9/29/2023

Winter Park Swoope Water 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 Swoope Plant Operation 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 as-built design drawings dated July 2002, 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. During this time, TLC was granted access to the building automation system to view the operation remotely. 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), Facility Improvement Measures (FIMs), and evaluated BAS trends. 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

ASHRAE Level II Audit of the Winter Park Swoope Plant Operations Building
511 W Swoope Ave, Winter Park, FL 32789

Gloria Eby
Natural Resources and Sustainability Director
geby@cityofwinterpark.org
Office: 407.599.3471

Lisa Pearcy
CEO, 15 Lightyears
lpearcy@15lightyears.com
Office: 855.438.1515

Eric McEwen
Principal, TLC Engineering Solutions
eric.mcewen@tlc-eng.com
Office: 407-487-1240
Cell: 904-635-0129

General Facility Description

The Swoope Plant Operations Building is a one-story civic building of approximately 3,760 square feet. An aerial view of the Operation Building is shown below.

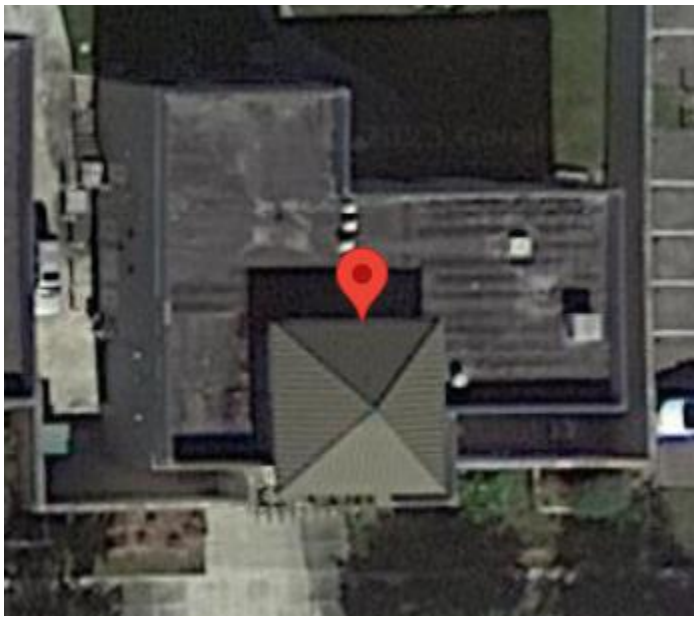


Figure 1: Aerial View of the Swoope Plant Operations Building

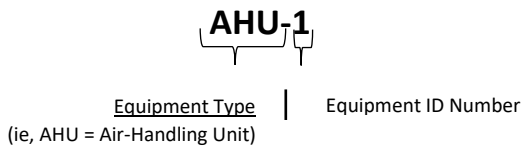
The operations building hosts a workroom, a mechanical room, a generator room, an electrical room, a sodium hypochlorite room, and fluoride room among others.

Mechanical Systems

The Swoope Plant Operations Building features a range of mechanical systems, including split-system air conditioners, a makeup air unit, and exhaust fans. Mechanical system information came from a combination of resources, including information gathered during TLC's audit walk-through of the building and review of the construction documents. 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.



Air Handling Units

Air conditioning for the building is provided by two (2) split-system air conditioning units and one (1) makeup air unit. The makeup air unit, manufactured by Addison, is original to the building's construction.

Exhaust Fans

Exhaust fans were observed on the rooftop, providing general exhaust for restrooms located within the building as well as the chemical areas within the Operations Building.

Building Controls

The building is not currently controlled by a centralized Building Automation System (BAS). All equipment within the building operates as a standalone system, based on the commands of local thermostats and wall switches.

Lighting Systems

Interior lighting throughout the facility is predominantly linear fluorescent fixtures. TLC and 15 Lightyears noted that some fixtures within the facility had been retrofitted with LED lighting technology.

Domestic Water Fixture (Plumbing) Systems

The building is served by one (1) electric water heater. The water heater has a 30-gallon tank capacity and a heater capacity of 4500 watts.

Building Envelope

The building envelope consists of a stucco façade over CMU block walls. The roof is a flat, built-up construction with equipment located on the roof. There were no issues noted in relation to the audit scope from the observable elements of the building envelope.

