

# Water Procurement for Data Centers UIC Water Recycling Team



Civil, Materials, and  
Environmental Engineering



As cloud computing, generative artificial intelligence (AI), and other data-intensive technologies expand, the need for high-capacity data centers surges. These data centers house the servers, networks, and storage systems that power our digital lives. The shift to AI places growing demand on local water and energy resources.

The University of Illinois Chicago (UIC) Water Recycling Team, led by [The Freshwater Lab](#), promotes industrial water reuse to meet the cooling demands of this expanding data-center network. Specifically, we recommend the reuse of municipal and industrial wastewater in new and existing data center facilities, including the Illinois Quantum and Microelectronic Park (IQMP) and other facilities in the Chicago metropolitan area, to reduce dependence on potable water, minimize energy needs, and support sustainable economic growth.

We have the expertise to further develop a technical, research-based framework that combines systems modeling, economic and policy analysis, and life cycle assessment for alternative water supply approaches for data centers and the associated energy impacts.

Our approach enables site-specific water reuse recommendations and applications and could support a digital tool that weighs various water reuse options and makes recommendations for particular projects.

Our success is evident in elevating public dialogue about water reuse at IQMP; forming [action 7.11](#) in the [U.S. Environmental Protection Agency Water Reuse Action Plan](#) (WRAP); contributions to [Illinois House Bill 3046](#) that approved revisions to any rules necessary to facilitate water reuse in the state; contributions to the [Metropolitan Water Reclamation District's Water Reuse Resolution](#); and introduction of [H.R. 2940 in the U.S. Congress](#) to allow an investment credit for certain water reuse projects. The UIC Water Recycling Team's 2023 report [From Waste to Water](#), that proposed a dual pipeline system for new communities joining the Chicago water supply, launched dialogue about water reuse in the Great Lakes region.

## Background

Most data centers rely on municipal drinking water, using the same high-quality supply as residents to primarily cool their computers, servers, equipment, and other systems. Data centers accounted for 17.4 billion gallons of site water use in 2023 and are projected to grow to 72.6 billion gallons by 2028. A single data center can use up to 5 million gallons of water daily, about the same as a medium-sized town (Osaka, 2024).

Supplying data centers with municipal drinking water is neither cost-effective, sustainable in the long term, nor aligned with goals for diversified economic growth (Mytton, 2021). Hyperscale data centers can also exert stress on wastewater treatment plants by introducing contaminants in their discharge that could require additional treatment and operational energy to meet current standards.

At the core of our work stands the recognition that the various forms of recycled water can address the problems of water stress and the quality of discharge. Data center cooling does not require highly treated water (i.e., drinking water quality). Providing data centers with recycled water can bring value to waste streams (outflowing water from municipal treatment plants and industrial facilities that has already been used once and, after appropriate treatment, can be captured and repurposed rather than discharged), preserve precious freshwater, yield energy savings, and promote economic growth.

**A shift to water reuse, first at new data centers coming online and eventually throughout the industrial sector, can position the region as the world's Water Belt, able to absorb new industry, agriculture, and population.**

## Nature of the research

Analysis of five possible approaches to water procurement at data centers informs our framework:

1. Using potable (treated) water for all of the water needs at data centers and its disposal through evaporation and into the adjacent water bodies post usage
2. Reusing treated wastewater from municipal treatment plants, in addition to the onsite harvested stormwater for the water needs of the data center, and disposal post-treatment
3. Use of a closed-loop system for cooling, and on-site harvested stormwater for supplement
4. Application of data center wastewater toward artificial groundwater recharge
5. An open-loop system that draws water from an aquifer, lake, or river for cooling. The released heated water can be harvested using these approaches, with positive implications for the water-energy nexus

In addition to technical analysis, our framework proposes the enabling regulations, policies, and public communication strategies that would allow the various approaches to be swiftly implemented.

**Our work aims to minimize freshwater dependence, optimize energy use, and position the Great Lakes as a resilient data center and quantum development hub.**

## Research team

- [Rachel Havrelock](#), Director, The Freshwater Lab at UIC, has expertise in water policy and governance, water reuse in the Middle East and Great Lakes region, and cross-sector facilitation.
- [Krishna Reddy](#), Director, Sustainable Engineering Research Laboratory, UIC Civil & Environmental Engineering, has expertise in life cycle assessment, sustainability, and resiliency.
- [Ralph T. Muehleisen](#), Chief Building Scientist, Argonne National Laboratory, has expertise in technical systems analysis, thermodynamic modeling, and open source modeling tools.
- [Ahmed-Rachid El-Khattabi](#), Research Fellow, UIC Great Cities Institute, has expertise in environmental economics and the development of financial digital tools.
- [Teresa Córdova](#), Director, UIC Great Cities Institute, has economic development and water management expertise from urban planning and policy perspectives.
- [Matthew Wilson](#), Associate Director, UIC Great Cities Institute, has economic and workforce development expertise.
- [Yu-Feng Lin](#), Director, Illinois Water Resources Center, has expertise in heat harvesting and closed-loop systems.
- [Andrew Stumpf](#), Principal Research Scientist, Prairie Research Institute, University of Illinois Urbana-Champaign, has expertise in geothermal, open-loop systems, and underground energy storage.

## References

- Mytton, D. 2021. Data centre water consumption. *npj Clean Water*, 4(1), 11.
- Osaka, Shannon. 2024. A new front in the water wars: Your internet use. In the American West, data centers are clashing with local communities that want to preserve water amid drought.

## Contact

Rachel Havrelock, director of The Freshwater Lab, [raheleh@uic.edu](mailto:raheleh@uic.edu)