9/29/2023

Winter Park East Treatment Plant

ASHRAE Level II Energy Audit

15 lightyears

Energy Testing | Solar Power | Green Certification

TLC ENGINEERING SOLUTIONS

Table of Contents

Executive Summary

TLC Engineering Solutions (TLC) and 15 Lightyears performed an ASHRAE Level 2 facility energy audit of the Winter Park Bongart Plant Lab building as a part of a contract with the City of Winter Park.

This report is related to the energy-consuming systems only and is intended to fulfill the requirements of an ASHRAE Level 2 Energy Audit, per the guidelines set forth by the ASHRAE document "Procedures for Commercial Building Energy Audits". The purpose was to observe existing conditions and gather information that would enable TLC to render an opinion concerning conditions or deficiencies that could affect efficient use of this facility, and to identify potential areas for improvement. Neither the field visits nor this report is intended to uncover hidden defects or the presence of hazardous materials.

TLC reviewed the current utility bills from January 2021 through December 2022, subsequent project documentation, and visited the site in January 2023 to review the mechanical and electrical equipment, the HVAC and lighting controls systems, and observe each space type and its general energy use intensity. In the course of its work, TLC obtained extensive photo documentation of the conditions of the facility. Several of the photographs are included in Appendix B of this report, and the reader is encouraged to thoroughly review the photographs and descriptions, as they are intended to support and supplement the observations described herein.

After the time on site, TLC developed energy saving spreadsheets to assist with the analysis of recommended Energy Conservation Measures (ECMs) and Facility Improvement Measures (FIMs). The combination of all the walkthrough and post-walkthrough activities led to the development of the ECM and FIM list. A complete description and analysis of each ECM, as well as a table summarizing estimated cost and savings of each measure, can be found later in this report in the Energy Saving Opportunities section.

Project Information & Contacts

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General Facility Description

The Bongart Plant Lab is a one-story civic building of approximately 418 square feet. An aerial view of the Bongart Plant Lab is shown below.

Figure 1: Aerial View of the Bongart Plant Lab

The building is used for plant support operations. Spaces within the building include storage, an office, and restrooms.

Mechanical Systems

The majority of the mechanical systems serving the Plant Lab were installed in 2019. Building systems include split-system air conditioning units and exhaust fans. Mechanical system information was obtained via from a combination of resources, including information gathered during TLC and 15 Lightyears' audit walk-through of the building and construction document review. The below breakdown of the mechanical systems and areas they serve is TLC's best attempt to consolidate all avenues of information into one master list.

Equipment Naming Convention

The general naming convention used on the mechanical drawings is shown below. Please note, this convention applies to most of the equipment, but not all equipment.

AHU-1

Equipment Type (ie, AHU = Air-Handling Unit) | Equipment ID Number

Air Handling Units

Air conditioning for the majority of the building is provided by two (2) split-system air conditioners, both with a 3-ton cooling capacity. These units operate in a single-speed manner and are enabled and disabled via the wall-mounted thermostat when a need for heating or cooling is sensed.

Exhaust Fans

The facility includes a rooftop exhaust fan, intended to provide the necessary ventilation for the restrooms within the lab building.

Building Controls

The site is not currently controlled by a centralized Building Automation System (BAS). Each system within the Wellness Place, including all lighting, water heating, and HVAC, is a standalone system. However, the HVAC equipment in the building has been outfitted with an Ecobee smart thermostat, which allows for remote adjustment of temperature setpoints and minimum operation periods, as well as limited operation trending. Additionally, through the Ecobee interface, the units are capable of 7-day setpoint scheduling.

Lighting Systems

Interior lighting throughout the facility is predominantly linear fluorescent fixtures utilizing T8 lamps. The audit team noted that occupancy sensors were in place at the time of the walkthrough to control the lighting within the Lab building.

Domestic Water Fixture (Plumbing) Systems

The building is served by one (1) Electric Water Heater. The water heater has a 42-gallon storage capacity and a heater capacity of 4500 W.

Building Envelope

The building envelope consists of CMU block walls for a portion of the building, and insulated metal walls for the remainder. The roof is a flat, built-up roof construction. During the walkthrough, no building envelope issues were observed in relation to the scope of the energy audit.

