Campus-wide Water Management: Two Atlanta Case Studies

Presented by:
Jonathan Lanciani, Sustainable Water

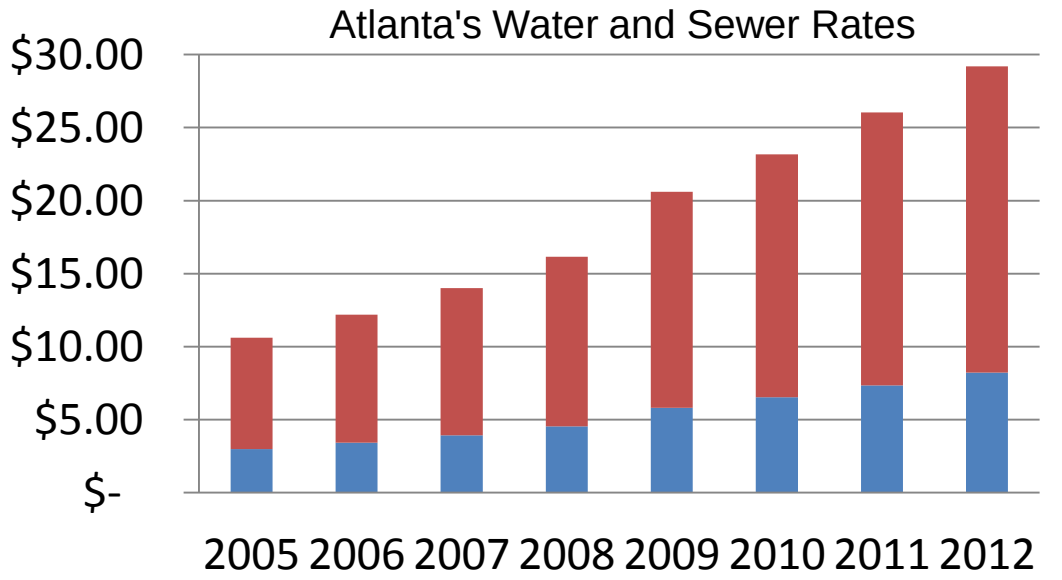
Water Issues

Scarcity

Rising Rates

Aging Infrastructure

Environmental Pressure



Georgia has suffered from consistent drought conditions since 1998

SUSTAINABLEWATER

Campus Utility Overview

Georgia Tech Steam & Chiller Systems

Startup Year	1917
Number of Buildings Served	86
Total Square Footage Served	4,851,323 sq ft
Central Plant Capacity	310,000 lb/hr steam
Satellite Plant Capacity	NA
Number of Boilers	4 boilers (3 natural gas & propane, 1 electric)
Fuel Types	Natural gas, propane, electricity
Distribution Network Length	14,913 trench ft
Piping Type	Direct-buried insulated carbon steel
Piping Diameter Range	2 to 12 inches
System Pressure	15 psig & 50 psig
System Temperatures	40 - 150 F condensate return
System Water Volume	NA

Startup Year	1972
Number of Buildings Served	61
Total Square Footage Served	3,536,428 sq ft
Central Plant Capacity	10,000 tons chilled water
Satellite Plant Capacity	15,250 tons chilled water
Number of Boilers	14 chillers (2 plants)
Fuel Types	Electricity
Distribution Network Length	54,749 trench ft
Piping Type	Direct-buried insulated carbon steel
Piping Diameter Range	2 to 23 inches
System Pressure	80 psig
System Temperatures	40 F supply/50 F return
System Water Volume	31,540 gal

Emory University Steam & Chiller Systems

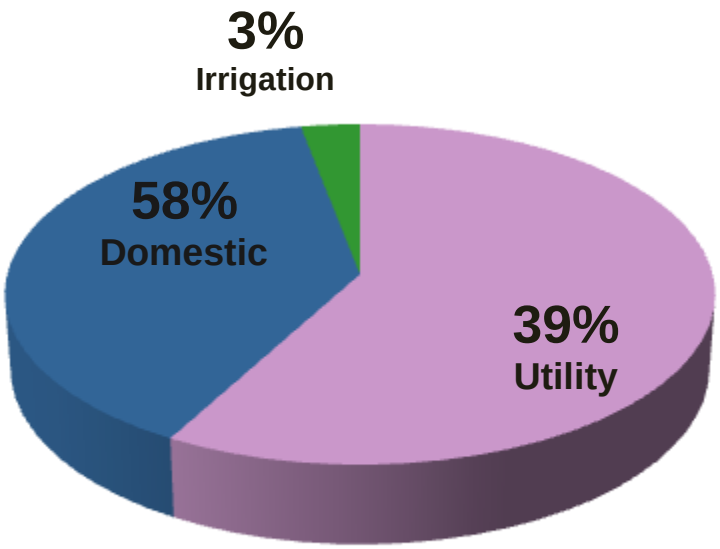
Startup Year	1922
Number of Buildings Served	70
Total Square Footage Served	7,500,000 sq ft
Central Plant Capacity	500,000 lb/hr steam
Satellite Plant Capacity	NA
Number of Boilers	5 boilers
Fuel Types	Natural gas, No. 2 fuel oil
Distribution Network Length	3.5 trench miles
Piping Type	Majority Class A direct-buried & some walk-through tunnels
Piping Diameter Range	1-1/2 to 12 inches
System Pressure	125 psig
System Temperatures	353 F/180 F condensate return
System Water Volume	NA

