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WAWARN helps utilities help each other during emergencies

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A POUND OF CURE: THE EMERGENCY RESPONSE ISSUE

NOVEMBER 2017

## TACOMA WATER'S EMERGENCY MANAGEMENT PROGRAM

EXERCISES PREPARE EMPLOYEES AND CUSTOMERS. BY JEREMY KAISER, OPERATIONS MANAGER, TACOMA WATER

Tacoma Public Utilities' Tacoma Water plays an important role in the community. It ensures water services are available to customers during and after natural disasters, planned events, and intentional or accidental incidents. The Tacoma Water Emergency Management Program focuses on prevention and mitigation strategies that aid response and recovery from incidents that threaten life, property and the environment. These strategies strengthen our ability to serve our customers.

One of the major elements of this program is providing training and emergency exercises for employees and customers. When they see what will happen during an emergency, they learn how they can protect themselves, their families, their property and their livelihoods.

In June 2016, Tacoma Water participated in Cascadia Rising, a regional earthquake exercise involving the state and local health jurisdictions, private industries, utility partners, and other organizations. In the scenario, a 9.0 earthquake occurred off the West Coast in the Cascadia Subduction Zone creating tsunamis, landslides, and aftershocks.

We simulated mobilization of water crews and incident management teams to assess critical infrastructure functions, minimize health and safety threats to the service area, and restore water systems and services during the aftermath of the catastrophic incident. More than 150 Tacoma Water employees participated in the three-day exercise. Additionally, Tacoma Public Utilities trained more than 1,000 employees on individual preparedness during an earthquake.



Tacoma Water and Burlington Northern staff protect the water system during a November 2016 exercise. Photo courtesy Tacoma Water.

Tacoma Water also works with partners from a broad range of industries. In November 2016, Tacoma Water and Burlington Northern Santa Fe (BNSF) Railway conducted an oil-train derailment exercise on the Green River. During this exercise, Tacoma Water and BNSF deployed booms to protect the water system from contamination that would result from a large petroleum spill.

In September 2017, Tacoma Public Utilities and Tacoma Water performed an active shooter exercise and drill with employees, Tacoma Police Department, and Tacoma Fire Department. Preparing for the scenario involved developing employee emergency response plans on how to react during the incident, training employees to "run, hide, or fight," and testing response plans by conducting an exercise and drill. More than 600 employees received training on life-saving skills needed to respond during an active shooter incident.

The trainings and exercises Tacoma Water conducted focus on preparing employees and customers for all hazards. The exercise program identifies current gaps, categorizes roles and positions that require more training, develops skills needed to manage complex incidents, pinpoints resources needed, and engages employees to be better prepared at work and at home.

Additionally, the training program focuses on communicating these elements to customers during an incident, so they can prepare. Through different annual exercises, Tacoma Water improved resiliency, identified vulnerabilities, and trained specific roles within the utility for incident response. With this improved emergency preparedness, Tacoma Water can focus on its priorities to serve their customers and keep citizens, customers, employees, and properties safe.

# COMMUNICATING WITH YOUR CUSTOMERS DURING A HEALTH ADVISORY

Water systems and state or local agencies issue drinking water advisories when they believe water quality is or could be compromised. Advisories tell individuals, schools, hospitals, and others about the situation and what they need to do to protect themselves.

If you have confirmed E. coli, nitrate in excess of the maximum contaminant level, or another problem that could make a person ill after drinking the water, you must notify customers of the situation within 24 hours. Many water systems also issue voluntary advisories to customers as a precautionary measure during unusual events.

Whenever you issue a health advisory, the goal is to inform customers of the situation as quickly as possible, and tell them what they need to do to protect themselves. You must reach as much of the population as you can by as many communication channels as you can, and keep your messages consistent across those channels.

It takes grit to manage a public health advisory, but anyone can do it. Searching for the cause of the problem, while at the same time coordinating sampling, answering calls from customers, talking to

the media, and keeping your leadership informed is stressful to say the least. You can make the job much less stressful with planning and preparation.

Consider your system's operations, vulnerabilities, and audiences. Are there language barriers? How will customers know they get their water from your water system? Do you serve vulnerable populations, such as schools or hospitals? Do you have partnerships with public health and emergency response agencies to help you get the word out? Who will respond to questions from the public? Take time to complete the **Emergency Response Planning Guide for Public Drinking Water Systems (331-211)**. You'll be glad you did next time your system loses power.

