Emory University, Atlanta, GA

A more resilient campus through water reuse

An on-site eco-engineered water reclamation plant reduces campus water use by nearly 40% - saving the university millions of dollars.

In the last decade, Atlanta has witnessed numerous water-related stresses, including: severe drought, EPA mandates to resolve critical infrastructure failures, and an extended political dispute over water rights in the so-called "Tri-State Water Wars." As a result of these challenges, Emory University set out to explore ways to minimize its impact on community water resources and the environment. Using close to 350 million gallons annually, the University deployed water conservation tactics ranging from low-flow fixtures to stormwater reuse. As regional water stresses persisted, the campus turned to a more strategic and impactful water management solution: campus-wide water reclamation and reuse.

"The WaterHub is expected to save the University tens-of-millions of dollars over the next 20 years."

With an extensive district energy system supplying steam heat and chilled water to campus, the University has significant process water demands that equate to nearly 40% of campus water use. A majority (85%) of this water is used by the steam plant and five campus chiller plants. These utility plants provide an ideal opportunity for displacing a significant portion of the campus water footprint with a reliable and sustainable source of water at discounted costs.

Sustainable Water designed Emory's reclamation system to integrate into the existing campus framework using two small parcels near Chappell Park field. Up to 400,000 gallons of wastewater is mined directly out of the campus sewer system daily. Water is cleaned to Georgia reclaimed water standards through an energy efficient eco-engineered treatment process supported by solar (PV) energy production. The system has 50,000 gallons of clean water storage cpacity, providing N+1 redundancy for campus district energy systems. Recycled water is distributed to the multiple utility plants and select dormitories for toilet flushing via a 4,400 linear foot "purple pipe" distribution system. At full build-out, the system will displace nearly 105 million gallons of potable water annually - providing tens-of-millions of dollars in savings to the University over the next 20 years.

The system is designed to promote research and community outreach, enhancing the concept of the campus as a "living laboratory." With built-in lab space and easy access ports for water quality testing, the facility enables research in a variety of topics. The lower site also includes a demonstration reciprocating wetland system as a showcase to visitors interested in other sustainable treatment technologies.

WATER HUB

EMORY UNIVERSITY

"With this facility, we're taking a major step forward by reclaiming our own wastewater, which will save tens-of-millions of gallons of potable water every year."

Matthew Early
Vice President of Campus Services
Emory University

Location
Atlanta, Georgia

Project
Domestic Sanitary Wastewater Reclamation & Reuse

Project Timeline
2015

Footprint
3,000 ft² GlassHouse
1,500 ft² Outdoor landscaping

Hydraulic Capacity
400,000 gallons per day

End Uses
Boiler Make-up
Cooling Tower Make-up
Toilet Flushing

Technologies Applied
Hydronponic w/ Submerged Fixed-Film Reactors
Reciprocating Wetlands (Demo)

"This facility is a case study for how an institution can move a community toward a bold step in water conservation."

