



Water Control, Wildfires, Earthquakes and Mountains



How a large coastal county in the western United States leverages the communications flexibility of its powerful SCADA system to improve water quality and management.

Managing the water supply for a large, geographically diverse county will never be like water flowing off a duck's back. It's hard, it's crucial and it's multi-faceted. The highest levels of water quality must be maintained, requiring constant and consistent measurement and oversight. Facilities—often situated in hidden, hard-to-reach locations—must be monitored round the clock, constantly on the lookout for problems such as leaks, bursts or contamination. System flexibility in response to natural and environmental events ranging from earthquakes to wildfires must be managed and maintained. Furthermore, the success of water management and distribution often depends on a variety of different equipment and technology located at a large number of sites over a wide geographic area.

A Cascade of Challenges

Complex water operations in counties covering hundreds of square miles containing multiple municipalities present some of the most complex challenges in all of government. Issues often include:

- **Terrain.** Many large counties, especially those in rugged coastal or mountainous regions, are saddled with major challenges in terms of terrain. In these types of environments, it's almost certain that a number of reservoirs, treatment plants, pumping stations, meters, water tanks, pipelines and other facilities and equipment will be situated in hard-to-reach locations such as mountains, remote canyons and deep ravines. No matter how remote, these sites must be monitored 24/7. Providing reliable, real-time data communications between these locations and a centralized control operation can be both difficult and expensive... but it's also necessary.
- **Natural Disasters.** No matter where on the globe a water district is located, it will be faced with significant natural and man-made disaster situations, ranging from monsoons to earthquakes to wildfires to tornados and many others. The issue is compounded by the reality that, in environmental disaster situations such as these, no utility service is more important than provision of an ample supply of fresh water for drinking, cooking, sanitary needs and public safety efforts.



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- **Multiple Municipalities.** In many cases, large counties encompass a number of municipalities that rely on integration with county water systems and operations. It is crucial to coordinate and communicate closely with each community, an imperative often made more problematic by the fact that each entity is likely to have a different technology and communications system. County water operations must have networks and systems with the flexibility to communicate with these diverse technological systems and solutions.

SCADA Solutions

The continuous high-level of monitoring, data gathering and reporting on a large-scale water system isn't something that can be done manually. It's a job best performed with an advanced SCADA (Supervisory Control and Data Acquisition) system. SCADA solutions allow water systems managers to monitor, control and automate functions that help optimize water management and distribution operations. One successful example of the efficacy of SCADA systems can be seen in the water district operations of one large county on the west coast of the United States.

Tying It All Together

“Actually, the biggest challenge of all,” says Mark Serres of TRC, the county water department's

SCADA system supplier, “is communications flexibility. The solution must tie a multi-faceted system together in terms of monitoring, communications and networks.” The county needed a water management system that would be able to communicate and coordinate with water departments in each of the county's large and small cities and towns. In addition, the solution had to be able to work over a 4,752 square mile area, and in terrain that includes mountains, beaches and ravines, all of which present formidable obstacles to fast, accurate data transfer and communications.

Why Motorola?

The client and TRC selected a total Motorola wireless SCADA solution that includes Motorola Remote Terminal Units (RTUs), including the new ACE3600. Motorola RTUs are located at 38 different sites to help water management personnel control the county's fresh water networks, waste water operations, water treatment and flood control systems. The RTUs interface seamlessly with the different types of technology and equipment, including water quality instrumentation and existing Programmable Logic Controllers (PLCs). “This is a turnkey Motorola solution that simplifies planning, deployment and maintenance and enables the county's entire water system to communicate on a single common infrastructure,” says Serres.

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Advantages of Wireless

Because of issues such as varied terrain, large coverage area and need for flexible, real-time communications, a wireless network was the optimum choice for the county. The reasons are many, and the major issue is almost never cost. It’s reliability.

The county is located in a major earthquake zone, and in addition, every year it must deal with the problem of wind-driven wildfires. In an earthquake, power lines are always one of the first casualties. Cellular towers are also vulnerable to both seismic activity and fire. Under these circumstances, water is not just important, it is vital. A water department cannot wait hours or days for equipment to be repaired or re-installed. These are major public safety issues that wireless networks are best suited to solve. Serres notes, “During major wildfires, the Motorola network plays a critical role in helping the county move water around to where it is most needed to help bring the fires under control faster. That helps save property and lives.”

