing Centrifuge with Screw Press	Variable	Variable
	Replace Centrifuge with Gravity Belt Thickener	Variable	Variable
	Digestion Options	Variable	Variable
	Mixing Options in Aerobic Digesters	10 – 50	1 – 3
	Mixing Options in Anaerobic Digesters	Variable	Variable
	Recover Heat from Wastewater	Variable	Variable
Special Treatment Options	Anoxic-Zone Mixing Options	25 – 50	3 – 5
	Side-stream De-ammonification	–	–
	Biotower Energy Efficiency	15 – 30	Variable
Biogas Enhancement	Optimize Anaerobic Digester Performance	Variable	Variable
	Use Biogas to Produce Combined Heat and/or Power (CHP)	Variable	Variable
	Assessment of Beneficial Utilization	Variable	Variable

Table based on information published by Wisconsin Focus on Energy in the "ENERGY BEST PRACTICES GUIDE: WATER & WASTEWATER INDUSTRY" (February 2020)– https://focusonenergy.com

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save 5% –20% of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, and planned capital upgrades, and it incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things—see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR Portfolio Manager

You've heard it before—you cannot manage what you do not measure. ENERGY STAR Portfolio Manager is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[6] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Maintenance

Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly. Adjust exterior lighting time clock controls seasonally as needed to match your lighting requirements.

[6] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager.

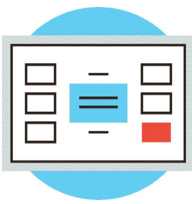
Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include 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.

Thermostat Schedules and Temperature Resets



Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. 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 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.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the AC or heat pump system, which increases the load on the distribution fans.

Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

Furnace Maintenance

Preventative 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 check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 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 more than three years old, have a technician inspect the sacrificial anode annually.

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense® ratings for urinals is 0.5 gpf and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense website[7] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[8] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. 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.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR or WaterSense products where available.

[7] https://www.epa.gov/watersense.

[8] https://www.epa.gov/watersense/watersense-work-0.

6 On-site Generation

You don’t have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility’s electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions, and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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.

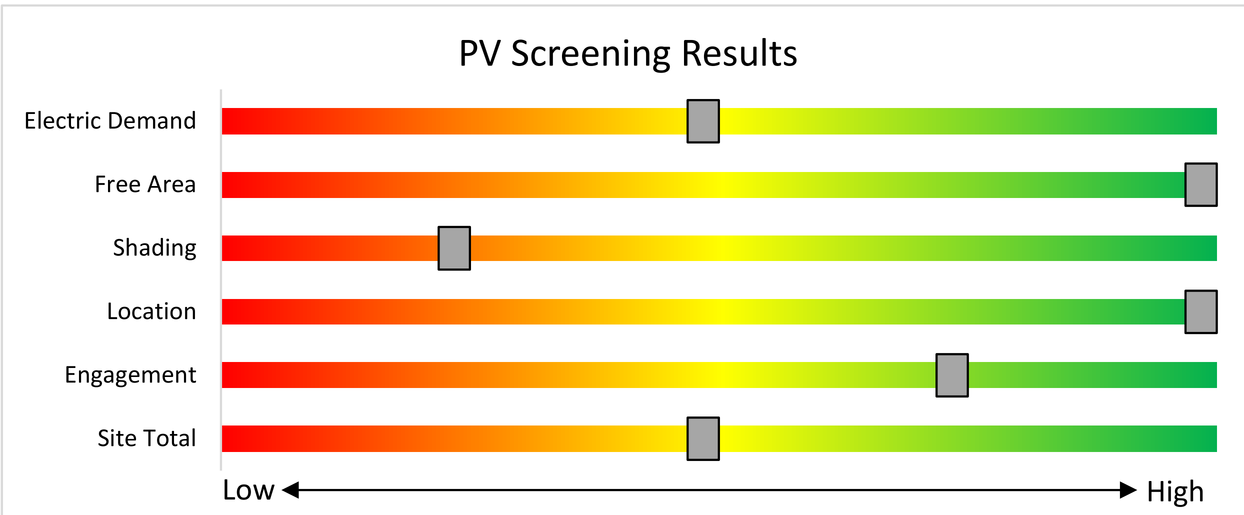
6.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the medium potential. A PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.



Potential	Medium	
System Potential	107	kW DC STC
Electric Generation	80,512	kWh/yr
Displaced Cost	$8,610	/yr
Installed Cost	$278,200	

Figure 8 - Photovoltaic Screening

Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The SuSI program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects. Solar projects may qualify to earn SREC- IIs (Solar Renewable Energy Certificates-II), however, the project owners *must* register their solar projects prior to the start of construction to establish the project's eligibility.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

Successor Solar Incentive Program (SuSI): https://www.njcleanenergy.com/renewable-energy/programs/susi-program

- **Basic Info on Solar PV in NJ**: www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs.
- **Approved Solar Installers in the NJ Market**: 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) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need 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 no potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

