

# Good SCADA Makes Good Neighbors

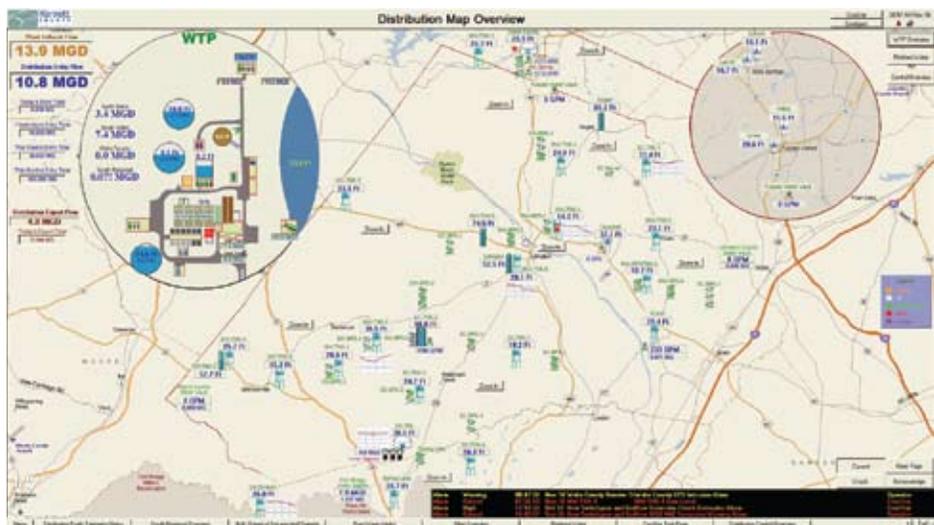
By Christopher Little

*In addition to serving its own 75,000 residents, North Carolina's Harnett County Department of Public Utilities (DPU) provides water and wastewater treatment services to seven nearby utilities. In 2009, the DPU partnered with the Fayetteville Public Works Commission (PWC) to provide water service for the Fort Bragg Military Base. Harnett County also will treat Fort Bragg's wastewater when the base retires its onsite facilities in 2012.*

New SCADA system helps  
North Carolina utility  
monitor and control sites

Based in the town of Lillington, N.C., the Harnett County DPU operates a water distribution system made up of Harnett County Regional Water Treatment Plant as well as 36 remote monitoring and control sites. These sites include water towers, pumping stations, underground valves and flow rate meters.

In 2009, the utility commissioned integrator Custom Controls Unlimited (CCU) to develop a new SCADA system to help meet the challenge of monitoring and controlling its diverse and widely distributed infrastructure. The project team, including Bryan Byrd of Harnett County and integrators Devin Carroll and David Riemenschneider of CCU, used VTScada Human Machine Interface (HMI) software to create an intuitive system that could encompass Harnett County's existing water treatment and distribution infrastructure while allowing it to share information more easily with its internal and external customers.



VTScada screen displaying Harnett County's water treatment plant and remote monitoring sites.

## ARTICLE SUMMARY

**Challenge:** The Harnett County Department of Public Utilities sought a new SCADA system to monitor and control its diverse, widely distributed water treatment and distribution infrastructure.

**Solution:** Integrator Custom Controls Unlimited (CCU) selected VTScada, which features a large library of direct drivers that allows it to communicate with all commonly used monitoring and control devices.

**Conclusion:** SCADA personnel can focus on other tasks without having to worry about managing the system. The county and CCU are working a parallel VTScada-based application for the wastewater system.

## A New SCADA System

To better monitor and control this dispersed infrastructure, the utility contracted Raleigh, N.C.-based integrator CCU to design and install a new SCADA application for its water treatment and distribution system. CCU Vice President Carroll led the integration team.

"The county deserves a lot of credit for the development of this system," Carroll said. "Their administration and managers had the vision to implement a state-of-the-art system and allow the staff, including plant operators and SCADA techs, to have input into the design. Many of the front-end graphics and controls were built on site with the staff's input. From an integrator's position, this design-on-site method often takes longer and usually costs more up front; however, you end up with a better system when it is designed in part by those who are going to use it every day."

