

SPECS SURVEY: Mobile Radios | WHAT'S NEW: Tower Site Equipment

RadioResource

May 2015 | MCCmag.com

# MissionCritical™

C O M M U N I C A T I O N S

## P25 Coverage Below the Capital

DC Water's New DAS Network

Inside

The **Latest Advances**  
in Fire Communications

RPCs Update 700 MHz  
State Plans with New Rules

P25 ISSI Interoperability  
Potential in Michigan

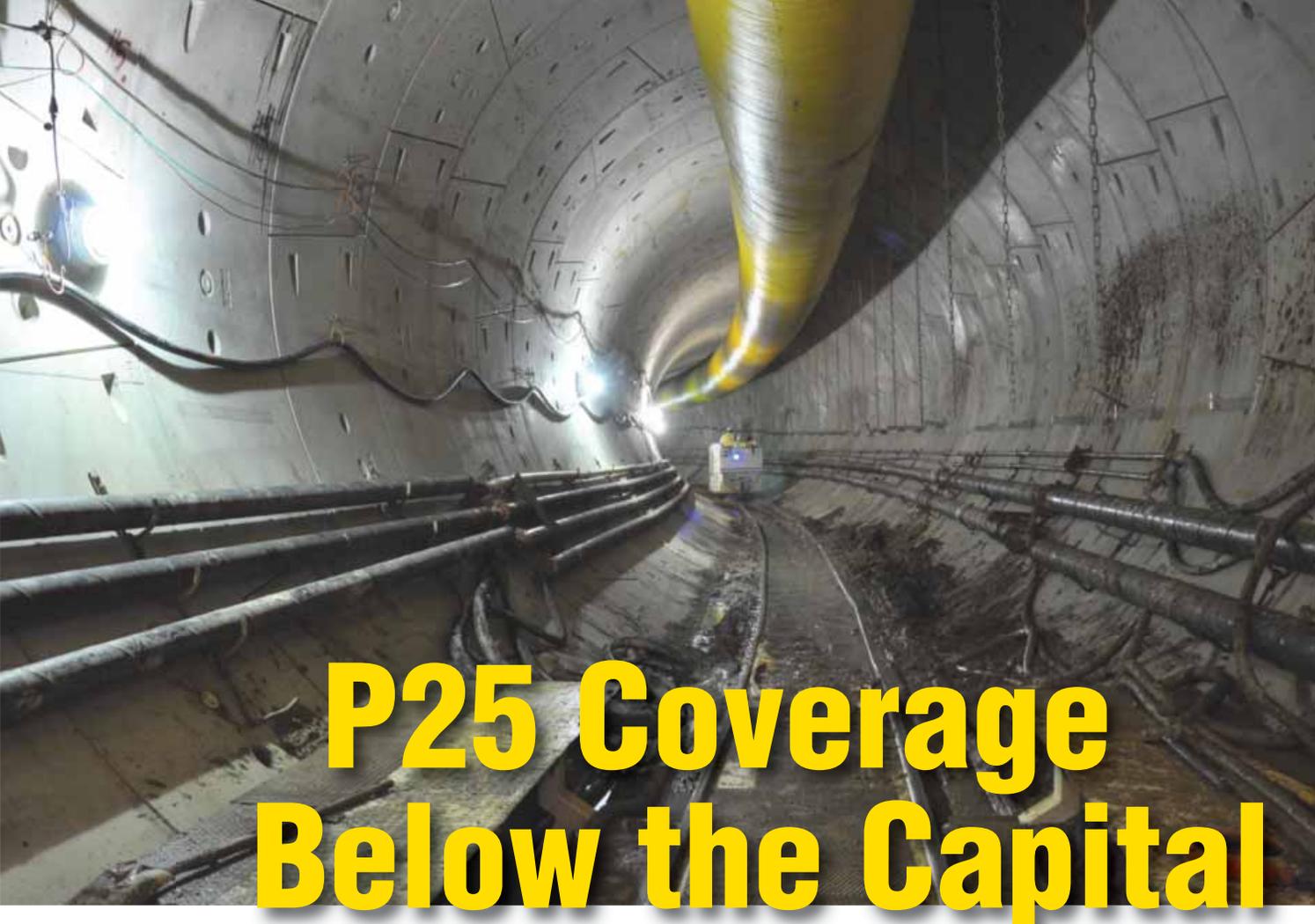


Photo courtesy DC Water

# P25 Coverage Below the Capital

**B**eneath the streets and buildings of our nation's capital, about 3 miles of tunnels, galleries and confined spaces are used to treat the wastewater and sewage for the District of Columbia's 640,000 residents and 17.8 million annual visitors. The District of Columbia's Water and Sewer Authority, known as DC Water, manages the most advanced wastewater treatment facility in the United States within these underground tunnels.

Until recently, whenever DC Water employees entered that environment below the surface, radio communications came to a halt. A new distributed antenna system (DAS) went live last September and effectively replaced an antiquated and failing 25-year-old installation with a modular, scalable and forward-looking design that integrates with the districtwide system used by other D.C. government agencies, such as police and fire.

DC Water is the third-largest agency using the District of Columbia

DC Water deployed a distributed antenna system (DAS) to provide coverage for first responders working in its 3 miles of wastewater tunnels.

By Manuel Ojeda

government's radio communications system. Now that its underground tunnels have a comprehensive network that staff and first responders can rely on, many other district agencies have taken notice and are anxious to enjoy the same benefits at their own facilities.

## DAS Underground

The DAS, built with DC Water frequencies, covers the underground tunnels housing DC Water's treatment facilities and other operations and includes various pieces of modular hardware from SOLiD. The installation includes 18 remotes with 700 and 800 MHz public-safety amplifiers all

connected via a single strand of fiber to an optical distribution unit that connects with a head-end chassis.