Startup Year	1960s
Number of Buildings Served	50
Total Square Footage Served	4,390,000 sq ft
Central Plant Capacity	20,300 tons (3 plants)
Satellite Plant Capacity	NA
Number of Boilers	20 chillers
Fuel Types	Electric
Distribution Network Length	2.5 trench miles
Piping Type	Direct-budried insulated steel
Piping Diameter Range	4 to 18 inches
System Pressure	90 psig
System Temperatures	44 F supply/54 F return
System Water Volume	295,000 gal

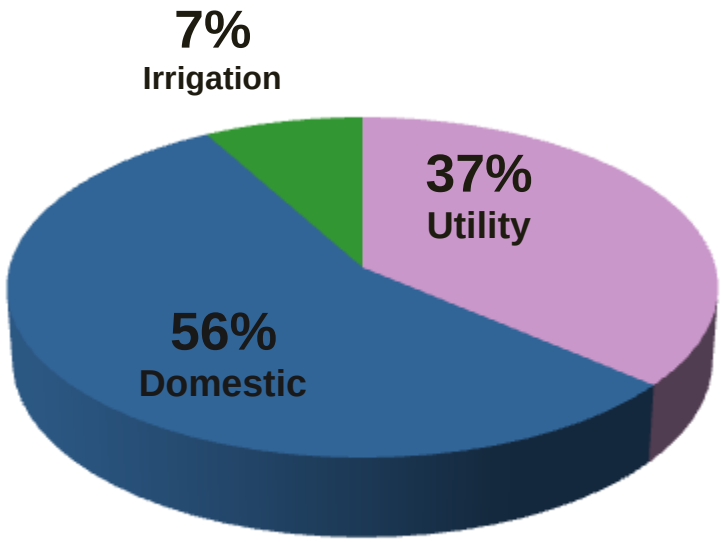
Growing Campuses: Complex systems with critical loads

Water Use by Type

Emory University



Georgia Tech



Predictable Demand

Rainwater & Greywater Harvesting at Emory University

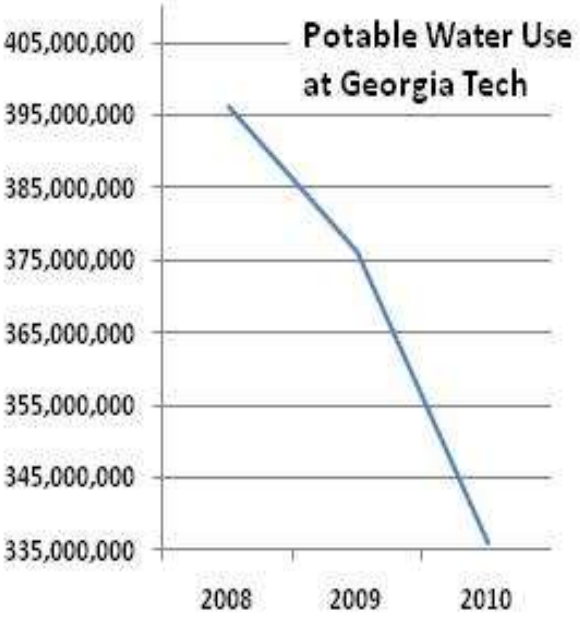
- LEED Gold
- 293 total beds
- 110,000 square feet
- Rainfall & AC Condensate
- 700,000 gallons recycled

- 351 total beds
- 138,000 square feet
- 825,000 gallons recycled

Proven Viability, but Unreliable Precipitation Patterns

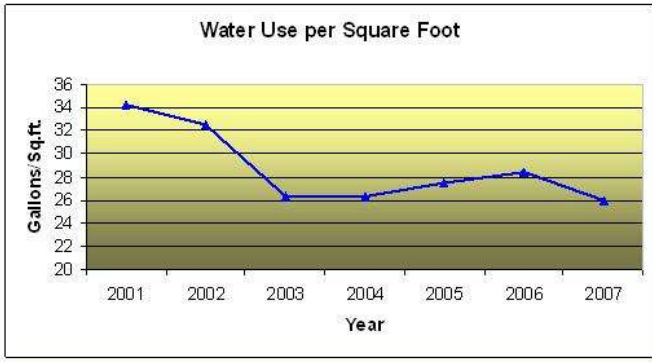
Master Planning at Georgia Tech

- Landscape, Cistern, Stormwater
- Sector Plan
  - 50% reduction of storm water runoff
  - 30% reduction in stormwater



