
CampusEnergy2021
BRIDGE TO THE FUTURE
Feb. 16-18 | CONNECTING VIRTUALLY
WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

January 6, 2020

The WaterHub® - Sustainable Water Management Through Reclamation and Reuse

DISTRICT AND CAMPUS-SCALE ECO-ENGINEERED SYSTEMS

SUSTAINABLE WATER®
EXTENDING THE LIFE CYCLE OF WATER

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INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Q&A Will Not Be Answered Live

Please submit questions in the Q&A box.
The presenters will respond to questions off-line.

SUSTAINABLE WATER

What We Do:

Turn-Key Developer - Water as a Service

Owner's Representation & Design Assist

Problems We Solve For:

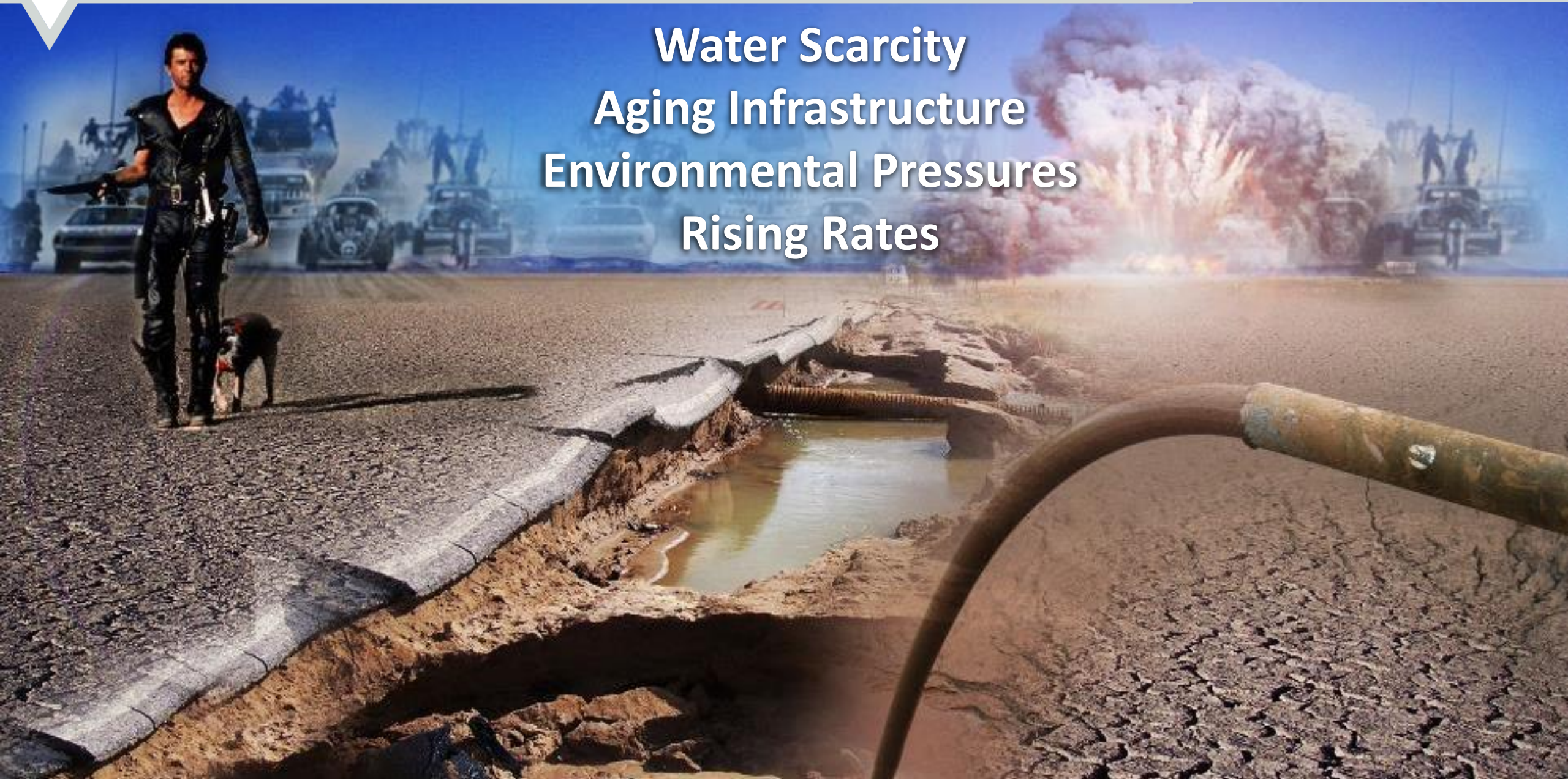
Capacity Constraints

Resiliency Against Aging Infrastructure