Key Operating Parameters

The building is currently operated 24/7 due to the nature of the building mission. From viewing the Ecobee thermostats in the Lab facility, it appears that the building is scheduled to be occupied from 6:30am – 11:30 PM. However, this schedule is not currently utilized to provide energy-saving temperature setbacks.

Site Visit

The site was audited by TLC engineers and 15 Lightyears personnel in January 2023. A full evaluation of existing energy consuming systems, compliant with ASHRAE Standard 211-2019 was performed. During the audit, TLC personnel were escorted by the City of Winter Park Facilities manager, Leif Bouffard. He, as well as any facility staff that were available for comment, were questioned on system operation, condition, and maintenance of the building systems.

Utility Analysis

Historical Utility Data

The building is currently provided with electricity and water utilities. Electrical utility consumption and demand values were provided for the months of January 2021 through Jun 2023. The monthly consumption profile is as expected, where values increase in the warmer months due to cooling needs. No specific costs or utility bills were provided, but a blended rate for kWh savings was determined based on the published rates for consumption and demand. Calculation of the blended utility rate takes into account the non-fixed costs associated with electrical utilities use by the facility, including fuel charges, per-kWh cost, demand charges, etc. Table 3 details the components of the blended rate calculation.

Please note that the utility consumption data provided to the audit team appears to include the entire Bongart Plant site, and does not represent the utilization of the lab building exclusively.

Table 1: Annual Baseline Energy Consumption

Utility	Total
Annual Electrical Consumption (kWh)	820,703
Annual Electrical Cost	-

The following graph and table show the total consumption per monthly billing period for electricity.

