



On Campus Water Reuse: Reliability and Readiness



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Who We Are...

Water Developer Specializing in <u>Turn-Key</u> Water Reuse Projects

- Technology Integrator
- Planning/Design/Build
- Financing
- Operations









Turn-key Water Management Projects



Water Management Consulting

Water Management Consultants

- Water Balances & Footprint
- Water Reuse Feasibility
- Optimizing Utility Water Systems
- Process Water Treatment
- Risk Management for Utility / Process Water Systems
- Flow Monitoring Studies
- Flow Meter Replacement Plans
- Comprehensive Water Management Plans



Helping Clients Utilize Water Resources More Efficiently



Project Planning & Feasibility Study Tools



Multi-Disciplinary Team Builds Client Trust



Why Water Reuse?



Local Water-Related Stresses

Aging Infrastructure







Environmental Constraints



Rate Increases Are Necessary for Infrastructure Improvements



Aging Infrastructure: A Local Concern



DeKalb County crews work to repair water main break



Atlanta's water needs rely on a system designed in 1875, and built piecemeal ever since



Hundreds go without water after water main break in DeKalb County Posted: Oct 18, 2013 4:26 AM EDT



Water Related Impacts Illustrate Need to Promote Water Management



Projected Cost of Campus Water Services



Hundreds of Millions of Dollars Demands Executive Attention

The Evolution of Water Conservation





Re-thinking water conservation to implement impactful solutions



Emory's Water Saving Initiatives



Water: Strategic Imperative Drives Project Execution for Small Yields

Campus Water Footprint, FY13-14



40% Considered Non-potable Demand



Decentralized System Approach

Lave Faillet Cumming Q Flowery Holly Springs artersville **Fowler Water Reuse** Milton Buford **Cherokee Water Reuse** (347) Brasel 85 Alpharetta Webb (401) Acworth Bridge Cauley Water Reuse 19 Johns Creek 1211 Kennesaw Roswell Auburn Johns Creek Environmental East Cobb (29) Lawrenceville Marietta 120 Sandy **Scott Candler Drinking Plant** (81) ble Springs (360) Fair Oaks vin Park Chamblee Lilburn Smyrna Hiram Brookhaven Tucker Snellville Mountain RM Clavton WWTP Buckhead Loganville (10) Universit Emor Mabletor 78 Atlanta Lithia Mountain Botanical C -Springs Garden Decatur (402) Douglasville Deer (81) Atlanta Lick Park Redan Candler-McAfee 75 Lithonia Panthersville (81) ure (402) East Point 285. Convers Cliftondale **Snapfinger WWTP** Panola Mo State Pa **Polebridge WWTP** ington Rex Union City Morrow Riverdale (162)Fairburn Stockbridge (70) Inneshore

Municipal Reclaimed Water Not an Option for Campus



Existing Infrastructure Unable to Provide Reclaimed Water



"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



water conservation







Emory's WaterHub uses natural processes to reclaim wastewater.

The WaterHub is Important Next Step in Long-Term Conservation Strategy



Campus Risk Mitigation

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





Reliable and Safe Alternatives to Potable Water



The WaterHub Project







Reclaimed Water Distribution



100% Displacement of Utility Water Demand



Future Expansion





Phase II Reclaimed Water Distribution Expansion

30% Total Reduction in Campus Water Use



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
- **Cumulative Savings** Long Term Pricing Stability •
- **No O&M Responsibilities** •
- SW bears majority of risk •



Flexible, Innovative Vehicle that Yields Guaranteed Savings

Community Outreach Research Opportunity

Living-Learning Laboratory

Educational Tool for Students

The WaterHub at Emory
Extending the lifecycle of our WaterRecycling 140 Million gallons
of water per year

Moving Bed Bioreactor (MBBR)

Treatment occurs through speciallyengineered 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



First and Only Ecological, Decentralized Reuse System in the US



	ReCip® Tidal Wetlands	Hydroponic and Fixed Media	Moving Bed Bioreactor (MBBR)	Membrane Bioreactor (MBR)	Conventional Activated Sludge
Capital Expense	•		•	•	0
Operating Expense	•	•	0	•	0
Energy Efficiency		0	0	•	
Effluent Quality	•	•	•	•	•
Footprint	0	•	0	0	•
Aesthetics			0	•	•

Innovative Technology Increases Biodiversity & Reduces Energy Requirements



The WaterHub at Emory University

35% of Total Campus Demand
90% of Utility Water Demand
3 Chiller Plants/1 Power Plant
400, 000 GPD Hydroponic System





Permitted for Use in Utility Operations, Irrigation, and Toilet Flushing



WaterHub Process Design

How the WaterHub Works



Extraction and Rotary Screen. Wastewater is extracted from the south site and pumped to the rotary screen at the north site (on roof) which removes non-bio-degradables. 2 Anoxic Moving Bed Bioreactors (MBBR). In an oxygen depleted environment, carbon containing material is removed by clustering microorganisms that colonize on freely-moving "BioPortz" (honeycombed plastic pellets which maximize habitat). Wastewater circuitates between MBBRs to optimize nitrogen removal and minimize creation of odorous gases.