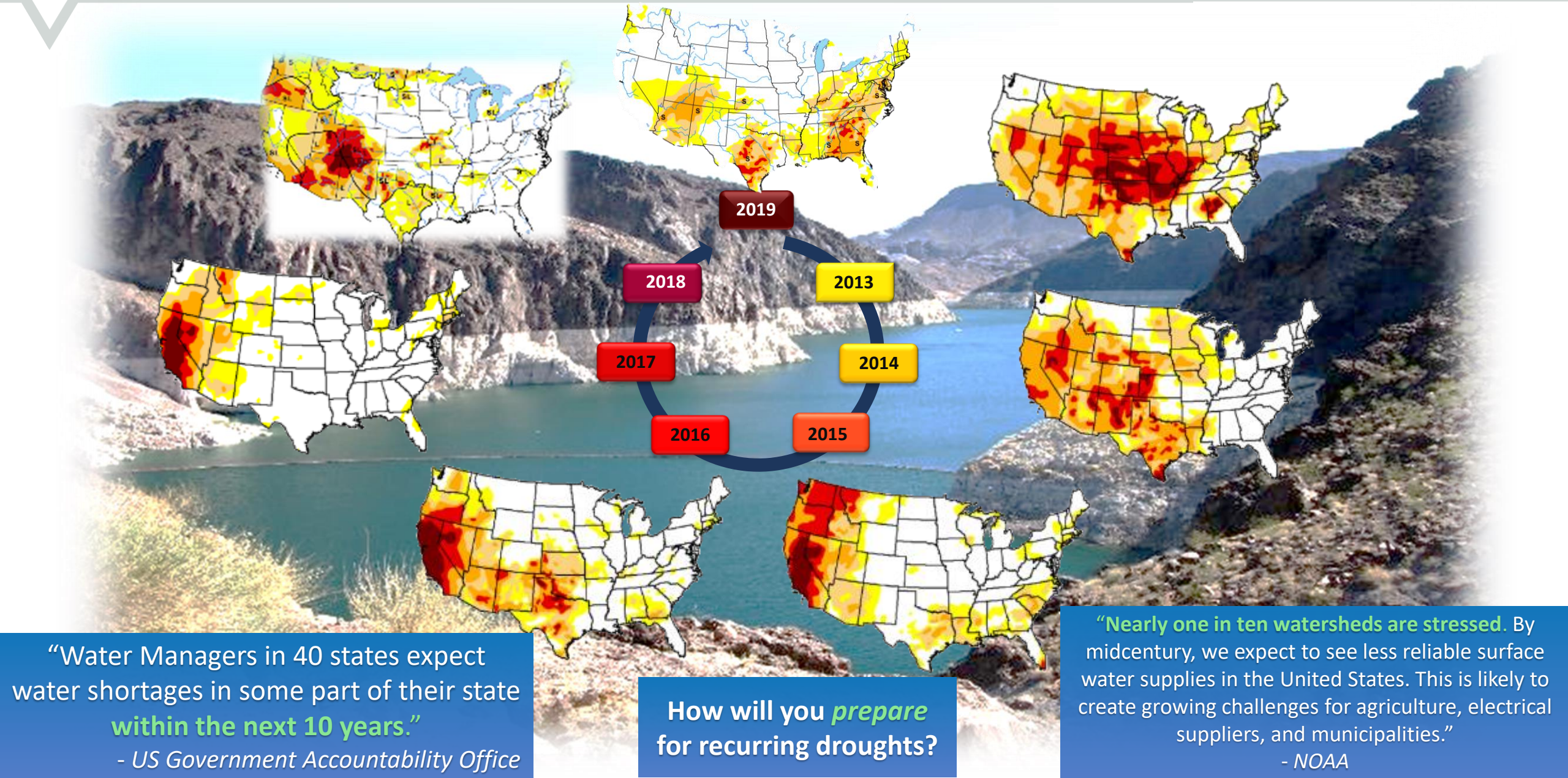
Mitigate Rising Rates

Conservation Goal / KPI Attainment

THE WATER APOCALYPSE



THE CYCLE OF DROUGHT



"Water Managers in 40 states expect water shortages in some part of their state **within the next 10 years.**"

- US Government Accountability Office

How will you *prepare* for recurring droughts?

"**Nearly one in ten watersheds are stressed.** By midcentury, we expect to see less reliable surface water supplies in the United States. This is likely to create growing challenges for agriculture, electrical suppliers, and municipalities."

- NOAA

FIXING A FAILING SYSTEM

"Through strategic, sustained investment, bold leadership, thoughtful planning, and careful preparation for the needs of the future, America's infrastructure will be improved and restored."