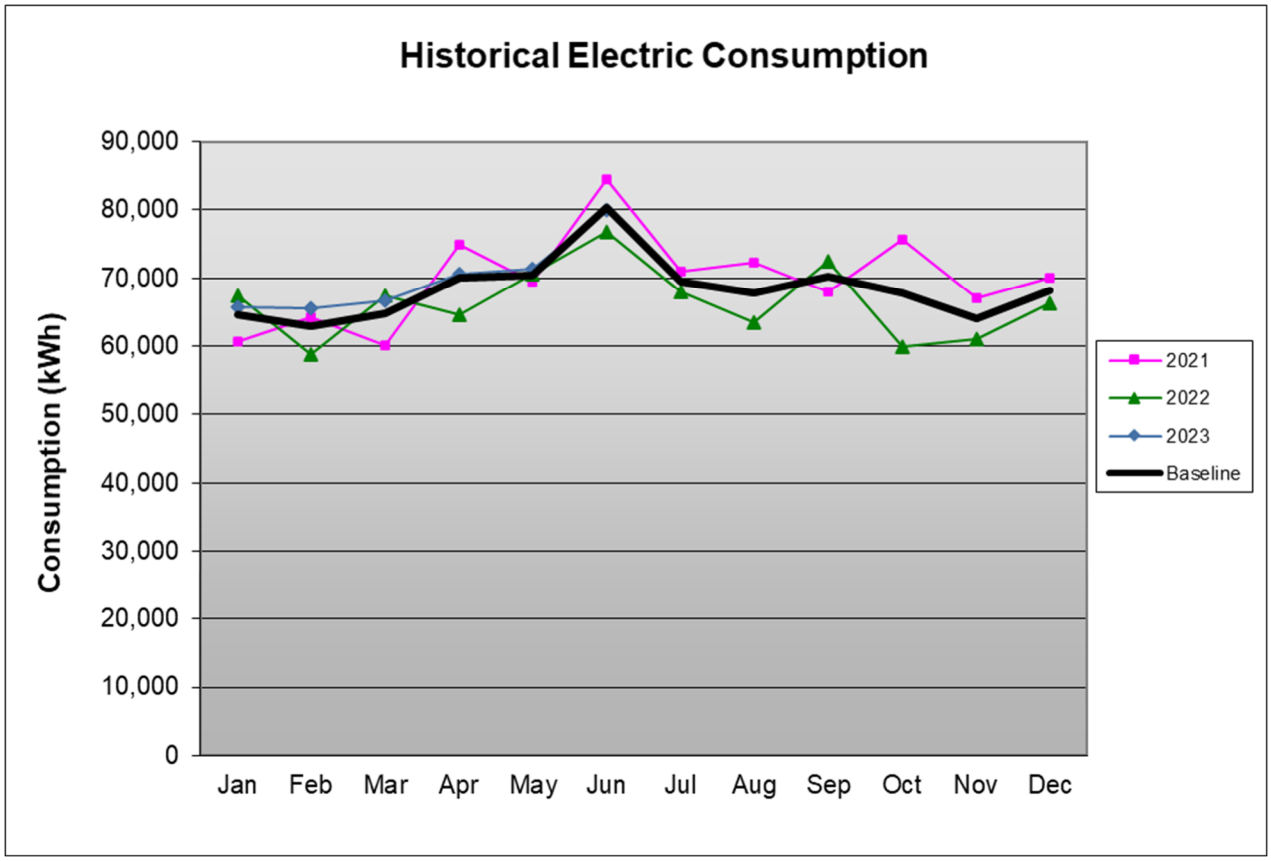


Figure 2: Bongart Plant Lab Electric Consumption

Table 2: Bongart Plant Lab Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	60,640	230
Feb-21	64,280	216
Mar-21	60,040	228
Apr-21	74,920	355
May-21	69,400	278
Jun-21	84,480	364
Jul-21	71,000	318
Aug-21	72,280	246
Sep-21	68,000	244
Oct-21	75,600	240
Nov-21	67,056	253
Dec-21	69,994	250
Jan-22	67,496	227
Feb-22	58,820	318
Mar-22	67,363	621
Apr-22	64,519	473
May-22	[no data]	
Jun-22	76,727	410

Date	Consumption (kWh)	Demand (kW)
Jul-22	68,025	391
Aug-22	63,404	389
Sep-22	72,570	388
Oct-22	59,968	380
Nov-22	61,085	378
Dec-22	66,367	387
Jan-23	65,666	391
Feb-23	65,630	402
Mar-23	66,730	416
Apr-23	70,593	412
May-23	71,447	423
Jun-23	79,910	427

Benchmarking

TLC compared energy consumption for the Bongart Plant Lab Building using common benchmarks to gauge how the site compares to similar ones both regionally and nationally, principally through the use of Energy Star Portfolio Manager. The building's Energy Use Intensity (EUI), which is used by energy engineers to determine overall energy consumption to a common unit of measure, was compared to other similar buildings throughout the United States. The Energy Use Intensity measures annual consumption of electricity per square foot, in kBTU/sf/year.

These benchmark tools were developed by the Department of Energy and are based on feedback from building operators all over the country. Using the utility billing information and observing the system operation allows the energy profiles to be broken down to greater detail. However, due to the nature of the building as a water treatment plant, no baseline for comparison was available.

Based on most recent 24 months of utility data, the calculated EUI of the Swoope Plant is 6,699.1 kBTU/sf. TLC and 15 Lightyears noted that the utility information provided to the audit team seemed to indicate that the entire Bongart Plant is provided with a single meter, so it was not possible to separate the consumption of the Operations Building. Equipment within other locations on the site significantly impacting the EUI calculation include aeration equipment and large pumps operating 24/7. Additionally, the small area of the lab serves to artificially increase the EUI calculation. However, the energy conservation measures detailed in this report will serve to decrease the EUI of the Lab facility itself through efficiency increases.

Utility Rate Analysis

The building is provided with electricity by Duke Energy, following the rate schedule for GSDT-1. The utility rate charges shown below were used to calculate the costs associated with the provided consumption and demand. Energy savings calculated for this building have been assigned a blended rate of $0.1293/kWh, which is the calculated blended rate not including fixed customer charges.

