Tapping into Water Security: Practical Solutions for Water Suppliers (Part I)

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EDITOR'S NOTE: "Safe and Secure Water" was the theme of November's annual Florida Section AWWA Conference, which featured several presentations on security planning. The following excerpt from one of those presentations, "Tapping into Water Security: Practical Solutions for Water Suppliers," focuses on distribution-systems protection. A second excerpt on treatment-facility protection will be published in our January issue, followed by a third excerpt on source-water protection in February.

In 1998, a Presidential Decision Directive on Critical Infrastructure Protection identified the following U.S. assets as the most-likely targets for a terrorist attack: 1)telecommunications, 2)energy, 3)banking and finance, 4)transportation 5)water systems, and 6)emergency services. In September 2001, the worst terrorist attack ever to take place on U.S. soil occurred. Since then, terrorist threats have continued, including a nonspecific threat to the water supply in the Orlando area in May 2002.

In response to the continuing terrorism threat, President George W. Bush signed the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 into law on June 12, 2002. The act includes language regarding drinking-water security and safety and amends the Safe Drinking Water Act to address the terrorism threat.

Although many programs are being developed to communicate specific terrorist actions that may be taken against water supplies and to assist water suppliers with the preparation of vulnerability assessments and emergency response plans, there is little compiled guidance to assist water suppliers, particularly smaller suppliers, in identifying and implementing available security measures to deter terrorist threats.

Distribution systems are inherently difficult to protect from attack because of the extensive lengths of pipe used to distribute drinking water and the multiple access points to the system at interconnects, pressure booster stations, fire hydrants, sample taps, service laterals, and other locations. For these reasons, security for the distribution system should focus on identifying conditions that may indicate an attack on the system, rather than endeavoring to protect the entire system.

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Monitoring methods commonly used in water-treatment and distribution systems may reveal tampering with the distribution system by indicating any of the following conditions:

- Sudden loss of chlorine residual.
- Rapid and noticeable shift in pH and/or temperature.
- Loss of pressure in the system.
- Higher than usual peak-hour water demand.
- Unusual fluctuations in water demand during "low-flow" periods.

Various methods, including many currently used by water suppliers and uncommonly considered as security methods, exist to identify these conditions. Water demands can be tracked by comparing day-to-day flow data as recorded on flow charts or by treatment-facility control software. Many flow-chart recorders can track seven days' worth of flow. An hourly review of flow demands and comparison of the flow demands with those of the previous few days can indicate anomalies.

Likewise, many control software packages allow the user to define expected ranges and acceptable deviations for various parameters, such as flow and pressure, and the software will signal an alarm when the parameter of concern is recorded outside the acceptable, predetermined ranges.

Some water suppliers also have automatic samplers and analyzers installed at various points in the distribution system to monitor chlorine residual. These systems can be easily used to identify sudden loss of chlorine residual. In many cases, the sampler/analyzer can be retrofitted with pH and temperature sensors to allow trending of this data as well.

For systems without in-line systems/analyzers, the chlorine residual readings that are collected daily from the distribution sys-

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tem for reporting to the Florida Department of Environmental Protection can be compared with chlorine-residual levels in the water leaving the treatment plant to identify unusual chlorine demands within the distribution system.

In addition to these commonly used water-monitoring methods, there are products being developed to identify the introduction of chemical and/or biological agents into the distribution system. Currently available products include the Microtox® toxicity test system and an online monitoring platform developed by Hach.

The Microtox® system identifies the presence of toxic organic and inorganic chemical pollutants through the use of luminescent bacteria. The bacteria react with the chemicals and indicate the presence and relative concentration of the chemicals as soon as 15 minutes after sample processing. This system can be installed in the distribution system with an automatic sampler/analyzer programmed to collect data for up to two weeks.

The Hach online monitoring platform is capable of identifying potential chemical and biological contamination within the distribution system by continuously monitoring pH, conductivity, total organic carbon, chemical organic demand, and/or biological toxicity. The system also allows for autosampling so that a baseline for these parameters mentioned above can be established for the distribution system and deviations from these normal conditions can be easily identified.

Trending information such as flow, pressure, and chlorine residual using in-place monitoring devices and operational procedures will help water suppliers identify anomalies in the distribution system that may be indicative of a terrorist attack. There are low-cost, readily available security measures that can be implemented by water suppliers of all sizes to help protect our drinking water systems from the threat of terrorism.

Next month: Treatment-facility protection

References

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