Water Use

23% reduction in water use per sq ft 2001-2007



30% reduction in water use since 11/07
Governor asked for 10% cut

A more sustainable water cycle: Decentralized Reclamation and Reuse

Before

After

Risk Mitigation

Campus water objectives:

- Redundant Water Supply
  - Drought
  - Municipal infrastructure failures
- Additional On-Site Storage
- Flexibility & Resilience
- Independence
- Availability in the event of failure
- Minimum recovery time
- Insulation from rising water costs

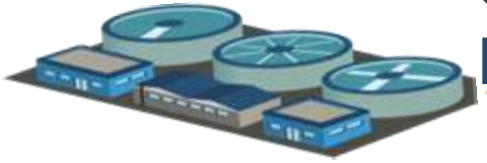
N+1: Reliable and Safe Alternatives to Potable Water

Centralized vs. Decentralized Reuse

Water Treatment Facility

~10+ miles

End User



Wastewater

Reclaimed Water

The Embodied Energy of Water

Existing Water and Sewer Capacity

SUSTAINABLEWATER

Some Independent Power Producers Currently Using Reclaimed Water

CALPINE

COVANTA ENERGY

AES we are the energy

DUKE ENERGY

Progress Energy

Panda Power Funds

SOUTHERN COMPANY

PANDA

nrg

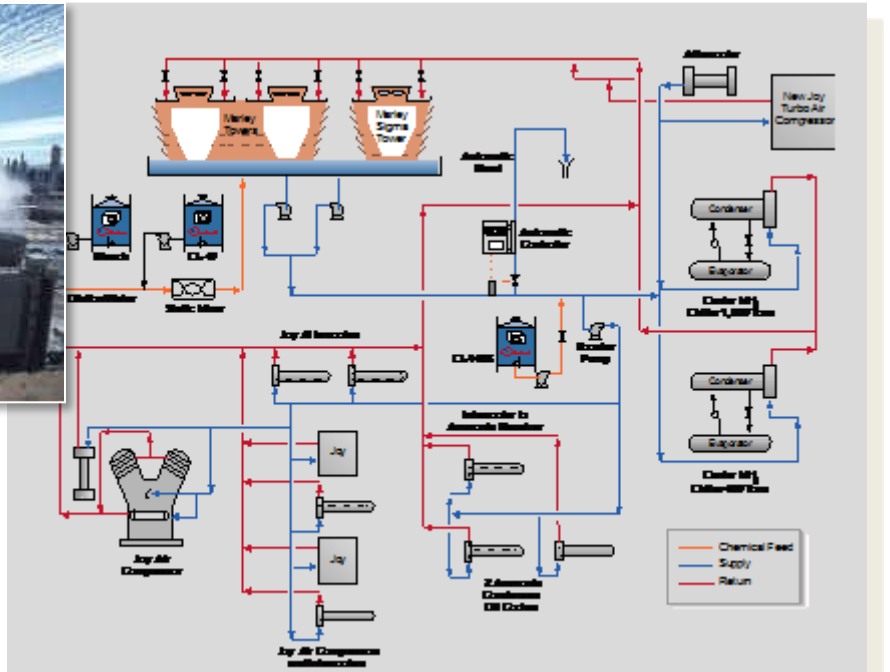
PSEG

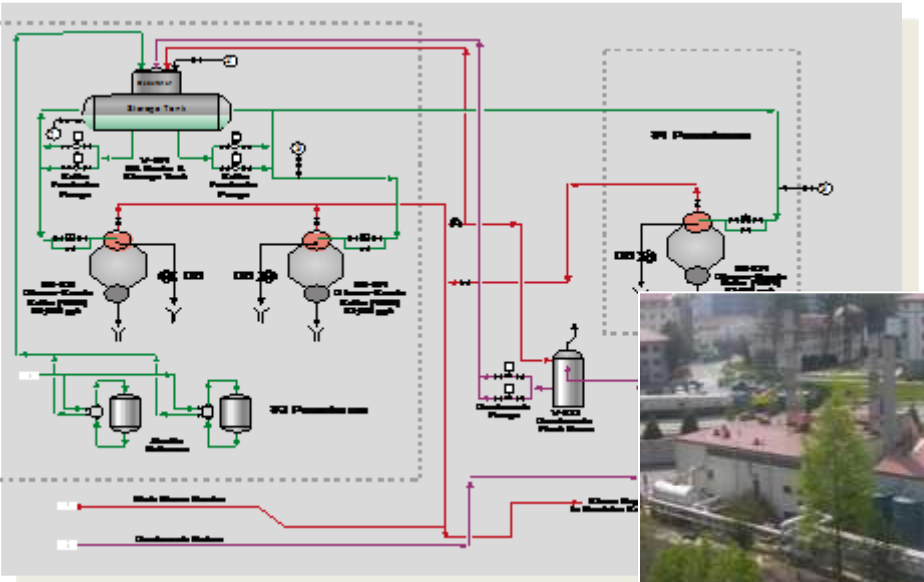
Xcel Energy

Wheelabrator Technologies Inc.