- American Society of Civil Engineers, *2017 Report Card for America's Infrastructure*

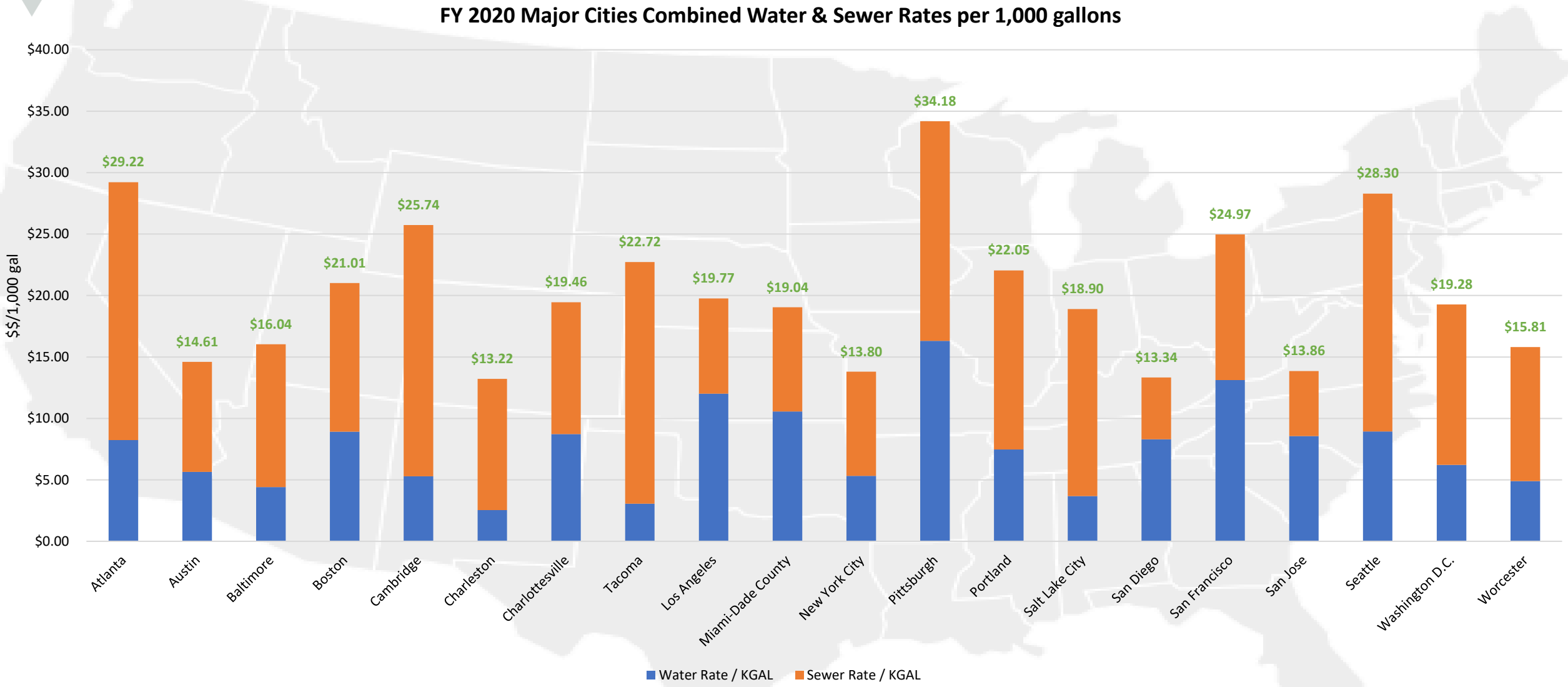
Suggested Solutions…

- Raise Awareness for the True Cost of Water
- Increase Costs for Water and Wastewater Services
- Develop and Harness New Technologies
- Increase Private Financing
- Implement Water Reuse & Expand Water Recycling

OVERVIEW

The nation's 14,748 wastewater treatment plants protect public health and the environment. Years of treatment plant upgrades and more stringent federal and state regulations have significantly reduced untreated releases and improved water quality nationwide. It is expected that more than 56 million new users will be connected to centralized treatment systems over the next two decades, and an estimated $271 billion is needed to meet current and future demands. Through new methods and technologies that turn waste into energy, the nation's 1,269 biogas plants help communities better manage waste through reuse.