## Channels you can use to get the word out

**News media:** Identify media outlets that cover specific areas of your service area and the region. If you're in a rural area, TV news may come from far away; consider local radio stations. You will need to find out how long it takes your media outlets to get news out. Ask them about their news cycles, deadlines, and

how they can use maps or graphics to show service areas.

**Reverse 9-1-1** is one of many automated communication systems public safety organizations can use to communicate with groups of people in a defined geographic area. These systems can deliver prerecorded voice messages, text messages, and emails. Many water systems use automated systems to notify customers about health advisories or other emergencies. To get information, contact your local emergency management agency.

**Social media** is a quick and easy way to keep customers informed during a drinking water emergency. Put a brief message on Facebook or Twitter and provide links to your website for more detailed information. Brief messages should include the water system's name, actions customers should take, and where they can get more information.

**Door hangers** or door-to-door visits are an effective way to get the word out, but may be hard to implement with large populations. You can download a boil-water door hanger in English and Spanish from our website.

# WA WARN: WASHINGTON WATER & WASTEWATER AGENCY RESPONSE NETWORK

BY DAVID BROWN, WAWARN STATEWIDE CHAIR AND CITY OF YAKIMA WATER/IRRIGATION DIVISION MANAGER

Most water/wastewater utilities maintain just enough staff, equipment, and spare parts to cover 24/7 service, plus a little extra to handle main breaks and service outages that seem to happen several times a year. Sometimes, utility managers need to quickly "super-size" their staff and resources in order to restore order.

WAWARN stands for Mutual Aid and Assistance Agreement for Washington State for Intrastate Water/Wastewater Agency Response Network. The WARN system was developed by the U. S. Environmental Protection Agency, the Federal Emergency Management Agency, and the American Water Works Association. WARN systems exist in every state.

WAWARN uses a Mutual Aid Agreement (MAA) to standardize how water and wastewater utilities can share resources. The agreement covers key issues such as reimbursement, indemnification, workers'



compensation, insurance, liability, and dispute resolution.

Why should you join WAWARN? First, there's no cost to become a member! Membership increases emergency preparedness and coordination. It enhances access to specialized water and wastewater resources. You can ask for assistance from statewide members or target a specific region with your request. In addition, the WAWARN agreement does not require a local or state declaration of emergency to request help.

All requests and assistance are voluntary. You are not required to send resources if it affects your ability to manage daily operations or respond to

your own emergency. Resources remain under the authority of the sending utility, which can recall them at any time.

Government response to a major event may not be immediate, causing delays in how quickly the emergency may be resolved. WAWARN provides access to utility-specific water and wastewater heavy equipment, tools, personnel, and supplies.

Currently, WAWARN has 110 members statewide. The more members who join WAWARN, the more resources become available to all.

More information is at [wawarn.org](http://wawarn.org). You'll find links to instructions, navigation guidance, and staff contact information if you have questions. You can register easily online and, when your membership is approved, you'll have access to WAWARN's emergency planning and response resources, recovery information, and training opportunities.

## DEFINING NORMAL FOR EMERGENCY RECOVERY

Most owners and operators prepare for emergencies by developing response plans. What systems may miss is a plan to return to normal operators after the emergency. To develop that plan, operators must know their water system's normal conditions at the source and, more importantly, throughout the distribution system.

Systems have plans for water main breaks resulting in extended distribution pressure loss; water quality events, such as the 4-methylcycohexanemethonal event on the Elk River in West Virginia; or supply interruptions caused by natural forces. A 1963 Journal of the AWWA even included an article entitled, "Water Utility Planning for Nuclear Attack." For any of these events, the concept of returning to normal assumes that you know what is normal for your water system.

### What is normal?

Just as medical providers use a set of normal conditions for human blood (pH, white blood count, bicarbonate, oxygen level) to detect problems and devise interventions, water system operators can use water system parameters to assess problems and determine when response steps are complete.

Although you may respond differently to each type of event, there are common parameters you can use to diagnose the health of your system, such as high and low pressures, typical base flows, free and total chlorine residuals, pH, temperature, and microbial activity in all pressure zones. Water systems may decide to use other parameters to define normal, too.

