The WaterHub® – On-Site Reuse at UT Austin

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On-Site Reclamation and Reuse

Decentralized Systems for Blackwater Capture, Treatment, and Beneficial Reuse

Problem Solving Tool For:

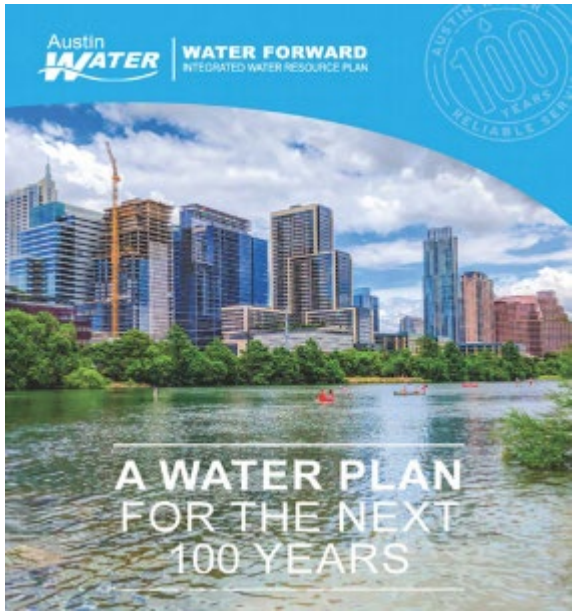
Capacity Constraints

Resiliency Against Aging Infrastructure

Mitigate Rising Water & Sewer Rates

Conservation Goal & KPI Attainment

New Regional Vision for Decentralized Reuse



Policy Change in Austin to Promote Reuse

Austin Water Put Up Rather Than Shut Up

The University of Texas at Austin Project

CLIENT TYPE
Public University

LOCATION
Austin, TX

PROJECT DESCRIPTION
District-Scale Wastewater Reclamation and Reuse

HYDRAULIC CAPACITY
1,000,000 GPD

FOOTPRINT
15,000 ft^2

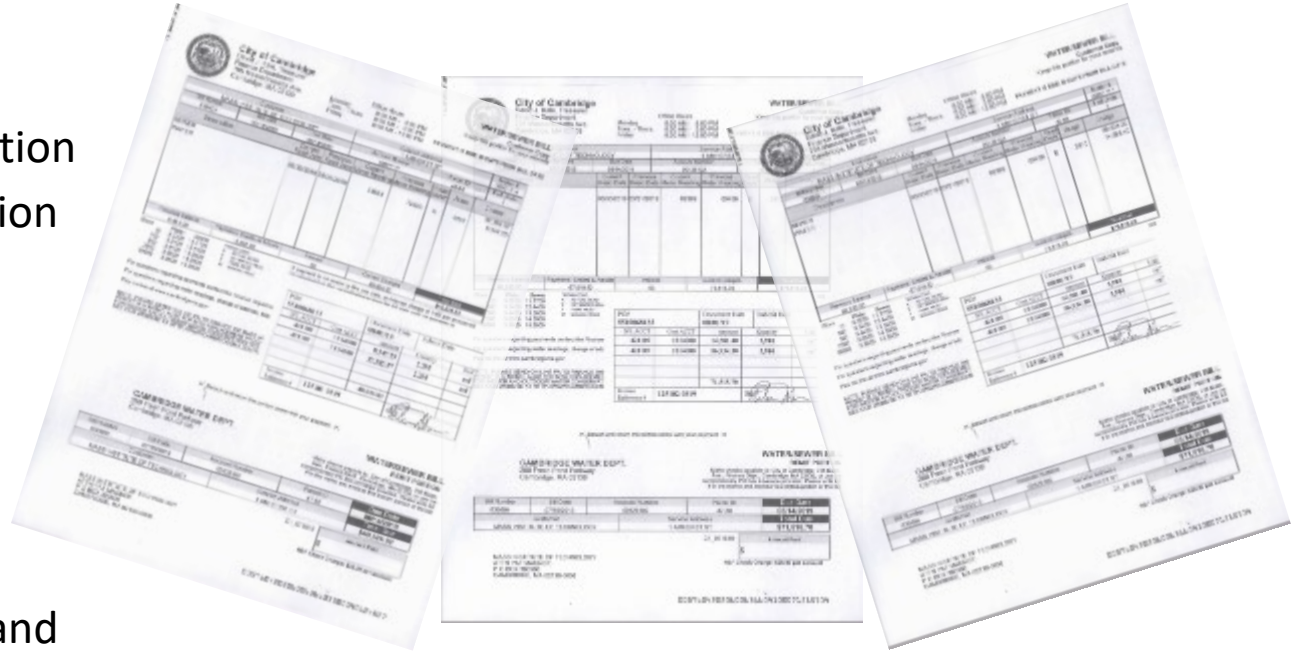
COMMERCIAL OPERATION
Spring 2021

END USES
Cooling Tower Make-Up
Boiler Make-Up

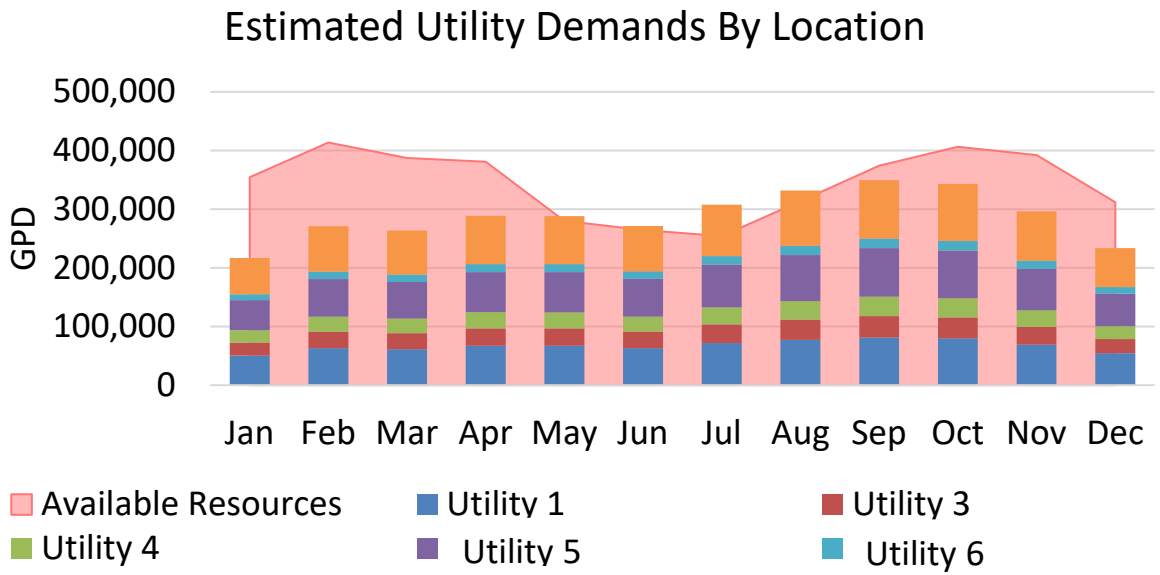
TECHNOLOGIES APPLIED
Hydroponics
Membrane Bioreactor (MBR)
Reverse Osmosis

Preliminary Assessment Data Request

- **Water Use (3 years)**
  - Total campus inbound water by Month and Location
  - Chiller Plant/Cooling Tower Make-Up by Month and Location
  - Boiler Make-Up/ Power Block Usage by Month and Location
  - Irrigation by Month and Locations
  - Any Supplemental Sub-Metering Data