Key Operating Parameters

The water treatment plant operates 24/7. However, exact occupancy timing of the Operations Building was not known at the time of the audit. Personnel are assumed to be present in the Operations Building from 8 am – 8 pm daily.

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 walkthrough, audit team personnel were escorted by the City of Winter Park Facilities staff. Operations 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 supplied with electricity and water utilities by the City. Electrical utility consumption values were provided for the months of January 2021 through December 2022. The monthly consumption profile is as expected, where values increase in the warmer months due to cooling needs. No billing statements were provided, but a blended rate for kWh savings was determined based on published rates. 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.

Table 1: Annual Baseline Energy Consumption

Utility	Total
Annual Electrical Consumption (kWh)	2,658,550
Annual Electrical Cost	-

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

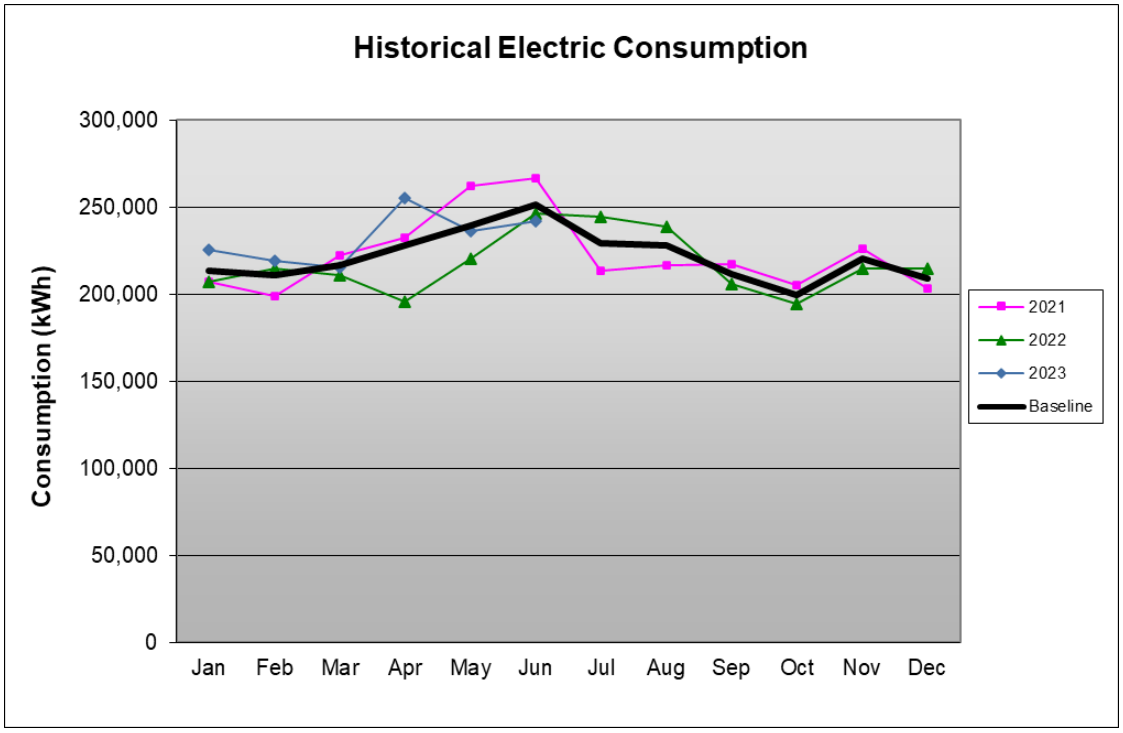


Figure 2: Swoope Plant Electric Consumption

Table 2: Swoope Plant Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	207,000	1,212.00
Feb-21	199,300	1,095.00

Date	Consumption (kWh)	Demand (kW)
Mar-21	222,600	1,146.00
Apr-21	232,500	1,253.00
May-21	262,100	1,284.00
Jun-21	266,700	1,362.00
Jul-21	213,800	1,362.00
Aug-21	216,900	718.00
Sep-21	217,300	443.00
Oct-21	205,100	615.00
Nov-21	226,300	609.00
Dec-21	203,500	637.00
Jan-22	207,500	637.00
Feb-22	214,700	637.00
Mar-22	211,200	637.00
Apr-22	195,700	637.00
May-22	220,800	641.00
Jun-22	246,300	644.00
Jul-22	244,800	644.00
Aug-22	239,200	973.10
Sep-22	205,700	1,302.20
Oct-22	194,500	651.10
Nov-22	215,100	651.10
Dec-22	214,900	651.10
Jan-22	225,500	651.10
Feb-22	219,000	651.10
Mar-22	215,500	651.10
Apr-22	255,500	651.10
May-22	236,300	666.90
Jun-22	241,800	666.90