Table 3: Utility Rate Schedule

Description	Charge
Demand Charges:	
Base Demand Charge	$2.12 per kW
Mid-Peak Demand Charge	$4.31 per kW
On-Peak Demand Charge	$1.23 per kW
Energy Charges:	
Non-Fuel Energy Charge:	$0.3276 per On-Peak kWh $0.2696 per Off-Peak kWh $0.01620 per Super-Off-Peak kWh
Fuel Energy Charge:	$0.0685 per On-Peak kWh $0.0561 per Off-Peak kWh $0.0416 per Super-Off-Peak kWh

Average Rates

As noted above, a blended cost per kWh has been calculated from the rate schedule. Savings for this building have been calculated using the blended rate. The following table details the average rate over the period of analysis.

Table 4: Average Utility Rate

Utility	Average
Electricity	$0.1293/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Bongart Plant Lab was observed to offer a few different avenues for improvement. This is to be expected given the age of the equipment itself and how long it has been in service. Improvements can be made by replacing the aging equipment as well as optimizing the control sequences and settings. The following table summarizes the recommended ECMs for this facility that should be considered for future projects. In addition, the table distinguishes between measures specifically intended to save energy (ECMs) and facility improvement measures (FIM) that benefit the overall operation of the facility but may not provide significant energy savings.

Table 5: ECM/FIM Summary

Energy Savings Measure	FIM/ ECM	ECM Category	Annual kWh Savings	Annual $ Savings	Cost $	Payback (years)
Lighting Improvements	ECM	Low Cost	993	$128	$240	1.9
HVAC Controls Optimization	ECM	Low Cost	3,289	$425	$900	2.1
Total			**4,282**	**$553**	**$1,140**	2.1

*ROI calculations exclude capital improvement items, as they are intended more for facility improvement than for energy savings.

The cost and paybacks shown in the table above are estimates based on the information gathered during the auditing process. TLC utilized RSMeans 2023, as well as engineering best practices, to estimate the cost of these suggested measures. Final pricing will vary based on contractors' estimation and final equipment selections. Final payback periods are also dependent on contractor pricing and the facility's negotiated utility price.

Lighting Improvements

General Description

This measure involves converting older style lighting fixtures, such as fluorescent and incandescent, to modern LED lighting fixtures and lamps. Unless a building has been built or renovated in the past few years, it is common to find extensive use of fluorescent and incandescent fixtures throughout the building. Fluorescent and incandescent lighting technologies are a product of their time and often remain without intentional replacement. Older lighting technologies require more wattage to produce the same amount of light as LED fixtures. This also results in a higher heat output from the lamps which raises HVAC cooling costs.

Existing fluorescent and incandescent lighting fixtures will be replaced/retrofitted with new LED lighting fixtures. This will greatly reduce the energy required to illuminate the building. Additionally, cooling systems will have to run less often to offset the heat generated by the lighting. There are several additional benefits to LED lighting technology. LED lighting has longer burn hour life, faster on/off response time, and easier dimming capabilities compared to fluorescent and incandescent technologies. Because LED light fixtures have longer burn hour life, this will reduce the material and time cost of replacing burned out lamps.

Site Specifics

The facility was observed to have predominantly linear fluorescent fixtures with T8 lamps. Existing non-LED lighting will be replaced with new LED lighting on a one-for-one basis. Existing lighting material waste will be disposed of according to local regulations.

Controls Optimization

General Description

The scope for this ECM involves optimizing the building HVAC controls through one or multiple controls strategies. For this project, the controls strategy recommended would be occupancy scheduling with setback temperatures.

Consistent occupied and unoccupied temperature settings will be implemented based on the building type and their needs. Occupied schedules for the HVAC controls will be set up to dictate the hours when the building is considered occupied versus unoccupied. Whenever a building enters unoccupied mode, the building HVAC controls will utilize the unoccupied settings in lieu of the occupied settings.

Site Specifics

The facility is split into two sections, a 24/7 area and a lab area that operates with normal working hours for Monday through Friday. Both areas appeared during the audit to currently be set at 72F on a 24/7 schedule. The lab area would be optimized with controls schedules based on the hours that this is typically occupied. HVAC controls will be given setback temperature settings to use during unoccupied conditions. Operating portions of the building at setback temperatures will result in energy savings due to the HVAC systems not having to work as hard to condition these areas when unoccupied

Calculation Methodology – Spreadsheet System Models

Savings for this report were evaluated using spreadsheet building models for the lighting and HVAC systems. The methodologies used for each measure are described separately in this section. Industry Standard methods of evaluation were used and are detailed in this section. Additionally, assumptions made to calculate the energy savings are detailed.