Project Engineer Kevin Monk, control systems engineer Nate Powell and SCADA integrator Riemenschneider also worked on the SCADA initiative. With the help of Harnett County staff, the team completed the new water system in the fall of 2010.

"We took about two months for the initial equipment installation and HMI development," Riemenschneider said. "It took another three to integrate the remote water telemetry system, create the graphic screens, build reports and fine-tune the process."

## Monitoring & Control Equipment

SCADA systems typically include three primary components: remote monitoring and control devices, HMI software to allow users to view process data and perform system control, and a communication network to connect the two.

One challenge for the DPU's new SCADA system was the diverse range of monitoring and control devices being used. "We have some really old stuff out there," Byrd said. "There are 11 remote telemetry units [RTUs] at the treatment plant, which monitor and control pumps, valves and instrumentation."

The system also monitors process control hardware such as the clarifier and filter control panels, ultraviolet disinfection system, control panels, generator, switchgear and polymer preparation system.

The DPU continues to run 36 remote sites with devices made in the 1980s, according to Byrd. "[For the new system] we ended up putting in all Allen-Bradley RTUs because some of the equipment already had Allen-Bradley. We used Allen-Bradley CompactLogix throughout."

## Serving External Customers

Byrd, a senior SCADA tech, has worked with Harnett County for more than nine years. "We have data coming in from other entities that partner with us or buy our water," he said. "Some of them are across county lines."

Harnett County currently sells water to the cities of Lillington, Fuquay-Varina, Holly Springs and Spring Lake, as well as to Johnston and Moore counties and Campbell University.

In 2010, Harnett County and the Fayetteville PWC completed a shared infrastructure project that allows them to jointly provide wholesale water to the nearby Fort Bragg Military Reservation. For this reason, Harnett County maintains many of its own monitoring and control devices at customer sites outside county lines.

"Generally we do not rely on anyone else's equipment because if we did it would be out of our control to maintain," Byrd said.

## Multiple Communication Networks

“We use multiple paths to get data back to display and allow us to perform control,” Byrd said. “We are doing a lot of controls. Our water system is all about controls. We are using a fiber network at the water treatment plant. It runs on one port via a fiber switch. I love the speed and reliability that fiber gives us. I never have to worry about whether we are having problems with atmosphere or if it is stormy, or if the foliage grows too high or any of the other things you have to deal with in a wireless network.”

Due to the large area being covered, fiber was not practical for the whole system. The DPU relies on wireless radios outside of the plants, Byrd said, noting the use of 5W licensed frequencies and spread-spectrum radios. The new water SCADA system needed to accommodate these.

## HMI Software

HMI software applications are responsible for logging process data and providing operators with an interface to remotely control equipment such as pumps, motors, gates and valves. For the DPU project, the HMI product needed to be able to communicate with all of the county’s different brands of programmable logic controllers and RTUs over fiber and radio communication networks.

Carroll selected VTSkada software from Trihedral. “[Carroll] was familiar with VTSkada and liked it,” Byrd said. “We started using it for the water system. Then we started using it everywhere. It already included everything that we needed.”

VTSkada includes a large library of direct drivers that allows it to communicate with all commonly used monitoring and control devices. “We haven’t had any issues with [the] drivers,” Byrd said. “They work with about anything we need them to. It also supports multiple forms of communication.”