Benchmarking

TLC compared energy consumption for the Swoope Plant Operations 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 2,397.2 kBTU/sf. TLC and 15 Lightyears noted that the entire Swoope Plant is provided with a single meter, so it was not possible to separate the consumption of the Operations Building. Equipment significantly impacting the

EUI calculation includes oxygen generation equipment and large pumps operating 24/7. The energy conservation measures detailed in this report will serve to decrease the EUI of the facility building through efficiency increases.

Utility Rate Analysis

The building is provided with electricity by the City of Winter Park (CoWP), following their Rate Schedule GSD-1, General Service – Demand. 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 $0.1067/kWh, which is the calculated blended rate not including fixed customer charges.

Table 3: Utility Rate Schedule

Description	Charge
Demand Charge	$5.05 per kW of billing demand
Energy Charge	$0.04216 per kWh
Fuel Cost Recovery Factor	$0.02281 per kWh
Gross Receipts Tax	2.5641%
Franchise Fee	6.00%
Electric Utility Tax	10.00%
EL State Sales Tax (Commercial Only)	7.45% (First $5,000)
EL State Sales Tax (Commercial Only)	6.95% (Over $5,000)

Average Rates

As noted above, a blended cost per kWh has been calculated from the rate schedule. Electric savings for this building have been calculated using the blended rate. .Water rates are based off the utility rate tables from the City of Winter Park under the assumption of a 2” water meter for combined water and sewer under Block 3 pricing. This table outlining these water rates is attached as Appendix D. The following table details the average rates over the period of analysis.

Table 4: Average Utility Rate

Utility	Average
Electricity	$0.1067/kWh
Water	$10.08/kgal

Energy Saving Opportunities

The operation and condition of equipment at the Swoop Plant Operations building 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 kGal Savings	Annual kWh Savings	Annual $ Savings	Cost $	Payback (years)
DX Unit Retrofits	ECM	Moderate Cost		15,107	$1,612	$23,000	14.3
Lighting Controls	ECM	Low Cost	--	2,741	$292	$532	1.8
Plumbing Retrofits	ECM	Low Cost	546	--	$55	$18	0.3
Totals			**546**	**17,848**	**$1,959**	**$23,550**	**12.0**

*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.

DX Unit Retrofit

General Description

This measure proposes replacing existing DX equipment, which is at or nearing the end of its predicted useful life. Direct expansion (DX) air conditioning equipment consists of a refrigerant loop, in which the refrigerant is compressed and expanded at different points of the loop to transfer thermal energy. Typically, a refrigerant coil is placed directly in the supply air stream, where the refrigerant absorbs thermal energy as it evaporates and expands. Thermal energy is rejected at a compressor, where the refrigerant is compressed and condenses, rejecting the heat that was removed from the supply air steam.

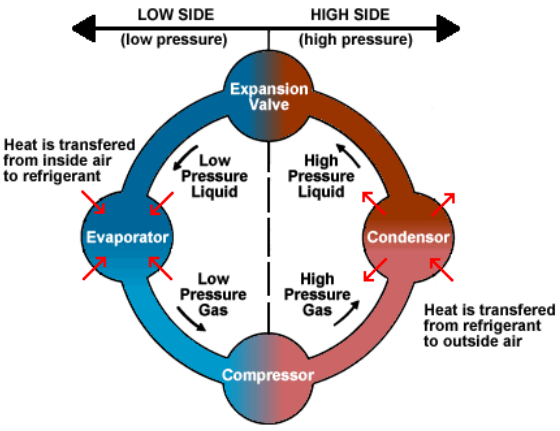


Figure 3: The Refrigeration Cycle

Over time, HVAC units degrade in operational efficiency as coil surfaces oxidize on the exterior and sometimes scale on the interior which reduces heat transfer efficiency. The moving mechanical components also wear, which further reduces the operational efficiency of the equipment. The new equipment will be installed in place of the existing equipment, including providing new refrigerant line sets for all split systems.