Mean Time Between Failure (MTBF)

A crucial network measurement for the county is meantime between failure. Under critical, yet uncertain circumstances, a system must be online at all times. “Think of how many times in the last week

you had to re-boot your computer,” says Serres. “It’s no big deal to you, but it’s a huge problem when public safety is at stake.” The county’s Motorola network is based on technology proven to have a meantime between failure rate of over 150,000 hours of continuous operation. Motorola RTUs can run for years without re-booting.

Line-of-Sight Issues

Wireless technology is also the most efficient and effective solution for water management SCADA networks that must be deployed in rugged, mountainous terrain. When a pump site is embedded deep in a valley, or a reservoir is surrounded by high hills or mountains, accurate, timely communications are crucial but are complicated by line-of-sight issues.

“Motorola networks are the industry leader in delivering near-line-of-sight (nLOS) and non-line-of-sight (NLOS) performance,” says TRC’s Serres. “The fact is, Motorola systems are designed for the integration with multiple communication strategies to meet difficult line of sight connectivity issues.” The county’s water management SCADA system includes seven Motorola store-and-forward sites based on technology that solves the line-of-sight problem.” These sites, based on Motorola’s point-to-multipoint OFDM technology, collect data from numerous RTUs in the remotest of locations up and down the coast, the foothills and the mountains, then distributes the data to the county’s central water management control station where it can be viewed on a single computer.

Data Normalization

In a SCADA system containing numerous different types of networks—including two-way radio and broadband—it’s important to be able to combine data from each network and transmit it directly to the water department’s control center. The Motorola network’s ability to accomplish this is called data normalization, and is one of the major benefits of Motorola’s communications flexibility. Motorola technology can move data from a wide variety of media—VHF, UHF, 800 MHz digital trucking and 900 MHz frequencies; 2.4, 4.8, 5.2 and 5.8 GHz frequencies, fiber optics, IP and more—accurately and simultaneously. The key is simultaneously for the Motorola ACE RTU. It’s simply plug and go.



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Cost Advantages

Wireless network technology also offers the county water department significant cost advantages. Its Motorola network is fast and easy to deploy, and is self-operating, helping to reduce or eliminate altogether the recurring monthly costs for phone—such as expensive T1 lines—or cellular connectivity. “With typical T1 costs of about \$700 to \$800 a month per location,” notes Serres, “this county could be spending \$30,000 or more annually to simply bring in their data and onsite video surveillance alone.” That doesn’t include the costs of actual work being done. By eliminating these recurring monthly costs, the Motorola wireless network is saving the county significant dollars—and time—right off the top.

Public Safety and Security

Are wireless networks secure enough for water management and other public safety systems? TRC’s Serres answers the question this way. “It’s very difficult to break into a Motorola wireless system. That’s one of the major reasons public safety departments buy Motorola products,” concludes Serres. Motorola networks are hardened, secure systems offering strong encryption options. “They are designed to collect and transmit secure wireless data communications for police, fire, water and public safety applications.”

Forward Compatible Migration

Motorola has been a respected global leader in SCADA systems and networks for more than 35 years. Over those years Motorola technology has evolved and grown more powerful and efficient, but especially important for evolving legacy systems, even 10-year-old equipment is seamlessly forward

compatible with the latest technologies. “Some people think older equipment, such as the Motorola MOSCAD RTU units, is obsolete,” says Serres. “That’s simply not true. Even decade-old Motorola equipment is seamlessly compatible with the newest equipment such as the ACE3600 RTU.” This seamless migration path can save any public utility a substantial amount of time and money.

Communications Flexibility

Public utility and safety operations are increasingly relying on fast, accurate, reliable wireless communications networks. Like the county water management department that is the subject of this case study, they need the exceptional communications flexibility provided by wireless Motorola SCADA solutions. Their networks must be able to work in difficult terrain and in environments subject to natural disasters. They must be able to offer line-of-sight and non-line-of-sight data collection and transmission. They must be able to communicate securely with virtually any type of network, and they must be able to aggregate and send data from hundreds of square miles away to a central control operation simultaneously.

The county water department’s Motorola-driven SCADA system is helping provide the highest levels of water quality to residents in every part of the county efficiently and cost-effectively...regardless of terrain, and under the most severe conditions, such as wildfires and earthquakes. With this kind of proven reliability, accuracy and cost efficiency, it’s no wonder that the counties around the United States rely extensively on the industry leading SCADA systems from Motorola.



MOTOROLA

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