4.0 GENERAL INFRASTRUCTURE

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UNIVERSITY OF CENTRAL FLORIDA

4.0 GENERAL INFRASTRUCTURE

2025-35 CAMPUS MASTER PLAN UPDATE

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4.1 INTRODUCTION

STATUTE & REGULATION

The General Infrastructure element is required by Florida Statue 1013.30(3). The element must follow the guidelines stated in Florida Board of Governors (BOG) Regulation 21.207:

> "This element ensures the provision of adequate capacity for stormwater management, potable water, sanitary sewer and treatment, and solid waste facilities required to meet the future needs of the university. The General Infrastructure Element shall consist of a Stormwater Management Sub-Element, a Sanitary Sewer Sub-Element, a Potable Water Sub-Element, and a Solid Waste Sub-Element."

NARRATIVE

These plans are intended to ensure that growth does not negatively impact the environment, and that infrastructure and University-provided utility services are not overwhelmed by unplanned development.

Future development shall optimize the use of existing utility infrastructure and utility generation assets. Conserving precious water resources through ongoing collaborative and integrated planning will avoid technical and financial risks, and capacity constraints associated with overburdening the University's generation, distribution, and transmission systems.

Campus development shall adhere to development best practices - meeting or exceeding University and State prescriptive green-building requirements to effectively minimize energy and water consumption These practices will reduce utility demands, the need for additional infrastructure and capacity, and ensure sustainable university growth.

UCF shall continue to apply engineering rigor to all design considerations for energy and water efficiency initiatives implemented in campus facilities. All building systems shall be treated as "utility system assets" in renovation projects resulting in more effective and efficient use of resources to reduce regional resource impacts, campus operational expenses, and overall environmental impact.

STRATEGIC PLAN ALIGNMENT

This element aligns with all four priorities stated in the UCF strategic plan "*UNLEASING POTENTIAL – Becoming the University for the Future.*"

Student Success and Well Being
Well-maintained infrastructure directly impacts the student experience:

- Reliable Power Supply: A reliable electrical system is essential for uninterrupted learning. Students rely on powered devices (laptops, tablets, etc.) for research, assignments, and virtual classes.

- Heating and Cooling: Proper climate control ensures comfort in classrooms, libraries, and dorms.
- Water and Sanitation: Clean water supply and functional restrooms are basic necessities.

Discovery and Exploration
High-quality infrastructure plays a crucial role in supporting research and innovation:

- Laboratories and Research Centers: State-of-the-art labs, technology centers, and collaborative spaces are essential for cutting-edge research, and have intense infrastructure demands.
- Infrastructure for Emerging Fields: As UCF expands its focus on fields like cybersecurity, space exploration, and biotechnology, appropriate infrastructure is vital.

Community and Culture
Infrastructure projects can positively impact the surrounding community:

- Community Spaces: Quality shared facilities (such as event venues, libraries, or parks) can benefit both UCF and the local community.
- Collaboration Opportunities: Infrastructure can foster partnerships with local businesses and organizations.

Innovation and Sustainability
One of the specific goals in the Strategic Plan is to achieve STARS Gold, which offers many points for Operations efficiency. Aligning infrastructure planning with sustainability goals is critical. Implementing energy-efficient systems reduces UCF's environmental impact and costs.

- Green Building Practices: Sustainable construction methods and materials contribute to long-term environmental stewardship and occupant comfort.
- Alternative Transportation: Encouraging biking, walking, and public transportation reduces carbon emissions and expands campus accessibility.

SUSTAINABILITY

Sustainability is integral to UCF's campus development and General Infrastructure. This encompasses energy efficiency, responsible water management, green building practices, and waste management. By prioritizing these aspects, UCF ensures a cost effective, resilient, and eco-friendly campus that benefits both current and future students.

Goals, Objectives and Policies that align with the Sustainability Tracking, Assessment & Rating System™ (STARS)[1] are shown in **green text**, with the specific *Category and Impact Area* and

[1] [1]STARS (Sustainability Tracking, Assessment, and Rating System) is "a transparent, self-reporting framework for colleges and universities to measure their sustainability performance."

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Credit # indicated in parentheses after the Goal, Objective, or Policy.

Specific STARS sections in this element are aligned with the Category and Impact Area, **Operations (OP)**, and with these STARS 3.0 credits:

- **OP-3: Water Use**
- **OP-4: Ecologically Managed Grounds**
- **OP-5: Energy Use**
- **OP-6: Greenhouse Gas Emissions**
- **OP-12: Waste Generation and Recovery**

RELATED ELEMENTS

See 5.0 CONSERVATION for utility use reduction strategies for energy and water conservation.

See 5.0 CONSERVATION for Conservation Easements.

See 8.0 CAPITAL IMPROVEMENTS for projected capital improvements during the planning timeframe.

CONCURRENCY

Concurrency Management Systems are defined in Florida Statute 163.3180 as sanitary sewer, solid waste, drainage [stormwater] and potable water.

UCF has elected to make additional facilities and services subject to concurrency, and included Sub-elements for: chilled water, electrical power, natural gas and telecommunications systems.

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4.2 GOALS, OBJECTIVES, & POLICIES

4.2 Utility Infrastructure Overview

GOAL 1: Develop and manage UCF's utility production, distribution infrastructure, and associated capital assets to support campus needs.

OBJECTIVE 1.1: Ensure that there is adequate and reserve capacity and infrastructure for distribution, transmission, and generation to accommodate growth.	POLICY 1.1.1: Utility infrastructure costs shall be considered as a component of a new building and renovation project budgets. POLICY 1.1.2: No development may be permitted if utility generation, infrastructure, and/or capacity is not available concurrent with the impacts of the development. Fiscal obligations for projects that increase campus capacity of infrastructure will be addressed in the "Utility Master Service-Level Disclosure." POLICY 1.1.3: The University shall transition towards higher-density new construction and renovation practices, seeking to maximize existing space, reduce energy-intensive mixed-use space, and implement alternative lower-carbon and resource-efficient expansion to reduce the capital required to adequately expand utility infrastructure University generation capacity. POLICY 1.1.4: To reduce the impact on greenhouse gas emissions, building operations, and utility costs, Utilities and Engineering Services (UES) shall have first-right of refusal for utility services where production and infrastructure capacity is available, and to all categories of end users and public-private partnerships. Commodities include natural gas, electric, water, stormwater, wastewater, chilled water, and heating-hot water. POLICY 1.1.5: UES is the single point of contact and liaison for all utility distribution design, interconnection, disconnection, expansion, and construction of utility facilities.
OBJECTIVE 1.2: Monitor and inventory infrastructure assets using smart technologies.	POLICY 1.2.1: The University will use GIS mapping to track, maintain, and protect its infrastructure distribution systems. POLICY 1.2.2: The University will implement and maintain smart infrastructure technologies to monitor reliability and efficiency of infrastructure distribution and production systems.

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4.2-A Stormwater Management Sub-Element

NARRATIVE

The University's stormwater system is located within the St. Johns River basin and is regulated by the St. Johns River Water Management District (SJRWMD).

As defined by SJRWMD, stormwater is rainwater that runs off of hard surfaces into the nearest body of water, both natural lakes and/or man-made retention ponds. A stormwater system is a tool for managing that runoff.

As UCF continues to develop, stormwater management remains crucial, as new development increases the risk of flooding through disruption to natural hydrological systems and watersheds.

GOAL 2: Manage stormwater to protect campus populations and facilities, remain sensitive to environmental inputs, and accommodate university growth.

OBJECTIVE 2.1: Pursue low-impact development practices to prevent increases to stormwater runoff.

POLICY 2.1.1: Stormwater retention and detention features shall be incorporated into the design of parks, trails, commons and open spaces, to enhance the recreational or aesthetic value of a site.

(OP-3: Water Use)

POLICY 2.1.2: Native vegetation and/or xeriscaping shall be employed, where feasible, to reduce peak runoff downstream through infiltration and storage.

(OP-4: Ecologically Managed Grounds)

POLICY 2.1.3: Techniques such as infiltration, storage and reuse, bioretention, semi-pervious surfaces, and the reduction of impervious areas shall be used to reduce runoff.

(OP-4: Ecologically Managed Grounds)

POLICY 2.1.4: Any future development that increases the quantity of impervious surface shall report the change in total volume of runoff (in cubic feet) relative to the existing site performance of stormwater runoff, assuming the 95th percentile of rainfall events.