Of course, you can't determine normal conditions in the middle of an emer-

gency. To know your water system and plan for emergencies, you must take time now to determine and record normal water system conditions. When you know your water system's normal range for water quality, pressure and quantity, you can speak and act from a position of knowledge.

Owners and operators should know the normal geographical and seasonal parameter values for their water system, and all water system staff should be able to access the parameters during an emergency.

Just as patients expect a health care provider to know the normal pH range for arterial blood, your customers expect you to know what's normal or abnormal throughout your water system.

## ON BEING VULNERABLE BY R. SCOTT POLLOCK, P.E.

Our mission is to provide safe and reliable drinking water so, when someone charged with ensuring water system reliability said, "I don't know why we have to worry about something bad happening, people will just be out of water," I was dumbfounded. Resigning oneself to water outages as inevitable is like giving up before the battle even begins.

You don't have to leave your water system "vulnerable," or open to attack or damage. You can start protecting your water system by using a vulnerability assessment to identify hazards most likely to cause harm. You can also take steps to reduce or avoid damage.

Of course, making a water system "everything-proof" is impossible. Trying would cost too much. That's why it is important to look for and manage vulnerabilities in efficient and thoughtful ways.

The Emergency Response Planning Guide for Public Drinking Water Systems (331-211)\* outlines a four-step process for doing vulnerability assessments. First, take stock of water system components: sources, treatment, pipes, pumps, storage, and so on. Second, evaluate how each of those components will or won't perform when various bad things happen. Third, set performance expectations and goals. Fourth, identify improvements that reduce effects from the most likely events.



A critical water pipe exposed when a stream changed course during a flood in Cowlitz County.

Taking stock of system components and ways they might fail is usually informative. Changes made over the years often don't work together as well as they might. Something that worked well decades ago may have reached its end or become less functional in the system that evolved around it. Records drift into the past. No one can remember why some changes were made.

A fresh search for weak links can uncover and solve many problems, often before they become serious. Going through the

effort of a vulnerability assessment helps to ensure people can count on their water system when they most need safe and reliable drinking water.

Increasing resiliency for emergencies can also pay for itself by avoiding costly component failures. When things fail, regardless of the reason, we consume amazing amounts of money on repairs that we could better spend elsewhere or save. As the old saying goes, "an ounce of prevention is worth a pound of cure."

# INTRUDER ALERT: DO YOU HAVE AN EMERGENCY RESPONSE PLAN?

When disaster strikes, it's not always a natural occurrence like an earthquake or storm. Sometimes vandals or others intent on harming a water system gain entry, causing damage or contamination. By preparing an emergency response plan on paper, utilities will know what steps to take when the time comes.

The U.S. Environmental Protection Agency (EPA) maintains online tools for water systems. The Emergency Response Protocol Toolbox\* helps you prepare for man-made contamination emergencies. (You can find it by searching for "DWRPTB" on the EPA website.) This response plan is tailored for intrusion-based contamination threats and differs from EPA's other emergency response guidelines.

Planning ahead helps you accurately evaluate threats and decide what actions to take during an actual incident. Use the EPA forms to organize your responses and gather your communication tools, threat evaluations, and information in one spot. With them, during an incident, anyone on duty will know step-by-step actions to take and who to contact.

Besides addressing physical security like fences, locks, and cameras, another best practice is recognizing when anything is out of place. Train your employees to practice awareness and spot unusual changes such as abandoned vehicles, modifications in vegetation, out-of-place damage, or atypical foot traffic.

In addition, study your watershed, well site, or reservoir and identify areas in need of more security.

An intrusion may disrupt service or involve getting water from another source until lab analysis clears your normal source. Perform a paper review of interties and MOUs. Identify alternate water sources and develop partnerships and plans for using them. You'll build resilience and create options to keep your community supplied with water in the event of service disruption.

Get to know your water system's profile by using normal operations and maintenance sampling results to develop seasonal and quarterly profiles. In the event of contamination, you can compare results and quickly identify any changes. This may enable you to bring your system back on-line more quickly.

