

# WATCHING THE WATERSHED

## Monitoring system helps county track watershed health, maintain compliance

By Danielle Dumont

After receiving a text message indicating a real-time spike in ammonium and conductivity, field technicians in Greenville County, S.C., dropped what they were doing to track the potential illicit discharge. Something unusual was going on near one of the storm water monitoring stations in the Reedy watershed.

The team quickly mobilized and drove to the station. Using a portable YSI-brand water quality sonde, the team took readings around the station, and then continued to take readings as they hiked upstream in search of changes in water chemistry. First they found a small pipe dumping water into the river; they traced the pipe back to a small tributary. Finally, the team pinpointed the source of the spike to a small drainage ditch where a sanitary sewer manhole was blocked and overflowing. Just as they arrived on the scene, a citizen was calling to report the sewer problem.

The real-time alerts from the continuous monitoring station had given the team fast insight into a suspicious

discharge so that they could act quickly to address it.

### Moving Beyond Grab Samples

Managing storm water pollutants from the county municipal separate storm sewer system (MS4) is a requirement for the Greenville County Land Development Div. Recognizing the need for more data to meet permit requirements, the county—a Phase 1 MS4 permit holder—transitioned from a grab sampling program to a continuous monitoring program five years ago.

“Continuous monitoring provides us with the type of information we need to meet our permit requirements,” said Judy Wortkoetter, county engineer. “Our consultants used the analogy that a grab sample was like taking a picture with a camera. It only gave us one image in time, whereas continuous monitoring was more like a video that gives us a better idea of the action taking place over a given period of time. It seemed to make sense for an MS4 because we were more concerned with

illicit discharges and conditions during rain events.”

Although a continuous monitoring program required upfront capital expenditures, the entire annual cost associated with ongoing management/analysis for one continuous station (with data collection every 15 minutes) is roughly equivalent to the cost associated with the collection of just one daily grab sample for a full year. The dynamic conditions associated with rivers and streams demand much more data. The switch to continuous monitoring also has yielded a robust, multipurpose dataset that can be utilized by other departments for a range of needs such as the detection of spills or other types of illicit discharges, further extending the value of the investment.

For example, while sewer overflows often are reported, illegal dumping and other discharges usually are not, but they still can potentially jeopardize the county’s compliance with its NPDES permit. Therefore, the county has been tracking the baseline health of its major



The flag-shaped design of the monitoring station creates a large work area, allowing multiple technicians to be on the platform together.



The permanent monitoring station features a stable aluminum platform that allows technicians to move over the body of water without getting wet.

## [NPDES]

waterways and knows when something veers away from the norm. The faster the county can trace the source, the faster it can put a stop to it.

### Testing the Waters

Greenville County did not take the leap to continuous or event monitoring all at once. Woolpert, a consulting firm that provides infrastructure management, geospatial and design services, provides NPDES program management services for Greenville County. Woolpert and the county conducted a pilot study of six continuous water quality monitoring stations with YSI multiparameter water quality sondes.

“We were impressed with what we could see with the continuous data,” said James Riddle, the project manager for Woolpert who managed the pilot study. Riddle said it was “eye-opening to see the daily fluctuations in data, such as dissolved oxygen,” and then, more importantly, the spikes when the data showed

something other than the norm. “The data from the sondes were pointing to illicit discharges, and we wouldn’t have known it was going on” if not for the continuous, high-frequency data.

After the convincing results of the pilot study, Greenville County worked with Woolpert and YSI Integrated Systems & Services to install permanent stations at six locations, complete with data loggers and telemetry for remote accessibility. Over the last four years, the team has installed an additional six monitoring stations for various short- and long-term study needs.

The main objectives of this data collection system are to detect and track illicit discharges and to approximate annual loads for total maximum daily load (TMDL) requirements. In addition, the stage/rainfall data is proving valuable for use in calibrating flood-plain models and is being used by the National Weather Service for weather and flood warnings.

### Selection & Design

The team carefully selected sites throughout the watershed for permanent and temporary stations.

“If you pick the wrong site, you pay for it later,” Riddle said. He commends the collaboration between city and state governments, in particular the city of Greenville and the South Carolina Department of Transportation, for allowing the team to access and use public land managed by various entities. In this way, the stations are situated to collect high-quality data in the areas of concern at specific sites that maintain perennial flow.

The design of the monitoring stations was heavily influenced by the objective of each location and anticipated duration of the data collection. Although the permanent stations are designed to withstand weathering and high flows, a less expensive, simpler design is used for those sites with shorter-term needs.

For these stations, the YSI team proposed a monitoring solution that would



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still allow for in-situ water monitoring, but with all operation and maintenance of equipment from the bank. These included a stilling well installed parallel to the slope of the bank, a water quality sonde housed inside the well submerged into the water and a fiberglass instrument enclosure for the data logger and remote telemetry.

Permanent stations, used for broad monitoring objectives in streams and rivers, are more robust than the temporary stations and enable more mounting options for placing water quality sensors and pumps. Based on previous permanent monitoring station installations, YSI proposed aluminum structures in a configuration that would reduce the portions of the structure that were in the water. The goal was to keep large debris from collecting at the base of the structure during a storm water event and potentially interrupting data collection or damaging the equipment and structure. The flag-shaped design creates a large work area, allowing multiple technicians

to be on the platform together.

“A key feature of these installations is the safety that these stations offer the technicians that service the sites,” said Rob Case, YSI project manager. “The stable aluminum platforms allow technicians to get out over the body of water without having to physically get into the water. They can go pull their water quality sondes for servicing while never having to get wet or deal with potentially dangerous rapidly moving water.”

### The Data Flows In

With a network of stable monitoring stations, Greenville County has a wealth of continuous data. The system allows the county to continuously monitor water quality as required by its NPDES permit. The county hopes that the baseline data also will allow it to assess the impact of various new programs designed to maintain or improve the health of the watershed, such as BMPs associated with construction, land use regulations and future TMDLs.

“With continuous monitoring, we can see emerging patterns, like whether an illicit discharge occurs regularly around the same time of day or week and for a certain length of time,” Wortkoetter said. “This helps us quickly narrow into the source of the discharge and eliminate it. Quicker elimination of illicit discharges better meets our goal of reducing pollutant loads in our river and streams.”

“Continuous storm water monitoring is about risk management,” Riddle said. Municipalities can use real-time data for “quick responses to illicit discharges, for flood modeling and for calculating the contributions to total pollutant loads.” Watching the watershed has become more effective. **SWS**

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#### PROJECT PROFILE:

## Stormwater Filtration

**PROJECT NAME:** Orange United Methodist Church  
**PRODUCT USED:** 8'-0" DoubleTrap®  
**TOTAL WATER STORED:** 42,869 cubic feet  
**LOCATION:** Chapel Hill, NC

#### PROJECT DESCRIPTION:

StormTrap® was chosen to design a stormwater management system for the Orange United Methodist Church expansion project. StormTrap manufactured a stormwater system that met the water quality and attenuation requirements of the entire site. The stormwater runoff enters into the sediment chamber and flows over the weir wall into the sand filter chamber. The runoff infiltrates through the sand and then exits through the underdrain pipes. The treated runoff is then conveyed to the outlet control unit and sent downstream.



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