Each piece of equipment is stored in National Electrical Manufacturers Association (NEMA)-rated enclosures painted a bright red to help first responders identify the DAS hardware during major incidents and emergencies. Each remote unit was installed in locations deemed the most ideal for DC Water's coverage needs while maintaining as much distance as possible from the processing facilities.

As the needs of DC Water change, the communications needs also change. The system supports two-way public-safety radio communications,

but the agency plans to add cellular and other data capabilities in the future. As such, the agency requires a DAS design and hardware that will enable it to expand, reroute and enhance its communications capabilities for many years to come.

DC Water joined the Unified Communications Radio Network, which is managed through the Office of Unified Communications (OUC). DC Water employees now use the same Project 25 (P25) handsets, the Motorola Solutions APX 4000 and APX 6000, as their colleagues in D.C.'s fire and police services. The entire DAS is also connected to backup power that will keep the entire system operational for at least four hours without running electricity.

### Radio Challenges

DC Water's tunnels present a particularly challenging environment for RF signals to propagate. Some of the tunnels curve and others slope upward or downward, making measurements, calculations and proper designs a critical component of the system's success.

"We do have entry areas of the tunnels that reach 60 to 70 feet below ground. Imagine a maze because you have treatment areas throughout the facility, and below ground are the motors, the pipes, the pumps that operate that above-ground treatment area," says Joe Taylor, telecommunications manager at DC Water. "It's over 3 miles of tunnels below ground, and it's steadily growing because of the different projects we have moving forward, like the tunneling project that we have moving through the city that's going to be part of the radio system next."

Before the new DAS was installed and went live, DC Water staff could only talk above ground, and the system was not compatible with the regional Unified Communications Radio Network, a more advanced public-safety communications network than its previous system.

DC Water's old UHF-based system ran on just one remote and used one channel for all agency communications. As the agency grew, various departments routinely found them-



Photo courtesy Morcom International

Curves and slopes within the tunnels made an accurate network design critical.

selves talking on the same channel, effectively talking over each other.

DC Water's tunnels, and the ability for public-safety personnel to communicate underground, are of paramount importance considering that every major government facility is within close proximity to at least one of the tunnels.

As the water agency began developing its radio communications roadmaps with plans to implement DAS, it was also working against the FCC's Jan. 1, 2013, VHF and UHF narrowbanding deadline. Moreover, DC Water had to integrate the new DAS with OUC and follow its communications guidelines because it is now propagating the heavily regulated public-safety signal below ground.

Morcom International won the contract after a competitive bidding process to design and build the DAS with SOLiD equipment. Every angle, nook and cranny of DC Water's underground facilities were measured before the first piece of equipment was purchased.

DC Water successfully obtained extensions from the FCC to keep its

old system running while it worked through the design and approval of the new DAS. The FCC approved DC Water's radio communications roadmaps as the agency worked to power down the old 450 MHz system.

### DAS Benefits

In less than six months, DC Water has more than doubled the number of active users, jumping from 170 to 355, on its public-safety communications system. The agency increased from three talk groups to six and has implemented channel segregation for special events.

"Once you're able to communicate, and it's working, and it's crystal clear, other people want it," says Taylor. "So I have had different departments go from 11 radios to 22 because of a need, and it's working for them."

DC Water's DAS is also part of and must follow protocol for the district's incident command system (ICS). "Today we are able to add the ICS communications plan to various talk groups and designate the functionality for each group," Taylor says.

"We can send that document to each branch that's participating in that incident and have a complete understanding of how to communicate, who you need to talk to and when you need to talk to them," he says. "All that information is written within that document, which makes ease of communication far better than it has ever been here at DC Water."

Reliable, interoperable communications among various agencies underground is a benefit for the entire district, including the people who work there or call it home. Now that DC Water's DAS has been up and running since late September,

**"We are able to add the ICS communications plan to various talk groups and designate the functionality for each group."**

— Joe Taylor, DC Water

other agencies are beginning to wonder how they can capitalize on the Unified Communications Radio Network to meet their unique needs in the field.

DC Water's DAS is a major improvement from a public-safety perspective as well. The District of Columbia Fire Department manages the facility during major incidents, and as such, is the first responder agency in the tunnels during emergency calls.

"In the past we would have to bring out a bi-directional amplifier (BDA) and put it in the area in order for emergency personnel to communicate," Taylor says. "With the new DAS, we're a part of their radio system, so when they come here there's no additional equipment. They can

just stand in the tunnels and communicate out to wherever they want to using their radios that they have with them every day.

"If they came to rescue or fight fire there's no exchange of handsets or any equipment. They can just come here and immediately start to communicate and that's been tested."

#### What's Next?

DC Water's facilities are always growing. In fact it just recently added a trio of new underground facilities including a pre-digestion, digestion and solids filter press facility. Tunnels are always expanding or being rerouted as the agency's underground needs change.

Keeping track of staff and equip-

ment is a feature that DC Water enjoys above ground, and it hopes to bring that same capability to its tunnels as well. DC Water plans to begin tracking people and equipment throughout its tunnels once it completes the next phase of its project by adding radio-frequency identification (RFID) tags and an underground Wi-Fi network. ■

---

Manuel Ojeda is president of Morcom International, which designs and implements broadband wireless infrastructure systems, public-safety radio communications, aeronautical communications and RF spectrum monitoring systems. Ojeda is recognized as an RF communications specialist and an expert on fire code development. Email comments to [editor@RRMediaGroup.com](mailto:editor@RRMediaGroup.com).