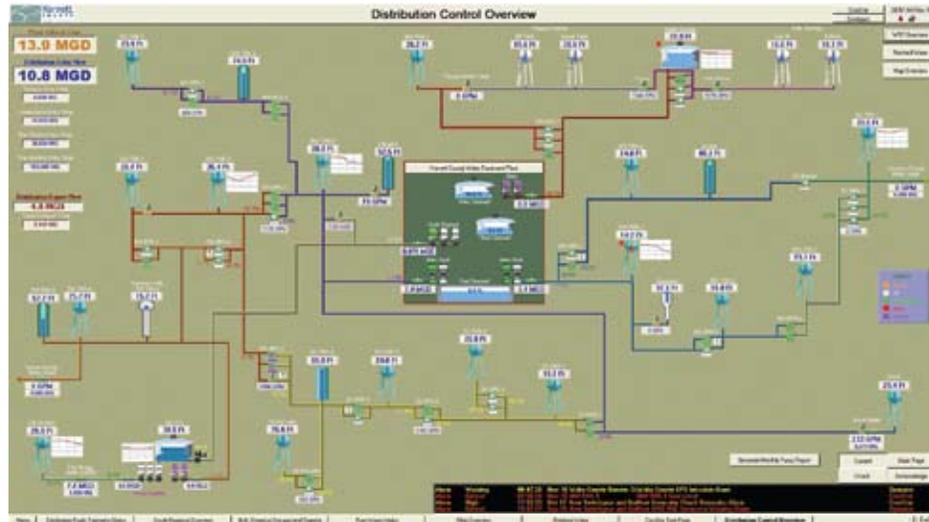
The software also includes built-in trending and reporting. “The [reports] tell us what we need to know on a day-to-day and month-to-month basis,” Byrd said. “VTSkada has ‘pump discrepancy’ reports that tell us if there is anything wrong at any of our remote stations. We also use the long run times to figure out when we need to pull a pump to see if its impellers are worn. We use it as a troubleshooting and a preventative maintenance tool.”

In some cases, reports are e-mailed directly to Byrd. Flow summary reports, including raw water and plant influent flow values as well as distribution entry flow and distribution export flow values, are e-mailed daily. The DPU hopes to establish a weekly pump runtime report soon, according to Byrd.

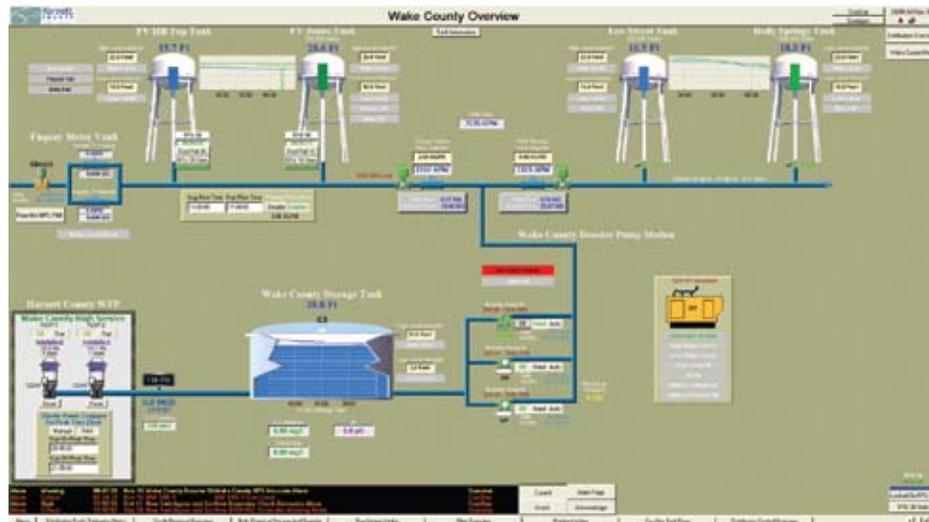
VTSkada also is being used by nearby municipalities, including Pittsboro, Fuquay-Varina, Selma, Smithfield and Pinehurst, many of which purchase water from Harnett County. The DPU’s partner Fayetteville Public Works uses the software too.