- **Economics (3 years)**
  - Recent Water & Sewer Bills
  - Internal OPEX Breakdown for Potable Water Production and Wastewater Pretreatment inclusive of:
    - Energy
    - Manpower
    - Chemical
    - Repair/Replacement



- **Wastewater and Quality Testing**
  - Current Industrial Discharge Permit
  - Historical Groundwater Influent Quality Testing
  - Wastewater Influent and Effluent Quality Testing
    - Industrial and Sanitary

Procurement Process at UT-Austin

Texas Comptroller of Public Accounts
Glenn Hegar

DBOO - District-Scale Water Reclamation and Reuse Facility

Status: Closed **Solicitation ID:** 18UTL006

Response Due Date: 4/13/2018

Response Due Time: 2:00 PM

Agency Number: 721

Days Solicited: 21+ Days for Solicitation Notice

Solicitation Posting Date: 3/5/2018

Last Modified: 4/13/2018 2:00 pm

Solicitation Description: The University is seeking qualified teams indicating their interest and qualifications for the design, build, own and operation of a district-scale water reclamation and reuse system. This document provides preliminary project details to solicit information related to proposed technology, system design and cost from qualified respondents. The full project details and specifications will be presented in a Request for Proposal (RFP), which will be issued to prequalified Respondents only. A pre-submittal conference will be held at the time and location described below. March 19, 2018 at 2:00 PM local time The University of Texas at Austin Utilities and Energy Management Department 215 East 24th St, PPE Rm. 3.304 Austin, Texas 78712

Class/Item Code: 90922-Building Construction, Non-Residential (Office Bldg., Etc.)

Attachments

#	Name	Description
1	ESBD_File_125545_DB RFQ.pdf	DBOO - RFQ
2	ESBD_File_125545_Addendum#1.pdf	Addendum#1
3	ESBD_File_125545_Exhbit H-Bldg Construction Revised 09182017.docx	HUBH
4	ESBD_File_125545_Exhbit h-Professional Services 08042017 #2.docx	HUBh

REQUEST FOR QUALIFICATIONS FOR
DESIGN/BUILD/OWN/OPERATE

The University of Texas at Austin
District-Scale Water Reclamation and Reuse Facility
RFQ No.: ***18UTL006***

RFQ SUBMITTAL DUE DATE: ***Apr. 13, 2018***

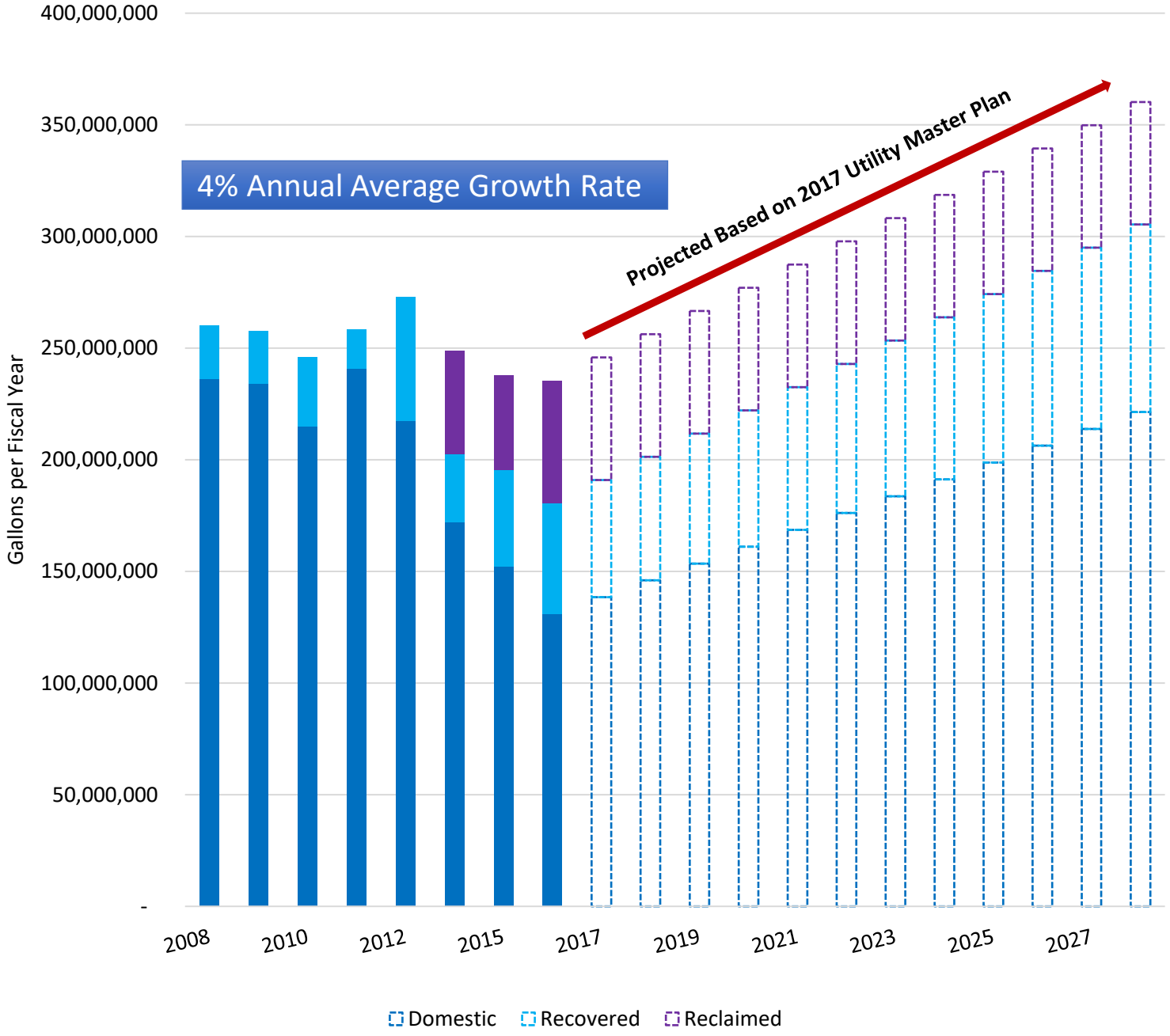
RFQ ISSUE DATE: ***March 5, 2018***

Prepared By:
Ken Bonin, Contract Administrator
The University of Texas at Austin
BFS - UEM
215 East 24th Street
Austin, Texas 78712
512-232-6296
ken.bonin@austin.utexas.edu

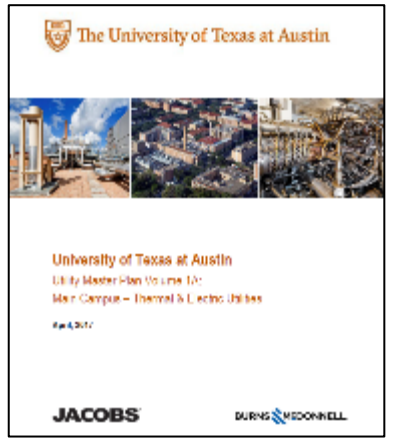
Detailed Feasibility Study

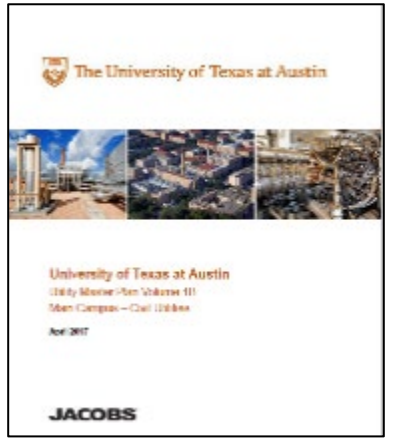
- **Existing Conditions Assessment**
  - Water Balance & Demands
  - Site & Infrastructure Review
  - Utility Water Audit / Review
  - Future Demand / Load Forecasts
  - Water Supply Resiliency Review
- **Supplemental Field Investigation**
  - Validate process / Cooling makeup
  - Wastewater Flow Monitoring
  - WW Characterization
- **Establishing the Vision**
  - Opportunities & Constraints
  - Campus Sustainability / Resiliency Goals
  - Developing a Basis of Design for Systems
- **Concept Design**
  - Site Plan
  - Conceptual Layout & Design
  - Water Supply Resiliency Assessment
  - Preliminary Constructability Review & Budget
  - Lifecycle Economics