HOW RATES COMPARE NATIONALLY



CAMPUS GROWTH IS CONTAGIOUS

OUR SOLUTION: THE WATERHUB®

Decentralized Systems for Blackwater Capture, Treatment, and Beneficial Reuse

Water Processing Agreement

Operating Lease | DBO Agreement | Performance Contract

ZERO
CAPITAL EXPENSE
—AND—
DEVELOPMENT RISK
TO THE END USER

Benefits

- No up-front capital
- Innovative technologies
- Leverages superior credit rating
- Lifecycle savings
- Long-term pricing stability
- No O&M responsibilities
- SW bears majority of risk


1. FEASIBILITY & PLANNING


2. ENGINEERING & DESIGN


3. CONSTRUCTION


4. COMMISSIONING & START-UP


5. FACILITY OPERATIONS

WATER PROCESSING AGREEMENT

Customer Benefits

- Utility Plant Operational Resiliency (N+1 Water Supply)
- Campus Sustainability Initiative
- Guaranteed Savings over Business-as-Usual
  - 5%-10% Typical Savings Will Provide Millions Over Contract Term
  - No Capital Investment
- Hands-Off Operations

Sustainable Water Responsibility

- Proper System Engineering & Design
- Construction / Development Costs & Bonds
- Facility Operational & Maintenance Cost
- Production of Compliant Reclaimed Water
- Long-term Upkeep of Plant

Customer Responsibility

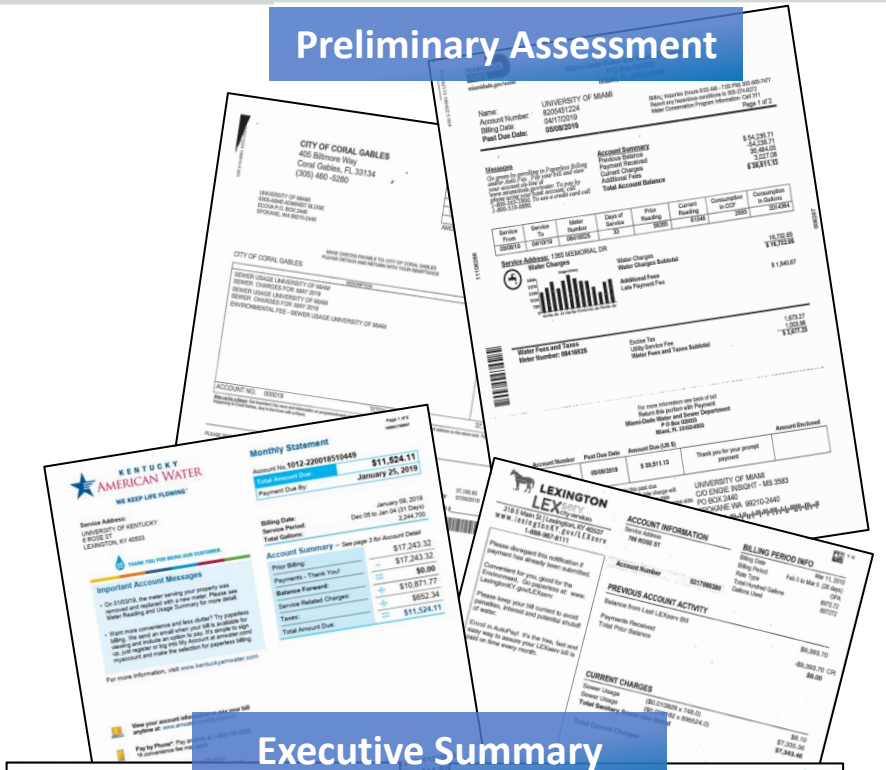
- Minimum Annual Purchase of Compliant Reclaimed Water
- Access to land, pipeline easement
- 30-Year Agreement

PRELIMINARY ASSESSMENT DATA REQUEST

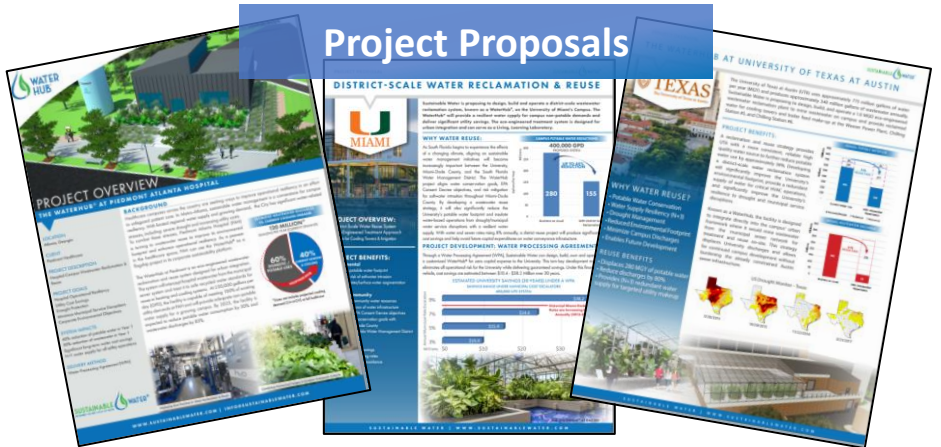
Client Data Request

- **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
- **Economics (3 years)**
  - Recent Water & Sewer Bills
- **Wastewater and Quality Testing**
  - Current Industrial Discharge Permit
  - Wastewater Influent and Effluent Quality Testing
    - *Industrial and Sanitary*