(OP-3: Water Use)

OBJECTIVE 2.2: Use Green Industry Best Management Practices (BMPs) to minimize University-generated stormwater pollutants.

POLICY 2.2.1: The University shall use slow-release fertilizers and/or carefully managed and timed fertilizer applications to ensure maximum root uptake and minimal surface water runoff or leaching into groundwater.

(OP-4: Ecologically Managed Grounds)

POLICY 2.2.2: The University shall perform routine maintenance on its motor vehicle fleet to prevent oil, grease, and other fluids from leaking onto impervious surfaces, where they might be conveyed to surface and ground waters by runoff.

(OP-4: Ecologically Managed Grounds)

	POLICY 2.2.3: The University shall avoid the use of broad-spectrum pesticides, using the least-toxic and minimal applications, aimed at targeted species, when possible. **(OP-4: Ecologically Managed Grounds)** POLICY 2.2.4: The University shall coordinate pesticide application with irrigation schedules to reduce runoff and leaching into groundwater. **(OP-4: Ecologically Managed Grounds)** POLICY 2.2.5: The University shall incorporate features into the design of fertilizer and pesticide storage, mixing, and loading areas that are designed to prevent/minimize spillage. **(OP-4: Ecologically Managed Grounds)**
OBJECTIVE 2.3: Oversee UCF's stormwater management.	POLICY 2.3.1: UES shall maintain all rainwater management facilities, perform monthly inspections, and resolve any issues within three months of identification. POLICY 2.3.2: UES shall perform all subsurface maintenance pertaining to stormwater management including, but not limited to, inlets, manholes, and pipes connecting stormwater movement and drainage. POLICY 2.3.3: UES shall perform all above-ground maintenance pertaining to stormwater, including but not limited to areas of erosion, retention and detention ponds, storm inlets, and environmental permitting.

4.2-B Sanitary Sewer Sub-Element

NARRATIVE	The University operates and maintains its own sanitary sewer collection facilities and transportation network comprising basins, lift stations, force mains, gravity lines, pump stations, and appurtenant equipment to collect and transport effluent to the Iron Bridge Water Pollution Control Facility (Iron Bridge), a regional wastewater treatment plant in Seminole County.
GOAL 3: Ensure that the sanitary sewer system adequately serves current and future campus needs.	
OBJECTIVE 3.1: Maintain the sanitary sewer distribution system and provide capacity to meet current and future needs.	POLICY 3.1.1. The University shall design and construct sanitary sewer distribution system improvements to eliminate system deficiencies, maintain and improve system characteristics, and expand the system to accommodate demand from proposed growth.

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4.2-C Potable Water Sub-Element

NARRATIVE	The University operates and maintains its own potable water treatment plant and distribution system. This system provides campus potable water needs
GOAL 4: Provide quality potable water to the campus with reliable backup sources and capacity for future needs.	
OBJECTIVE 4.1: Ensure that adequate potable water supply and distribution infrastructure is available for new and renovated facilities.	POLICY 4.1.1: The University shall rely upon land uses, the Campus Master Plan (CMP), and Building Programs to address potable water capacity as limited by the SJRWMD. The concurrency management system establishes the statutory mechanism that ensures campus facilities and services needed to support development are available in relation to the impacts of such development. POLICY 4.1.2: Monitor usage of potable water compared to the universities Consumptive Use Permit (CUP), and ensure allowed capacity continues to meet University future needs. POLICY 4.1.3: The campus water system shall have redundant supply and distribution networks. Supply redundancy can be achieved by multiple water plant sources, e.g., Orange County and the Research Park, and by multiple raw water wells.
OBJECTIVE 4.2: Maintain potable water facilities to keep the current quality and quantity of potable water available.	POLICY 4.2.1: The University shall perform annual reviews of major system components of the water supply and distribution system. Review shall include wells, well pumps, water treatment plant components, storage tanks, distribution pumps, backup generators, distribution piping and valves, etc. POLICY 4.2.2: Monitor and maintain the quality and capacity of raw water sources. Bi-annual testing of wells for sediment, water source testing as needed during maintenance. POLICY 4.2.3.: Meet or exceed all pertinent FDEP and EPA water quality requirements by maintaining all regulatory water testing and treatment. POLICY 4.2.4: Address updated EPA guidelines for Per- and Polyfluoroalkyl Substances (PFAS) and disinfection byproducts (DBPs) with new or expanded treatment facilities or new sources of potable water.
OBJECTIVE 4.3: Conserve potable water for human health and advancing research.	POLICY 4.3.1: Regardless of first cost, all new construction and renovations that increase water use shall adhere to the mandatory provisions in the latest *high-performance building standard* and follow the appropriate compliance paths to ensure campus water efficiency and conservation measures are implemented. **(OP-3: Water Use)** POLICY 4.3.2: The University shall first use all available lower-quality sources of water, including reclaimed water, and

	stormwater, before using higher-quality water sources, when possible, as required by the CUP. POLICY 4.3.3: All irrigation and industrial uses of water shall utilize reclaimed water as their primary source, with potable water backup for mission critical facilities, unless reclaimed water has potential to impact campus health and safety. **(OP-3: Water Use)**

4.2-D Solid Waste Sub-Element

NARRATIVE	UCF Recycling has made tremendous strides, diverting more than 30% of solid waste from entering landfills, compared to baseline data of a 5% recycling rate in 2006. UCF implements a single-stream recycling program.
GOAL 5: Plan future campus development to ensure that solid waste collection and disposal, and recycling efforts adequately serve campus needs.	
OBJECTIVE 5.1: Ensure that adequate solid waste collection and disposal capacity can accommodate future demand and development.	POLICY 5.1.1: The University shall continue to assume one or more of the following level-of-service standards: • Multiple weekly waste collections • Approximately 1 pound per day per person of landfill • Approximately 3 pounds per day per person of recyclables POLICY 5.1.2: Future increases in campus waste generation shall be approved only if existing solid waste disposal capacity is already on-line to accommodate the increased need, or additional capacity will be funded and on-line at the forecasted time of need. POLICY 5.1.3: As necessary and appropriate, UCF shall continue to participate in the regional solid waste management and waste reduction strategies undertaken by Orange County. POLICY 5.1.4: The University shall continue to use commercial vendors to collect and transfer solid waste to area disposal sites. POLICY 5.1.5: UCF Recycling shall identify the location of waste and recycling areas, dumpster sizes, and pick-up schedules for new construction.
GOAL 6: UCF will continue to develop a robust recycling program.	
OBJECTIVE 6.1: Promote recycling through education and outreach.	POLICY 6.1.1 The University shall promote ongoing education, awareness, and student involvement to establish practices that align with UCF's waste diversion and recycling initiatives, and the implementation of large-scale recycling programs. **(OP-12: Waste Generation and Recovery)**

POLICY 6.1.2: UCF Recycling shall continue to establish relationships with student working groups and organizations to brainstorm ideas, gather data, and create recycling initiatives.

(OP-12: Waste Generation and Recovery)

POLICY 6.1.3: UCF Recycling shall continue to actively participate on UCF committees and engage with community groups to increase awareness and increase the campus recycling rate.

(OP-12: Waste Generation and Recovery)

OBJECTIVE 6.2: The University shall strive to reach the statewide recycling goal of 75% to reduce the volume of solid waste entering the landfill.

POLICY 6.2.1: UCF shall continue to promote recycling by strategically placing receptacles at campus facilities (inside/outside).

(OP-12: Waste Generation and Recovery)

POLICY 6.2.2: UCF Recycling shall continue to work with departments to properly recycle or repurpose materials that would otherwise be discarded; and promote responsible purchasing plans that minimize waste generation and reduce chemical waste.

(OP-12: Waste Generation and Recovery)

POLICY 6.2.3: UCF shall construct a Recycling Center (as funding becomes available) to centralize recycling efforts, house compactors and equipment, and increase the efficiency of our recycling collection process.

(OP-12: Waste Generation and Recovery)

POLICY 6.2.4: UCF will continue to work closely with contracted haulers and local Recycling Centers to promote remanufacturing and the use of recyclables as a source of raw material.