3

Aerobic Moving Bed Bioreactors. Wastewater is aerated with course bubble diffusers. This removes much of the carbonaceous material and further removes odorous gases from the water. Hydroponic Reactors. Within the greenhouse, dense tropical plant root systems and BioPortz provide a healthy habitat for large microbial populations. This results in stable biofilm growth and efficient, stable wastewater treatment. Outdoor Hydroponic Reactors utilize native and naturalized plant species and allow greater volumes of wastewater to be treated. Fine bubble aeration diffusers add oxygen to enhance reduction of carbonaceous material and nitrification. Beneficial organisms graze on microbial biomass and reduce solids/sludge. Demonstration Reciprocating Wetlands (DRW). Created to demonstrate alternate waste treatment systems, the DRW receives screened influent from the MBBR. The fill-and-drain wetland cells use various sizes of gravel which provide microorganism habitat. Fill-and-drain cycling occurs & to 18 times a day and provides alternating anoxic and aerobic treatment. Requiring little mechanical energy, yet large land mass, a Reciprocating Wetland is a treatment system appropriate to rural areas and developing countries.





Ecological Treatment Design



Seamlessly Integrated Into the Built Environment



Outdoor System (Lower Site)



Convergence of Multiple Ecological Treatment Technologies





Small Physical Footprint, Sited in the Middle of Campus



GlassHouse (Upper Site)



GlassHouse Footprint Compact and Efficient at 2,100 SF



Moving & Fixed Media Solutions



Biomimicry: Maximizing Treatment Capacity / Minimizing Energy and Space





Emory - Construction Photos









Construction Time Frame: 6 – 8 Months





Technology Overview



The WaterHub at Emory University



Showcase Project for College Campus with Sustainable Vision



The WaterHub at Emory



Fully Secured Facility Serves as a Sustainable Beacon



Sustainability 101



Educational Awareness Imperative to Complete Sustainability Messaging



Emory Hydroponic System



A Sustainable Treatment Solution to Treat Extensive Water Demands





Distribution System Tour



4,425 Linear Feet of Distribution Piping





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 All Maintenance &
 - Taxes

- Insurance
- Chemicals
- Discharge Fees
- All Maintenance & Repair

Operations Performed in Accordance to State Standards/Protocols

Living, Learning Laboratory





Active

R&D



"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

Multi-Functional Facility Serves as Educational Asset



EPA Administrator Tours WaterHub





••••○ AT&T LTE 1:50 PM \$ 40% ■→





Gina McCarthy @GinaEPA

.@EmoryUniversity cut water use by ~35% w/new WaterHub, saving the school big on utility costs. A model for us all! pic.twitter.com/FQUVPOJoBt





Gina McCarthy @GinaEPA

Appreciate the feedback from House Transportation & Infrastructure members on ensuring clean water for all Americans #ProtectCleanWater

View more Tweets

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"...saving the school big on utility costs, a model for us all." – Gina McCarthy

Federal validation on treatment approach and financing model



EPA Administrator Tours WaterHub

The Administrator Washington, D.C. 20400

FEB 2 7 2015

Ms. Ciannat Howett Director of Sustainability Initiatives Emory University 201 Dowman Drive Atlanta, Georgia 30322

Dear Ms. Howett:

The tour of the WaterHub was a highlight of my recent visit to Emory University, and I want to thank you and your colleagues again for all the hard work you devoted to making it so interesting and informative.

I enjoyed learning more about Emory's commitment to best practices in water stewardship and in conservation. You offered a great overview of the operations there, and everyone I met was so eager to share their knowledge and to answer my questions.

Given the U.S. Environmental Protection Agency's ongoing focus on protecting and improving the quality of America's waters, I was impressed to learn the new facility will make it possible for Emory to save tens of millions of gallons of potable water every year. That is a real achievement.

I applaud Emory's leadership in sustainability and wish you continued success in your exciting initiatives.

Sincerely. Gina McCarthy

"The WaterHub will make it possible for Emory to save tens of millions of gallons of potable water every year. That is a real achievement." – Gina McCarthy



Federal validation on treatment approach and financing model



EXTENDING THE LIFECYCLE OF WATER.

Nature's Idea. Our Science. QUESTIONS?

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