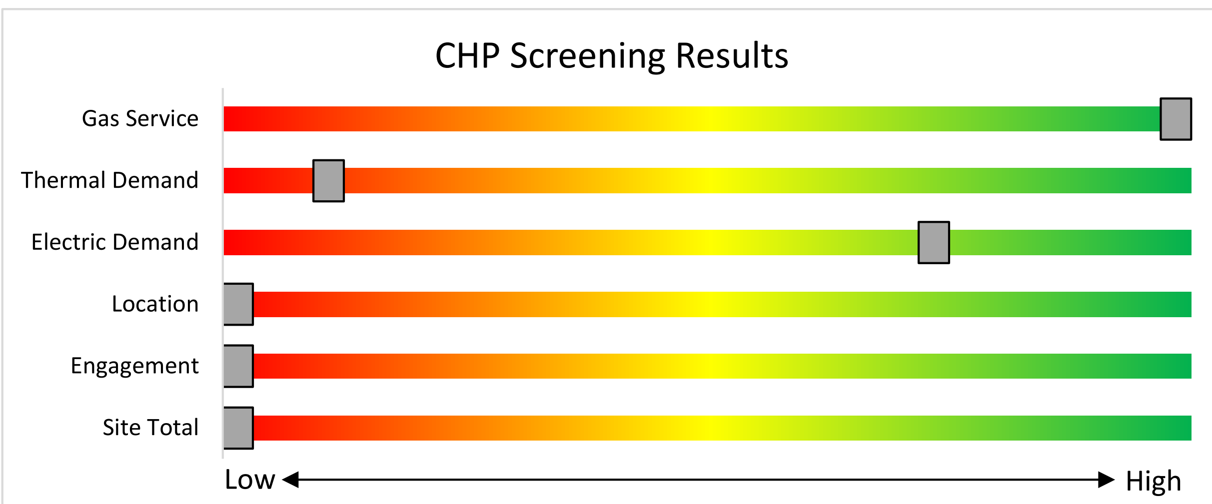


Figure 9 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

7 Project Funding and Incentives

Ready to improve your building's performance? Your utility provider may be able to help.

7.1 Utility Energy Efficiency Programs

The Clean Energy Act, signed into law by Governor Murphy in 2018, requires New Jersey's investor-owned gas and electric utilities to reduce their customers' use by set percentages over time. To help reach these targets the New Jersey Board of Public Utilities approved a comprehensive suite of energy efficiency programs to be run by the utility companies.

These new utility programs are rolling out in the spring and summer of 2021. Keep up to date with developments by visiting:

https://www.njcleanenergy.com/transition

8 New Jersey's Clean Energy Programs

New Jersey's Clean Energy Program will continue to offer some energy efficiency programs.

8.1 Large Energy Users

The Large Energy Users Program (LEUP) is designed to foster self-directed investment in energy projects. This program is offered to New Jersey's largest energy customers that annually contribute at least $200,000 to the NJCEP aggregate of all buildings/sites. This equates to roughly $5 million in energy costs in the prior fiscal year.

Incentives

Incentives are based on the specifications below. The maximum incentive per entity is the lesser of:

- $4 million
- 75% of the total project(s) cost
- 90% of total NJCEP fund contribution in previous year
- $0.33 per projected kWh saved; $3.75 per projected Therm saved annually

How to Participate

To participate in LEUP, you will first need submit an enrollment application. This program requires all qualified and approved applicants to submit an energy plan that outlines the proposed energy efficiency work for review and approval. Applicants may submit a Draft Energy Efficiency Plan (DEEP), or a Final Energy Efficiency Plan (FEEP). Once the FEEP is approved, the proposed work can begin.

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

8.2 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

Eligible Technologies	Size (Installed Rated Capacity)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine	>3 MW	$350		
Fuel Cells with Heat Recovery				
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

How to Participate

You will work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at www.njcleanenergy.com/CHP.

8.3 Successor Solar Incentive Program (SuSI)

The SuSI program replaces the SREC Registration Program (SRP) and the Transition Incentive (TI) program. The program is used to register and certify solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SREC-IIs (Solar Renewable Energy Certificates-II). SuSI consists of two sub-programs. The Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) Program.

Administratively Determined Incentive (ADI) Program

The ADI Program provides administratively set incentives for net metered residential projects, net metered non-residential projects 5 MW or less, and all community solar projects.

After the registration is accepted, construction is complete, and a complete final as-built packet has been submitted, the project is issued a New Jersey certification number, which enables it to generate New Jersey SREC- IIs.

Market Segments	Size MW dc	Incentive Value ($/SREC II)	Public Entities Incentive Value - $20 Adder ($/SRECII)
Net Metered Residential	All types and sizes	$90	N/A
Small Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects smaller than 1 MW	$100	$120
Large Net Metered Non-Residential located on Rooftop, Carport, Canopy and Floating Solar	Projects 1 MW to 5 MW	$90	$110
Small Net Metered Non-Residential Ground Mount	Projects smaller than 1 MW	$85	$105
Large Net Metered Non-Residential Ground Mount	Projects 1 MW to 5 MW	$80	$100
LMI Community Solar	Up to 5 MW	$90	N/A
Non-LMI Community Solar	Up to 5 MW	$70	N/A
Interim Subsection (t)	All types and sizes	$100	N/A

Eligible projects may generate SREC-IIs for 15 years following the commencement of commercial operations which is defined as permission to operate (PTO) from the Electric Distribution Company. After 15 years, projects may be eligible for a NJ Class I REC.

SREC-IIs will be purchased monthly by the SREC-II Program Administrator who will allocate the SREC-IIs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

The ADI Program online portal is now open to new registrations effective August 28, 2021.