(OP-12: Waste Generation and Recovery)

4.2-E Chilled Water Production Sub-Element

NARRATIVE

Chilled water for campus cooling is produced at centralized district energy plants, rather than being produced on site at individual campus buildings. Chilled water produced in the district cooling system is distributed through over 15-miles of underground pipes to cool student residence halls, academic, research, administrative, and athletic facilities. UCF's district plants are strategically placed to efficiently service the needs of core campus buildings and reduce building energy consumption. The remaining campus buildings are currently supported by stand-alone chilled water systems, direct expansion HVAC (Heating, Ventilation, and Air Conditioning) units, and ground source heat pumps.

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GOAL 7: Promote district cooling with energy- and economic-efficiency where appropriate within the district energy loop; and maintain capacity for future needs.	
OBJECTIVE 7.1: Invest in chilled water technologies that facilitate economies of scale, otherwise infeasible on a single-building basis.	POLICY 7.1.1: All new construction and renovation projects shall connect to UCF's thermal district energy systems based on the results of a life cycle cost analysis and where geographically feasible. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)** POLICY 7.1.2: Any replacement of HVAC systems not connected to district chilled water must have a life cycle cost analysis done, and be converted to district chilled water if economical, except systems which are backup to district chilled water for mission critical facilities. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)**
OBJECTIVE 7.2. Expand and optimize district chilled water system facilities to ensure the ability to meet future campus demands most efficiently.	POLICY 7.2.1: Chilled water production facilities will be expanded as necessary to meet the demands for all projects planned. POLICY 7.2.2: Chilled water production facilities will be optimized to generate chilled water in the most reliable, economical and energy efficient means possible utilizing controls, thermal energy storage, and any proven technology available. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)**

4.2-F Electrical Power and Other Fuel Sub-Element

NARRATIVE	Primary power to the University is provided by Duke Energy Florida. The University also produces cost-effective electricity to offset purchased electricity.
GOAL 8: Provide cost-effective, reliable, and resilient electric utilities.	
OBJECTIVE 8.1. Maintain and extend reliability and resiliency of the University electric grid.	POLICY 8.1.1: The University will make every effort to collaborate with the utility service provider to configure the campus electric grid in ways to maintain and extend its reliability and resiliency, ensuring capacity is available for future campus demands. POLICY 8.1.2: The University shall investigate opportunities to implement distributed generation and smart grid technologies to provide reliable and resilient electrical services to campus buildings.
OBJECTIVE 8.2. Continue to evaluate and implement distributed technologies	POLICY 8.2.1: Reduce and track purchased energy consumption through conservation, demand side management, fuel-switching and renewable energy initiatives.

that provide the lowest cost of energy and achieve sustainability goals.	• UCF tracks changes in greenhouse gas emissions through time using SIMAP and submits these reports in fulfillment of OP-6 STARS requirements. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)** POLICY 8.2.2: The University shall evaluate lower-carbon distributed generation technologies with higher efficiencies with intent to reduce energy costs, improve infrastructure efficiency, and provide portfolio diversity. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)** POLICY 8.2.3 UCF shall evaluate, with its research partners and utility providers, microgrid technologies that incorporate energy storage and sustainable energy generation, to reduce cost and improve reliability of the campus electric grid. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)**

4.2-G Natural Gas Sub-Element

NARRATIVE	Natural gas provides heating for building domestic water and HVAC systems, and fuel for electricity production. The University owns and maintains the natural gas infrastructure and purchases wholesale natural gas on the open market.
GOAL 9: Provide the campus with fuel to reduce utility expenditure and achieve greater heating efficiencies.	
OBJECTIVE 9.1. Provide a natural gas system to reliably serve the University.	POLICY 9.1.1: Continue to reduce purchased natural gas costs by leveraging competition among natural gas marketers and suppliers through contract negotiations on the open market. POLICY 9.1.2: The University shall use existing and developing technologies to provide additional safety and reliability for the campus systems. POLICY 9.1.3: Any new or replacement natural gas (or any other combustion fuel) equipment must have a life cycle cost analysis done against electric alternatives, and electric must be used, except where cost savings are made by natural gas. **(OP-5: Energy Use)** **(OP-6: Greenhouse Gas Emissions)**

4.2-H Telecommunications Systems Sub-Element

NARRATIVE	UCF IT provides the University with all Information Technology and applications for daily operations. The mission of UCF IT is to support our students, faculty, and staff in achieving their teaching, learning, research, and service objectives by:

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Providing reliable technology solutions and services.

Providing responsive and reliable IT infrastructure and support

Continually assessing and improving our service offerings.

As the primary provider of information technology resources, UCF IT is responsible for designing, installing, and maintaining all IT enterprise systems and support for the UCF community, including Physical Infrastructure (including multiple campuses and over 450+ MDF/IDF's[2]).

- Campus Network - WAN, LAN, WIFI, Cellular Center and Cloud infrastructure.
- Information Security
- Applications

Campus IT enterprise systems shall comply with all University Policies, Section 4: "Technology and Communications." https://policies.ucf.edu/

GOAL 10: Provide an on-campus telecommunications system, which adequately serves future campus population needs.

OBJECTIVE 10.1: UCF shall continue to identify and resolve deficiencies in telecommunications systems, through ongoing inspection and coordination with service providers.

POLICY 10.1.1: The University shall continue to identify, upgrade, repair, and/or replace existing Encased Duct Banks and telecommunications copper, fiber, and Coaxial cables as facilities are added or renovated.

POLICY 10.1.2: The timing and phasing requirements and priorities for the provision of future enterprise IT system improvements shall be driven by the CAPITAL IMPROVEMENTS element.

OBJECTIVE 10.2: Ensure the provision of adequate telecommunications facility services through continued internal funding of improvements and coordination with external service providers.

POLICY 10.2.1: UCF IT shall be responsible for the continued coordination of enterprise IT infrastructure and services that includes staff, vendors, and manufacturers.

POLICY 10.2.2: The University shall establish the following overall implementation priorities:

(1) Continued operations of all UCF IT enterprise systems,
(2) Maintenance of the UCF-owned Maintenance Holes and duct bank system,
(3) Expansion of the existing telecommunications distribution system capacity in order to serve the University more efficiently, and
(4) Expansion of the telecommunications distribution system capacity, including the designation of future demarcation sites to link new development areas/buildings with on and off-campus systems.

[2] A main distribution frame (MDF) is the primary hub that interconnects IT and telecommunication lines coming into a building to the internal IT network via Intermediate Distribution Frames (IDFs) which cross connect from the MDF to remote workstation devices.

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POLICY 10.2.3: The University shall rely upon the land uses identified in FUTURE LAND USE, and projects identified in the CAPITAL IMPROVMENTS and the Capital Improvements Plan (CIP), to coordinate a staged expansion of IT enterprise systems to ensure that an adequate system is on-line at the time of projected increased demand.

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4.3 DATA & ANALYSIS

Capital Renewal and Concurrency Management

Ongoing capital renewal is necessary to provide continued reliable utility services to the campus.

- The University shall continue to identify and reserve funding to facilitate the improvement, expansion, and maintenance of its utility infrastructure, as described in this element.

Concurrency means that adequate facilities and services are in place to serve new development as it occurs.

- The University shall ensure concurrency for capital projects, if and when they are funded. See UCF's Schedule of Capital Projects (SCP) in element 8.0 CAPITAL IMPROVEMENTS for a list of proposed projects through the Horizon Year.

4.3-A Stormwater Management Sub-Element D&A

NARRATIVE

Stormwater is of concern for two main issues, the threat of flood due to volume and timing of runoff water, and potential contaminants and high nutrient content within the water entering the environment. Stormwater management is intended for flood prevention, water drainage, filtration, and for managing water through efficient infrastructure and low-impact strategies.

Campus stormwater is currently managed by Utilities and Engineering Services (UES). The basin and pond locations are maintained within ArcGIS. In the unlikely event that additional stormwater ponds are needed, alternative methods of storage may be used, such as the exfiltration system under Garage H.

STORMWATER ANALYSIS

The Stormwater Master Plan and subsequent stormwater permit were generated in the early 1990s based on projected development within the campus. The University is divided into four major drainage basins and three sub-basins, as shown on Exhibit 4.4-1. Modifications have been made to the master permit as a result of changes in projected growth and development.

The University currently maintains a master stormwater permit (No. 20026) from the SJRWMD. This permit allows for development within designated stormwater basins as it relates to an approved additional impervious area within each basin. Currently, the permitted impervious impacts are monitored by the University and an independent consultant to ensure that permit capacities are not exceeded. The University maintains a current record of existing stormwater facilities and the current permitted impacts available to review for future development. The remaining Impervious Area, available in each drainage sub-basin, is carefully tracked. This information, along with plan data, is maintained by the University and updated as new development impacts the current data.