Utility Cooling and Boiler Water

- Biological studies
- Corrosion studies
- Automation
- Treatability studies
- Equipment Integrity

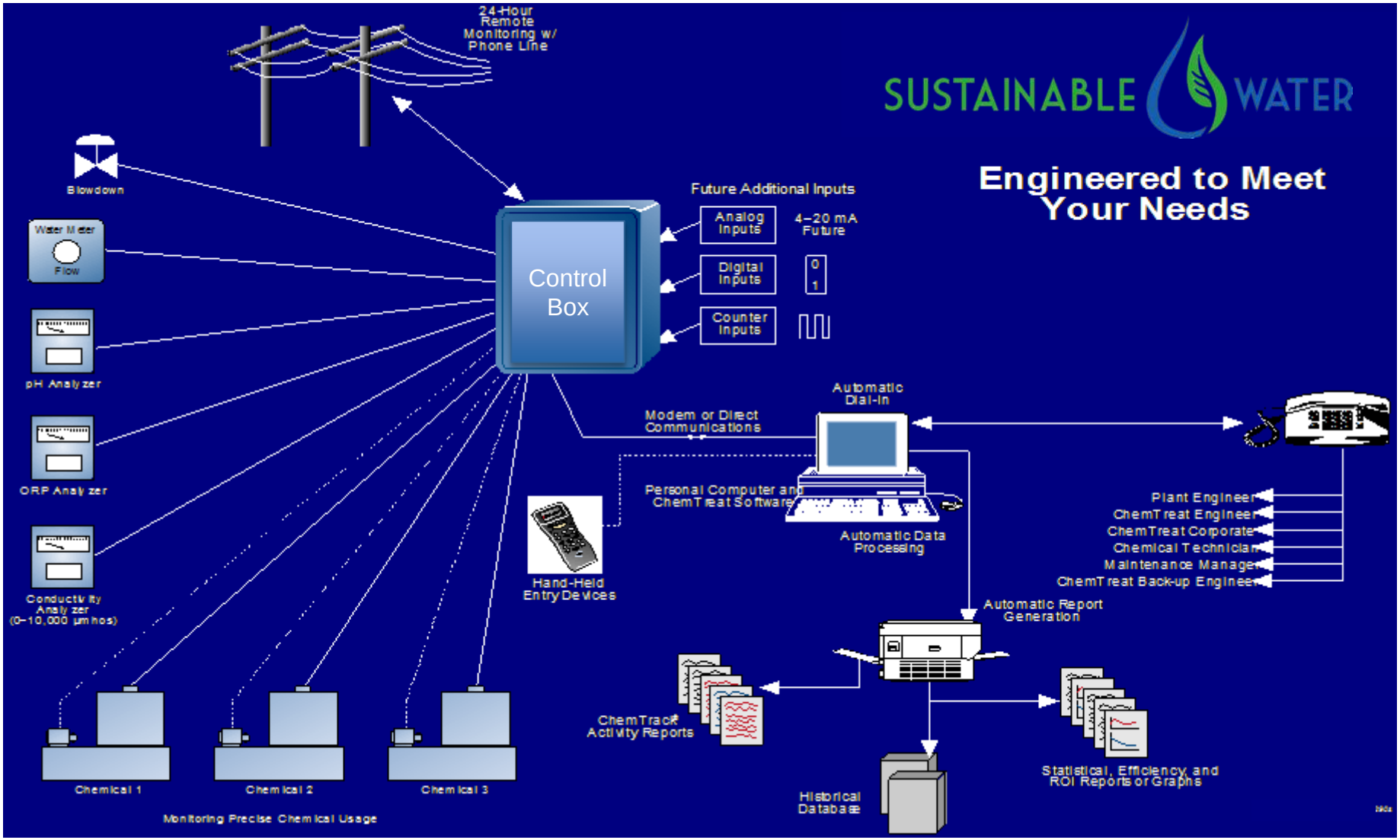




- Feasibility and treatability studies
- Scale inhibitors
- Sludge dispersants
- Treatment specifications
- Purity studies
- Corrosion studies
- Fuel conservation studies