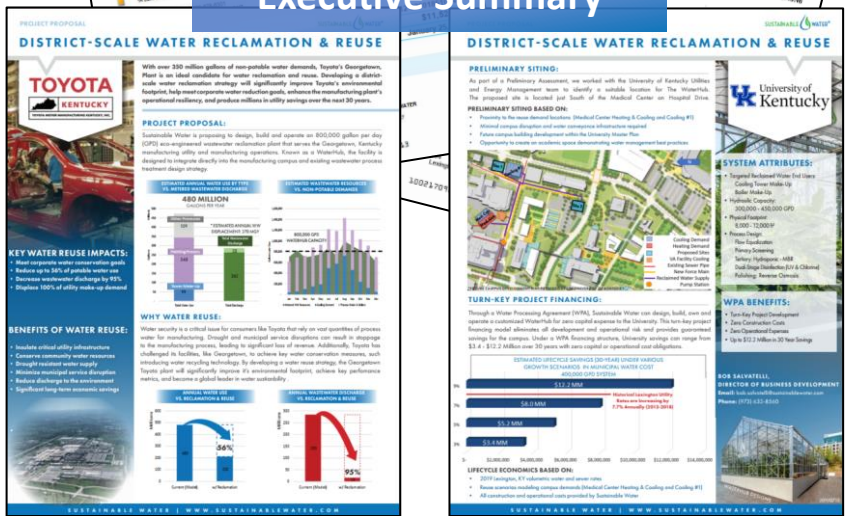
Preliminary Assessment



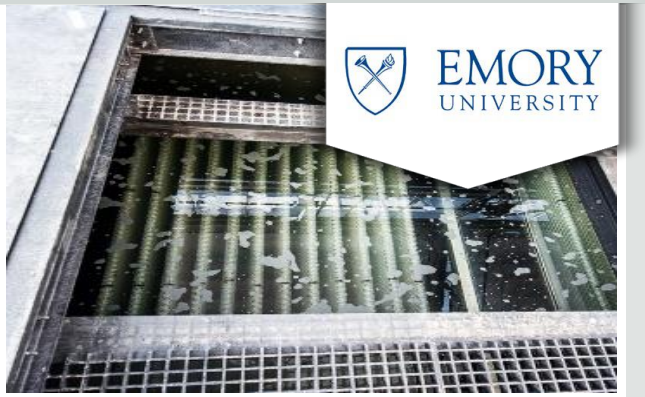
Project Proposals



Executive Summary



THE WATERHUB® AT EMORY UNIVERSITY



OUTDOOR WETLANDS

INTERIOR HYDROPONICS

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 Makeup
Cooling Tower Makeup
Toilet Flushing

GOALS / OUTCOMES
40% Reduction in Potable Water
66% Decrease in Discharge

TECHNOLOGIES APPLIED
Hydroponic – MBBR
Reciprocating Wetlands

THE WATERHUB® AT EMORY UNIVERSITY

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
- 340 Million Gallons of Water Delivered since May 2015
- 99% Up-Time Reliability
- Over 5,000 tours conducted

THE WATERHUB – LIVING & LEARNING LAB

EMORY | news center

Fall courses offer fresh perspectives on high-profile issues

By Laura Douglas-Brown and Leslie King | Emory Report | Aug. 24, 2016

Students taking Water and Sanitation in Developing Countries will gain hands-on experience through fieldwork at the Emory Waterhub. Here, professor Christine Moe (second from left) visits the Waterhub to plan water-sampling locations for the class assignment with student Yvonne Kienast, assistant research professor Amy Kirby and student Emeli Anderson. Emory Photo/Video

Emory's fall semester courses bring critical insights to current events and offer new approaches to familiar subjects.

Students will explore high-profile topics like the presidential election, the refugee crisis, Islamophobia and the global struggle for human rights, while also gaining unique perspectives from Emory resources such as the Waterhub and the upcoming display of Shakespeare's First Folio, which Emory was selected to host for the state of Georgia.

Here is a sample of fall classes, from first-year seminars to graduate courses, that are timely, creative or just plain cool.

Appcology: New Commerce Infrastructure

Instructor: Benn Konsynski, George S. Craft Distinguished University Professor of Information Systems & Operations Management

Cool factor: With the assistance and experience of actual app developers, we will explore the design and creations of these "snackable" applications for mobile and desktop environments. The course will consider the opportunities for new patterns of communication between organizations and their mobile stakeholders.

Course description: The course will explore issues associated with the emerging types of and services, changing forms of software ecosystems and commerce interactions. ...ement of real apps, gizmos and widgets.