## Sharing Data

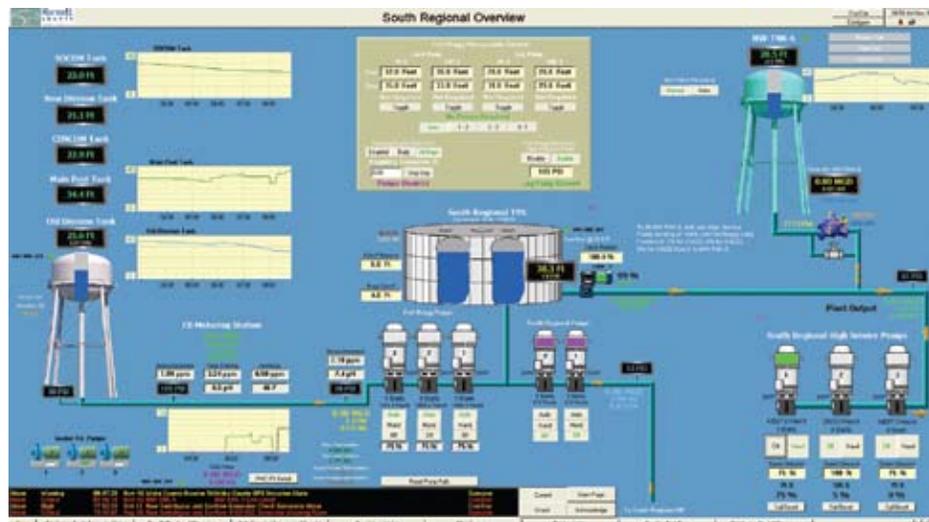
Most of the municipal water customers draw process data directly from Harnett County’s RTUs. “We



VTSkada screen displaying Harnett County and Fort Bragg sites.



VTSkada overview page showing the sharing of data with Fuquay-Varina and Holly Springs.



Overview page displaying the Fort Bragg Meter Station and the Old Division Tank.

share with them analog and digital data,” Byrd said. “They take it and use it however they like.”

Riemenschneider designed many of the reports for the new system. “If a wholesale water customer requests information on water flow totals, demand peaks or other collected data, they can generate reports using the VTSkada report generator and send them as Excel workbooks or printed reports.”

In some cases the new water system shares information with the new wastewater SCADA system. “We have several different communication networks,” Carroll said. “From some locations it made more sense to bring back water parameters over the wastewater radio network. Then, once we had the information in the wastewater VTSkada application, we could port it to the water application over the wide area network using the Modbus protocol.”

## Redundancy

Because so many people depend on this information, uptime is critical. “We can’t get by very long at

all without this system,” Byrd said. “That’s why we have a hot standby [server] running right now. Thank goodness we don’t get to use it much. Our system is so large that we can’t afford not to invest in primary and secondary servers. We also duplicated our master telemetry units so that we can have another unit up and running right away.”

In addition to supporting an unlimited number of redundant servers, VTSkada supports redundant Internet servers and communication links.

## Fort Bragg

Harnett County maintains monitoring and control devices at two sites within the Fort Bragg Military Reservation: a meter station and a tank.

The Fort Bragg Meter Station is located at the base’s wastewater treatment plant. This RTU monitors the combined water flow to the base from Harnett County and Fayetteville. In addition, it logs system pressure, pH, water temperature, monochloramine, chlorine and ammonia levels. Both Fayetteville and Fort Bragg draw information directly from this RTU.

The Old Division Tank is found near the middle of the base. In addition to returning the tank’s level, this is the main control tank for the pump control automation. It acts as a data portal for the interface between Harnett County, Fayetteville and the base. All three parties have radio telemetry remotes at this location. The remotes are interconnected to share information, including tank levels, pump run status and flow values, between the three different SCADA systems.

## Technical Support

Harnett County relies on CCU for ongoing support and system expansion and is pleased with the partnership, according to Byrd. On occasion, Byrd receives software support directly from VTSkada developer Trihedral. He also considers this partnership a success.

## Conclusion

“I am most proud of the reliability of this system,” Byrd said. “We are so dependent on it. I don’t have enough personnel to go around and do what it does. Now it is the least of my worries. I can focus on other things without having to worry about managing the system.”

Harnett County and CCU currently are working on a parallel VTSkada-based application for the wastewater system. This project is scheduled for completion in 2012. **WWD**

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