



AE2S & BEYOND



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HOW TO PREPARE YOUR UTILITY FOR A FLOOD

There are several potential causes of flooding - heavy rains, rapid snowmelt, and as we saw in 2017, powerful hurricanes. If your utility is located in a flood prone area, it pays to have a plan in place before the floodwaters arrive.

HISTORIC FLOODING

AE2S staff has extensive experience with helping cities and utilities recover from catastrophic flooding. The historic flood of 1997 in Grand Forks, ND inundated the City's water and wastewater collection

systems. AE2S assisted Grand Forks with rebuilding the water supply and treatment facilities, as well as repressurization, flushing, and disinfection of the water distribution system.

"We identified the critical areas and facilities that needed water, such as the flood command headquarters, hotels housing emergency workers, and the hospital. Plans were made to obtain temporary water from the nearby Grand Forks-Traill Rural Water District and

Agassiz Water Users District, as well through the use of Reverse Osmosis Water Purification Units (ROWPU) provided by the National Guard," explains Charlie Vein, AE2S President.

In parallel with providing temporary water services, a plan was developed to get the water treatment plant (WTP) running at a limited capacity within 11 days of being flooded. Crews worked day and night to pump out the lower levels of the facilities. Power was a significant need because much of the electrical gear was damaged by the floodwaters, including power supply transformers and the main utility services. The majority of the WTP's electrical components had to be repaired or replaced because the power was left on when the building flooded.

"One of the biggest things we learned during the 1997 flood is that you have to consider how your water utility is connected to the rest of the City's utilities. The Plant actually flooded from the inside because the City's stormwater and sanitary sewer systems were inundated with floodwater. Water started backing up through a floor drain, roof drains, and backwash lines inside the Plant. We had several feet of water in the building," says Vein.

While emergency work at the WTP was being completed, a plan was being developed to repressurize the distribution system. Primary transmission mains were isolated and flushed first to reservoirs and water towers. Then 'zones' were isolated, pressurized, and flushed sequentially as sanitary and stormwater services were available. "An interesting thing we observed

during the repressurization process was water loss through broken off water heater plumbing within homes. This was coupled with contamination in the form of fuel oil from floating and damaged fuel tanks located in residents' flooded basements," says Wayne Gerszewski, AE2S Project Manager.

AE2S provided oversight of reconstruction activities and coordinated contractor efforts. In addition, the team tracked individual Damage Survey Report (DSR) budgets, contractor pay estimates, and invoicing. This helped ensure smooth construction compensation and avoided accounting and invoicing problems on behalf of the City of Grand Forks, as well as meeting strict FEMA requirements. Over a 10-year period following the flood, AE2S assisted the City of Grand Forks with long-term recovery efforts which included \$75 million of projects. In addition to building a new intake, the damaged WTP was rebuilt and the water distribution system was revamped.

AE2S also provided local support services to the City of Grand Forks to implement a multi-year, \$400 million flood protection project to keep residents and businesses safe from the threat of future floods. The project includes more than 10 miles of earthen levee and concrete floodwalls to keep the City safe, as well as a tie-back levee system and drainway. FEMA has used the City of Grand Forks' recovery from the flood of 1997 as an example of how other cities should navigate natural disasters.

Vein, Gerszewski, Nate Weisenburger, Roger Grimsley, and Cal Thelen stayed in Grand Forks throughout the flood

emergency. Several AE2S staff members were relocated about 25 miles from Grand Forks, to a bed and breakfast in Northwood, ND where they were able to work remotely. Others worked out of the Bismarck, ND AE2S office until the evacuation order was lifted in Grand Forks.

“Since the AE2S headquarters is located in Grand Forks, this natural disaster impacted our employees immensely. It was a very tense time for everyone who lived in Grand Forks and the surrounding communities. I am grateful that we had the opportunity to help the City recover,” says Vein.

ADDITIONAL FLOOD FIGHTS

AE2S has provided engineering, restoration, construction, and other services for other flood disasters as well.

The City of Fargo, ND called upon AE2S to ensure its water and wastewater treatment facilities remained operational during the spring of 2009 when record flood levels threatened to overtop levees along the Red River. AE2S is now part of the project team for the Fargo Moorhead Diversion project, an effort to protect the area from future flood threats.