Involve local law enforcement. Take them on a tour of your water system and help them understand its unique nature. Your community depends on a secure, steady water supply for public health and safety. Disruption to that service puts vulnerable populations at risk and affects the community's economic well-being.

Planning and preparing for the unexpected gives you the foresight and flexibility to respond efficiently, quickly, and confidently. A sound well-rehearsed plan of action makes a big difference during an emergency.

## BACKFLOW INCIDENT RESPONSE PLANS

**A** backflow incident occurs when an unpotable solid, liquid, or gas enters the distribution system through an unprotected cross connection. Public water systems must protect their distribution systems from cross connections.

Although a rigorous cross-connection control program can mitigate potential risks from backflow, incidents occasionally happen. Many are difficult to identify because:

- ◆ Chemical and bacteria monitoring is not thorough or frequent enough to identify most backflow incidents.
- ◆ Chemical and bacterial contamination can be transient and localized.
- ◆ Not all contamination can be detected by color, odor or taste.
- ◆ Low chlorine residual may be overlooked.
- ◆ Water system operators may not report suspected incidents due to concerns about liability or loss of consumer confidence.
- ◆ Customers may not know it is important to report water quality issues.
- ◆ Reduced pressure in the distribution system can be transient and localized.
- ◆ Health effects are difficult to link to backflow incidents.

- ◆ Contamination may not be widespread enough to draw attention of public health officials.
- ◆ Backward spinning meters may not be noticed during routine operations.

### Develop a Backflow Incident Response Plan

Your plan will help you identify backflow incidents, reduce the effect of incidents that do occur, and improve your ability to recover.

Start by identifying the person in responsible charge. State rules require the system's cross-connection control specialist (CCS) to investigate and respond to backflow incidents. The CCS can be in charge of the incident or assist a water system manager. In any case, someone must lead to carry out the plan. An identified backup person should be ready to assume the lead role if the leader isn't available.

Next, create your emergency response team. This includes health officials, law enforcement, the fire department, your local emergency response network, and a hazmat team. You must maintain current contact information for all members and have a mode of 24-hour communication.

Finally, after you establish your team, develop your plan. The plan must:

- ◆ Clearly identify roles and responsibilities.
- ◆ Identify potential alternative water supplies.
- ◆ Develop detailed information about your water system.
- ◆ Develop a unidirectional flushing and water main disinfection plan.
- ◆ Train public water system staff on backflow and emergency management.
- ◆ Establish a water sampling team and identify appropriate labs for analysis.
- ◆ Identify your baseline water quality during normal operations to recognize abnormal situations.
- ◆ Establish a procedure for responding to customer complaints and maintain records of backflow incidents.
- ◆ Identify a communications team and create template documents relaying information to affected customers.

When incidents occur, public water systems must notify the Office of Drinking Water, local plumbing officials, and the local health jurisdiction as soon as possible, but no later than the end of the next business day (WAC 246-290-490). You must also document the incident on an official Backflow Incident Report Form (331-457-F), available at [doh.wa.gov/odwpubs](http://doh.wa.gov/odwpubs).

# HOW TO PREVENT ACCIDENTAL CHEMICAL OVERFEEDS

Water treatment involves adding chemicals to the water supply to help remove sediment and impurities, kill bacteria and other disease-causing organisms, prevent corrosion, and even improve the oral health of the community.

Injecting chemicals into the water supply also creates potential for overfeed if the dispensing equipment malfunctions or if it's improperly designed, installed, operated, or maintained. Nationally, overfeeds of ammonia, chlorine, sodium hydroxide, and fluoride have been reported in public water supplies. In every case, failures were caused by operations and maintenance errors, engineering or installation flaws, electrical/mechanical or control malfunction, installation mistakes, or a combination of them.

You can minimize the potential for overfeeds by evaluating your system design and establishing appropriate operation guidance or standard operating procedures (SOPs).

System design should always include day tanks when large bulk volumes of treatment chemicals are necessary. Day tanks should be designed to store no more than 30 hours of supply, and for an operator to fill them in a controlled manner; automatic filling is unacceptable (Ten State Standards, 2012). These tanks promote daily inspection of chemical feed systems and reduce the magnitude of overfeeds that occur. Where physical day tanks are not practicable, acceptable electronic alternatives may involve redundant systems to continuously monitor chemical flow and chemical tank weight, and analyze key treated water parameters. Consider including continuous monitoring equipment with integrated alarms for pH, chlorine, and fluoride. In some cases, use redundant monitoring equipment, in

others it may be appropriate for these alarms to shut down the equipment or the source automatically.