> "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

THE WATERHUB® AT PHILIP MORRIS USA

CLIENT TYPE
Industrial Manufacturing

LOCATION
Richmond, VA

HYDRAULIC CAPACITY
650,000 GPD

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

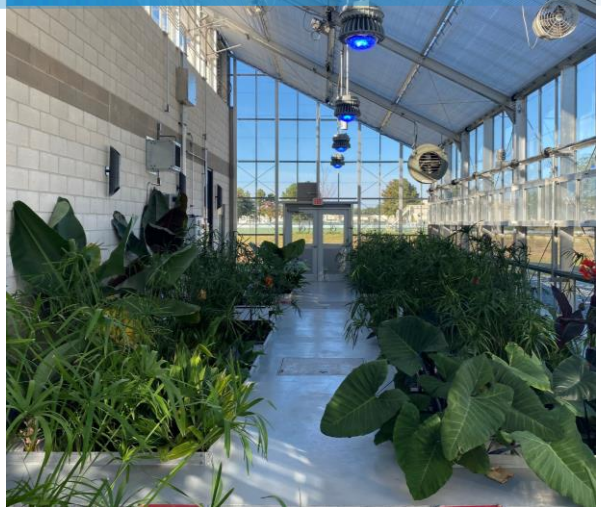
COMMERCIAL OPERATION
August 2019

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

TECHNOLOGIES APPLIED
- Hydroponic – MBR
- RO Polishing

REUSE STORAGE TANK

INDOOR HYDROPONIC DESIGN



THE WATERHUB® AT PHILIP MORRIS USA

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

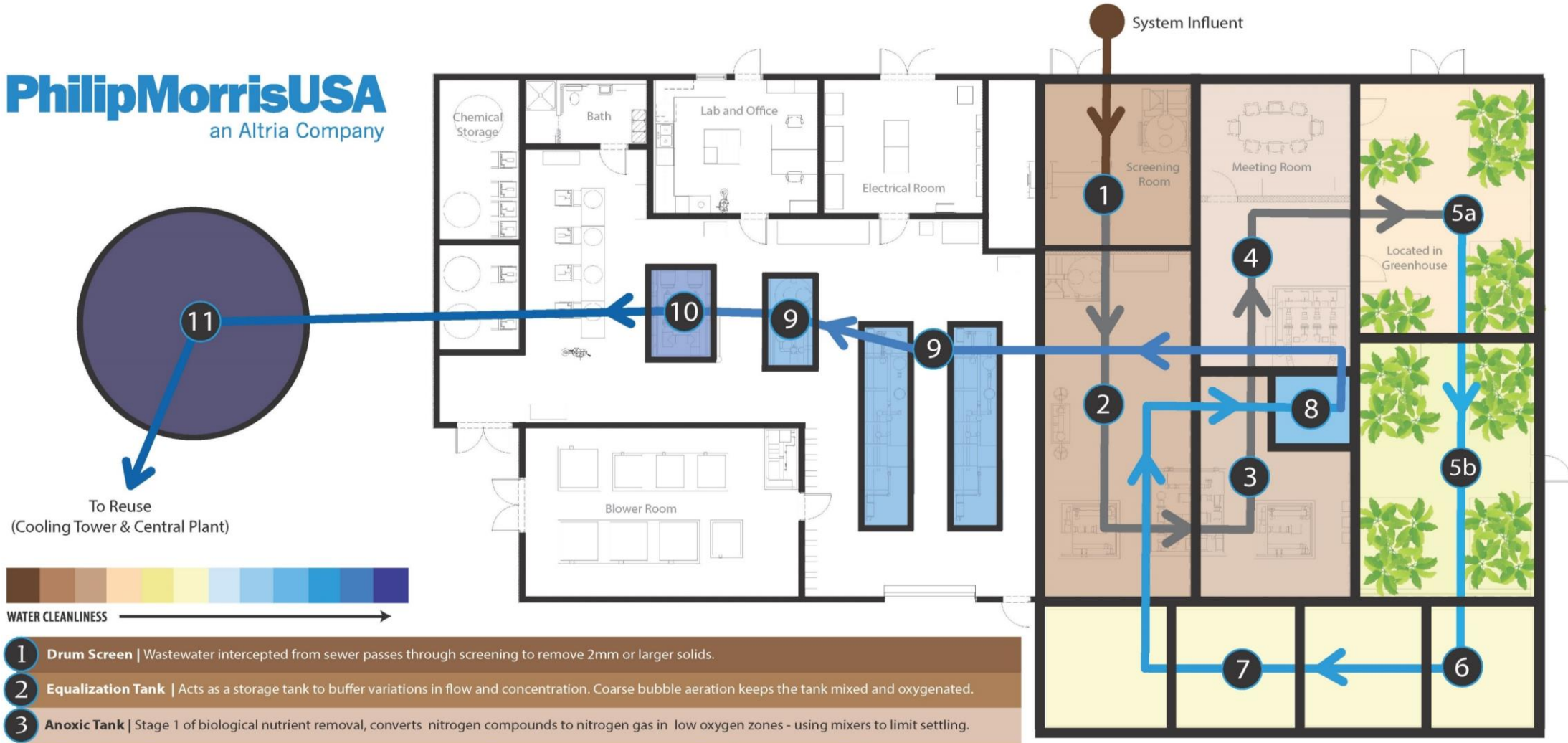
PROJECT GOALS:

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

WaterHub® at PMUSA 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

PhilipMorrisUSA
an Altria Company



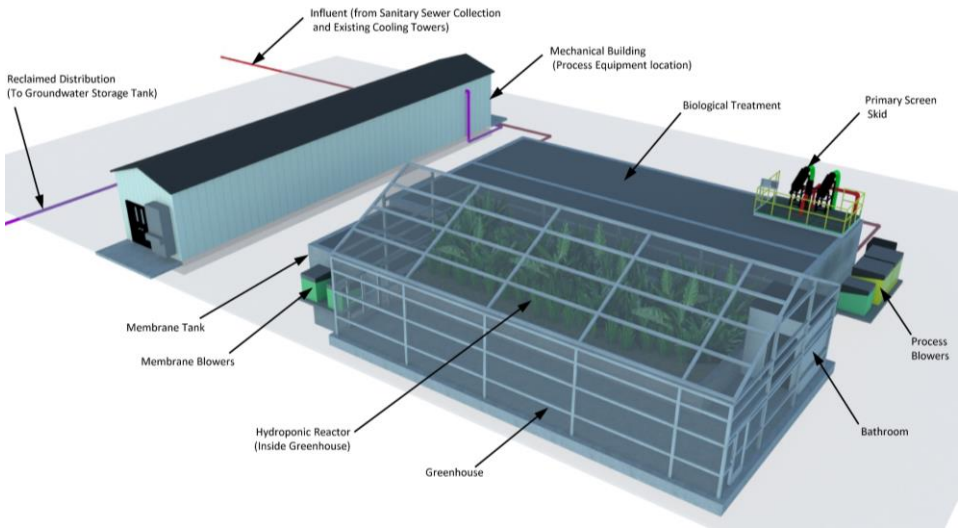
1. **Drum Screen** | Wastewater intercepted from sewer passes through screening to remove 2mm or larger solids.
2. **Equalization Tank** | Acts as a storage tank to buffer variations in flow and concentration. Coarse bubble aeration keeps the tank mixed and oxygenated.
3. **Anoxic Tank** | Stage 1 of 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®