Projected Chilling Station Demands



TEXAS
The University of Texas at Austin

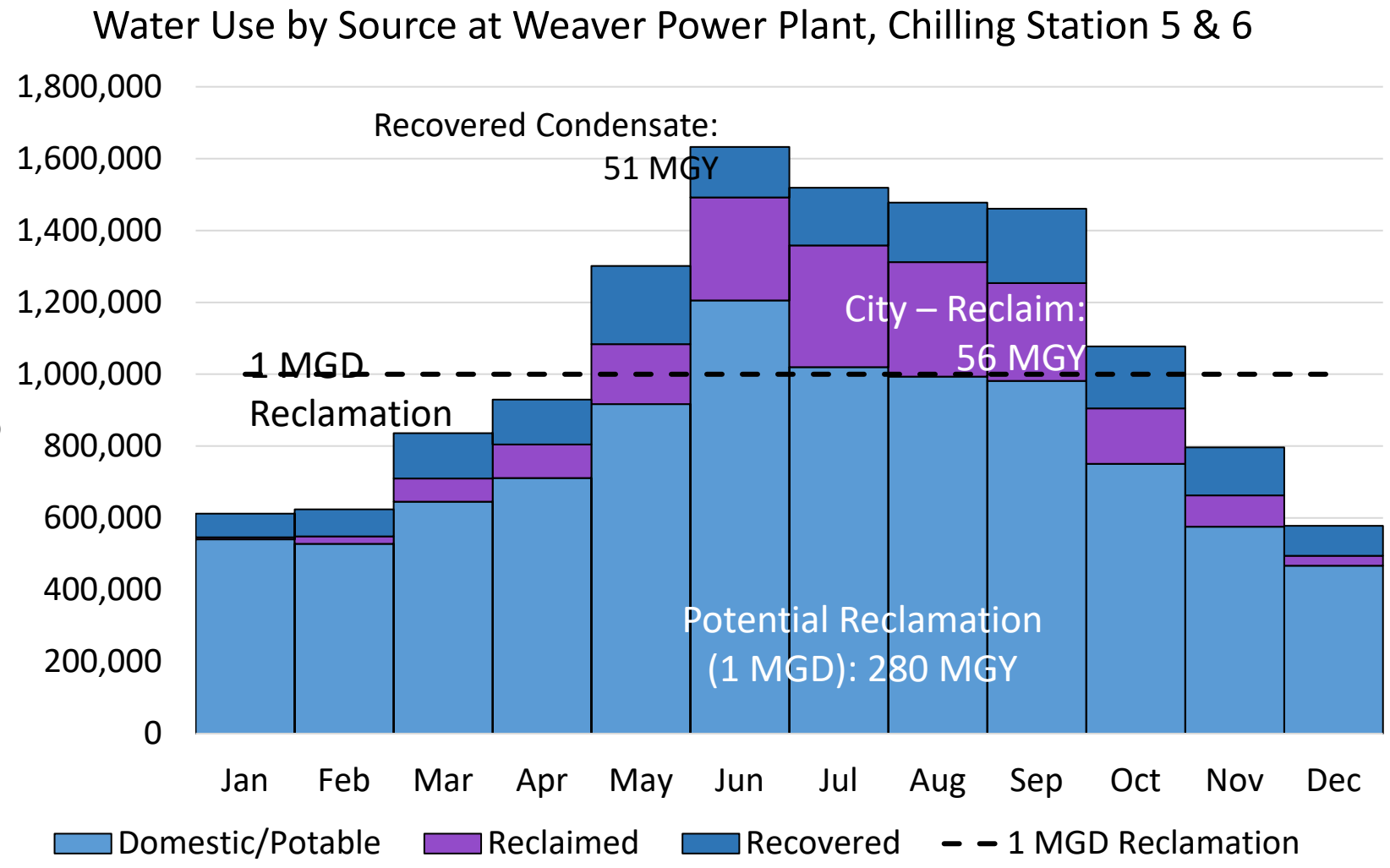




Projected Chilling Station Demands

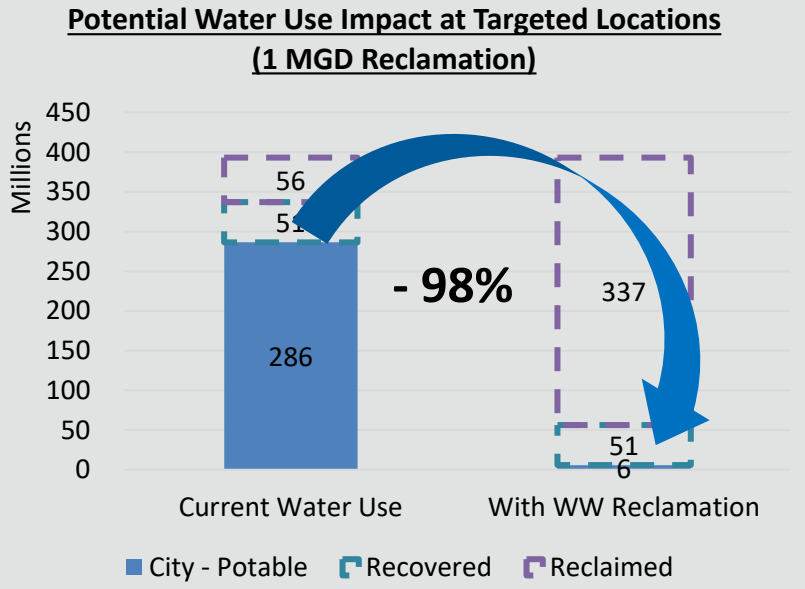
- **Based on 2017 Utility Plan**
  (does not include Weaver PP)
- **2016 Demand**
  - 31,328 Peak Tons
  - 235 MGY cooling m/u
    - Domestic: 131 MGY
    - Recovered: 49 MGY
    - Reclaimed: 55 MGY
- **2028 Cooling Projections**
  - 53% Increase
  - 47, 675 peak tons
  - 360 MGY cooling m/u
    - Domestic: 221 MGY
    - Recovered: 84 MGY
    - Reclaimed: 55 MGY

