WATER ONLINE

Article | June 28, 2019

Ready Or Not? A Checklist For Building Natural Disaster Resilience

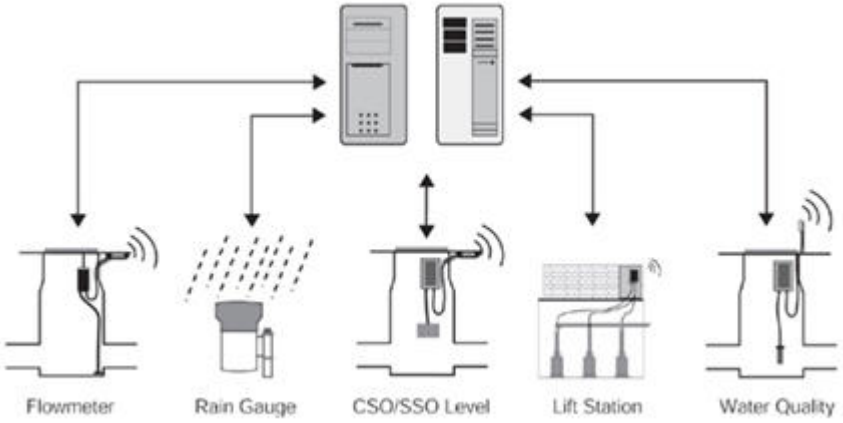
Source: Trimble Water

You've seen the headlines, read the case studies, taken stock of your resilience plan (or lack thereof), and posed the question "What now?" Here are a dozen ways battery-powered wireless recorders and transmitters can support a new Resiliency Master Plan for your utility and your community — one that can provide cost-saving and even life-saving insights under extreme conditions.

Avoid Risk; Plan For Built-In Resilience

In the past, not all water and wastewater applications were well-suited for hardwired feedback to central control systems. Some were simply too remote to make extending a power source worthwhile. Others had survived years without real-time data collection. Even those that were hardwired for continuous feedback were often susceptible to disruption in the face of electric utility outages or power losses related to natural disasters involving wind, fire, flooding, or seismic activity.

Today, battery-powered wireless remote sensing devices can remain functional despite power-grid disruptions in the teeth of a storm or other catastrophe. They can collect data at regular intervals throughout an entire event and relay it whenever communications networks permit — during or after the event. That data can support routine operations or specific aspects of an emergency event (Figure 1).



Graphic courtesy of Trimble Water

Figure 1. Systems and software that integrate bidirectional data transmission across a range of utility applications make it easier for utility operators and public safety directors to compare multiple inputs, map a clearer picture of evolving events, and evaluate the most viable alternatives for response.

The key to building resilience lies in identifying the answers you'll be expected to have under the worst-case scenarios, then determining the best ways to obtain them. Battery-powered wireless devices can help utilities meet their own needs as well as respond to pressures from municipal leadership and public safety directors who are concerned about broader issues of resilience.

Be Prepared To Answer These Questions

Unless you currently have full confidence in being able to answer the following questions under the stresses of a natural disaster, it can be worth exploring wireless battery-powered data collection and transmission methods to provide the necessary data:

- **Water Treatment And Distribution**
    - **Potable Reserves.** Does your treated water capacity at your highest-altitude storage locations have enough reserve capacity to serve water customers for a day, two, or longer if a storm or power outage takes out water treatment or pumping capacity?
    - **Sudden Losses.** How quickly can you detect sudden pressure losses due to water main or service connection breaks caused by shifting ground or total washouts?
    - **Full Compliance.** Do you have a way to assure that sufficiently high water pressure (> 20 psi) is sustained in all district metered areas (DMAs) to preclude unnecessary 'boil water' alerts before the power returns?
    - **Flow Capacity.** Will local firefighters have the water capacity and pressure to fight fires during an emergency event (Figure 2) and, if so, for how long?

Figure 2. Based on data transmitted from battery-powered units, Napa Valley water utility managers were able to keep track of available water capacity for firefighting — even from remote locations and despite disruptions to the electrical grid.

- **Wastewater Collection And Treatment**
    - **Sewer Overflows.** Getting low stormwater/combined-sewer flow readings and high-level alerts in the face of increasing rainfall indicates a potential blockage that could cause a major sewer overflow if it is not located and cleared quickly. Can your system tell you about potential clogs or trouble spots far enough in advance to mitigate such problems?
    - **Treatment Plant Overloads.** Whether or not your utility operates under a consent decree, can you afford either the fines or the risk of public relations impacts for discharging untreated sewage? Having advance warnings to shunt excess stormwater to storage before it overwhelms a treatment facility can extend the treatment time for that slug of water over a broader time frame.
    - **Infrastructure Risk.** Because many wastewater treatment plants are situated to discharge into running streams and rivers, they can be threatened by extreme floodwaters. At what flood levels will the operating integrity and effluent compliance of those treatment plants be threatened?

- **Public Health And Safety**

  Beyond sewer overflow measurements, are you prepared to plot topographic contours and keep an eye on rising storm-surge or floodwater levels for other utility or health and safety purposes?

  - **Non-Sewer Flooding.** The same types of water-level recording devices used in wastewater utility infrastructure can also feed GIS mapping systems to plot changing flood coverage and identify open vs. flooded roadways.
  - **Infrastructure Risk.** Are you prepared to define the risk of disruption or financial loss for utility infrastructure — including water treatment plants and wastewater treatment plants — at each incremental level of flooding (i.e., 10-year flood, 100-year flood, or 500-year flood)?
  - **Emergency Access.** Which neighborhoods will be accessible or inaccessible at various storm-surge or floodwater levels? For example, during and after Hurricane Sandy, New York City wastewater utility personnel used battery-powered sensors originally installed for sewer overflow monitoring to keep city officials advised on how extreme storm-surge levels affected different infrastructure and neighborhoods.
  - **Evacuation Plans.** Where are the alternate routes to access or evacuate residents at different flood levels, based on terrain and drainage patterns?
  - **Vulnerable Residents.** What major institutions (e.g., hospitals, nursing homes, jails, etc.) pose the greatest challenges to resident evacuations at certain flood levels?

Instill Greater Resilience As Part Of Everyday Infrastructure

Beyond emergency events, wireless battery-powered monitoring devices in water and wastewater systems have use in everyday applications, including as backup reporting systems for when regular SCADA systems go down.

In water distribution, those instances typically revolve around pressure — for purposes such as addressing customer complaints, minimizing non-revenue water related to leaks, developing hydraulic models, or supporting capital planning.

On the wastewater side, they typically focus on lift station monitoring and wet weather event management — including understanding water level and flow patterns under different circumstances and documenting U.S. EPA regulatory compliance related to sewer overflows. Many utilities have made minimal monitoring investments in limited locations only as mandated for regulatory compliance. As unit costs for Industrial Internet of Things (IIoT) capabilities become more competitive, expanded installation of sensors for broader system management can become increasingly cost effective.

The resilience afforded by such systems extends to how they can be implemented as well as the data they can provide. Small or capital-constrained utilities can selectively implement remote battery-powered solutions as a hosted service for an established fee. Utilities with larger budgets and systems experience can also install and manage an entire solution in-house.