



## GRAND PRIZE - SMALL PROJECTS

### GREENING GREY INFRASTRUCTURE:

## A LIGHTWEIGHT ALTERNATIVE TO UPGRADE THE DISTRICT'S WATER SUPPLY FACILITIES

ENTRANT: DC Water

ENGINEER-IN-CHARGE: John Cassidy

LOCATION: Washington, DC

The District of Columbia Water and Sewer Authority (DC Water) is implementing its Long Term Control Plan (LTCP) through the DC Clean Rivers (DCCR) Project to control combined sewer overflows to the District's waterways and improve water quality. In addition to the new grey urban infrastructure (underground tunnels), DCCR has completed a project retrofitting existing DC Water facilities with Green Infrastructure (GI) measures. The most prominent element of this project, due to its size, complexity, sensitive location, and overall project impact, is a 42,390 square foot green roof that was installed over an existing drinking water reservoir located at Fort Reno (FR) in northwest DC.

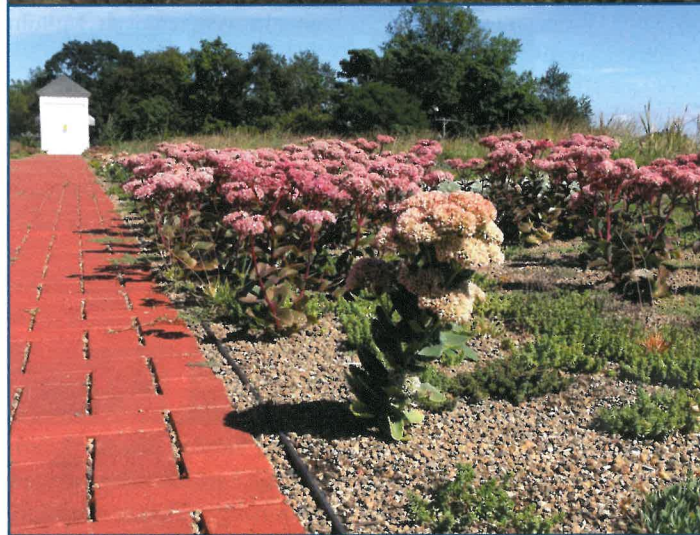
The FR Reservoir is a covered 5.8 million gallon reservoir system that was constructed in the early 1900's. The roof is made up of an 8-inch thick reinforced concrete slab topped with a built-up roof to protect it from the elements.

Two key drivers dictated the design of the green roof: total green roof system weight and protection of the drinking water supply. These factors guided every design decision to create a lightweight and "leak-proof" green roof.

A complete structural analysis of the existing reservoir roof slab was completed prior to proceeding with the design of the green roof and allowed for the design of a green roof system weighing 50 pounds per s.f. The soil media formulation was chosen to provide just enough organic material to sustain the green

roof plantings while meeting the strict weight requirements. The insulation is composed of extruded polystyrene due to its hydrophobic properties, low water absorption, and low weight. Incorporating this material allowed the designers to create a rolling topography for added visual interest on the roof and permitted greater plant diversity that complemented the topography. Lastly, through the incorporation of a 1/2 inch thick capillary fabric, the designers were able to minimize the soil media depth while maintaining diversity in plant selection.

To ensure a "leak-proof" green roof, a series of multiple waterproofing layers in conjunction with a continuously-operating leak detection system were used. Both mod-bit waterproofing and thermoplastic membranes were installed as part of the green roof assembly. A vapor barrier was applied directly to the concrete roof slab to inhibit moisture within the reservoir from migrating up through the green roof system and protect the drinking water supply from green roof infiltration. In conjunction with the multi-layer waterproofing, a 40-mil High-Density Polyethylene root barrier tops the mounding insulation to inhibit root growth through the barrier and protect the waterproofing membranes. A continuously-operating leak detection system actively monitors the roof for any potential leaks and is linked to DC Water's Supervisory Control and Data Acquisition System to provide 24-hour monitoring of the roof



**TOP** Fort Reno Reservoir prior to construction of green roof (2011).

**MIDDLE** Fort Reno Reservoir green roof during first growing season (2013).

**LEFT** Fort Reno green roof succulent thriving in its new home on the Fort Reno Reservoir green roof during the first growing season.

and protection of the drinking water supply.

Post-construction monitoring is currently underway for the green roof and indicates a 90% reduction in runoff volume compared to

pre-construction data. In addition to the environmental benefits, this project serves as a showcase to create public awareness and promote the benefits of GI and how it can be successfully implemented.