TARGET LOCATIONS: SEASONAL DEMAND

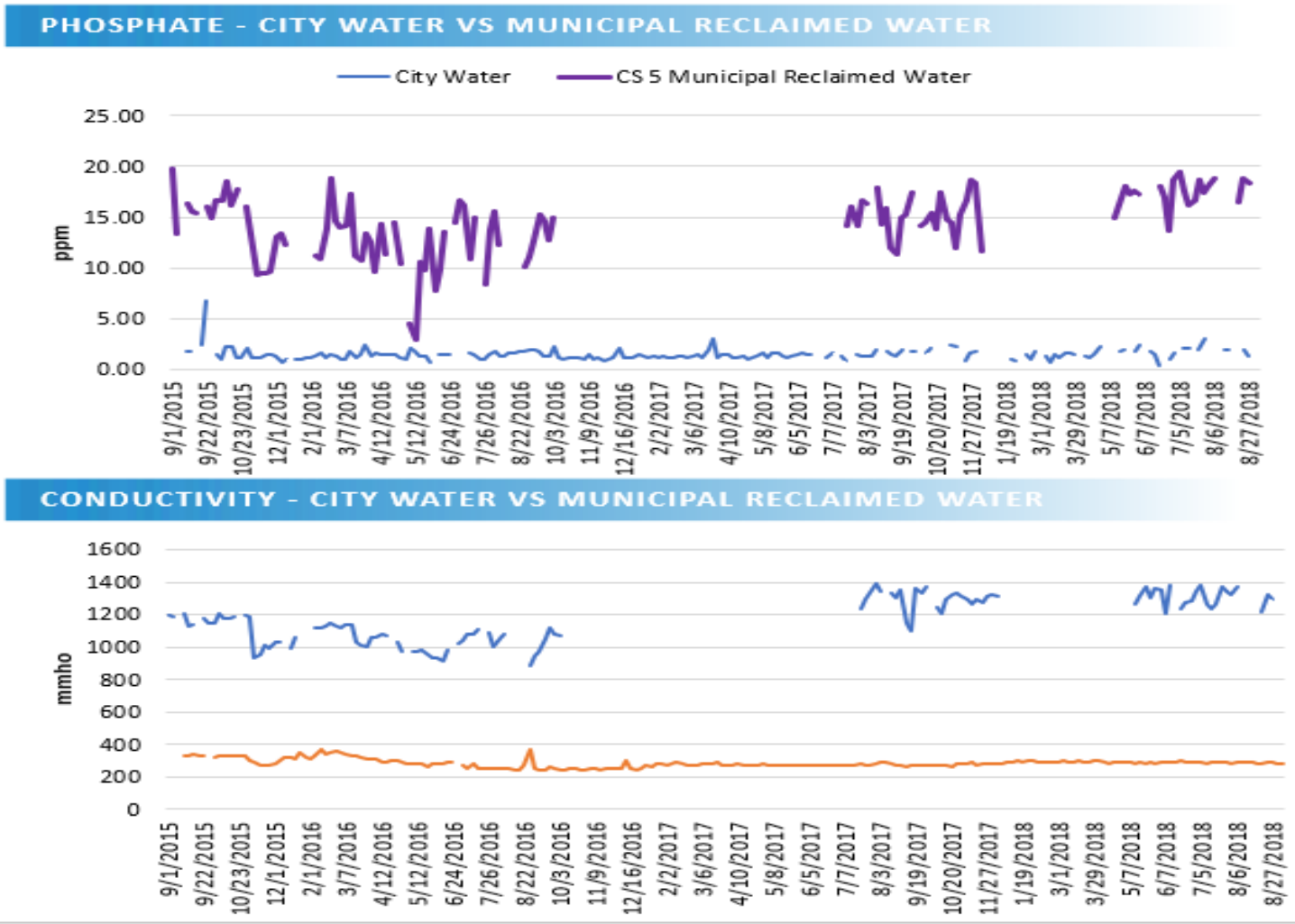


WASTEWATER REUSE

- Virtually eliminates potable water use at Power Plant, CS 5 & 6
- Designed to work with existing water supplies seasonally



CITY WATER VS CS5 RECLAIMED WATER



UTILTIY WATER QUALITY (FY16-FY18)

Phosphorus Results:

City Water
- *Average:1.46*
- *Min: 0.4*
- *Max: 6.8*

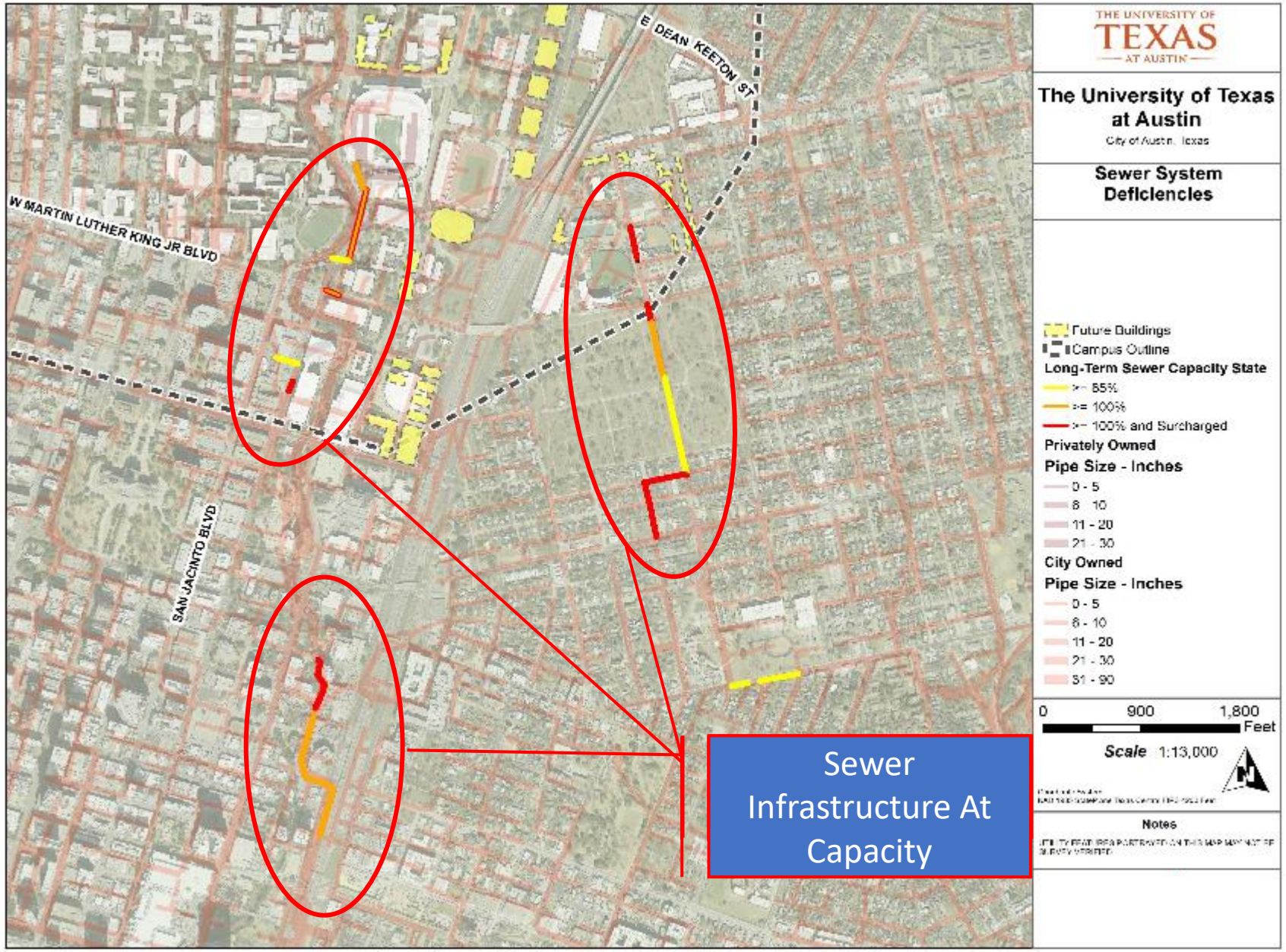
CS 5 Reclaimed Water
- *Average: 14.42*
- *Min: 2.86*
- *Max: 19.8*