Advances in technology and improvements necessitated by energy code updates have led to DX equipment available today with far higher efficiencies than what was used in the past. Replacing the existing systems with new higher efficiency systems will reduce energy consumption and provide improved occupant comfort.

Site Specifics

The Addison condensing unit was observed to be nearing the end of its expected useful life and in need of replacement. This measure proposes to replace the existing condensing unit with a like-for-like replacement. As stated above, the newer system will be more efficient than the existing system and will result in slight energy savings.

Lighting Controls

General Description

This measure encompasses the installation of various lighting controls such as remote wireless controllers, dimming modules, and exterior photocells. Light fixtures within the existing system currently lack such controls options and are controlled only by manual on-off switches or simple timers. These methods are less efficient and may regularly allow conditions for lighting energy to be wasted running at their full output levels or during daylight outdoors.

New lighting controls systems will be implemented in interior and exterior areas suited to the space and usage. These changes allow for occupants to have more efficient usage of light fixtures and more easily create modular groupings of fixtures. Remote controls applications also require less wiring and thus lowered costs for installation, maintenance, and future customization of lighting scenes and groupings. In school and office settings, dimming controls have become more commonplace and are reported to also result in an increase to productivity and comfort levels.

Site Specifics

Even though the building is not occupied on a 24/7 basis, the facility was observed to have predominantly manual on/off light switches as a means of lighting control. During business hours, not all areas of the building may be actively occupied. This building could benefit from the installation of occupancy sensors as a form of lighting control which will allow lighting to shut off in unused areas after a set period of time.

Plumbing Retrofit

This measure involves replacing older style plumbing fixtures that consume a large amount of water in comparison to modern low-flow fixtures. Unless a building has been built or renovated with low water

consumption in mind, it is not uncommon to see standard plumbing fixtures with a higher water consumption than necessary.

Existing high-usage plumbing fixtures will be replaced or retrofitted with low-flow, low water consumption fixtures. This will greatly reduce the water required to operate these fixtures without impacting the usefulness they provide to the building occupants as well as slightly reduce the amount of hot water used in the building.

Site Specifics

The sink faucets in the facility are standard flow rated fixtures. Adding low flow aerators on sink faucets will reduce the gallons per minute flow rate in order to save water. Additionally, energy savings should also be produced in addition to these savings by using less hot water for the sinks.

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.

DX Unit Retrofits

Savings for this measure have been based on an improvement in the efficiency of the DX equipment. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: DX Unit Retrofit Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
2-ACCU-1 Rated Capacity	2-ACCU-1	6.2 tons	Manufacturer info
2-ACCU-1 Existing Efficiency	2-ACCU-1	10.57 SEER	Mfg. info and typical degradation for age
2-ACCU-1 Proposed Efficiency	2-ACCU-1	14.0 SEER	Engineering judgment
Effective Full Load Hours	2-ACCU-1	8,760 hr./yr.	Estimate based on project location

Calculations:

Savings for this measure were based on calculating the energy consumption of the DX equipment with the existing and proposed efficiencies. The unit's energy consumption in kWh was calculated with the following formula.

$$Energy\ Consumption = Tons \times \left(\frac{12}{SEER}\right) \times Effective\ Full\ Load\ Hours$$

In the formula, the terms in the bracket yield efficiency in kW/ton.

Lighting Controls

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 7: Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area	Entire building	3,760sf	Provided value
Existing Lighting Power Density	Entire building	1.0 W/sf	Typical value for T8 lamps throughout
Existing Annual Burn Hours	Entire building	2,430	Building schedule
Proposed Annual Burn Hours	Entire building	1,701	Engineering Judgement

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.

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

Plumbing Retrofits

Savings for this measure are based on a reduction in the water consumption by the replacement of sinks with more efficient fixtures with lower gallons per minute flow rate. The following table shows the major inputs used in the calculation of savings for this measure.

Table 8: Plumbing Retrofits Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Number of people	Entire building	2	Engineering judgement
Minutes of sink use/person/day	Entire building	1.5	Engineering judgement
Existing Sink Flow Rate	Entire building	1.20 GPM	Engineering judgement
Proposed Sink Flow Rate	Entire building	0.5 GPM	Engineering judgement

Calculations:

Savings for this measure were comprised of water savings. The water savings were the difference in the existing and proposed annual water consumption based on assumed annual usage and flow rate of the fixture in GPM (gallons per minute). The water usage for existing and proposed fixtures were calculated using the following formulas for sinks.