Competitive Solar Incentive Program

The Competitive Solar Incentive (CSI) Program will provide competitively set incentives for grid supply projects and net metered non-residential projects greater than 5MW. The program is currently under development with the goal of holding the first solicitation by early-to-mid 2022. For updates, please continue to check the Solar Proceedings page on the New Jersey's Clean Energy Program website.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan.

If you are considering installing solar photovoltaics on your building, visit the following link for more information: https://njcleanenergy.com/renewable-energy/programs/susi-program.

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. 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. Annual payments are lower than the savings projected from the energy conservation measures (ECMs), ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

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 used 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 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 PROJECT DEVELOPMENT

Energy conservation measures (ECMs) have been identified for your site, and their energy and economic analyses are provided within this LGEA report. Note that some of the identified projects may be mutually exclusive, such as replacing equipment versus upgrading motors or controls. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning that includes the review of multiple bids for project work, incorporates potential operations and maintenance (O&M) cost savings, and maximizes your incentive potential.

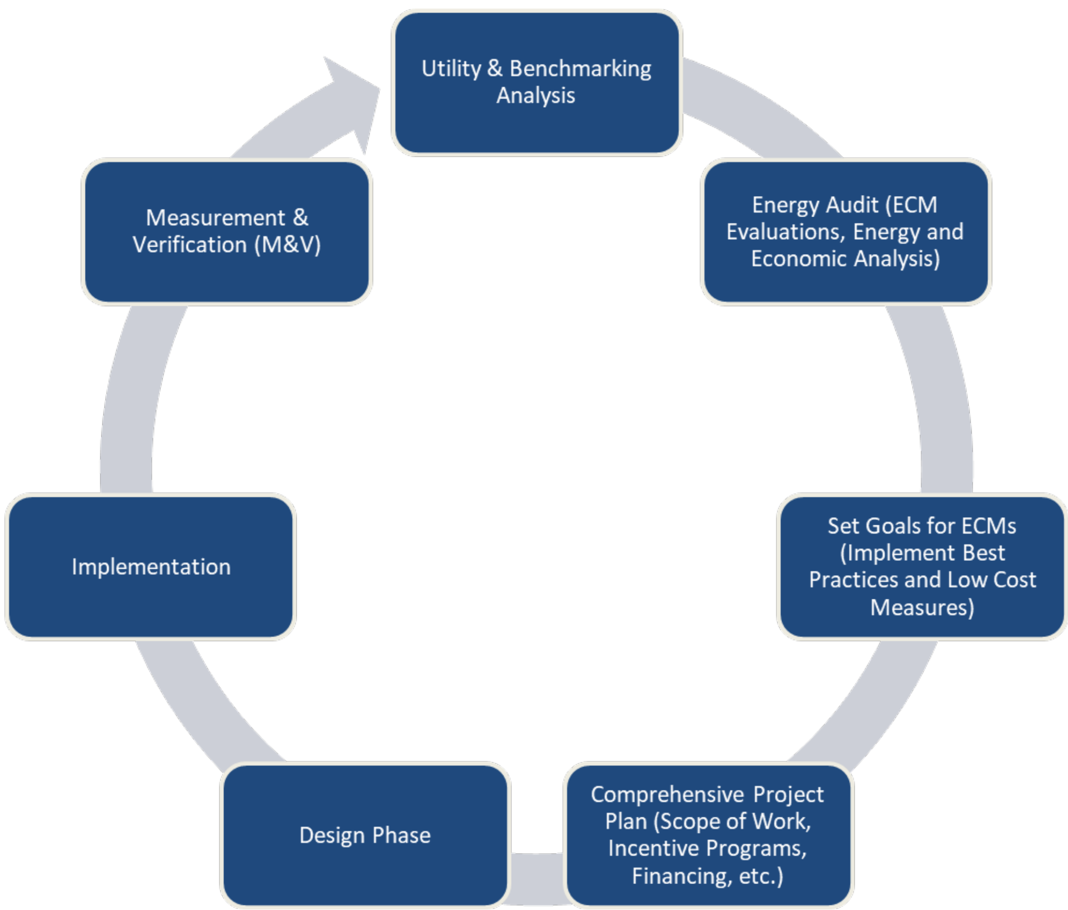


Figure 10 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. 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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[9].

10.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market based and fluctuate monthly. The utility provides basic gas supply service 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[10].

[9] www.state.nj.us/bpu/commercial/shopping.html.

