Decentralized Water Reclamation and Reuse: Extending the Lifecycle of Water

By: Erin Gallimore
Background
Why Water Reuse
The WaterHub Project
Responsibilities & Costs
Background
Emory University
Why Water Reuse
Local Water-Related Stresses

Aging Infrastructure

Scarcity

Rate Pressure

Environmental Constraints

Rate Increases Are Necessary for Infrastructure Improvements

DeKalb DWM Water & Sewer Rates

11.5% CAGR

Sewer  Water  Combined


$6.26  $7.94  $8.83  $10.54  $11.71  $12.33  $14.43

$/1,000 gallons
Aging Infrastructure: A Local Concern

Atlanta’s water needs rely on a system designed in 1875, and built piecemeal ever since.
Projected Cost of Campus Water Services

Annual Water & Sewer Costs Over 30 Years, Emory University

Annual Water Demand: ~333 M gallons
Water Cost: ~$3 per 1,000 gallons
Sewer Cost: ~$12 per 1,000 gallons

CAGR @ 3%     CAGR @ 5%     CAGR @ 7%     CAGR @ 10%
The Evolution of Water Conservation

Re-thinking water conservation to implement impactful solutions

Building-Based Solutions

"Low Flow"

Harvesting

Graywater Reuse

Campus-Wide Solutions

Behavioral Awareness

CONSERVE WATER

Level of Sophistication and Impact

Bulk Water Reclamation and Reuse

Re-use
Emory’s Water Saving Initiatives

- Stormwater Reuse Saves 800 KGPY
- Graywater Reuse Saves 750 KGPY
- Signage & Advertising
- Low-flow Fixtures
- Consumes >340 MGPY
Moving Bed Bioreactor (MBBR)
Treatment occurs through specially-engineered BioPortz moving media to mimic natural processes.

Submerged Fixed Film
Natural and synthetic plant roots provide habitat for microbes.

Reciprocating Wetland
Utilizes biomimicry to imitate and improve upon natural tidal processes through multiple fill and drain cycles.

System Benefits:
- Protects water quality
- Decreases campus water footprint by over 1/3
- Saves millions of dollars in utility costs
- Diminishes demand on the community
- Lowers stress on county water infrastructure
- Reduces energy footprint by treating water on-site
“We looked at where we currently use the most potable water in our facilities — applications where we don’t really need drinking-water quality water — and it came down to our toilets, our steam plants and our chiller plants.”

Brent Zern, Asst Director of Operational Compliance & Maintenance Programs, Emory University
"This (facility) offers an interesting case study for how an institution can move a community toward a bold step in water conservation. It’s also exactly the kind of reduction we need to see in order to support a more sustainable future .”

Ciannat Howett, Director of the Office of Sustainability Initiatives at Emory

Emory’s WaterHub uses natural processes to reclaim wastewater.
Benefits to Emory University:

• Redundant Water Supply
  – Drought
  – Municipal infrastructure failures

• Additional On-Site Storage

• Reduced Environmental Impact

• Flexibility, Independence & Resilience

• Reduced Community Reliance

• Minimum recovery time

• Insulation from rising water costs
The WaterHub Project
Emory - Aerial View: Under Construction

Small Physical Footprint, Sited in the Middle of Campus
Ecological Treatment Design
GlassHouse (Upper Site)
Increased biodiversity

Highly diverse community of microorganisms optimizes treatment efficacy

Aquatic Worm

Rostrifera

Collotheca

Philodina

Aquatic Worm
Emory - Construction Photos

Construction Time Frame: 6 – 8 Months
The WaterHub at Emory University
The WaterHub at Emory
Emory Hydroponic System
Reclaimed Water Distribution

100% Displacement of Utility Water Demand
Future Expansion

30% Total Reduction in Campus Water Use

Phase II Reclaimed Water Distribution Expansion

30% Increase

Gallons/Day

Jan  Mar  May  Jul  Sep  Nov

Phase 1

Phase 2
Unique Development Approach

Water Purchase Agreement

~ Shared Savings Agreement ~ Operating Lease ~ DBO Agreement ~ Performance Contract

Benefits

- **No up-front capital**
- Innovative Technologies
- Leverages superior credit rating
- Immediate, Guaranteed Savings
- Long Term Pricing Stability
- **No O&M Responsibilities**
- SW bears majority of risk
O & M under WPA

• Highly Automated Operations with Remote Monitoring Capabilities
• State Certified Operator On-Site
• Daily Compliance Testing
• Preventative & Predictive Maintenance & Repairs
• Includes All Operating Expenses

• Labor
• Energy
• Permit Fees
• Compliance Testing
• Taxes

• Insurance
• Chemicals
• Discharge Fees
• All Maintenance & Repair
"I think it also shows an important role the university can play in advancing sustainability and engaging in this idea of the campus as a living laboratory, a place of experimentation and engagement and learning. This (facility) offers an interesting case study for how an institution can move a community toward a bold step in water conservation. It’s also exactly the kind of reduction we need to see in order to support a more sustainable future."

Ciannat Howett, Director of the Office of Sustainability Initiatives at Emory
EXTENDING THE LIFECYCLE OF WATER.

QUESTIONS?

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