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The stormwater system functions in accordance with the existing master permit. No adverse impacts have occurred as a result of discharges leaving University property through the stormwater management system.

UCF's stormwater system is in good condition, and its life expectancy is anticipated to exceed 25 years with routine maintenance.

The system's discharge points were selected to minimize impacts to adjacent natural resources. The University has made extensive efforts to reduce impacts to adjacent resources, including construction of stormwater ponds, maintaining and enhancing existing wetland systems by incorporating them into the master drainage system, restricting post development discharge to less than pre-1985 rates, and providing required water-quality treatment.

The University may need to modify the existing master permit to accommodate future expansion in several sub-basins, including the transfer of available impervious areas from one sub-basin to another. SJRWMD has been receptive to transfers, provided the final outfall conditions remain the same and additional treatment is provided in higher pollutant-loading areas.

The University has maintained a stormwater management facility which accommodates and exceeds SJRWMD criteria for preservation, except for Basin 4-F which is allowed to discharge directly into Wetland W-9. This condition was grandfathered by SJRWMD when the master stormwater system was developed and permitted in 1994. The stormwater system enhances the existing wetlands by providing natural hydration to each system to maintain its ecological function. Because the ecological function of the existing wetlands was considered in the original permitting design, the University should also consider habitat enhancements for wetlands and other transitional areas (buffers).

Inventory of mapped distribution assets

Lines	26	Mi.
Combination Inlet	73	Ea.
Curb Inlet	172	Ea.
Grate or Drop Inlet	646	Ea.
Other Inlet	4	Ea.
Yard Inlet	1	Ea.
Pipe Inlet	30	Ea.
Pipe Outlet	120	Ea.
Stormwater Manhole	354	Ea.
Pond Outlet	25	Ea.

Impervious Area

According to the most recent *Stormwater Master Plan Impervious Area Status Report (March 25, 2024*), there are 68 acres of remaining imperious area allowed on campus, subject to the proximity of construction to the drainage area.

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4.3-B Sanitary Sewer Sub-Element D&A

NARRATIVE

Wastewater on campus is collected through various-sized gravity sewer mains that feed from student residence halls, concessions, athletics, academic and research facilities, and retail establishments as well as campus thermal and electrical generation facilities. The effluent is then discharged into underground pumping or lift stations through dedicated force mains on campus, ultimately discharging to the Seminole County/City of Orlando Iron Bridge Water Pollution Control Facility (Iron Bridge).

Twenty-four pump stations collect and lift the effluent out of the low points on campus. The effluent is then pumped through 16" force mains to a demarcation point located at the corner of McCulloch Road and S.R. 434 prior to being pumped to Iron Bridge.

The University also has an extended wastewater collection service area, collecting and transporting effluent outside of the main campus. Municipal wastewater services were not available in the early 1980's, and as a result, the University provides sanitary sewer collection and transportation utility services to Central Florida Research Park (1200-acre campus), a subsidiary of the Orange County Research Development Authority (OCRDA) (1981), and Siemens Quadrangle I (1983).

The expansion of the existing utility distribution network is directly influenced by the location of new buildings on campus. Because the final locations of proposed buildings are unknown, a sanitary sewer hydraulic study and resulting performance model will be necessary. This model will allow the campus and future design engineering teams to evaluate the hydraulic performance of the campus under a variety of load scenarios and peak conditions.

Existing Conditions

The University has a bulk wholesale agreement (2018) with Seminole County to transfer an annual average limit of 1,100,000 gallons per day (GPD) of wastewater to Iron Bridge. UCF may also purchase up to an additional 700,000 GPD until December 31, 2040.

Contractual Obligations:

- Central Florida Research Park Contract: 350,000 Gal/Day
- UCF Hotel Contract: 40,500 Gal/Day
- Siemens Quad 1 Contract: 20,633 Gal/Day

Average UCF use the past 5 years, including contractual customers: is 600,000 Gal/Day. Available Capacity is 500,000.

Capital Renewal Funding (CRF) is required to keep the infrastructure and lift station assets in good condition for its present use, based on facility life cycles.In the event of a power grid interruption or loss of power, sanitary spills could occur, carrying negative risk and consequences from both regulatory and environmental perspectives, as well as public perception.

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Inventory of mapped distribution assets

Gravity Main	7.9	Mi.
Force Main	5.3	Mi.
Service Lines	3.9	Mi.
Plug Valve	11	Ea.
Tapping Valve	11	Ea.
Gate Valve	4	Ea.
Lift Stations	22	Ea.
Manholes	262	Ea.

Future Conditions

The sanitary sewer system at UCF is capable of supporting UCF's projected enrollment. The total current system capacity is 1,100,000 gallons per day, with 500,000 available to the main campus, which is using approximately 188,867 gallons per day. This leaves a substantial available capacity to accommodate future increases in usage. The projected growth in Full-Time Equivalent (FTE) students and employees over the next decade is expected to be within the limits of the existing sewer infrastructure.

4.3-C Potable Water Sub-Element D&A

NARRATIVE

The University owns and operates a water treatment plant that can process up to 3.2 million GPD. This system consists of four wells that pump from the Floridan aquifer to elevated storage tanks (200,000 gal) and ground water storage tanks (100,000 gal), with pump capacity of 2,200 gallons per minute (GPM).

The maximum annual ground water withdrawal from the Floridan aquifer system for commercial, industrial, and institutional use is limited to 385.1 million gallons per year (MGPY).

The domestic water system serving UCF is monitored, controlled, and maintained by the University, and is held to the same rigorous testing standards as municipal water systems under Florida Department of Environmental Protection (FDEP) drinking water standards. Each year, the University provides a Consumer Confidence Report to inform the public about water quality and services delivered.

The University employs an Inter-local Emergency Interconnection Agreement with Orange County Utilities (OCU). A control valve (24") allows UCF to switch to OCU potable water during emergencies. OCU water is then provided through the UCF-owned and -operated booster pumping station, to provide supplemental system pressure.

4.0 GENERAL INFRASTRUCTURE

Existing Conditions – Water Infrastructure

UCF needs a larger groundwater storage tank for furnished water, due to potable water capacity constraints and increasingly stringent water quality parameters, as monitored by the Environmental Protection Agency (EPA).

As regulation requirements continue to become more stringent, the University must prepare for additional advanced treatment to meet the unfunded mandates from the EPA. Over the last several years, the EPA has required UCF to monitor per-and polyfluoroalkyl substances (PFAS) and Disinfection by-products (DBPs). This necessitates additional capital investment into infrastructure, technology, and treatment systems to monitor and collect data and fulfill these requirements.

Campus water pipe distribution extends over 21 miles of the Main Campus, serving the majority of the University along with Siemen's Quadrangle I, and as an emergency interconnection supply to the Central Florida Research Park.

The expansion of the existing utility distribution network is directly influenced by the location of new buildings on campus. Because the final locations of proposed buildings are unknown, a potable water hydraulic study and resulting performance model are recommended prior to approval of any new construction.

Inventory of mapped distribution assets

- Water Lines
- Backflows
- Valves
- Miscellaneous

Core Main	3.2	Mi.
Service Lines	2.9	Mi.
Potable	165	Ea.
Irrigation	1	Ea.
Other	15	Ea.
Fire	78	Ea.
Hydrant	174	Ea.
Hydrants	176	Ea.
Gate Valve	412	Ea.
Tapping	127	Ea.
Butterfly	55	Ea.
Interconnect	19	Ea.
Fire Valves	212	Ea.
Water Meters	237	Ea.
Curb	9	Ea.
Abandoned	7	Ea.