Evaluate equipment failure modes and add redundant safeguards if needed. For example, a redundant flow switch wired in series with feed pumps will stop the chemical injection system after it detects no treated water flow. Alternatively, consider installing flow-based chemical feed control.

Take into account the operator's capacity to properly operate, control, and maintain water treatment plant facilities. Operator error or inattention will cause or aggravate overfeed incidents. SOPs should describe how to react to unexpected changes in water quality parameters (increasing or decreasing pH, values outside "normal" ranges, and other issues).

Focus SOPs on routine equipment maintenance. Select chemical injection points to minimize the potential for siphoning or hydraulically draining chemical storage tanks, even if their design includes antiphon features.

Water systems should still inspect their antiphon valves at least annually and replace them as needed. Engineers should provide appropriate cross-connection control, and a cross-connection control specialist should evaluate it.

## What Can Happen When Operators Don't Follow SOPs

**Ammonia:** An injection point was moved downstream in the process of increasing free chlorine contact time prior to chloramine formation. An anti-siphon valve designed to prevent overfeed failed. At the new injection location, ammonia was able to flow into the main without pumping due to hydraulic head of the bulk storage tank. This allowed the full

bulk storage tank to empty into the water system. Operators observed unusually high pH values and unusually low chlorine residuals, but failed to recognize the cause of the problem.

**Sodium Hydroxide (Caustic Soda):** To control corrosion, a water system treated its well supply with sodium hydroxide. During main repairs operators closed distribution system valves, which reduced well production from 450 gallons per minute (gpm) to less than 85 gpm. Caustic feed continued at the same rate, with the water eventually reaching pH 13. Reduced flow and pH build-up occurred over a two-day period. During this time two people who drank water from a nearby public fountain received mouth and throat burns. Daily inspection of the well and treatment system would have caught the problem sooner and prevented injury.

**Fluoride:** A 1992 incident in Hooper Bay, Alaska caused 1 death and about 262 illnesses. An incorrectly wired circuit for the fluoride feed pump allowed fluoride solution to pump into the water system even when the source wasn't operating. As a result, a fluoride overfeed was delivered to customers. Health officials later determined the actual level was up to 150 times the recommended dose.

**Chlorine:** A circuit card on a rate-of-flow controller malfunctioned, failing to shut down a chlorinator when the reservoirs filled and well sources shut off. Even though the wells were not producing water, chlorine continued to feed into the main. When reservoir levels dropped and the well sources were turned back on, highly chlorinated water was delivered to the distribution system. Nearby customers filed complaints of high chlorine taste and odor.





## OUTREACH IN OUTLOOK

It was raining hard in Yakima and it was getting warmer. Snow melted and water stood in pools on many fields surrounding the community of Outlook. Then, in the early hours of March 1, a berm at a dairy farm broke sending water across another farm's compost piles and into Outlook. Manure-contaminated floodwater inundated properties and surrounded private wellheads.

The Outlook Community Water system issued a boil-water advisory to its customers and the Yakima Health District advised private well owners not to use their water. For the next eight days, some residents experienced life without safe tap water.

Many Outlook residents were immigrants. Some spoke very little English and some worried about their legal status in this country.

A complex, multi-agency task force quickly formed to assess damage, assist residents, restore safe drinking water, and begin the long process of rebuilding the community. Yakima Emergency Services and the Yakima Health District led the effort. Responders also included the state departments of Health, Agriculture (WSDA) and Ecology, and the Hispanic Affairs Commission.



Manure-contaminated floodwater inundated properties, surrounded private wellheads, and damaged four homes. Photo by Ignacio Garcia, WSDA.

"It was an impressive response," said Scott Mallery, Office of Drinking Water's eastern regional office assistant manager. "Communications were complex partly because of the many agencies on the ground and the language differences, but also because some residents got their water from private wells while others were on the community system."

Fortunately, there were many community advocates on scene. They provided translation services for emergency responders as they assessed damage and sampled well water, translated emergency warnings,

and kept residents informed about WSDA's investigation into the berm break.