Conductivity Results:

City Water
- *Average: 284.9*
- *Min: 240.5*
- *Max: 370*

CS 5 Reclaimed Water
- *Average: 1,170.63*
- *Min: 888*
- *Max: 1,393*

DOWNSTREAM SEWER CAPACITY



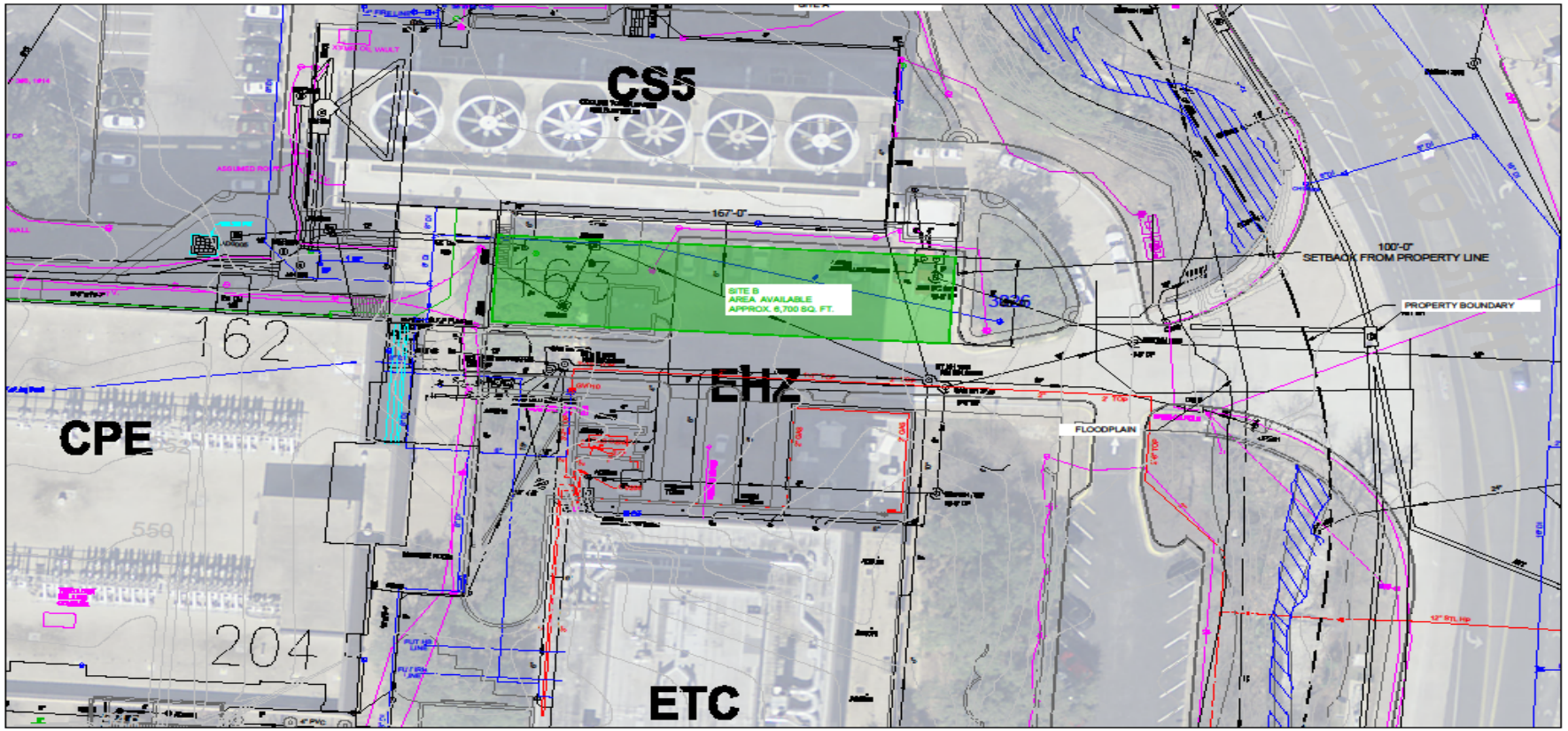
TEXAS
The University of Texas at Austin

DOWNSTREAM CAPACITY

Currently Under Sewer Constraints

- 6.5 Million GSF of Proposed Development
- Over $3 Million of Recommended Sewer Improvements (Jacobs – 2017 Utility Master Plan)