Future Conditions

The analysis of potable water usage indicates that UCF's current infrastructure is well-positioned to support UCF's projected enrollment over the next decade. With a Consumptive Use Permit (CUP) capacity of 385,100,000 gallons per year and a current usage of 238,190,500 gallons per year, there is a significant buffer to accommodate increased demand. The estimated 10-year increase in water use is projected to be manageable within the existing capacity, ensuring that the infrastructure can support the anticipated growth without requiring immediate upgrades. This suggests that UCF's potable water system

	is robust enough to handle the additional load from future development.
Environmental Stewardship and Sustainability	The University should continue to rely upon land use density, high-performance building programs as identified in the CMP, and ongoing implementation of Capital Plans and Programs to address the limited potable water capacity as constrained by SJRWMD. Strategic focus should adhere to the latest green building industry standards to treat water "efficiency first" with respect to conservation initiatives. UCF must holistically evaluate indoor, outdoor, and specialized water uses, while deploying advanced metering infrastructure to protect the Floridan Aquifer and the state's precious water resources. Moreover, the SJRWMD has made an aggressive effort to conserve and protect the Floridan Aquifer since 2001. The University will have to continue to re-prioritize growth needs and capital means to supply these future water demands.
Indoor Water Use Reduction	Potable water usage in buildings constitutes a large portion of freshwater consumption at the University. As campus growth continues to increase, existing campus buildings will require mechanical, electrical, and plumbing renovations and reprogramming in pursuit of pre-eminence. The installation of new plumbing fixtures (urinals, private lavatory faucets, and showerheads) that meet or exceed the EPA WaterSense Label will significantly reduce consumption by as much as 20-50%, when compared to code compliant fixtures. Since 2009, UCF has further reduced fixture and fitting water use from the calculated baseline (code-compliant building) adhering to the latest version of the U.S. Green Building Council's Leadership in Energy and Environment Design (LEED) Indoor Water Use Reduction Water Efficiency credit, achieving 20-52% reduction over the baseline in all new capital projects that are eligible to participate in the program requirements.
Outdoor Water Use Reduction (Irrigation)	The University has transitioned irrigation for much of the campus from potable to reclaimed water; with the exceptions of the Arboretum, where food is harvested for human consumption, and the Recreation and Wellness Center pool perimeter (as required by health codes). Irrigation practices had previously consumed large quantities of the campus's potable water. Landscape and Natural Resources (LNR) has adopted industry best management practices for landscaping. Responsible landscape designs and the use of native, adapted, and drought-tolerant plants have dramatically reduced, and in some cases eliminated, the need for irrigation, while integrating building sites into their surroundings more effectively. Native plants also tend to require less fertilizer and fewer chemical pesticides, which degrade water quality when carried away in stormwater runoff.

Specialized Water Use Reduction (Cooling Tower Water Use)

The campus district chilled water system provides centralized cooling to 58 buildings on the main campus, servicing over five million square feet of space. It employs a refrigeration system that removes heat by an evaporative process through the use of multiple cooling towers located at each of the generation facilities. The water used in the cooling towers would account for over 50% of the University's annual Consumptive Use Permit (CUP) allocation.

Through Seminole County – UCF Bulk Wholesale Wastewater and Reclaimed Water Service Agreement, UCF can receive up to 2M gallons of reclaimed water per day for specialized uses (such as irrigation and the evaporative cooling process) until December 31, 2040.

The University has used reclaimed water to augment the potable water supply required in the cooling towers, thus reducing water consumption against the CUP. Over the past 5 years, UCF has also reduced potable water use in other applications, including 200M gallons per year for irrigation and 30M gallons per year for industrial uses.

Water efficiency and conservation efforts at UCF will require continuous evaluation to identify and implement alternatives to potable water in response to stringent changes made by the Florida water management districts, FDEP's changes in drinking water quality standards, water conservation, changes to the Florida Building Codes, and aggressive reduction efforts championed by national green building standards. Most importantly, water conservation is a mandatory operating condition of the CUP that expires in 2034.

4.3-D Solid Waste Sub-Element D&A

NARRATIVE

The University strives to develop an environmentally- and economically-sustainable materials-recovery program, through campus-wide promotions and recycling opportunities; and be certified as "Zero Waste Campus". Although great progress has already been made, UCF has also partnered with Orange County to work toward a greater impact than just UCF.

- Non-Hazardous Recycling

UCF Recycling Services, a unit of Facilities Operations, operates a robust recycling program. The UCF recycling program includes:

- Plastics #1 through #7 (tubs, jugs, jars, bottles, etc.)
- Mixed Paper (office paper, books, magazines, phonebooks, newspaper, cereal boxes, paper egg cartons, paper bags, milk cartons, juice cartons, etc.)
- Corrugated cardboard
- Glass (bottles and jars)
- Scrap metal (steel cans, aluminum cans, loose metal lids, steel bottle caps, clean balled aluminum foil, empty aerosol cans)

- Hazardous Recycling

EHS recycles hazardous materials that are ignitable, corrosive, toxic, or reactive, specifically:

- Batteries
- Light bulbs and ballasts
- Chemicals (laboratory, housekeeping, landscaping, antifreeze)

- Specialty Recycling

UCF Surplus Property handles the transfer or disposal of property, equipment, or other assets for which the originating department no longer has a justifiable use. UCF Surplus Property collects and repurposes:

- UCF Logo items
- Electronics (E-waste)
- Furniture and large items
- Burn boxes

Surplus property recycling is governed by statutes and regulations including three (3) Florida statutes (F.S. 273.04 Property Acquisition, F.S. 273.05 Surplus Property, and F.S. 273.055 Disposition of State-Owned Tangible Personal Property) and a UCF regulation (7.302 Surplus Property).

Monthly Recycling Rate (FY 2023)

The recycling rate is the monthly percentage of solid waste diverted from the landfill and recycled.

January 2023	28.36%
February 2023	26.24%
March 2023	26.75%
April 2023	27.50%
May 2023	22.05%
June 2023	33.11%
July 2023	38.24%
August 2023	25.01%
September 2023	32.97%
October 2023	30.05%
November 2023	26.28%
December 2023	48.84%
Recycle percentage FY 2023 (Rounded)	**30.45%**

4.0 GENERAL INFRASTRUCTURE

Recycling & Solid Waste Data (Jan-Dec 2023)

Recycling & Solid Waste Figures CY January - Dec 2023	Running Total Weight (lbs)
Scrapmetal - Tin (lbs)	17,600.00
Surplus (Pounds Sold)	296,411.04
Surplus (Pounds Recycled)	0.00
Single Stream Recycling (lbs)	205,240.00
Cardboard (lbs)	621,906.00
Ballasts (lbs)	2,478.00
Lamps (lbs)	12,405.60
Batteries (lbs)	6,337.00
Oils (lbs)	3,424.75
Hazardous Waste (lbs)	39,338.00
Tires (Pounds Sold)	0.00
Pallets - Wood (lbs)	0.00
Yard waste (lbs)	1,154,499.96
Donations (Housing)	10,622.00
Mattresses (Housing)	2,805.00
Mixed Recycling/Construction Debris (lbs)	526,340.00

4.3-E Chilled Water Production Sub-Element D&A

NARRATIVE

Chilled water demand is evaluated in terms of capacity (tons of refrigeration) and flow, measured in GPM. Historically, the peak summer demand (August and September) for refrigeration (cooling) of campus is approximately 10,000 tons, serving the energy needs of 58 campus buildings with over five million gross square feet.

Environmental Stewardship and Sustainability

A robust district energy system is both necessary and integral to keep up with campus demands, providing the necessary flexible platform to integrate multiple resources (combined heat and power, and thermal-energy storage) to provide the University with a more resilient, efficient, and sustainable campus and support the core missions of research and education.

The District Energy approach of generating chilled water centrally is more energy-efficient than using in-building equipment; thus, environmental impacts are reduced. Greater efficiencies are possible when using larger, more efficient equipment and with the ability to stage equipment to match the load while remaining within its highest efficiency range. The district cooling system allows UCF to incorporate peak shifting technologies such as thermal energy storage, to reduce the cost of purchased electricity.

As UCF centralizes its approach to cooling campus buildings, and phases out in-building equipment, there will be less use of refrigerants that can potentially affect the ozone layer and contribute to global

warming. Additionally, the University must inventory, manage, and track refrigerants for regulatory and compliance purposes. Many refrigerants are being commercially phased out as part of the Montreal Protocol.

Economic Benefits

The University's district energy plants provide economic benefits, including, but not limited to:

- Realizing fiscal economies of scale, when compared to the more conventional, decentralized approach.
- Achieving higher thermal and emission efficiencies than stand-alone equipment.
- Reducing and eliminating the need for building engineers and operators for in-building HVAC (Heating, Ventilation, and Air Conditioning) systems.
- Reducing property and liability insurance costs with the elimination of in-building equipment.
- Reducing noise associated with in-building equipment.
- Freeing up space for the building's intended use; and
- Providing asset redundancy to ensure campus cooling.