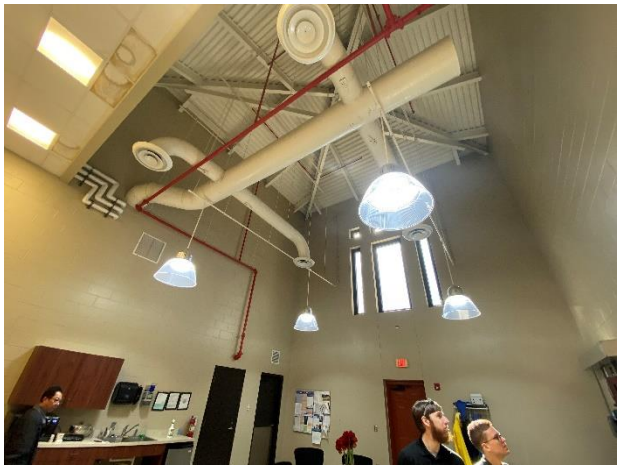
$$Water\ Usage = Number\ of\ people \times GPM \times Minutes\ of\ use\ per\ day \times 365\ days/year$$

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	Age
voope Plant Op Bl	Water Heater	Water Heater	All Areas		1		BTU	RUUD	PE30-2T D	RU 1203B38179	2003	20
voope Plant Op Bl	Makeup Air	Makeup Air Unit		2-MAU-1	1	4.9	Tons	Addison	VCA 071CX4E	0-40104802001	2004	19
voope Plant Op Bl	Supply Fan	SF		2-SF-1	1		HP					
voope Plant Op Bl	Supply Fan	SF		2-SF-2	1		HP	Greenheck	GRS-16-QD	02L16358		
voope Plant Op Bl	Exhaust Fan	EF		2-EF-1	1	1/12	HP	Fiber-Aire	12 WA	C-04-358560-1-1		
voope Plant Op Bl	Exhaust Fan	EF		2-EF-2	1	1/12	HP	Fiber-Aire	12 WA	C-04-358560-1-2		
voope Plant Op Bl	Exhaust Fan	EF		2-EF-3	1	1/8	HP	Fiber-Aire	WA 12	C-04-358560-2-1		
voope Plant Op Bl	Condensing Unit	Air Cooled Condensing Unit		2-ACCU-1	1	6.2	Tons	Addison	RCA071004F	0-40104601001	2004	19
voope Plant Op Bl	Condensing Unit	Split System Condensing Unit			1	3.0	Tons	Goodman	GSX140361KA	1503043402	2015	8
voope Plant Op Bl	Condensing Unit	Split System Condensing Unit			1	7.5	Tons	Daikin	DX11TA0904AA	2201205411	2022	1
voope Plant Op Bl	Air Handler	Air Handling Unit		2-AHU-1	1	1/3	HP	Goodman	ARUF37C14AA	1503205300	2015	8
voope Plant Op Bl	Air Handler	Air Handling Unit		2-AHU-2	1	2.0	HP	Daikin	DAT09044AA	2208464114	2022	1
voope Plant Op Bl	Supply Fan	SF		3-SF-1	1		HP	Greenheck				
voope Plant Op Bl	Rooftop Unit	Packaged Rooftop Air Handling Unit			1	3.0	Tons	Trane	TSC036G4R0A26	214210978I	2021	2
voope Plant Op Bl	Exhaust Fan	EF		3EF-2	1	1.0	HP	Marathon	BVA 56T17D2092J P			
voope Plant Op Bl	Air Conditioner	XR14 Heat Pump			1	2.4	Tons	Trane	4TTR4030L1000BA	21525BD63F	2021	2

Appendix B – Site Walkthrough Photos



C-1: Interior Lighting

C-2: Restroom Fixtures

C-3: Addison Condensing Unit

C-4: Supply Fan

C-5: Exhaust Fan

C-6: Goodman Condensing Unit

C-7: Daikin Condensing Unit

C-8: Trane Rooftop Unit

Appendix C – Water Rates for City of Winter Park

COUNTY

WATER & SEWER (COMMERCIAL & PUBLIC AUTHORITY)

