Facing the Storm

Protecting water quality in Pennsylvania.

Rainwater harvesting in Redondo Beach.

By Frank Birney

Four projects conquer today's unique storm water challenges

Storm water pollution continues to be a leading cause of water quality impairment across the country. Regulations continue to adapt and evolve, but there still is not a one-size-fits-all solution. Recent years have seen the industry shift to a green infrastructure approach to managing storm water, such as low-impact development (LID). An LID design mimics predevelopment hydrology by managing storm water on site through infiltration or reuse practices. There continues to be a need, however, for conventional end-of-pipe solutions because use of small, decentralized treatment systems is not always cost-effective on projects with high flows and large impervious surfaces. On redevelopment projects, where land can be scarce, land-based treatment systems are not always practical. While each site has unique challenges and local requirements, there are cost-effective technologies available to meet regulations and successfully reduce storm water pollution.

Nutrient removal in Virginia.

Subsurface installation in Wisconsin.

Rainwater Harvesting in California

The Alta Vista Park Diversion and Reuse Project was designed to help the city of Redondo Beach, Calif., comply with Regional Water Quality Control Board requirements to reduce storm water pollution and included the installation of a rainwater harvesting system. Capturing and reusing dry-weather and first-flush flows as well as larger rain events will provide many benefits, including runoff reduction, pollution control and irrigation for the site.

Because space was limited in the park, an underground system was required. An UrbanGreen rainwater harvesting system from Contech was installed. First, a CDS system pretreats the runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding.

Storm water runoff then flows to a steel-reinforced polyethylene (SRPE) cistern that regulates the flow through the main pipelines by acting as a buffer during peak loads. SRPE offers superior joint quality. Its ElectroFusion joint remains watertight with a zero leak rate up to a pressure of 30 psi. The frequency of rain events can be sporadic in southern California, and the reduction of water loss is important.

Next, water is treated with a storm water management StormFilter before it flows to a second SRPE cistern that is the main storage before irrigation reuse. The irrigation water supply system includes two vertical turbine pumps and a hydropneumatic tank to maintain the water pressure and flow rates equivalent to current irrigation demands. If the cistern is dry, water will be provided by the municipal water system. A reduced-pressure double-check backflow preventer also has been installed to prevent cross-contamination. The system will be monitored through a SCADA system, allowing for remote real-time observation.

Subsurface Infiltration in Wisconsin

When redesigning a campus parking lot, the University of Wisconsin at Stevens Point wanted to utilize a green method of managing storm water. Originally, a series of biofiltration systems was incorporated into the design.

To meet the Wisconsin Department of Natural Resources' storm water requirements, however, a greater volume of runoff had to be infiltrated than the specified systems could provide. A certain number of parking spaces was required, and they were already at their minimum. Without available surface land, the project team decided to go underground.

An underground corrugated metal pipe infiltration system from Contech was installed. With a capacity to store more than 8,622 cu ft, it will prevent flooding of the parking lot. The fully perforated system slowly releases storm water into the surrounding soil, mimicking predevelopment hydrology, thus meeting the university's green infrastructure requirements. Additionally, because steel is one of the world's most recycled materials, production of the steel required less energy and materials, lowering its carbon footprint.

Nutrient Removal in Virginia

Strategically located in one of the fastest-growing areas in the U.S., Watkins Centre is a 600-acre mixed-use development in Chesterfield County, Va. Westchester Commons is the first phase of retail development and encompasses more than 100 acres. The site is the first large-scale development on the Route 288 corridor and is located on the border of the watershed limits of the Swift Creek Reservoir, which provides drinking water for a portion of the county.

The site has a high area of impervious acreage—more than 80 acres—and Virginia storm water regulations require a 65% removal of total phosphorous (TP) from runoff. Because Chesterfield County requires that a surface basin contains 10 times the water quality volume to achieve a 65% TP reduction, the surface basin initially proposed would have had a footprint in excess of five acres. Additionally, it would have eliminated an intermittent stream channel, which caused the U.S. Army Corps of Engineers to reject the plans.

Ultimately, a StormFilter system—one of only two manufactured systems granted a TP removal performance level of 50% by the Virginia Department of Conservation—was installed. Chesterfield County approved the use of the system.

The sheer size of the drainage area feeding the system required development of a new configuration for the vault housing the filter cartridges. A CON/SPAN structure from Contech was installed to house the 928 filter cartridges.

Surface basins still were required on site to reach the 65% TP reduction, but use of the StormFilter drastically reduced their size. This resulted in a significant amount of project cost savings by eliminating the large retaining walls surrounding the storm water ponds and the need for dam safety permitting.

Protecting Water Quality in Pennsylvania

The Philadelphia Regional Produce Market is one of the largest produce markets in the U.S. It needed space to grow and relocated to an old junk/scrap yard. The new 667,000-sq-ft facility will be nearly twice the size of the current facility.

The site was nearly all impervious, with storm water discharging to the nearby Schuylkill River. This meant flow rates would be high and made removing pollutants important. The Vortechs system from Contech was chosen.

Two systems incorporated a unique design in which two Vortechs model 16000s were installed in parallel with an 8-by-20-by-8-ft StormGate bypass structure. The bypass structure separates the treatment flow between the systems and allows higher flows to bypass. Because of its large swirl chamber (the Model 16000's has a 12-ft diameter), the Vortechs system provides a large treatment zone surface area.

There was limited space on site due to existing utilities (e.g., water, sewer and gas lines) and groundwater elevations were relatively high, so developers were looking at high excavation costs. The Vortechs had the shallowest depth below invert compared to similar systems, which reduced the amount and cost of excavation. WWD

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