ADDITIONAL FIELD INVESTIGATION AND CAD REVIEW

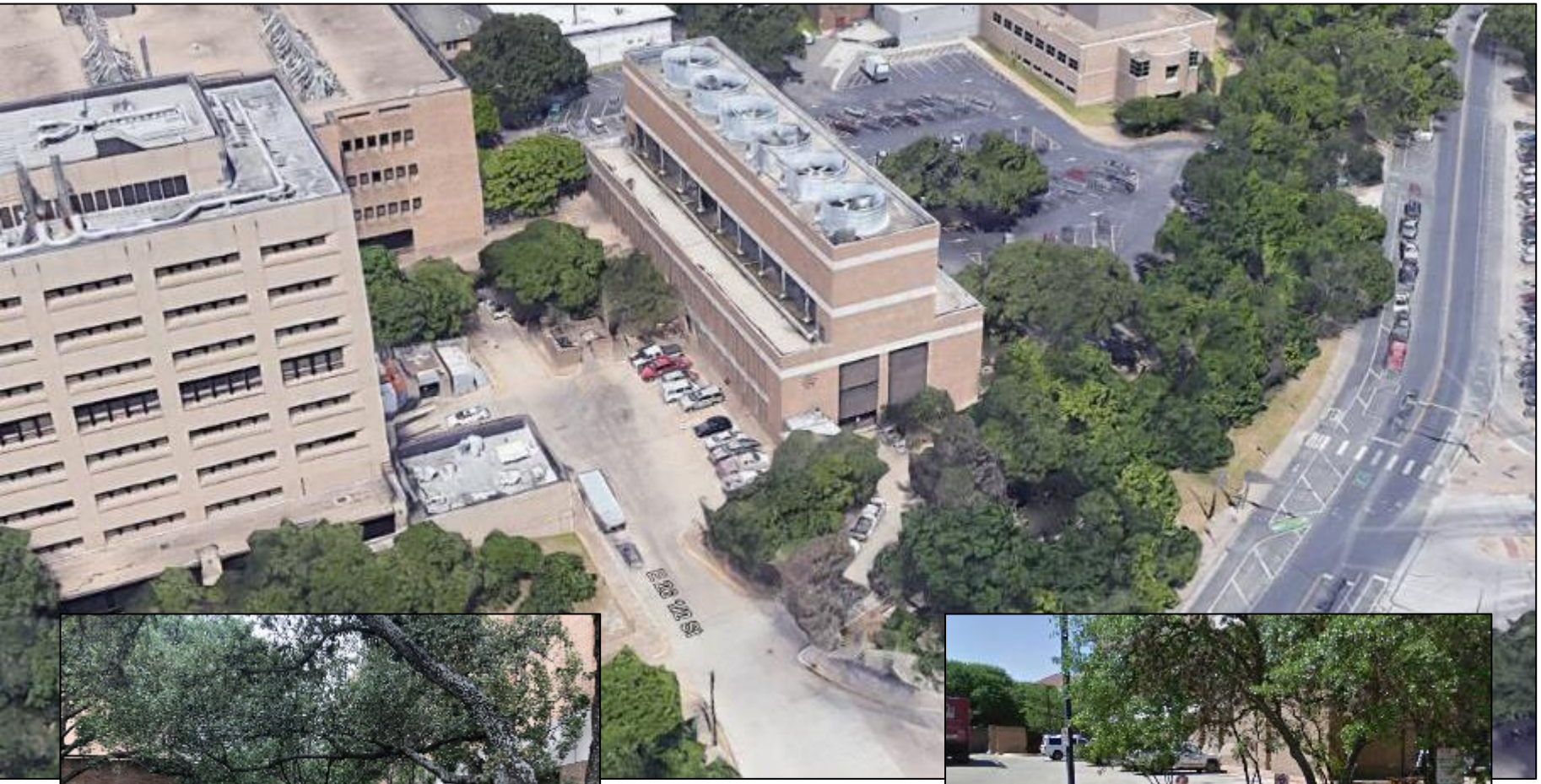


FLINTCO BURNS McDONNELL

Project: District Scale Water Reclamation & Reuse Facility		Title/Description: Potential Site Area B- Existing Conditions 50' Setback Property Boundary	THE UNIVERSITY OF TEXAS AT AUSTIN
Client: University of Texas - Austin	Location: Austin, TX	Initial: 12/11/18	Revision: -

4
A

PROPOSED SITE LOCATION: CS5 SOUTH



APPROXIMATE SIZE:

- 7,500 ft2

STRENGTHS:

- Less Emphasis on Design Aesthetics
- Less Invasive for CS5 Parking lot
- Like-Land Use
- Conducive with Future Buildings
- Proximity to End Use Location
- Flat, Cleared Area
- Outside of 50ft Setback & Floodplain

WEAKNESSES:

- Limited Area South of CS5
- Maintain Vehicular Access
- Not an Integrated Site Design
- Relocation of Storm & Electrical
- Potential Large Tree Removal (North)

OPPORTUNITIES:

- Connectivity to Pedestrian Bridge

SITE B: CONCEPTUAL BUILDING MASS

A LIVING, LEARNING LABORATORY


EMORY | news center

Fall courses offer fresh perspectives on high-profile issues

> "THE WATERHUB PROVIDES THE EXPERIENCE OF COLLECTING REAL DATA, INTERPRETING RESULTS AND WRITING REPORTS. FOR SOME STUDENTS, IT MAY HAVE BEEN THE FIRST HANDS-ON LAB EXPERIENCE THAT THEY'VE HAD."
>
> - CHRISTINE MOE, DIRECTOR OF THE CENTER FOR GLOBAL SAFE WATER, EMORY UNIVERSITY

EDUCATIONAL FEATURES:

Info / Educational Plaques & Signage
Classroom & Lab Space
Easy Access Water Quality Ports
Public Operations Monitors

NOTEWORTHY RESULTS:

- Over 5.000 tours held since May '15
- Used in graduate thesis studies
- Centerpiece of Student Docent Program
- Integrated into core coursework

RESEARCH & CURRICULUM:

- Used in the following fields:
  - Biology
  - Water, Sanitation & Hygiene (WASH)
  - Journalism
  - Chemistry
  - Law
- New Courses Introduced:
  - Water and Sanitation in Developing Countries
  - Research Methods in WASH

SUSTAINABILITY SHOWCASE OPPORTUNITY

Water Processing Agreement:

Integrated development and service performance commitment

Customer Benefits

- No upfront capital costs
- No operational oversight obligations
- Utility plant operational resiliency
  - (N+1 water supply)
- Facility sustainability and corporate ESG goals
- Savings over business-as-usual
  - 5%-10% typical savings will provide millions over contract term
- Hands-off operations

Host Client Responsibilities

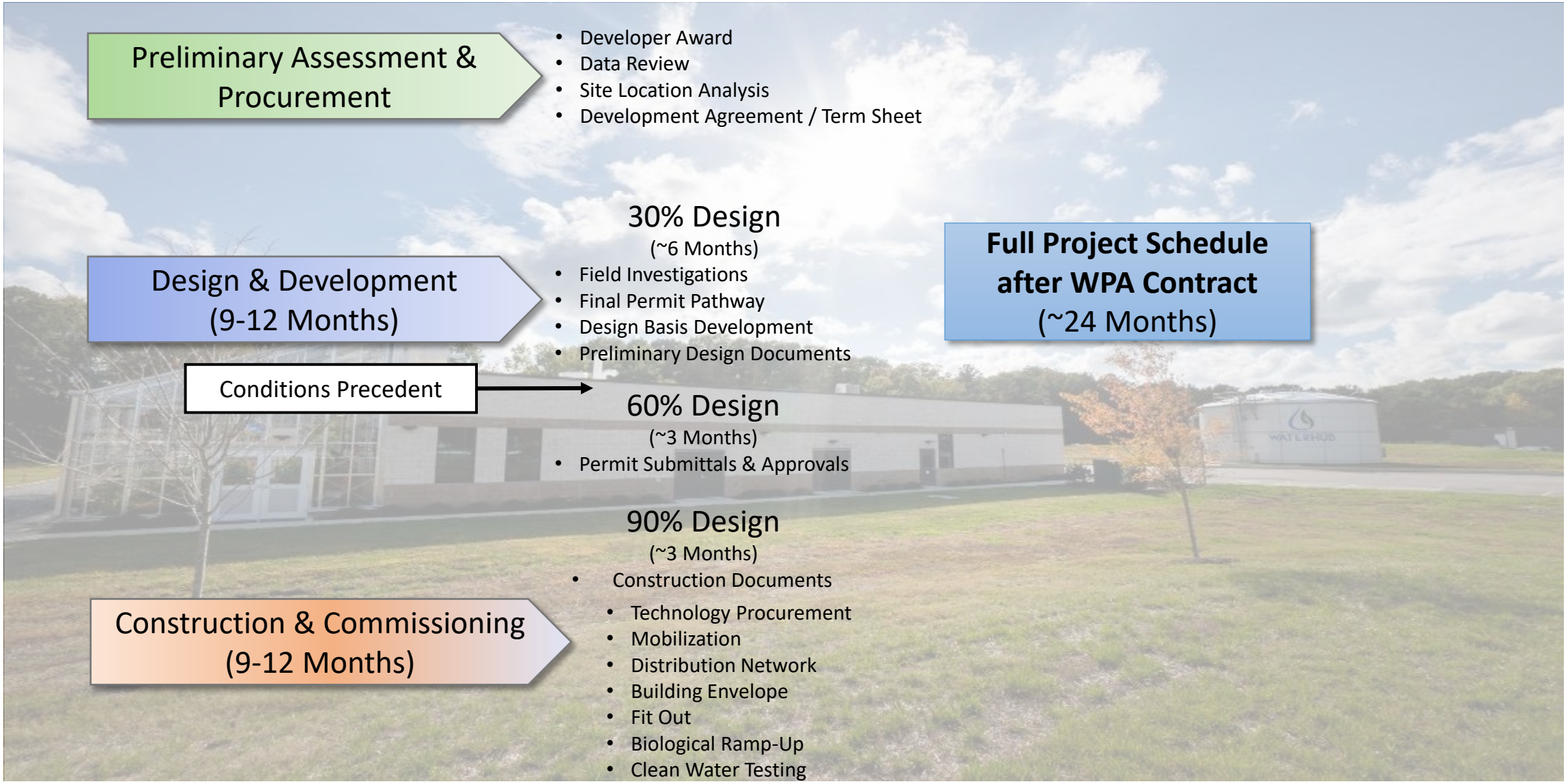
- Minimum annual purchase of compliant reclaimed water
- Access to land for WaterHub footprint and pipeline easement
- 30-year water processing agreement