District energy operations at UCF function to provide greater asset availability. The criterion for evaluating this paradigm is to allow for one machine to be out of service for maintenance, and for a second machine to fail during campus peak cooling demand. This is commonly referred to as having a firm capacity of N+2, where "N" is the number of machines available for use, and N+2 is the total number of machines.

District Energy Plant (DEP) Capacities

Description	Plant Capacity	Build-Out Capacity
DEP I	8,000	8,000
DEP II	4,000	4,000
DEP III	4,000	4,000
DEP IV Cooling Capacity	4,000	8,000
DEP IV Heating Hot Water Capacity Installed	5,257MBh	10,514 MBh
DEP IV Heating Hot Water Capacity Available	2,628MBh	
Peak Cooling Demand	15,000	
Available Cooling Capacity (N+2)	490	
Subscribed Cooling Capacity	510	
Total Refrigerated Tons (RT)	20,000 RT	24,000 RT

Existing District Energy System

The campus is served by four (4) central chilled water generation facilities through a network of below-ground district chilled water piping systems that span 15 miles on campus. District Energy Plants (DEP) I-IV were built in 1966, 1994, 2008, and 2018, respectively.

The district piping systems are circuitous in nature, following the circular configuration of the campus topography, roads, and walkways. Pipes are composed of high-density polyethylene (HDPE) and ductile iron, with the some of the oldest being asbestos concrete pipe.

Cooling energy from the district energy system is distributed through district piping systems to the buildings on campus. Most campus buildings are also equipped with tertiary pumps, piped in series with the DEP distribution pumps. The tertiary (building) pumps respond through local controls unique to each respective building's piping circuit. Building pipe pressure is monitored to increase or decrease flow rates corresponding to the cooling demands of each building.

A small number of campus buildings are not equipped with tertiary pumps, but rely on the district piping system pressure, which is generated through the distribution pumps.

The University constructed a three-million-gallon thermal energy storage (TES) tank in 2009, which stores and cools water at less-costly off-peak electric rates (at night). The water is discharged during the on-peak hours, or when campus electrical demand is highest. This allows the University to realize considerable savings by shifting approximately two megawatts of electricity to off-peak and lower demand periods, by storing chilled water for campus cooling demands.

In 2017, to improve the reliability metrics of chilled water distribution, UCF and Duke Energy Florida partnered to separate the distribution feeders at each chilled water generation facility into three (3) separate feeds. In the event of a momentary outage or power outage on the commercial grid, this reduces the negative risk associated with interruption of environmentally sensitive cooling and dehumidification of campus buildings.

Inventory of mapped distribution assets

Return	8.2	Mi
Supply	8.1	Mi
Hot Water	1.3	Mi.
Chilled Water Valve	373	Ea.
Hot Water Valve	28	
Chilled Water Vault	35	
Hot Water Vault	16	

Infrastructure Improvements

Much of the original chilled water distribution from the 1970s, about 3.4 miles, is made up of asbestos concrete pipe that should be phased out due to age, surface corrosion, operator safety, and deterioration. Underground asbestos does not pose a threat to health and safety while it is in place, but working on the material requires special mitigation procedures to avoid exposure.

Much of the original chilled water distribution from the 1970s, about 3.4 miles, is made up of asbestos concrete pipe that should be phased out due to age, surface corrosion, operator safety, and deterioration. Underground asbestos does not pose a threat to health and safety while it is in place, but working on the material requires special mitigation procedures to avoid exposure.

To prevent HVAC equipment from fouling and organics from forming in the evaporative distribution network, distribution flow rate must be a minimum of 5 feet/sec. Several portions of campus are well below the desired flow rate. To combat this issue, right-size piping is necessary to replace existing pipe, in addition to adding hydraulic flow relief through new infrastructure to support the system's peak cooling loads.

Distribution capacity is at its limit in some areas on campus where growth is expected, new lines are being installed in these areas to accommodate the expansion. Other areas have had no chilled water infrastructure and have been dependent on air-cooled chillers or heat pump equipment. Some of this new distribution infrastructure will be used to connect existing buildings to chilled water as the existing equipment comes to its end of life.

4.3-F Electrical Power and Other Fuel Sub-Element D&A

NARRATIVE

The University purchases electricity from Duke Energy Florida through a Time-of-Use (TOU) tariff for General Service Time of Use (GSDT-1) and Stand by Service (SS-1). As such, the energy and demand components of the University electric billing is further apportioned by an on-peak period and a base period, and is categorized according to season; March through November (summer) and December through March (winter).

An important operating characteristic of TOU rates is that electric utilities target or define certain hours by season, month, and period, with the intent to incentivize customers to reduce energy consumption and/or demand with tiered rates. Weekends and select holidays are considered base hours, the lowest rates.

The University owns and operates a 5.5-megawatt (MW) Combined Heat and Power (CHP) Plant, employing a natural gas combustion reciprocating engine to provide on-site electrical and thermal

generation. Due to overall efficiency of the CHP, lower natural gas price prices, and generation of power on campus, UCF has avoided purchasing more of its electricity from Duke Energy.

Existing Conditions of the Electrical Infrastructure

Duke Energy Florida feeds power to UCF through two of its owned and operated substations: UCF South (near Facilities and Safety) and North (near the stadium). UCF's strategic planning for future load growth necessitates close collaboration with Duke Energy to ensure seamless scalability and sustainability. Presently, the feeders dedicated to serving UCF collectively have an approximate capacity

4.0 GENERAL INFRASTRUCTURE

of 80 megawatts (MW), while UCF's campus peak demand approaches 24 MW.

The UCF-Duke Energy commercial grid distribution system was designed with multiple redundancy features. Manual switching options allow for each substation (and its respective circuits) to carry the full UCF electric load. The switching capabilities also facilitate maintenance functions and minimize the duration of electrical outages.

The University leases equipment from Duke Energy, including approximately 82 medium voltage distribution switches and approximately 189 distribution transformers. Duke Energy charges UCF approximately $50k per month. The lease fee covers existing Duke Energy equipment (distribution switches and transformers) and new equipment as required (or as requested by UCF) to meet electrical power and distribution requirements. The lease is periodically adjusted based on equipment changes (new additions, replacement / repairs and removals).

Radial circuits are a type of electrical distribution configuration where power flows from a single source, such as a distribution board or transformer, outward to various endpoints or loads. In this setup, each endpoint is connected directly to the source, forming a radial pattern resembling spokes on a wheel. While simple and easy to install, radial circuits are susceptible to single points of failure. If any part of the circuit experiences a fault or failure, it can disrupt power supply to all downstream endpoints connected to that radial. This vulnerability underscores the need for more resilient configurations, such as looped circuits, which can maintain power supply even if one section of the circuit is compromised. Most of the facilities are on looped circuits, but there remain 8 radials on non-critical facilities.

Distribution transformers in need of attention are classified into the following groups, along with the quantity of each:

- Tier One: Radial services needing conversion to loops. (5)
- Tier Two: Radial services that may not require conversion to loops. (7)
- Tier Three: Radial services that are disconnected and do not require looping. These units are slated for removal. (5)

The substations have ~70% capacity available at peak, so there are no anticipated transmission needs for any future growth.

Inventory of mapped distribution assets

Electric Manholes	72
Electric Switchgears	82
Electric Transformers	189

The Combined Heat and Power plant (CHP) is approaching half of its expected useful life and continues to provide an educational living lab for students and cost savings to the university. Manufacturer service contracts and regular maintenance ensure continued reliable operations.

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The university maintains approximately 120kW of PV solar installed on campus. Of the two primary sites, the Garage B solar is about halfway through its useful life, and the solar charging system is at its end of life. An additional 150kW of PV solar is being built as part of a research microgrid project, with a 500kW/1000kWh battery energy storage system (BESS) and more.

Energy Storage and Smart Grid Projects

UCF is well-positioned to become one of the most electrically efficient, reliable, and resilient institutions in the country, while also bringing significant economic benefit and reduction of carbon emissions. Most importantly, these improvements can be interactively integrated with the teaching and research mission of the University, resulting in a world-class showcase of advanced energy technology.

This opportunity presents at a time when several developments have converged to offer all institutions improvements in various energy system attributes, including an unsubsidized cost of energy from PV systems that is competitive with traditional fossil-fueled generation; reduced electric energy storage costs in batteries; and dramatic improvements in the efficiency of major electric loads.