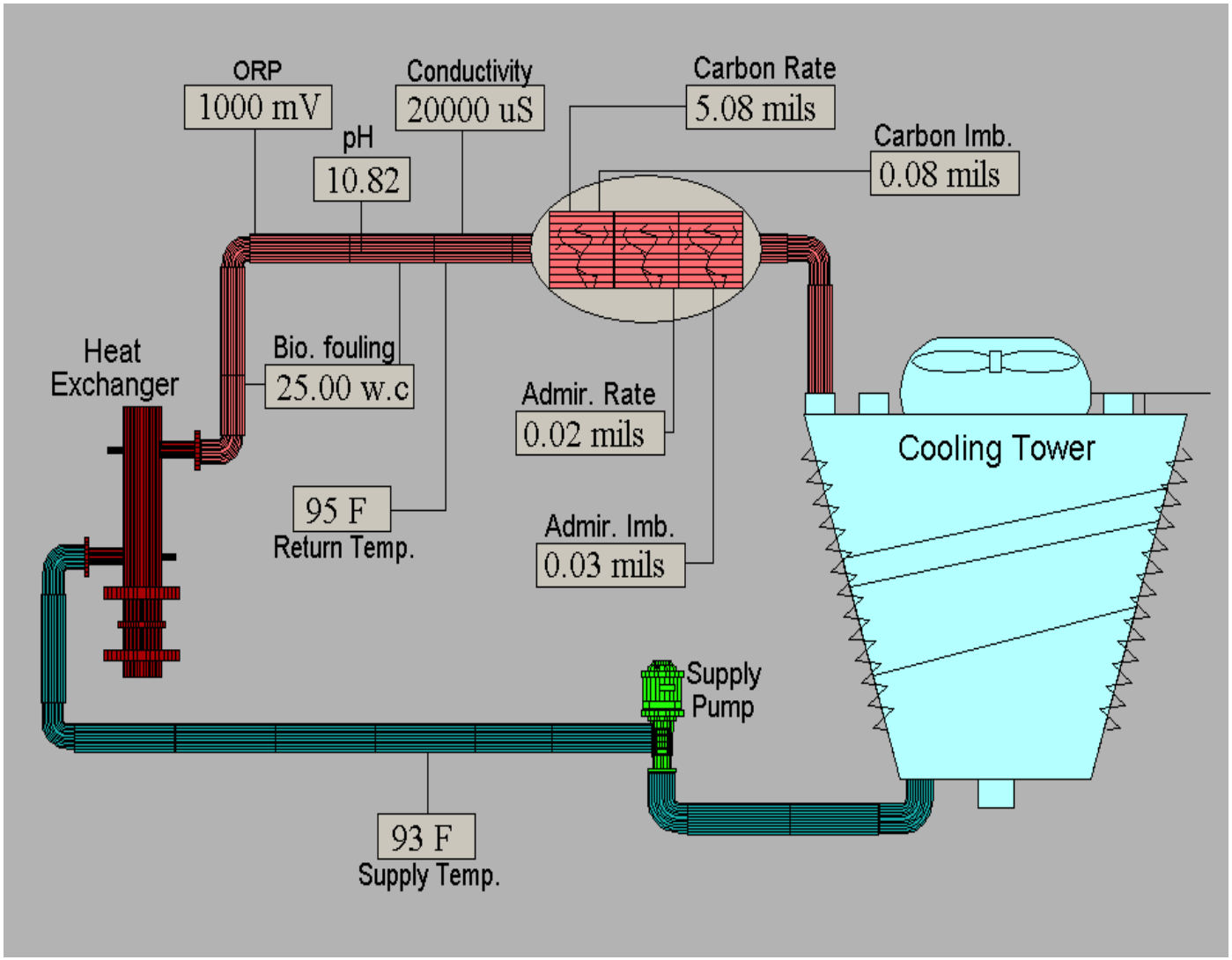
Superior Program Oversight: Unparalleled Collaboration