[10] 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	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office Exterior Wall Pack	2	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	1,253	0	$134	$692	$100	4.4
Exterior Wall Pack	1	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	626	0	$67	$346	$50	4.4
Exterior Wall Pack	7	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	4,384	0	$469	$2,421	$350	4.4
Exterior Wall Pack	1	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	626	0	$67	$346	$50	4.4
Exterior Wall Pack	1	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	626	0	$67	$346	$50	4.4
Exterior Pole Light	3	High-Pressure Sodium: (1) 250W Lamp	Timeclock		295	4,380	1	Fixture Replacement	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	75	4,380	0.0	2,891	0	$309	$1,336	$300	3.4
Exterior Wall Pack	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		18	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	18	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	9	LED Lamps: (1) 45W A23 Screw-In Lamp	Timeclock		45	4,380		None	No	9	LED Lamps: (1) 45W A23 Screw-In Lamp	Timeclock	45	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	2	LED Lamps: (1) 50W Corn Bulb Screw-In Lamp	Photocell		50	4,380		None	No	2	LED Lamps: (1) 50W Corn Bulb Screw-In Lamp	Photocell	50	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	1	LED - Fixtures: Wall Pack	Photocell		18	4,380		None	No	1	LED - Fixtures: Wall Pack	Photocell	18	4,380	0.0	0	0	$0	$0	$0	0.0
Mechanical 1	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Mechanical Room	17	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	S	295	4,368	1	Fixture Replacement	No	17	LED - Fixtures: High-Bay	Wall Switch	75	4,368	2.5	16,336	-4	$1,712	$8,587	$850	4.5
Mechanical Room	6	LED Lamps: (1) 85W Corn Bulb Screw-In Lamp	Wall Switch	S	85	4,368		None	No	6	LED Lamps: (1) 85W Corn Bulb Screw-In Lamp	Wall Switch	85	4,368	0.0	0	0	$0	$0	$0	0.0
Mechanical Room	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	4,368	2	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.1	773	0	$81	$206	$30	2.2
Office - Enclosed 1	1	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Occupancy Sensor	S	88	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,918	0.0	215	0	$23	$105	$10	4.2
Boiler room	4	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.2	1,309	0	$137	$390	$60	2.4
Corridor 1 breezeway	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,918		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,918	0.0	0	0	$0	$0	$0	0.0
Corridor 2	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2	1	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Occupancy Sensor	S	88	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,918	0.0	215	0	$23	$105	$10	4.2
Dining Area 1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Dining Area 1	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	3,918		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,918	0.0	0	0	$0	$0	$0	0.0
Dining Area 1	3	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.2	981	0	$103	$293	$45	2.4
Electrical Room 1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Electrical Room 1	1	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.1	327	0	$34	$98	$15	2.4
Janitorial 1	1	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Occupancy Sensor	S	88	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,918	0.0	215	0	$23	$105	$10	4.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Laboratory 1	6	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Occupancy Sensor	S	88	3,918	2	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,918	0.2	1,293	0	$136	$628	$60	4.2
Locker Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,080		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.0	0	0	$0	$0	$0	0.0
Locker Room 1	2	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.1	654	0	$69	$195	$30	2.4
Multipurpose 1 belt Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	9	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	S	295	4,368	1, 4	Fixture Replacement	Yes	9	LED - Fixtures: High-Bay	Occupancy Sensor	75	3,014	1.4	9,563	-2	$1,002	$6,526	$765	5.7
Multipurpose Belt Room	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	4,368		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	4,368	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.1	515	0	$54	$138	$20	2.2
Multipurpose Belt Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	144	0	$15	$37	$10	1.8
Restroom - Male 1	2	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.1	654	0	$69	$195	$30	2.4
Restroom - Unisex 1	1	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	S	127	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,918	0.1	327	0	$34	$98	$15	2.4
Vestibule restroom	1	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Occupancy Sensor	S	88	3,918	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,918	0.0	215	0	$23	$105	$10	4.2
Stairs 1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 1	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch		88	4,368	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.1	594	0	$62	$138	$20	1.9
Stairs 1	3	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch		88	4,368	2, 5	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,014	0.1	855	0	$90	$539	$135	4.5
Stairs 2	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 3	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch		88	4,368	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.1	594	0	$62	$363	$90	4.4
Stairs 4	3	U-Bend Fluorescent - T12: U T12 (40W) - 2L	Wall Switch		88	4,368	2, 5	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,014	0.1	855	0	$90	$539	$135	4.5
Stairs 3	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	4,368	3, 5	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,014	0.0	183	0	$19	$37	$10	1.4
Laboratory Sand Filter Room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Laboratory Sand Filter Room	10	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	S	295	4,368	1	Fixture Replacement	No	10	LED - Fixtures: High-Bay	Wall Switch	75	4,368	1.5	9,610	-2	$1,007	$5,051	$500	4.5
Laboratory Sand Filter Room	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	4,368		None	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Garage	8	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,640	4	None	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,512	0.0	131	0	$14	$270	$35	17.1
Garage	12	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	3,640	2, 4	Relamp & Reballast	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,512	0.4	2,271	-1	$238	$1,095	$155	4.0
Maintenance Shop	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	3,640	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	3,640	0.1	313	0	$33	$129	$20	3.3
Storage Room	5	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,040	2, 4	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	718	0.4	563	0	$59	$759	$100	11.2
Exterior Wall Pack	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		15	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	15	4,380	0.0	0	0	$0	$0	$0	0.0
Basement Pump Room	4	LED - Fixtures: High-Bay	Wall Switch	S	45	6,552		None	No	4	LED - Fixtures: High-Bay	Wall Switch	45	6,552	0.0	0	0	$0	$0	$0	0.0
Electrical Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	144	0	$15	$37	$10	1.8
Electrical Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior Wall Pack	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell		23	4,380		None	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	23	4,380	0.0	0	0	$0	$0	$0	0.0
First Floor	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
First Floor	5	LED - Fixtures: High-Bay	Wall Switch	S	45	4,368		None	No	5	LED - Fixtures: High-Bay	Wall Switch	45	4,368	0.0	0	0	$0	$0	$0	0.0
Electrical Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Electrical Room	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	3,640	3	Relamp	No	2	LED - Linear Tubes: (2) 4' T5 (14.5W) Lamps	Wall Switch	30	3,640	0.0	218	0	$23	$114	$20	4.1
Exterior Wall Pack	4	High-Pressure Sodium: (1) 150W Lamp	Photocell		188	4,380	1	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	2,505	0	$268	$1,383	$200	4.4
Laboratory	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Laboratory	6	LED - Fixtures: High-Bay	Wall Switch	S	45	2,600		None	No	6	LED - Fixtures: High-Bay	Wall Switch	45	2,600	0.0	0	0	$0	$0	$0	0.0
2nd Floor Control Room	6	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Occupancy Sensor	S	72	3,918	2	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,918	0.2	1,011	0	$106	$413	$60	3.3
2nd Floor Blower Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
2nd Floor Blower Room	9	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Occupancy Sensor	S	72	3,918	2	Relamp & Reballast	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,918	0.3	1,516	0	$159	$619	$90	3.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Basement	9	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	S	295	3,640	1	Fixture Replacement	No	9	LED - Fixtures: High-Bay	Wall Switch	75	3,640	1.3	7,207	-2	$755	$4,546	$450	5.4
Basement	8	LED - Fixtures: High-Bay	Wall Switch	S	45	3,640		None	No	8	LED - Fixtures: High-Bay	Wall Switch	45	3,640	0.0	0	0	$0	$0	$0	0.0
Basement	1	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	3,640	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,640	0.0	157	0	$16	$69	$10	3.6
Exterior Wall Pack	3	LED Lamps: LED Corn Bulbs	Photocell		45	4,380		None	No	3	LED Lamps: LED Corn Bulbs	Photocell	45	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Anarobic Tanks	5	LED Lamps: LED Corn Bulbs	Wall Switch		24	1,820		None	No	5	LED Lamps: LED Corn Bulbs	Wall Switch	24	1,820	0.0	0	0	$0	$0	$0	0.0
Exterior Clarifier Tanks	4	LED Lamps: LED Corn Bulbs	Wall Switch		24	1,820		None	No	4	LED Lamps: LED Corn Bulbs	Wall Switch	24	1,820	0.0	0	0	$0	$0	$0	0.0
Exterior Oxyd Tanks	21	LED Lamps: LED Corn Bulbs	Wall Switch		24	1,820		None	No	21	LED Lamps: LED Corn Bulbs	Wall Switch	24	1,820	0.0	0	0	$0	$0	$0	0.0
Restroom	1	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	2,080	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.0	89	0	$9	$69	$10	6.3
Stairs	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs	4	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch		72	3,120	2, 5	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,153	0.1	649	0	$68	$500	$180	4.7
Stairs	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch		29	3,120	5	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,153	0.0	28	0	$3	$225	$35	64.6
Stairs	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch		72	3,120	2, 5	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,153	0.1	324	0	$34	$363	$90	8.0
Storage Room	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,040	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	718	0.1	108	0	$11	$254	$20	20.6
Boiler Room	1	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	2,600	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.0	112	0	$12	$69	$10	5.0
Break Room	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	2,600	2, 4	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.1	270	0	$28	$254	$40	7.5
Corridor	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor	9	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	3,120	2, 5	Relamp & Reballast	Yes	9	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,153	0.3	1,382	0	$145	$1,392	$405	6.8
Exterior Wall Pack	9	LED Lamps: LED Corn Bulbs	Photocell		45	4,380		None	No	9	LED Lamps: LED Corn Bulbs	Photocell	45	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior recessed	2	LED Lamps: A Lamp	Photocell		10	4,380		None	No	2	LED Lamps: A Lamp	Photocell	10	4,380	0.0	0	0	$0	$0	$0	0.0
OEM Garage	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	2,600	4	None	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,794	0.1	421	0	$44	$270	$35	5.3
OEM Garage	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office - Recreation Foreman	4	U-Bend Fluorescent - EST12: U T12 (34W) - 2L	Wall Switch	S	72	2,080	2, 4	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,435	0.1	410	0	$43	$689	$75	14.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,820		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,820	0.0	0	0	$0	$0	$0	0.0
Restroom - Female	2	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	1,820	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,820	0.1	157	0	$16	$138	$20	7.2
Storage 2	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,040		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,040	0.0	0	0	$0	$0	$0	0.0
Storage Room	10	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	1,040	4	None	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	718	0.0	47	0	$5	$0	$0	0.0
Storage Room	16	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	1,040	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' T5 (14.5W) Lamps	Occupancy Sensor	30	718	0.4	654	0	$69	$1,353	$160	17.4