### Lessons Learned

From this experience, Yakima Health District identified needs for more multilingual resources, more practice working with communities during emergencies, and tightening up on emergency preparedness.

Water systems may need to think about how they will bring resources to bear in a community where English isn't a first language and residents may fear responders because of concerns about their legal status.

## HIGH 5 AWARDS: OUTLOOK

Events in Outlook underscore the importance of effective interagency communications and coordination for a successful response effort. When we tried to target our High 5 award to just few a people, each said it was a team effort. There were too many champions to list but you know who you are, and we thank you.

### Yakima Valley Office of Emergency Management

**Scott Miller**, director, initial responder that advised residents not to drink the water and offered to evacuate them to shelter. Ensured bottled water was available.

### Department of Agriculture

**Ignacio Marquez**, a regional assistant to the director, went door to door to explain the health advisory and distribute notices about water contamination. He also helped to collect water samples from private wells to check for contamination, and provided translation services.

**Ginny Prest**, Dairy Nutrient Management Program manager (now retired), collected drinking water samples and supervised the staff that investigated the berm break at the dairy farm.

**Kirk Robinson**, deputy director, approved the staff resources and cost of conducting drinking water tests. He also facilitated the conference calls with all of the state and county government agencies.

### Department of Ecology

**Sage Park**, regional director, and **Melanie Redding**, hydrogeologist, sampled wells at individual homes affected by the flood. Coordinating with the departments of agriculture and health, they responded to concerns related to groundwater pollution from manure. Ecology conducted several sampling rounds at Outlook area homes, with Department of Agriculture and followed with later sampling to confirm whether groundwater wells were safe for drinking water.

### Yakima County Health District

**Ted Silvestri**, Solid Waste and Water Program lead, was the agency's lead coordinator for mobilized efforts.

**Ryan Ibach**, chief operations officer, coordinated with all outside county, state and federal agencies mobilized for the event.

**Paul Garcia**, environmental health specialist, was the lead agency representative on the ground conducting community outreach, Spanish translation and support to community members affected by the flood.

**Dave Cole**, former environmental health director (now deceased), brought outside volunteer agencies to bear to assist the local community with aid government agencies did not provide.



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# EMERGENCY RESPONSE PLANNING GUIDE FOR DRINKING WATER SYSTEMS

Most public water systems have experience managing routine operating emergencies like pipe breaks, pump malfunctions, coliform contamination, and power outages. However, a lack of emergency planning often compounds the effects of more serious, unanticipated emergencies, such as sabotage, chemical spills, floods, earthquakes, windstorms, or drought.

Public water systems in Washington must have an emergency response plan as part of a water system plan or small water system management program (**Chapter 246-290-415 (2)(b) WAC**).

The 4-1-1 for developing your system response plan is the **Emergency Response Planning Guide for Public Drinking Water Systems (331-211)**. It gives step-by-step instructions on preparing all the parts and people at your water system to respond appropriately to emergencies.

It's important to know which emergencies could happen at your system and how big of a problem they would be. The table

below is from the guide. You can use it to help categorize the emergencies you may face.

Emergency response planning is more than classifying emergencies, though. The process helps water system managers and staff explore vulnerabilities, make improvements, and establish procedures to follow. Practicing a response plan can save lives, prevent illness, enhance system security, minimize property damage, and lessen liability.

The **Washington Water and Wastewater Agency Response Network (WAWARN)** allows water and wastewater systems to receive rapid mutual aid and assistance from other systems during an emergency. Utilities sign the WARN standard agreement, which allows them to share resources with other Washington systems that signed the agreement. See the WAWARN article on page 2.

This issue of *H<sub>2</sub>Ops* is dedicated to practical, real-life examples of emergency response. So read on, and **be prepared!**

	Description	Coordination	Health Impact	Resolution Time
<b>Level 1</b>	Routine	Internal/Minimal	Unlikely Impact	Less than 24 hours
<b>Level 2</b>	Minor	Contact with DOH may be needed	Potential Impact	Less than 72 hours
<b>Level 3</b>	Significant	Mandatory for successful response	Likely Impact	More than 72 hours
<b>Level 4</b>	Catastrophic	Immediate and widespread	Definite Impact	Days to weeks