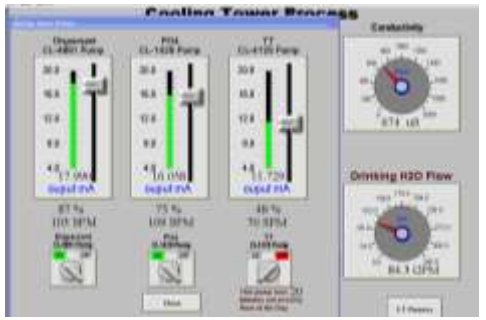
Harnessing the power of the internet

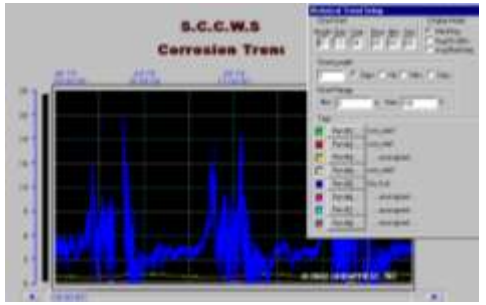


Reduces operational risk through greater oversight

Automation & Controls

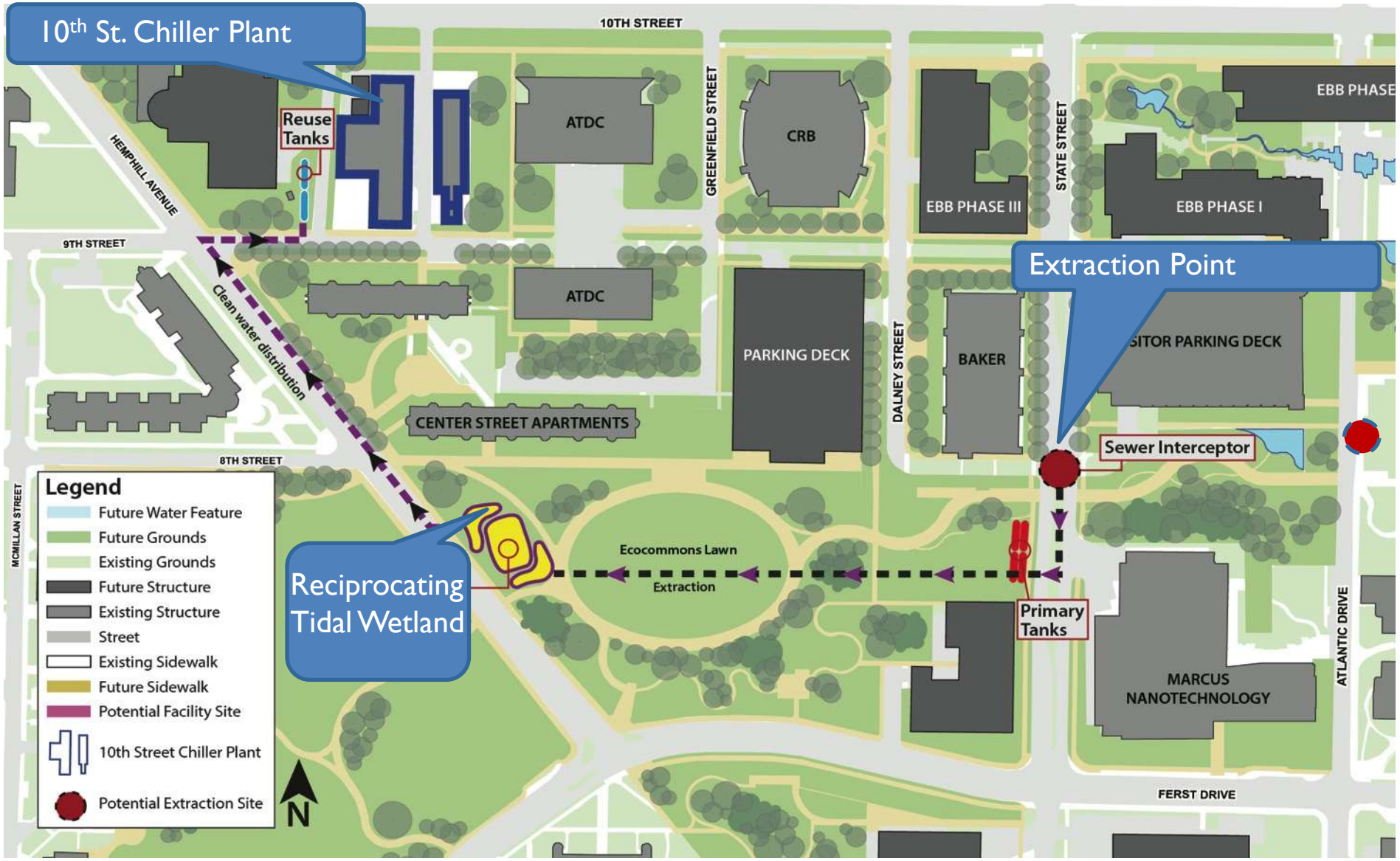






Improved reliability & economics through higher automation

Georgia Tech: Proposed Phase 1 (150k GPD)