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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Multipurpose Belt Room	Belt #2	1	Air Compressor	1.0	82.0%	No			B	936		No	82.0%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Belt #1	1	Air Compressor	1.0	85.5%	No			W	936		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Polymer Blending System	1	Air Compressor	0.3	70.0%	No			W	780		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-6 - Electrical Room	1	Exhaust Fan	0.8	70.0%	No			N	2,184		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-5 - Restroom/Locker Room	1	Exhaust Fan	0.3	65.0%	No			N	2,184		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-12 - Laboratory	1	Exhaust Fan	0.1	65.0%	No			N	2,184		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-7 - Control Room	1	Exhaust Fan	0.5	70.0%	No			N	2,184		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	1	Exhaust Fan	0.3	65.0%	No			W	2,184		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Electrical Room	Electrical Room	1	Exhaust Fan	0.3	65.0%	No			W	2,184		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Multipurpose Belt Room	1	Exhaust Fan	0.8	70.0%	No			W	2,184		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Heating Hot Water Pump	2	Heating Hot Water Pump	1.5	86.5%	No			W	1,792	9	No	86.5%	Yes	2	0.3	1,739	0	$186	$6,781	$150	35.7
Pump Room	Return Activated Sludge Pumps #1& 2	2	Process Pump	25.0	93.0%	Yes			B	5,460	6	Yes	93.0%	No		0.0	0	0	$0	$8,258	$0	0.0
Pump Room	Return Activated Sludge Pump #3	1	Process Pump	25.0	70.0%	Yes			W	1,456	6	Yes	91.7%	No		3.5	6,885	0	$736	$2,366	$0	3.2
Pump Room	Thickener Feed Pump #2 (Truck Loader)	1	Process Pump	20.0	93.0%	Yes			W	156		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Pump Room	Thickener Feed Pump #1 & #3	2	Process Pump	20.0	93.0%	Yes			W	312		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	1	Other	0.1	65.0%	No			W	728		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Belt Room	Rollup Door	1	Other	0.2	65.0%	No			W	182		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Thickener Drive #1	1	Process Pump	3.0	78.0%	No			B	260		No	78.0%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Thickener Drive #2	1	Process Pump	3.0	81.5%	No			W	260		No	81.5%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Multipurpose Belt Room	Scrubber Recycle Pump #1 & #2	2	Process Pump	5.0	84.0%	No			B	4,380	6	Yes	89.5%	No		0.3	1,793	0	$192	$1,842	$0	9.6
Multipurpose Belt Room	Scrubber Suction Fan #1 & 2	2	Exhaust Fan	3.0	84.0%	No			W	4,380	6	Yes	89.5%	No		0.2	1,076	0	$115	$1,610	$0	14.0
Multipurpose Belt Room	Sludge Tanks Blower Pumps #1	1	Process Blower	60.0	91.3%	No			B	1,456	11	No	94.5%	Yes	1	18.6	28,399	0	$3,036	$25,311	$0	8.3
Multipurpose Belt Room	Sludge Tanks Blower Pumps #2	1	Process Blower	60.0	93.0%	Yes			W	5,460		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Sludge Tanks Ventilation S-1	1	Supply Fan	1.5	70.0%	No			W	2,016	8	No	86.5%	Yes	1	0.6	1,623	0	$174	$3,380	$75	19.0
Pump Room	Sump Pump #1 & #2	2	Other	0.5	70.0%	No			W	728		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Pump Room	Waste Activated Sludge Pump #1,2,3	3	Process Pump	5.0	89.5%	Yes			B	268	6	Yes	89.5%	No		0.0	0	0	$0	$2,763	$0	0.0
Multipurpose Belt Room	Thickener Drive Air Compressors #2	1	Air Compressor	1.0	78.5%	No			B	1,092		No	78.5%	No		0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Thickener Drive Air Compressors #1	1	Air Compressor	1.0	85.5%	No			W	1,092		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	HVU-1 - Belt Thickener Room	1	Supply Fan	15.0	89.5%	No			N	2,016	8	No	92.4%	Yes	1	4.5	9,986	0	$1,067	$7,086	$1,200	5.5
Roof	RTU-1 - Offices (VAV Boxes)	1	Supply Fan	10.0	89.5%	No			N	2,016	7	No	91.7%	Yes	1	3.0	6,574	0	$703	$5,375	$1,100	6.1
Roof	HVU-2 - Belt Thickner Room	1	Supply Fan	3.0	86.0%	No			N	2,016	8	No	89.5%	Yes	1	0.9	2,106	0	$225	$3,812	$200	16.0
Pump Room	Sump Pump	1	Other	0.5	70.0%	No			B	728		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Sand Filter Room	Service Water Pump #1	1	Water Supply Pump	25.0	91.0%	No			W	3,276	10	No	93.6%	Yes	1	2.7	26,436	0	$2,826	$11,471	$1,400	3.6
Sand Filter Room	Service Water Pump #2	1	Water Supply Pump	25.0	83.0%	No			B	3,276	10	No	93.6%	Yes	1	3.7	33,231	0	$3,552	$11,471	$1,400	2.8
Sand Filter Room	Sand Filtration Tanks	2	Process Pump	2.0	84.0%	No			W	183		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Sand Filter Room	Sand Filtration Tanks	4	Process Pump	3.0	84.0%	No			W	183		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Pump Room Furnace	2	Supply Fan	2.0	86.5%	No			W	2,016	8	No	86.5%	Yes	2	1.1	2,608	0	$279	$7,246	$200	25.3