The City of Williston, ND made the same call to AE2S in 2011, when the flooding Missouri River threatened that City’s WTP. The lessons learned during the Grand Forks flood were used to create flood plans to protect both the Fargo and Williston WTPs.

In June 2010, the Rocky Boy’s Reservation in north central Montana was hit with heavy rainfall that compounded the effects of a very wet spring. The Reservation was inundated with water, causing damage

to homes and roads, as well as water and wastewater utilities. Throughout the flood recovery efforts, AE2S coordinated with more than 10 Federal and State government agencies to facilitate the disaster recovery.

BEST PRACTICES

Over the years, AE2S developed best practices and suggestions for recovering from a natural disaster.

“Preparation needs to be proactive and occur when there is not an emergency. Proactive discussions with regulators are also important to understand the expectations for maintaining operations in an emergency. In addition, utility managers need to understand what mobile or temporary assets are available that are either owned or readily available for rent. Some rental contracts allow for first-choice for a retainage fee. A communications and staffing plan with periodic practice and training is also key. Basically, any proactive planning will pay off in an emergency situation. Reactive fixes are very costly, if those solutions are even available,” says Scott Schaefer, AE2S Wastewater Practice Leader.

Gerszewski echoes the importance of proactive planning. “If a utility is susceptible to flooding, emergency preparedness is paramount – this includes risk management planning and emergency response planning. Two well thought out documents – a Risk Management Plan (RMP) and Emergency Response Plan (ERP) – will aid in an efficient, faster, and properly managed emergency response,” he says.

“I cannot stress enough the importance of creating a flood preparation plan for



each utility in flood-prone areas. Each plan should be created after carefully considering each utility’s vulnerabilities, including all the potential ways water could get inside. As we saw in Grand Forks, a building can flood from within. Develop very clear parameters for when the power should be shut down and staff should evacuate. It is far less damaging to the electrical systems if the power is shut down before the water arrives,” says Vein.

“You also need to think carefully about each part of the system. For a water utility, that includes the intake, treatment, distribution, and waste removal systems. What components are necessary to run the system in an emergency? What about operational considerations such as how will treatment chemicals be delivered to the site? How will we get waste out? If people need to stay at the utility during the emergency, what supplies do we need on hand to live?” says Vein.

Finally, Schaefer says using existing infrastructure as part of reactive solutions will typically be more effective than bringing in a full mobile solution, due to the size or scale of the infrastructure. “Our team is very good at determining work-arounds and different operational strategies when one portion of a system fails, and even going through that exercise with clients when there is no emergency can be very instructive about which assets should be on hand for emergency situations,” he says.

Although you cannot prevent a natural disaster from occurring, you can certainly prepare your response ahead of time. Due to AE2S’ extensive flood work, our staff has developed best practices for recovery. City and utility leaders are encouraged to save the checklist on the following page and refer to it in case of an emergency. ●

NATURAL DISASTER RECOVERY CHECKLIST

✓ GET ORGANIZED

- Develop a flood plan and review it annually.
- Make sure the leadership and utility staff understand flood levels and their impacts at various critical locations throughout the city. Identify vulnerable areas and develop protection plans.
- Gather all available maps (contour maps are particularly useful during floods), facility drawings, aerial photographs, and other related documents. Maintaining an GIS database is a good practice to consider.
- Assign a leader who knows the entire utility to oversee emergency reconstruction efforts, facilitate meetings, and serve as the direct point of contact for the media.
- Assign someone to answer incoming calls from people who need assistance.
- Form an evaluation team of utility staff, related utilities, consultants, public health officials, and regulatory officials.
- Maintain daily logs of all activities.
- Document everything and take dated photographs BEFORE cleaning or removal to show where the damaged equipment was located.
- Conduct daily, and if possible first thing in the morning, status meetings with all team members. These status meetings should continue until services are fully restored.
- Keep close track of expenditures; retain all invoices and records of employee hours worked.