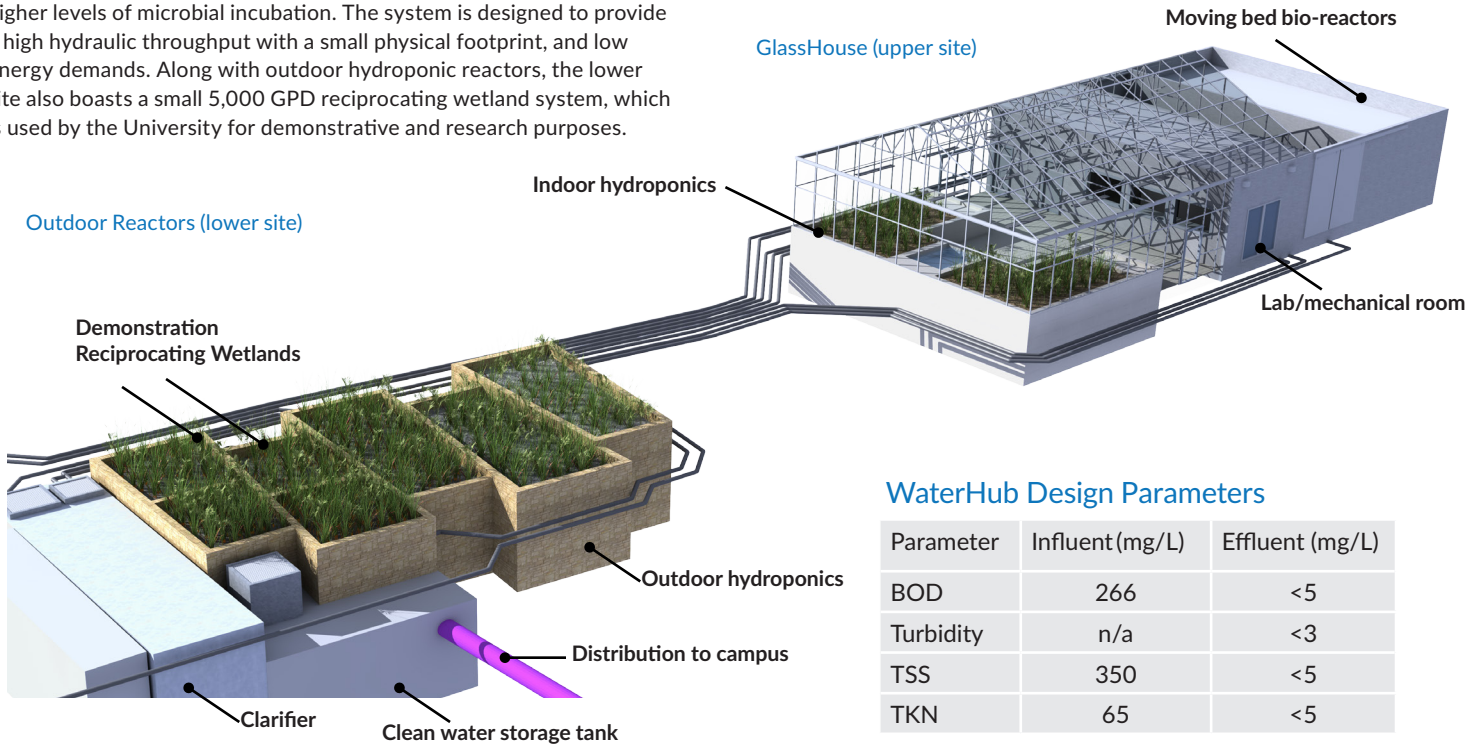
Ciannat Howett, Director
Office of Sustainability
Emory University

Technology Description

The WaterHub at Emory is an adaptive ecological water reclamation system designed to treat domestic sanitary sewage for beneficial reuse. Wastewater is mined from a 30" sewer line near the lower site and then pumped to the upper site where it enters a rotating drum screen before entering the moving-bed bioreactor (MBBR) system. The process design combines submerged fixed-film hydroponic reactors with a MBBR as an initial treatment step. After primary treatment, water passes through a small clarifier, a disk filter, and a dual-stage disinfection system consisting of ultraviolet (UV) light and an oxidizing agent (chlorine).

The hydroponic reactors utilize plants and their root systems to mimic and maximize natural treatment efficiencies associated with oxygen diffusion and habitat creation. Below the root zone is an artificial media, called BioWeb, that extends the submerged fixed-film surface area for higher levels of microbial incubation. The system is designed to provide a high hydraulic throughput with a small physical footprint, and low energy demands. Along with outdoor hydroponic reactors, the lower site also boasts a small 5,000 GPD reciprocating wetland system, which is used by the University for demonstrative and research purposes.

Hydroponic reactors and water feature inside the GlassHouse



WaterHub Design Parameters

Parameter	Influent (mg/L)	Effluent (mg/L)
BOD	266	<5
Turbidity	n/a	<3
TSS	350	<5
TKN	65	<5

Cooling towers at Michael St. Chiller Plant now receive reclaimed water

Lower Site: outdoor hydroponics and demonstration reciprocating wetlands