Electrical Room	Electrical Room	2	Exhaust Fan	0.5	70.0%	No			W	2,184		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Ground	Air Blower	1	Process Blower	10.0	89.5%	No			W	3,640	11	No	91.7%	Yes	1	3.1	11,869	0	$1,269	$5,375	$1,100	3.4
First Floor	Bar Screen Pump	1	Process Pump	3.0	89.7%	No			W	2,184		No	89.7%	No		0.0	0	0	$0	$0	$0	0.0
First Floor	Bar Screen Pump	1	Process Pump	3.0	87.0%	No			B	2,184	6	Yes	89.5%	No		0.0	118	0	$13	$876	$0	69.7
Basement Pump Room	Raw Pumps	3	Process Pump	65.0	91.3%	Yes			B	2,920	6	Yes	95.0%	No		3.4	13,590	0	$1,453	$18,426	$0	12.7
Roof	Pump Room Furnace	2	Supply Fan	5.0	90.2%	No			W	2,016		No	90.2%	No		0.0	0	0	$0	$0	$0	0.0
Electrical Room	Exhaust Fan	2	Exhaust Fan	0.5	70.0%	No			W	2,184		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior	Air Blower	1	Process Blower	10.0	91.0%	Yes			W	5,096		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Laboratory	Grit Screen Bar	1	Process Pump	1.5	84.0%	No			W	876		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Laboratory	Rollup Door	1	Other	0.3	65.0%	No			W	183		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF-HVU-3 - Control Building	1	Exhaust Fan	3.0	86.5%	No			N	2,184		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-9 - Blower Room	1	Exhaust Fan	3.0	86.5%	No			N	2,184		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-10 - Blower Room	1	Exhaust Fan	3.0	86.5%	No			N	2,184		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RF-11 - Restroom	1	Exhaust Fan	0.1	65.0%	No			N	2,184		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
2nd Floor Blower Room	Backup Aeration Blower # 1 & 3	2	Process Blower	125.0	95.0%	No			W	0		No	95.0%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
2nd Floor Blower Room	Main Aeration Blower # 2	1	Process Blower	125.0	95.0%	Yes			W	7,446		No	95.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement	Internal Recycle Pump #1 & #2	2	Process Pump	20.0	91.0%	Yes			B	5,460	6	Yes	91.7%	No		0.1	1,025	0	$110	$6,824	$0	62.3
Basement	Internal Recycle Pump #3 (Backup)	1	Process Pump	20.0	91.0%	Yes			B	1,456		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Tank	Clarifier Tanks	2	Process Pump	0.5	70.0%	No			W	3,640		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Tank	Oxic Mixing Pumps	2	Process Pump	4.0	86.0%	No			W	1,456		No	86.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Tank	Anoxic & AnerobicTanks Mixing Pumps	6	Process Pump	8.3	84.0%	No			W	1,456		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Heating System	2	Heating Hot Water Pump	0.8	70.0%	No			B	1,680	6	Yes	81.1%	No		0.1	276	0	$29	$1,073	$0	36.4
Garage	Garage Doors	3	Other	0.3	65.0%	No			W	183		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Storage 2	Doors	4	Other	0.3	65.0%	No			W	183		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged 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 (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office	Main Office	1	Split-System	5.00		12.00		Goodman	GSX130601BA	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	HVU-1 - Belt Thickner Room	1	Forced Air Furnace		640.00		0.8 AFUE	Reznor	RPBL-800	N		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1 - Offices (VAV Boxes)	1	Package Unit	8.50	162.00	12.00	0.81 AFUE	Trane	YZC102F4R	N		No							0.0	0	0	$0	$0	$0	0.0
Roof	HVU-2 - Belt Thickner Room	1	Forced Air Furnace		640.00		0.8 AFUE	Reznor	RPBL-800	N		No							0.0	0	0	$0	$0	$0	0.0
Multipurpose Belt Room	Multipurpose Belt Room	2	Unit Heater		80.00		0.8 AFUE			N		No							0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	2	Unit Heater		60.00		0.8 AFUE			W		No							0.0	0	0	$0	$0	$0	0.0
Dining Room	Dining Room	1	Window AC	1.26		10.70		Electrolux	FAM156R1A	W		No							0.0	0	0	$0	$0	$0	0.0
Laboratory Sand Filter Room	Laboratory Sand Filter Room	1	Unit Heater		80.00		0.8 AFUE			N		No							0.0	0	0	$0	$0	$0	0.0
Storage Room	Storage Room	1	Unit Heater		62.25		0.83 AFUE	Reznor	UDAP75	W		No							0.0	0	0	$0	$0	$0	0.0
Garage	Garage	2	Unit Heater		62.25		0.83 AFUE	Reznor	UDAP75	W		No							0.0	0	0	$0	$0	$0	0.0
Maintenance Shop	Maintenance Shop	1	Unit Heater		62.25		0.83 AFUE	Reznor	UDAP75	W		No							0.0	0	0	$0	$0	$0	0.0
Electrical Room	Electrical Room	1	Electric Resistance Heat		10.24		1 COP	Qmark		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Pump Room	1	Forced Air Furnace		480.00		0.8 AFUE	Heatco	HDA600CS4	B	14	Yes	1	Forced Air Furnace		480.00		0.97 22.6573333 333333	0.0	0	42	$381	$8,758	$500	21.7