ZERO
CAPITAL EXPENSE
AND
DEVELOPMENT RISK
TO THE END USER

Third Party Developer Responsibilities

- Proper system engineering & design
- Construction and development costs
- Facility operational & maintenance cost
- Production of compliant reclaimed water
- Long-term upkeep of the system

TYPICAL DEVELOPMENT SCHEDULE



Preliminary Assessment & Procurement

- Developer Award
- Data Review
- Site Location Analysis
- Development Agreement / Term Sheet

Design & Development (9-12 Months)

30% Design
(~6 Months)

- Field Investigations
- Final Permit Pathway
- Design Basis Development
- Preliminary Design Documents

Conditions Precedent →

60% Design
(~3 Months)

- Permit Submittals & Approvals

90% Design
(~3 Months)

- Construction Documents

Construction & Commissioning (9-12 Months)

- Technology Procurement
- Mobilization
- Distribution Network
- Building Envelope
- Fit Out
- Biological Ramp-Up
- Clean Water Testing

Full Project Schedule after WPA Contract (~24 Months)

Emory University Project


OUTDOOR WETLANDS


INTERIOR HYDROPONICS


LABORATORY SPACE

CLIENT TYPE
Private University

LOCATION
Atlanta, GA

HYDRAULIC CAPACITY
440,000 GPD

FOOTPRINT
Building: 3,500 ft^2
Lower Site: 3,000 ft^2

COMMERCIAL OPERATION
May 2015

END USES
Boiler Make-Up
Cooling Tower Make-Up
Toilet Flushing

TECHNOLOGIES APPLIED
Hydroponic – MBBR
Reciprocating Wetlands

Emory University Project

CAPABILITIES:

- Up to 400K GPD and 146M GPY Capacity
- Displaces Up to 40% of Total Campus Demand
- Reduces Up to 70% of Campus Wastewater
- Displaces 90% of Utility Water Demand
- Living, Learning Laboratory

PERFORMANCE TO DATE

- 95% of City Water Displaced at Cooling Towers
- Averaging 7 Million Gallons per Month Campus Wide
- 280 Million Gallons of Water Delivered since May 2015
- 99% Up-Time Reliability
- Over 5,000 tours conducted

The Philip Morris Project

RECLAIMED STORAGE TANK

MEETING SPACE

HYDROPONIC PLANTINGS

CLIENT TYPE
Industrial Manufacturing

LOCATION
Richmond, VA

HYDRAULIC SIZING
650,000 GPD

FOOTPRINT
Building: 8,200 ft^2
Storage Tank: 1,200 ft^2
(24 ft. hgt. & 39 ft. dia.)

COMMERCIAL OPERATION
August 2019

END USES
Cooling Tower Make-Up
Open-Aired Chiller Make-Up

TECHNOLOGIES APPLIED
- Hydroponic – MBR
- RO Polishing

The Philip Morris Project

CAPABILITIES:

- Up to 650K GPD and 237M GPY capacity
- 40% reduction of consumed water
- 55% reduction of wastewater discharge
- Exceed corporate KPI (25%) in water reduction
- Sustainability featured in campus tour

PROJECT GOALS:

- Conserve community water resources
- Provide leadership in water sustainability
- Relieve strain on local municipal infrastructure
- Insulate operational viability & supply chain

The Virginia Project

Central Plant

Extraction Pipe Route

Wastewater

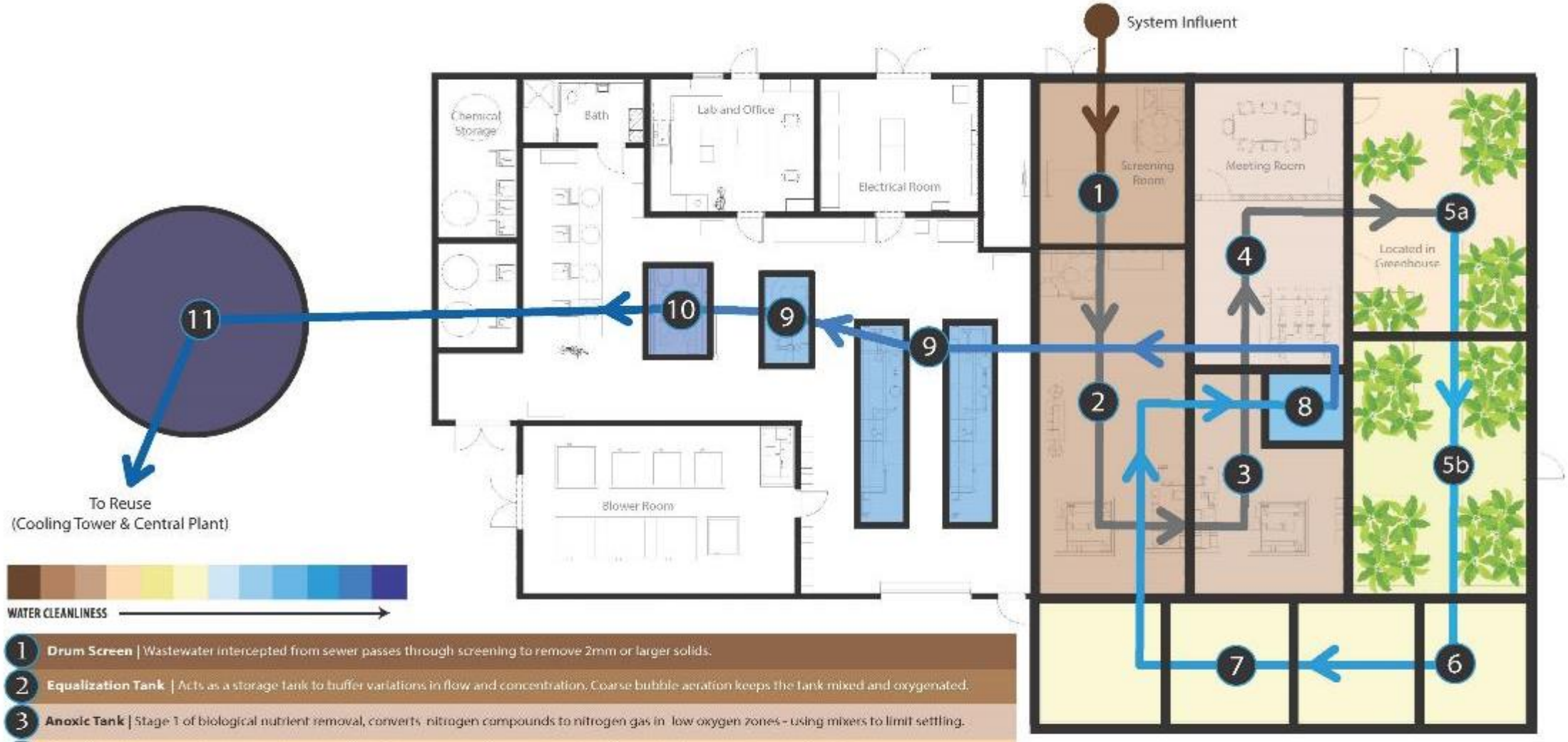
Outfall #006

Outfall #001

Virginia Project Goals

- Conserve community water resources
- Provide leadership in water sustainability
- 40% reduction in consumed water
- 55% wastewater discharge reduction
- Relieve strain on local municipal infrastructure
- Insulate operational viability & supply chain

Image Landsat / Copernicus



1 **Drum Screen** | Wastewater intercepted from sewer passes through screening to remove 2mm or larger solids.