The campus grid is effectively that of a small city, with many commuting workers, full-time residents, and significant electric and critical loads. There are many benefits of operating as a microgrid.

The campus has several existing buildings that are solar-ready – the rooftop structure and electrical gear are compatible with the installation of PV panels and interconnecting equipment with little modification. The buildings and estimated generating capacities for this effort are:

- Trevor Colburn Hall: 380 kW
- Research 1: 170 kW
- Band Building: 165 kW

Other existing buildings with substantial generating potential will have their structural and electrical systems modified and upgraded to accommodate rooftop PV installation. These buildings and their estimated generating capacities are:

- Millican Hall: 172 kW
- Nicholson Fieldhouse: 901 kW
- Wayne Densch Sports Center: 555 kW
- Recreation and Wellness Center: 533 kW
- Nicholson School of Communication: 339 kW
- Parking Garage top decks fitted with structures to support the PV panels and provide shaded parking beneath, for a total combined array size of 13,700 kW.

Several of the campus stormwater retention ponds could support Floating Photovoltaic (FPV) systems, by covering about 60% of the pond surface with solar arrays. Benefits of FPV include efficiency gains due to lower cell temperatures; reduced balance of system costs associated with land costs and control of vegetation; improved water quality; reduced evaporation rates; and avoidance of land-energy

	conflicts. The estimated total combined array size for potential retention ponds (including 1-F, 4-B2, 4-B1, 2-H, and 1-D) is 2,480 kW. There are occasionally opportunities provided by the local utility providers for opting into community solar programs. In these programs, utility scale solar is constructed and maintained by the utility provider off campus, and a modified rate is used to provide that solar energy to a customer. The result is functionally renewable energy, reducing volatility of electric costs, and in some cases reduced cost of electric utilities; all while requiring no capital expense from the university.
Environmental Stewardship and Sustainability	The University must shift its paradigm toward carbon-free distributed generation facilities with higher efficiencies; thereby reducing energy cost; improving infrastructure resiliency through grid-strengthening projects; and providing portfolio flexibility with campus energy mixes deploying both smart and microgrid applications, as well as renewable energy. More information on conservation efforts and emerging technologies can be found in element 5.0 CONSERVATION, Conservation of Energy.

4.3-G Natural Gas Sub-Element D&A

NARRATIVE	UCF owns, operates, and maintains a natural gas distribution network on campus, and distributes gas supplied by TECO Peoples Gas through more than 24,000 linear feet of low-, medium-, and high-pressured pipeline. The system serves academic and research buildings, food service operations, and the combined heat and power plant. Secondary services supplied, owned, and operated by TECO Peoples Gas includes much of Greek Park, Knights Plaza, Towers I-IV, Additions Arena, and UCF Athletics on the north end of campus. Because natural gas is deregulated in Florida, UCF has been able to reduce its natural gas costs by leveraging competition among natural gas marketers and suppliers through contract negotiations on the open market. Natural gas provides greater efficiencies than electricity when comparing their use for the same applications. Due to its lower cost, natural gas is used as a primary fuel source to power UCF's combined heat and power plant; feed boilers for domestic hot water heating, building heating and dehumidification processes; and to operate gas appliances in kitchen and concession areas. The University's natural gas system is designed and sized to service only the UCF campus but may be expanded to serve the demands created by its future growth. The expansion of the existing gas utility distribution network is directly influenced by the location of new buildings on campus. Because the final locations of proposed buildings and renovations are unknown, a natural gas analysis shall be completed using GasWorks to

understand the distribution pressure relationships and system performance scenarios prior to approval of any new construction.

Regular maintenance ensures the integrity and reliability of the distribution system, as well as compliance with safety regulations and industry standards. The university contracts out annual valve maintenance of valves within the natural gas distribution system as required. This addresses regulatory compliance, valve inspection, testing, repair, and replacement, as necessary.

The university operates and maintains cathodic protection systems used to mitigate corrosion and protect underground metallic structures within the natural gas distribution network. This includes monitoring the effectiveness of cathodic protection measures through periodic inspections and testing. monitoring in identifying and addressing corrosion-related risks, safeguarding infrastructure longevity, and ensuring regulatory compliance.

The main gas distribution on campus is up to 100psi, which is necessary to operate the Combined Heat and Power Plant. A study was completed that indicates the pressure on the distribution system downstream of the CHP could be reduced to 35psi without impacting service. Lowering pressure reduces the risk of leaks and potential hazards associated with higher pressure systems. Avoiding natural gas applications where possible would reduce the risk of safety hazards, such as gas leaks and carbon monoxide poisoning, while also promoting energy efficiency and decreasing greenhouse gas emissions.

Inventory of mapped distribution assets

Main	9.8	Mi.
Service Lines	2.1	Mi.
Gas Meters	45	Ea.
Gas Valves	124	Ea.

4.3-H Telecommunications Sub-Element D&A

A facility capacity analysis, by geographic service area indicates capacity surpluses and deficiencies.

- **Existing conditions**

Existing conditions, based on the facility design capacity and the current demand on facility:

The UCF IT Enterprises systems consists of an underground network of encased duct banks and maintenance holes interconnecting the majority of the buildings on the Main Campus: and several satellite campuses. This interconnection of Telecommunications utility pathways serves all buildings and major Nodes.

All UCF IT Enterprises systems and services are distributed over the campus fiber optic backbone, throughout the encased duct bank system. Services such as Voice, CATV, emergency services, data network (wired and wireless) are all delivered over the fiber backbone along with associated network electronic equipment.

These systems are maintained through a fiber mesh topology that terminates at seven geographical nodes throughout all campuses. Each of these demarcation points contain network border and WAN equipment that interconnect through a ring utilizing Florida Lambda Rail's Internet and Research capabilities

In addition, UCF IT:

- Maintains detailed sub-system drawings in CAD, Bluebeam, and other map applications.
- Has GPS coordinates for all maintenance holes and encased duct bank paths.
- Has performed first responder, cellular, and WIFI mapping for all campus locations.

In 2024, UCF IT continued to focus on reducing duplicative systems and applications that create additional system administration and expense to the university.

UCF IT enhanced the former Telecommunications Master Plan to include annual lifecycle IT enterprise system expense that contains all physical layer infrastructure, network, data center, audio visual, and peripheral devices. These lifecycles are structured around UCF IT Standards and Guidelines for all IT enterprise systems.

- **Future Planning to the Horizon Year**

UCF IT expects to continue the use of the existing fiber optic cabling and reduce the overall amount of copper cabling between a Node and building.

- However, technological advancements or new service requirements cannot always be predicted and may involve a change in current plans.
- The use of encased duct bank facilitates low-cost changes of cable media between buildings.

UCF IT will continue to evaluate

- The general performance of existing telecommunications systems and facilities,
- The adequacy of the current level of service provided by the facility,
- The general condition and expected life of the facility, and
- The impact of the facility upon adjacent natural resources.

UCF IT will continue to design, install, and support the telecommunications infrastructure throughout all campus locations. The level of service provided will remain high.

UCFIT will remain the sole owner-provided locator of underground telecommunications utilities, with respect to Sunshine811 compliance.