		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 (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	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	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Electrical Room	Electrical Room	1	Electric Resistance Heat		10.24		1 COP	Qmark		W		No							0.0	0	0	$0	$0	$0	0.0
Laboratory	Laboratory	1	Electric Resistance Heat		17.06		1 COP	Dayton		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Laboratory	1	Forced Air Furnace		480.00		0.8 AFUE	Heatco	HDA600CS4	W		No							0.0	0	0	$0	$0	$0	0.0
Restroom	Restroom	1	Electric Resistance Heat		13.65		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Basement	Basement	1	Unit Heater		62.25		0.83 AFUE	Reznor	UDAP75	N		No							0.0	0	0	$0	$0	$0	0.0
Office Foreman	Office Foreman	1	Through-The-Wall HP	2.00	15.35	11.00	6.5 HSPF	LG		B	12	Yes	1	Through-The-Wall HP	2.00	15.35	12.00	3.3 COP	0.2	608	0	$65	$1,065	$0	16.4
Break Room	Break Room	1	Through-The-Wall HP	2.00	14.65	10.80	6.5 HSPF			B	12	Yes	1	Through-The-Wall HP	2.00	14.65	12.00	3.3 COP	0.1	610	0	$65	$1,065	$0	16.3
Storage Room	Storage Room	1	Unit Heater		80.00		0.8 AFUE			B	15	Yes	1	Infrared Heater		64.00		0.93 29.4206968 253968	0.0	0	16	$141	$5,044	$500	32.2