Effective 10/01/2022

DEPOSIT REQUIREMENTS

	3/4" Mtr	1" Mtr	1 1/2" Mtr	2" Mtr	3" Mtr	4" Mtr	6" Mtr	8" Mtr	10" Mtr
Water Service	75.00	100.00	130.00	165.00	270.00	375.00	690.00	Avg x 3	Avg x 3
Water & Sewer Service	145.00	165.00	195.00	570.00	675.00	780.00	1,140.00	Avg x 3	Avg x 3

WATER RATES

Meter Size	Availability (Base)	Block 1		Block 2		Block 3		Block 4		Block 5	
		(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)	(1,000 gallons)	($$ per 1,000)
3/4"	11.87	(4) 1 to 4	1.68	(4) 5 to 8	2.48	(4) 9 to 12	3.55	(8) 13 to 20	4.72	21 & Greater	6.07
1"	29.70	(10) 1 to 10	1.68	(10) 11 to 20	2.48	(10) 21 o 30	3.55	(20) 31 to 50	4.72	51 & Greater	6.07
1 1/2"	59.39	(20) 1 to 20	1.68	(20) 21 to 40	2.48	(20) 41 to 60	3.55	(40) 61 to 100	4.72	101 & Greater	6.07
2"	95.03	(32) 1 to 32	1.68	(32) 33 to 64	2.48	(32) 65 to 96	3.55	(64) 97 to 160	4.72	161 & Greater	6.07
3"	190.05	(64) 1 to 64	1.68	(64) 65 to 128	2.48	(64) 129 to 192	3.55	(128) 193 to 320	4.72	321 & Greater	6.07
4"	296.96	(100) 1 to 100	1.68	(100) 101 to 200	2.48	(100) 201 to 300	3.55	(200) 301 to 500	4.72	501 & Greater	6.07
6"	593.91	(200) 1 to 200	1.68	(200) 201 to 400	2.48	(200) 401 to 600	3.55	(400) 601 to 1,000	4.72	1,001 & Greater	6.07
8"	950.24	(320) 1 to 320	1.68	(320) 321 to 640	2.48	(320) 641 to 960	3.55	(640) 961 to 1,600	4.72	1,601 & Greater	6.07
10"	1,365.98	(460) 1 to 460	1.68	(460) 461 to 920	2.48	(460) 921 to 1,380	3.55	(920) 1,381 to 2,300	4.72	2,301 & Greater	6.07

SEWER RATES

	Availability Charge (Base)		3/4" Mtr	1" Mtr	1 1/2" Mtr	2" Mtr	3" Mtr	4" Mtr	6" Mtr	8" Mtr	10" Mtr
			14.03	35.07	70.14	112.21	224.43	350.67	701.33	1,122.13	1,613.08
	(1,000 gallons)	($$ per 1,000)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)	(Base + Cons)
6.53	1	6.53	20.56	41.60	76.67	118.74	230.96	357.20	707.86	1,128.66	1,619.61
	2	13.06	27.09	48.13	83.20	125.27	237.49	363.73	714.39	1,135.19	1,626.14
	3	19.59	33.62	54.66	89.73	131.80	244.02	370.26	720.92	1,141.72	1,632.67
	4	26.12	40.15	61.19	96.26	138.33	250.55	376.79	727.45	1,148.25	1,639.20
	5	32.65	46.68	67.72	102.79	144.86	257.08	383.32	733.98	1,154.78	1,645.73
	6	39.18	53.21	74.25	109.32	151.39	263.61	389.85	740.51	1,161.31	1,652.26
	7	45.71	59.74	80.78	115.85	157.92	270.14	396.38	747.04	1,167.84	1,658.79
	8	52.24	66.27	87.31	122.38	164.45	276.67	402.91	753.57	1,174.37	1,665.32
	9	58.77	72.80	93.84	128.91	170.98	283.20	409.44	760.10	1,180.90	1,671.85
	10	65.30	79.33	100.37	135.44	177.51	289.73	415.97	766.63	1,187.43	1,678.38
	11	71.83	85.86	106.90	141.97	184.04	296.26	422.50	773.16	1,193.96	1,684.91
	12	78.36	92.39	113.43	148.50	190.57	302.79	429.03	779.69	1,200.49	1,691.44