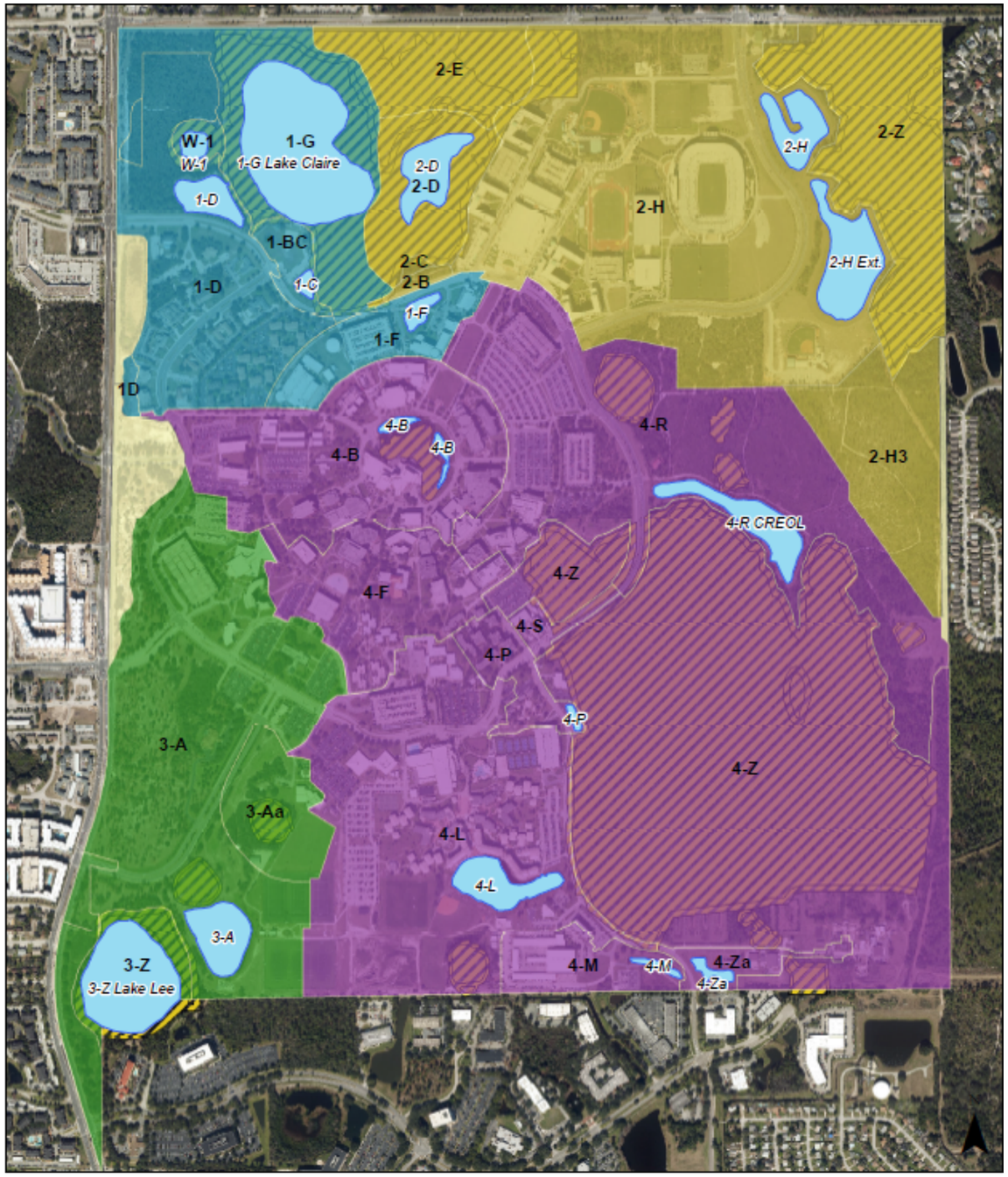
4.4 EXHIBITS

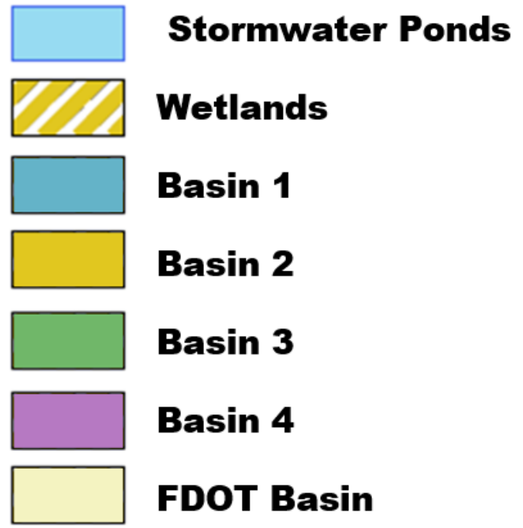
Exhibit 4.4-1 Stormwater Basins, Ponds & Wetlands Map
Exhibit 4.4-2 UCF Stormwater Master Plan Map

The following UCF Maps are restricted for security purposes:

Sanitary Sewer Infrastructure Map
Solid Waster Infrastructure Map
Potable Water Infrastructure Map
Telecommunications Infrastructure Map

Exhibit 4.4-1
Stormwater Basins, Ponds & Wetlands Map





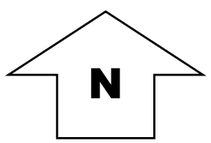
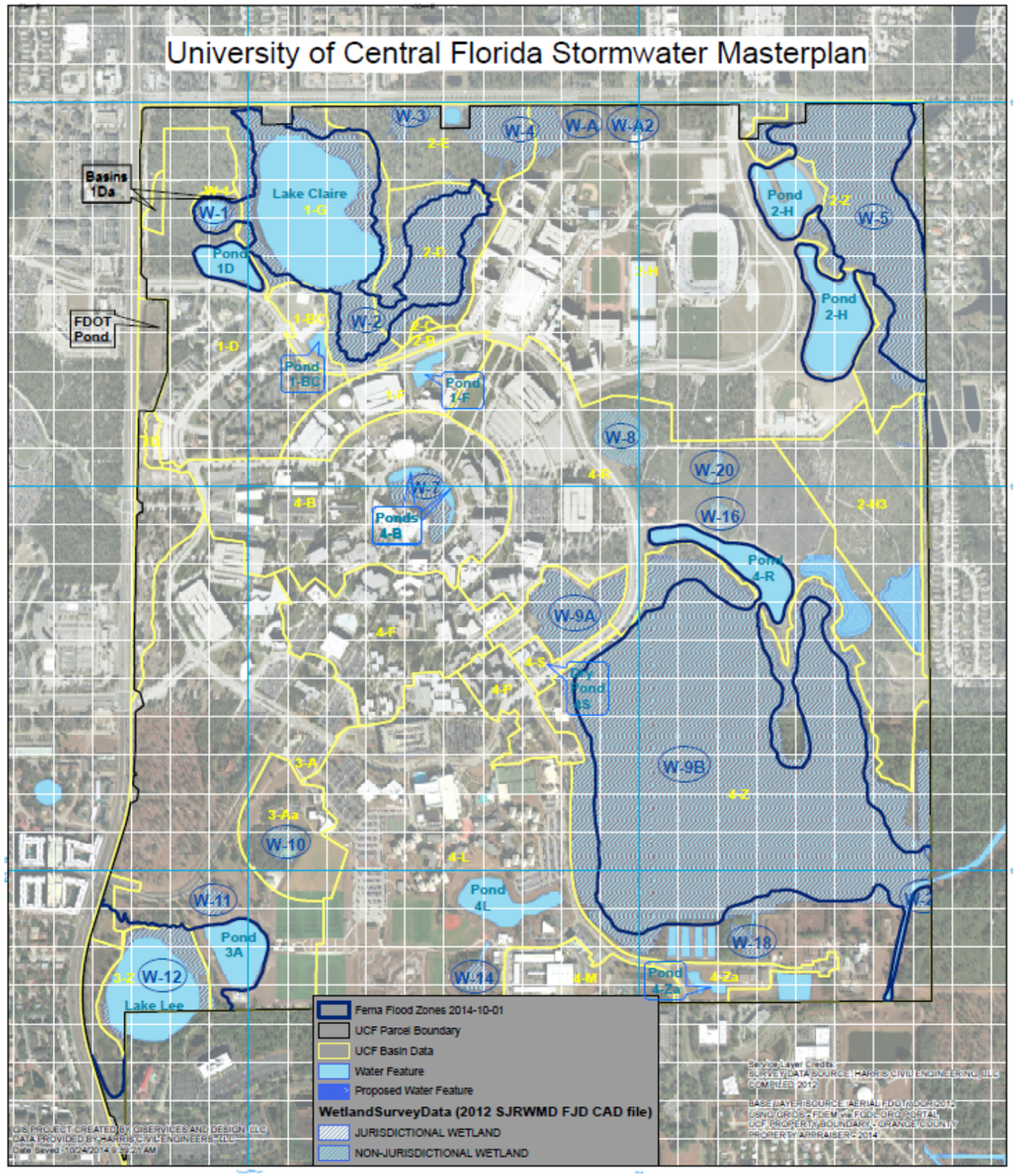


Exhibit 4.4-2
UCF Stormwater Master Plan Map



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OVERALL BASIN BREAKDOWN		
TOTAL DRAINAGE AREA	1173.25	acres
ONSITE AREA NOT INCLUDED	26.07	acres
OFFSITE AREA INCLUDED	(1.62)	acres
TOTAL UCF BOUNDARY AREA	1197.70	acres