Space Heating Boiler 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)	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office - Boiler Room	Hot Water Heating System	3	Condensing Hot Water Boiler	379	Triangle Tube	Prestige SOLO 399	W		No						0.0	0	0	$0	$0	$0	0.0
OEM - Boiler Room	Hot Water Heating System	1	Non-Condensing Hot Water Boiler	112	Crown Boiler	ABF-140SPD	B	13	Yes	1	Non-Condensing Hot Water Boiler	112	85.00%	AFUE	0.0	0	4	$37	$4,097	$400	99.2

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office Boiler Rm	DHW	16	2	1.00	0.0	0	1	$8	$12	$4	0.9
OEM Bay	DHW	16	8	1.00	0.0	0	2	$20	$46	$16	1.5

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office Boiler Room	Domestic Hot Water System	1	Storage Tank Water Heater (≤ 50 Gal)	Rheem	PROG50-42N	W		No						0.0	0	0	$0	$0	$0	0.0
Chemical Storage	Domestic Hot Water System	1	Storage Tank Water Heater (≤ 50 Gal)	A O Smith	DSE-5-3	W		No						0.0	0	0	$0	$0	$0	0.0
OEM	Domestic Hot Water System	1	Storage Tank Water Heater (≤ 50 Gal)	A O Smith	FSG-40	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Main Office	17	2	Faucet Aerator (Kitchen)	2.50	1.50	0.0	0	0	$4	$14	$4	2.6
Main Office	17	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$7	$14	$8	0.9
Chemical Storage	17	1	Faucet Aerator (Lavatory)	2.20	0.50	0.0	111	0	$12	$7	$4	0.3
OEM	17	3	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	1	$10	$22	$12	0.9

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Main Office	3	Desktop	120			
Main Office	2	Electric Space Heater	500			
Main Office	1	Microwave	1,000			
Main Office	1	Paper Shredder	225			
Main Office	2	Printer (Medium/Small)	245			
Main Office	1	Printer/Copier (Large)	600			
Main Office	1	Refrigerator (Mini)	350			
Main Office	1	Refrigerator (Residential)	550			
Main Office	2	Television	240			
Main Office	1	Toaster Oven	800			
Main Office	1	Water Fountain	292			
OEM	1	Desktop	120			
OEM	1	Microwave	1,000			
OEM	1	Printer (Medium/Small)	245			
OEM	1	Refrigerator (Residential)	550			
OEM	1	Toaster	800			
OEM	1	Commercial Refrigerator	1,500			

APPENDIX B: ENERGY STAR STATEMENT OF ENERGY PERFORMANCE

Energy use intensity (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.

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Woodland Sewer Treatment Plant & OEM Building (Campus)

Primary Property Type: Wastewater Treatment Plant
Gross Floor Area (ft²): 34,739
Built: 1975

For Year Ending: April 30, 2020
Date Generated: October 20, 2021

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
Woodland Sewer Treatment Plant & OEM Building (Campus) 35 Florence Avenue Morris Township, New Jersey 07960	TwpofMorris 50 Woodland Avenue PO Box 7603 Convent Station, NJ 07961 973-326-7360	Timothy Quinn 50 Woodland Avenue PO Box 7603 Convent Station, NJ 07961 973-326-7360 tquinn@morristwp.com

Property ID: 15143545

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
217 kBtu/ft²

Source EUI
509.6 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,947,082 (26%)
Electric - Grid (kBtu)	5,592,127 (74%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	143
National Median Source EUI (kBtu/ft²)	335.8
% Diff from National Median Source EUI	52%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	623

Signature & Stamp of Verifying Professional

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

LP Signature: ____________________ Date: __________

Licensed Professional

____ _______
,
(___)___-_____
____

Professional Engineer or Registered Architect Stamp
(if applicable)

Appendix C: Glossary

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR	ENERGY STAR is the government-backed symbol for energy efficiency. The ENERGY STAR program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp.
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MH	*Metal halide*: a type of HID lamp.
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp.
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money, and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR Portfolio Manager.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
TREC	*Transition Incentive Renewable Energy Certificate:* a factorized renewable energy certificate you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use.
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense®	The symbol for water efficiency. The WaterSense® program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.