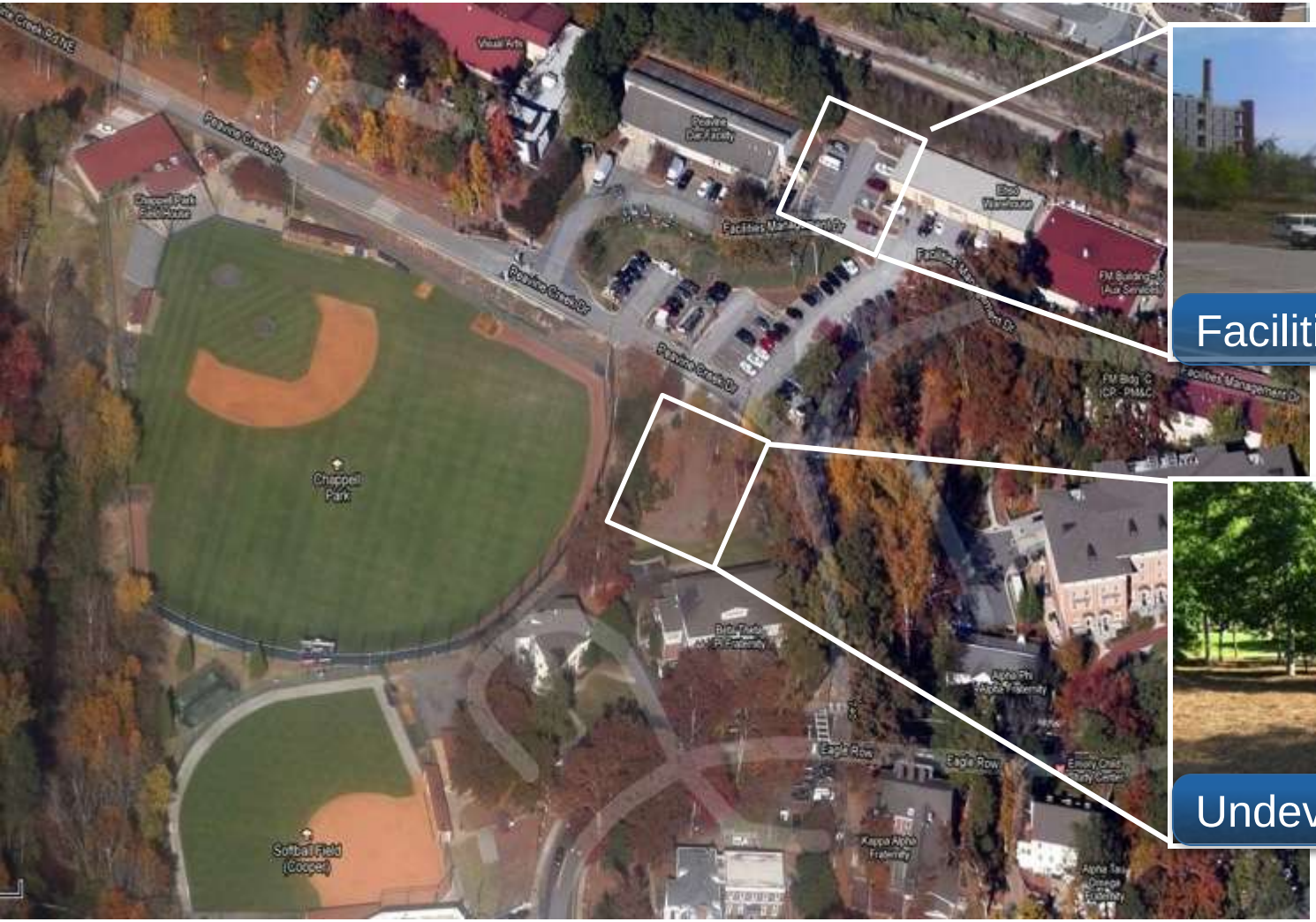


Complete build-out concept rendering

Phase 1: Reciprocating Tidal Wetlands

Phase 2: Expansion

Emory University
Site Selection

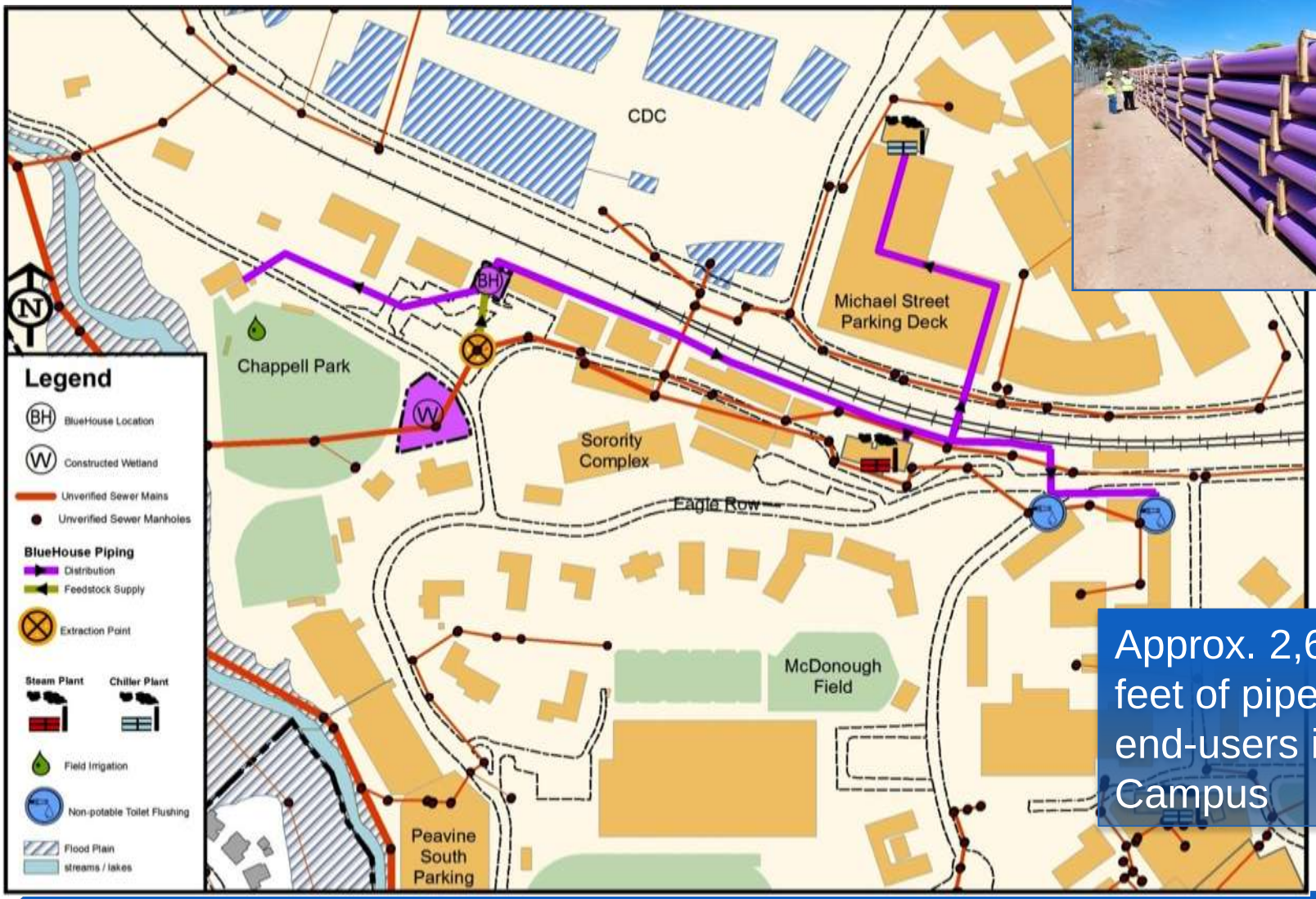


Facilities parking lot

Undevelopable parcel

Site Selection Balances Economics with Practicality

Reclaimed Water Infrastructure



Approx. 2,600 linear feet of pipe to 4 initial end-users in North Campus

Infrastructure that can serve future demand

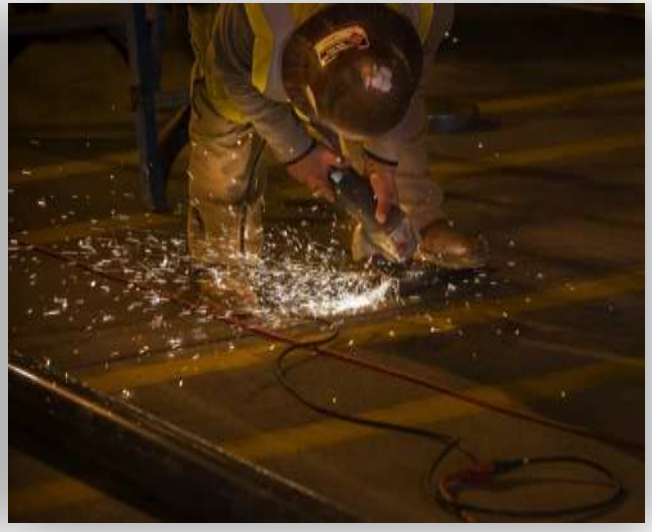
SUSTAINABLEWATER

WaterHub™

Functional, but also a Living, Learning Classroom

SUSTAINABLEWATER

WaterHub™ Construction



Knowledge, Know-How & Expertise

Benefits

- Reduces risk
- Diminishes demand
- Defers capital improvements & expansions
- Enables campus growth
- Protects water quality
- Enhances utility reliability
- Provides student engagement opportunities

Validated benefits promote diverse acceptance

SUSTAINABLE WATER

EXTENDING THE LIFE CYCLE OF WATER

QUESTIONS?

Jonathan Lanciani (804) 965-5590
Jonathan.Lanciani@sustainablewater.com

Nature’s Idea. Our Science