UPCOMING PROJECTS



THE WATERHUB® AT PIEDMONT

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 WATERHUB® AT UT AUSTIN

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

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

THE WATERHUB® AT DUKE UNIVERSITY

CLIENT TYPE
Private University

LOCATION
Durham, NC

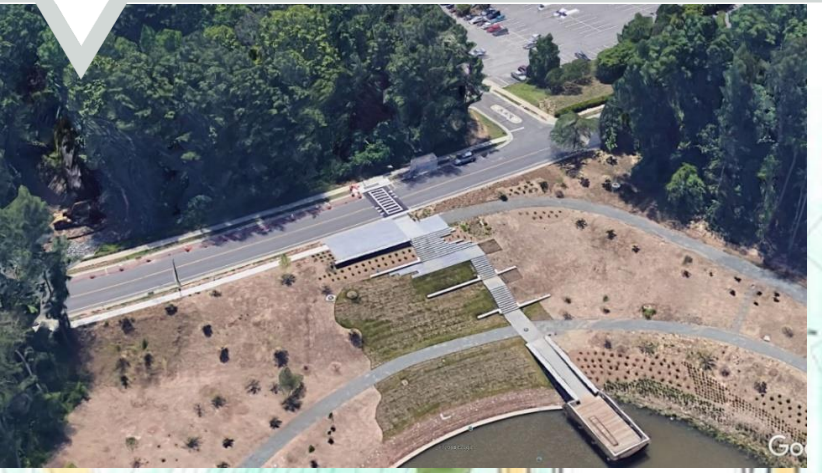
HYDRAULIC CAPACITY
600,000 GPD

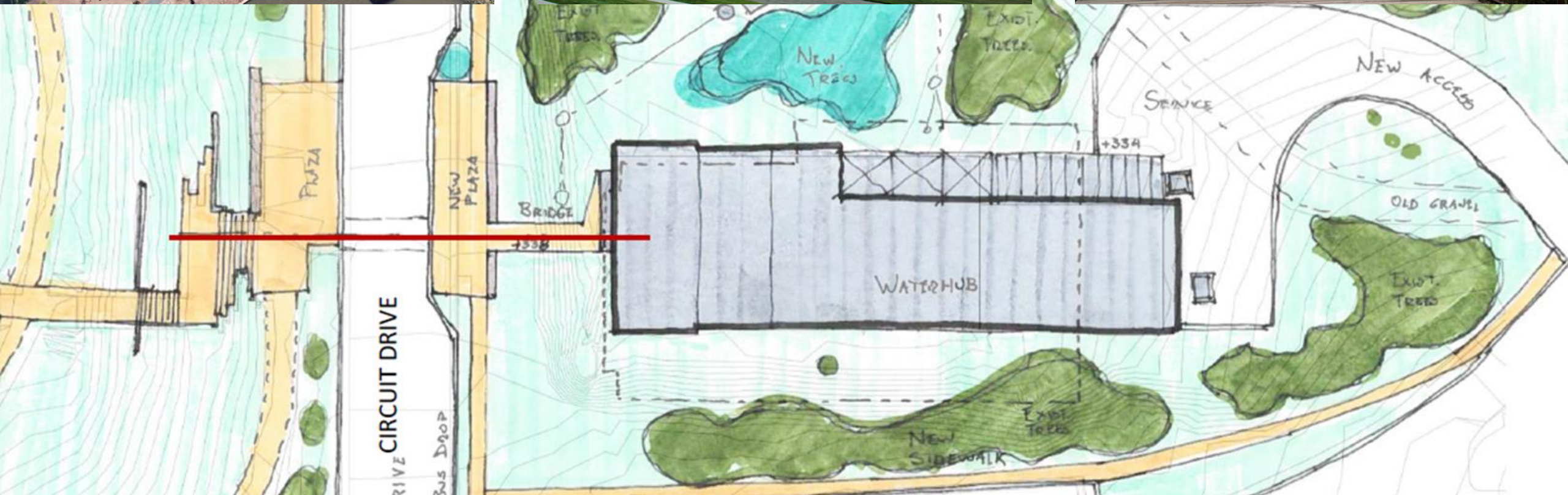
FOOTPRINT
9,400 ft^2

COMMERCIAL OPERATION
Anticipated Spring 2023

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

THE WATERHUB® AT DUKE UNIVERSITY





LESSONS LEARNED: GENERAL

Don’t Underestimate Public Interest

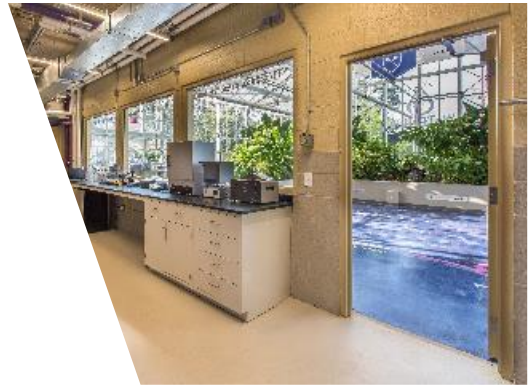
- Tours, Program Space, Community Outreach
- 4,500 Tours at Emory University

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 and money down the road



LESSONS LEARNED: PROCESS

Pre-Fabrication

- Hydraulic “Sweet-spots” to more or less prefabrication
- Skids, Tanks, Operator Rooms

Process Resiliency

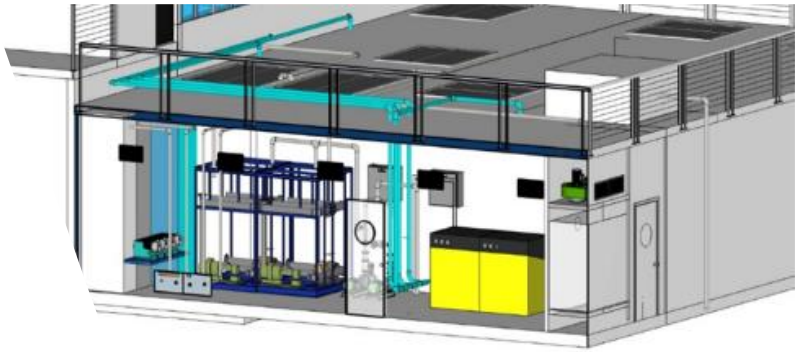
- Equipment Redundancy (Primary screening, Influent Pumps, UV, etc.)
- Dual Process Trains
- You can’t optimize what isn’t measured
- WQ Sensors starting in influent wet-well

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



SUSTAINABLE WATER®

EXTENDING THE LIFECYCLE OF WATER

Bob Salvatelli | Mobile: (973) 632-8560
Bob.Salvatelli@sustainablewater.com

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