✓ ASSESS THE DAMAGE

- Assign evaluation tasks to team members to get a true picture of the damage and required repairs. It is beneficial to create teams of people that include electrical and process engineers to get a thorough understanding of the damage.
- Identify equipment and systems that are critical or noncritical and functioning or nonfunctioning.
- Develop a plan to repair or replace critical, nonfunctioning equipment or systems.
- When developing a plan for turning the water distribution system on, be sure that the wastewater and stormwater facilities and systems are also operational.
- Maintain Damage Survey Report (DSR) / Preliminary Damage Assessment (PDF) files meticulously.
- Utilize local contractors who are familiar with the facilities whenever possible.

✓ FEMA BEST PRACTICES

- Take the time to understand the FEMA process; failure to understand the requirements may result in the loss of Federal reimbursement.
- Follow the FEMA competitive bidding process closely.
- On-site FEMA field reps may not understand local design standards, codes, laws, etc. Help them to understand with clear, comprehensive explanations.
- Obtain written authorization whenever possible from FEMA and make sure direction is received from a representative who has the authority to make the decision.
- Be up front, courteous, and helpful to FEMA auditors.



HORIZONTAL INFRASTRUCTURE COSTS INCREASE DUE TO RECENT HURRICANES

The most recent hurricane season devastated parts of Texas, Florida, and areas of adjacent States, as well as Puerto Rico and the U.S. Virgin Islands. As the post-storm cleanup costs mount, other parts of the country are also faced with financial impacts from the powerful storms. Fuel prices are typically the first to be affected. As Hurricanes Harvey and Irma bore down on Texas and Florida, fuel prices rose sharply before stabilizing due to Gulf Coast oil refinery operation and pipeline transmission disruptions.

Although fluctuating fuel costs are somewhat predictable, municipal and utility leaders may be surprised to hear the catastrophic hurricanes also caused pipe prices to increase substantially. The hurricanes in the Gulf Coast area have damaged several pipe resin manufacturing facilities, resulting in an acute

shortage of resin material. “The availability of pipe resin material is limited, and pipe suppliers informed us that the supply shortage has driven up pipe prices in the range of 25 to 30 percent for polyethylene based pipe,” says Jeff Hruby, Civil Practices Director.

AE2S Nexus advises those with projects that were bid recently or others who plan to bid soon to take a step back and consider the options. “If you already bid a project, I suggest contacting the vendors to confirm the prices that were bid. If you have a near-term project that cannot wait, it is prudent to research the updated costs and adjust your estimates so you have a realistic budget. After you have updated your budget to account for higher material costs, prepare to explain the cost increases to the City Council or

Commission, and other city leaders. It's important to communicate budget changes like this in a timely fashion," says Shawn Gaddie, AE2S Nexus Division Manager.

Another option is to postpone major pipe projects until the market recovers. "It's actually the opposite of what financial advisors tell clients about the stock market – to ride it out. I advocate for being prepared to bid projects when the market conditions are more favorable," says Nate Weisenburger, AE2S Drinking Water Practice Leader.

"Timing is everything when it comes to asset management and horizontal infrastructure replacement. Monitoring market trends can make a huge difference in the effectiveness of capital investments. With the exception of a few areas, we have enjoyed a great bidding environment lately, and some may think that they missed an opportunity right now due to an unfortunate bidding environment. If you are able to postpone a project a few months, you can be ready to bid when conditions are more favorable," explains Weisenburger. ●