2 **Equalization Tank** | Acts as a storage tank to buffer variations in flow and concentration. Coarse bubble aeration keeps the tank mixed and oxygenated.

3 **Anoxic Tank** | Stage 1 of biological nutrient removal, converts nitrogen compounds to nitrogen gas in low oxygen zones - using mixers to limit settling.

4 **Aerobic Tank** | Blowers and fine bubble diffusers provide mixing and oxygenation that support bacterials respiration to consume organic materials.

5 **Hydroponic Reactor** | Specific plant species, suspended over aerobic tanks, grow roots into the reactor to provide additional surface area for fixed-film microorganisms..

6 **Post Anoxic Flex Reactor** | The final biological treatment step is a flexible tank operated in either aerobic or anaerobic conditions to remove residual organics or nitrogen.

7 **Submerged Membranes** | Water passes through a 0.5 micron membrane to remove biosolids. The rejected biosolids recycle to anoxic tank for continued microbial growth.

8 **Permeate Tank** | Effluent from submerged membranes is stored here after passing through an ultraviolet disinfection (UV) system that inactivate pathogens.

9 **Reverse Osmosis (RO)** | An RO system treats a side-stream of flow to remove residual minerals and blended into the effluent stream to achieve target conductivity levels.

10 **Reclaimed Water Distribution Pumps** | Pumps designed to supply reclaimed water flow and pressure to industrial users.

11 **Reuse Tank** | Tank to provide clean water storage and chlorine pathogen disinfection.

THE WATERHUB®

HOW IT WORKS

SUSTAINABLE WATER®

THE ROCKY MOUNT PROJECT

CLIENT TYPE
Automotive Manufacturing

LOCATION
Rocky Mount, NC

HYDRAULIC CAPACITY
75,000 GPD

FOOTPRINT
5,500 ft^2

COMMERCIAL OPERATION
Summer 2020

END USES
Boiler Make-Up
Cooling Tower Make-Up
Toilet Flushing

TECHNOLOGIES APPLIED
Hydroponic – MBR

THE ROCKY MOUNT PROJECT

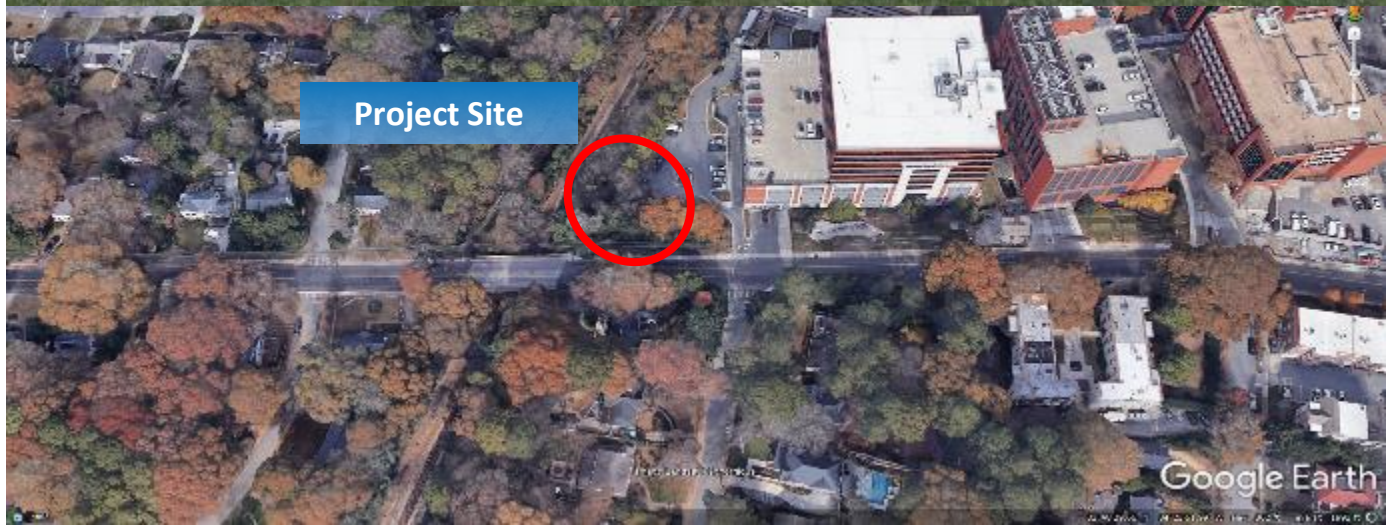
CAPABILITIES:

- 100% factory up-time/plant production
- Up to 75K GPD and 27M GPY capacity
- 34% reduction of consumed water
- 90% reduction of wastewater discharge
- 15M gallons of reused water created annually

PROJECT GOALS:

- Redundant (N + 1) water supply for utilities
- Drought protection
- Long-term economic savings
- Provide leadership in water sustainability
- Insulate operational viability & supply chain

THE PIEDMONT ATLANTA HOSPITAL PROJECT



CLIENT TYPE
Commercial Healthcare Campus

LOCATION
Atlanta, GA

HYDRAULIC CAPACITY
250,000 GPD

FOOTPRINT
4,300 ft^2

COMMERCIAL OPERATION
Anticipated Fall 2022

GOALS
- Resilient Utility Operations
- Water Conservation
- 75% Decrease in Discharge
- Enable Future Development

TECHNOLOGIES APPLIED
Outdoor Hydroponics
Tertiary: Membrane Bioreactor (MBR)
Disinfection: Dual-Stage UV & Chlorine

THE DUKE UNIVERSITY PROJECT

CLIENT TYPE
Private University

LOCATION
Durham, NC

HYDRAULIC CAPACITY
600,000 GPD

FOOTPRINT
9,400 ft^2

COMMERCIAL OPERATION
Anticipated Spring 2023

GOALS / OUTCOMES
- Utility / Operational Resiliency
- Reuse 120 MGY
- 45% decrease in discharge

THE DUKE UNIVERSITY PROJECT

THE DUKE UNIVERSITY PROJECT

Lessons Learned

- **Don’t Underestimate Public Interest**
  - Tours, Program Space, Community Outreach
  - 5,000 Tours at Emory University
- **Facility Design Aesthetics**
  - Public access areas from Front to Back of House
  - Pedestrian circulation through system
  - Fully enclosed mechanical areas & better operator access
- **Data Collection & Field Investigations**
  - Never “too much” operational, sampling & flow data
  - Strong data collection investigations in preliminary engineering, save time down the road
  - Work closely with the city or servicing district to ensure a successful project than will get permitted properly

Technical Lessons Learned

- **Pre-Fabrication**
  - Hydraulic “Sweet-spots” to more or less prefabrication
  - Skids, Tanks, Operator Rooms
- **Process Resiliency**
  - Equipment Redundancy (Primary screening, Influent Pumps, UV, etc.)
  - Dual Process Trains
  - You can’t optimize what isn’t measured
  - WQ Sensors starting in influent wet-well
- **Maintenance**
  - Removal & Maintenance of Influent Pumps from Wet Well
  - Ability to Pump Backwards from Screen or EQ to flush influent lines
  - Membrane / Filter Access, Location of Hoists
- **Turn-Down**
  - Contingency planning for turn-down scenarios

Q&A

SUSTAINABLE WATER®

EXTENDING THE LIFECYCLE OF WATER

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