Lighting Improvements

Savings for this measure have been based on a reduction in the lighting energy based on a reduction in lighting installed wattage. The following table shows the major inputs used in the calculation of savings for this measure.

Table 4: Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area on 24/7 schedule	Entire building	209sf	Provided value
Building Area on M-F 8am-8pm schedule	Entire building	209sf	Provided value
Existing Lighting Power Density	Entire building	1.0 W/sf	Typical value for T8 lamps throughout
Proposed Lighting Power Density	Entire building	0.6 W/sf	Typical value for LED lamps throughout
Annual Burn Hours 24/7	Entire building	8,760	Building schedule
Annual Burn Hours M-F 8am-8pm	Entire building	3,120	Building schedule

Calculations:

Savings for this measure were comprised of energy savings. The energy savings were the difference in the existing and proposed kWh for all the lighting fixtures in the building. The energy usage in kWh for the building was calculated using the following formula.

$$Energy\ Usage = \frac{Building\ Area \times LPD \times Hours}{1{,}000}$$

Controls Optimization

Savings for this measure have been based on a reduction in cooling energy due to setting back non-critical portions of the building that are not always occupied. The following table shows the major inputs used in the calculation of savings for this measure.

Table 5: Controls Optimization Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
% Cooling Energy Reduction	Entire building	5%	Engineering judgment

Calculations:

Savings for this measure were based on calculating the annual cooling energy and saving a percentage of it. The existing annual cooling energy was calculated from the electric utility baseline as the sum of all the electrical consumption for each month exceeding the lowest month's consumption. The following formula was used to calculate existing annual cooling energy.

$$Existing\ Cooling\ kWh = Annual\ Total\ kWh - (12 \times Baseload\ Month\ kWh)$$

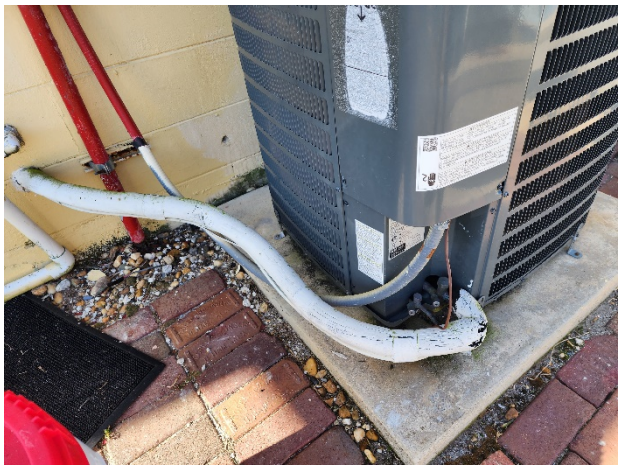
Appendix A – Mechanical Equipment

The following table shows a listing of all recorded major equipment in the building.

Building	Type	Equip	Location Served	Tag	Qty	Capacity	Units	Make	Model	Serial Number	Year
Bongart Plant Lab	CU	Condensing Unit			1	3.0	Ton	Goodman	GSX140361KD	1901181280	2019
Bongart Plant Lab	AHU	Air Handling Unit			1	1/3	HP	Goodman	ARUF37C14AD	1912714640	2019
Bongart Plant Lab	EWH	Electric Water Heater - 42 Gallon			1	4721.0	kWh	Rheem	XE30S06ST45U0	A371406560	2014
Bongart Plant Lab	CU	Condensing Unit			1	3.0	Ton	Goodman	GSX140361KD	2002228683	2020
Bongart Plant Lab	AHU	Air Handling Unit			1	3/4	HP	Goodman	ASPT39C14BA	19122729517	2019

Appendix B– Site Walkthrough Photos

C-1: Exterior of Building



C-2: Condensing Unit (1)

C-3: Interior Lighting

C-4: Air Handling Unit (1)

C-5: Electric Water Heater

C-6: Condensing Unit (2)

C-7: Air Handling Unit (2)