LOOK FOR AE2S AT THESE UPCOMING CONFERENCES

JANUARY

9-11, PIERRE, SD

SD Rural Water Annual Technical Conference

10-12, CHAMBERLAIN, SD

SD Society of Professional Land Surveyors Annual Convention

23-25, ST. LOUIS PARK, MN

MECA Annual Erosion Control & Stormwater Mgt Conference & Trade Show

23-25, WINNEPEG, MANITOBA

Red River Basin Land & Water International Summit Conference

FEBRUARY

6-8, WISCONSIN DELLS, WI

Annual Midwest Water & Wastewater Operator Expo

7-9, BISMARCK, ND

ND Society of Professional Land Surveyors Conference

13-15 FARGO, ND

ND Rural Water Systems Annual Water EXPO & Technical Conference

21-23, HELENA, MT

MT Association of Registered Land Surveyors Conference

21-23, GREAT FALLS, MT

MT Rural Water Systems Technical Conference & Exhibition Show

FEBRUARY/MARCH

26-2, ST. GEORGE, UT

Rural Water Association of Utah Annual Conference

MARCH

6-7 BISMARCK, ND

ND League of Cities March Madness Conference

6-8, ST. CLOUD, MN

MN Rural Water Association Annual Water & Wastewater Technical Conference

7-9, BISMARCK, ND

ND Water Quality Monitoring Conference

14-16, ROCHESTER, MN

AWWA-MN Section Southeast District Water Operators School

21-23, BROOKLYN PARK, MN

MPCA Annual Collection System Operators Conference

25-28, SEATTLE, WA

AWWA Sustainable Water Mgt Conference

26-29, LACROSSE, WI

WI Rural Water Assoc. Annual Technical Conference



THE SCHAEFER FAMILY (L-R): VERN, DAN, SCOTT, MIKE, AND RUTH
PHOTO COURTESY: RYAN DWYER PHOTO

A FAMILY TRADITION! WORKING TOGETHER IN THE NAME OF STEM

The last time you got together with family over a beer, how did the day end? Many families might enjoy a good game on TV, or a board game on the kitchen table. For Scott Schaefer, PE, AE2S Wastewater Practice Leader, the day prompted a family collaboration on a highly technical, and helpful, article published in the October 2017 issue of WE&T (Water Environment and Technology) magazine, the official publication of the Water Environment Federation.

The article, titled “Have you X-rayed your collection system lately?”, provided a characterization of hydrogen-sulfide-induced concrete corrosion using established and new methods. Hydrogen sulfide can harm or kill workers in wastewater collection systems, as well as degrade the interior of concrete pipes and manhole structures. The article presents a case study of how Schaefer has helped clients address this challenge.

However, at the time, no one knew the late October day during which Scott Schaefer enjoyed a beer with his brother would serve as the spark for a dense text that is assisting other engineers in solving similar problems across the country.

“It was an opportunity through that family connection,” said Scott. He was visiting his brother, Michael, a few days after Scott had conducted an initial investigation and field work for a corrosion issue that one of AE2S’ clients was experiencing. Michael, who was finishing his PhD at Stanford University, offered to run some extra lab tests.

“I was telling Mike about these corrosion samples, and he mentioned that he could do elemental analysis with the instruments at his Stanford lab, and the project just built from there,” said Scott.

Michael Schaefer has an undergraduate degree in Civil/Environmental

Engineering, and got into water chemistry as a Master’s student studying aqueous iron reactions. He then studied aqueous arsenic (among other topics) for his PhD, which included a year in Cambodia studying naturally occurring arsenic contamination in shallow river-bank wells.

“We wrote the original WEFTEC abstract without Dad knowing about it, and then gave him a copy with the three of us (and two others) as authors for his birthday,” said Scott. “We did make him do some review and editing for the final manuscript to ‘earn’ his authorship.”

Scott and Michael’s father, Vern, is a geotechnical professor who spent most of his career at South Dakota State University and Iowa State University. His focus has been not only on soils, but also groundwater and surface water, including a major groundwater recharge project near Huron, South Dakota; and the impact of surface water erosion on slope stability along the reservoirs of the Missouri River. Vern Schaefer was also the Director of the Northern Great Plains Water Resources Research Center (now renamed the Water and Environmental Engineering Research Center). Coincidentally, the person who took over as Director of the Research Center after Vern was Delvin DeBoer, PhD, who is now a Special Projects Engineer at AE2S. Del and Vern are longtime collaborators.

Writing the article with Michael and Vern was an experience Scott will fondly remember. “It was definitely fun working with them on a technical level. I had a decent idea of how Michael would work up to the deadline because I have known him so long. We had also been coordinating

informally for years on topics that are within our specialty areas, so it was really only the written manuscript portion that seemed new for this article.”

The Schaefer family connection to STEM fields does not stop with Scott, Michael, and Vern. Their destinies become understandable when you look more closely at the rest of the family.

“We are definitely a STEM family,” Scott says. “All four of my Dad’s brothers are also in engineering or math. Our youngest brother, Dan, is in technical fabrication and metalwork. Our mom, Ruth, is a retired Nurse Practitioner; and nearly all of her 14 siblings are in a variety of engineering, science, medical, or math fields. Yes, that is a lot of STEM! My wife, Jen, teaches human anatomy/physiology and neuroscience at College of St. Benedict/St John’s University; and our five year old, Caleb, asked to dress up as a scientist this year for career day with his kindergarten class. Our three year old, Weston, appears to still be open about a career path.”

The Schaefer family submitted their article as a WEFTEC abstract, were selected for WEFTEC 2016, and then WE&T picked up the topic via WEFTEC to be modified for the WE&T article. They also collaborated with Michael Massey and Scott Fendorf on the WE&T article. To read it, WEF members may access full, online versions of WE&T magazine, including the October 2017 issue, on this web page: <https://wef.org/resources/publications/all-magazines/water-environment-technology/wet-issues/water-environment--technology2/wet-magazine---october-2017/> •



EMPLOYEE SPOTLIGHT:

**ROGER GRIMSLEY, PLS & GISP
SENIOR PROJECT MANAGER**

Retirement is near for a beloved, longtime AE2S employee. In April 2018, Roger Grimsley, Senior Project Manager, will retire after more than 24 years with the firm. In January 1994, he was hired as the eighth employee of AE2S.

AE2S President Charlie Vein and CEO Steve Burian worked with Grimsley at KBM prior to launching AE2S in 1991. “We hired Roger for his multi-faceted skill sets as a surveyor, CADD technician, and civil designer. He took our site designs to the next level,” says Burian.

Grimsley says the industry has changed drastically over the course of his career, but some important things stay the same. “GPS, Internet, and ever-evolving software have been game changers for these professions. Technology has changed everything except for the need for critical thinking and application of discipline and experience,” he says.

During his more than two decades at AE2S, Grimsley wore many hats, including Project Manager, Client Manager, and Geomatics Practice Leader. He also dabbled in IT when the firm was smaller.

“With Roger’s entrepreneurial vision, he invested significant efforts to grow and develop the survey, civil, and eventually

the GIS areas. Roger’s success stems from his creativity in business development, key relationships that he developed with clients, an extreme work ethic, and his passion for finding solutions,” explains Burian.

Preparation for Grimsley’s retirement has been years in the making, to ensure a smooth transition. The large multi-dimensional Geomatics Practice was broken into several separate practices due to the rapid growth of AE2S over the past five years. Jeff Hruby, PE, moved into the Civil Practices Director role; Mac Hall, PE, became the Private Civil Practice Leader; Jarda Solc, PE, is the Municipal Civil Practice Leader; Nick Stattelman, PLS, PE, CFedS, became Survey Practice Leader; and Lucas Rengstorf, GISP, took the reins of the company’s GIS endeavors.

“I’m not saying Roger was doing the work of five people... but I’m not saying he wasn’t either,” Burian says with a laugh. “Roger did an excellent job of building up our various geomatics services and then transitioning the leadership of several new practices to very knowledgeable colleagues to ensure all of his clients will be cared for just as well, after he retires.”

Grimsley says the relationships he built during his career have been very rewarding.

“A number of clients have become personal friends and that is very fulfilling. I will never forget the day we won a large survey/GIS project for the Fargo-Moorhead MetroCOG over all the big players in the area. In my mind, it’s the day when we ‘arrived’ in the Survey/GIS arena! I am especially proud to have been a part of the Grand Forks City-wide GIS and Grand Forks Flood Protection Survey Services. Many small town improvement projects, both rewarding and challenging, have created lasting impressions,” says Grimsley, naming some career highs.

He has big plans for retirement, which include spending lots of time with family. He and his wife Deb have been together since high school. The couple has two sons, Tanner and Travis, and three granddaughters.

“I really enjoy spending time at the lake with friends and family. I recently built a shop where I can restore and modify

cars. My wife is retiring as well, and we plan to travel and help my son Tanner with his development endeavors. We are all very close and are excited to spend more time together. Deb and I also enjoy home improvement projects,” says Grimsley.

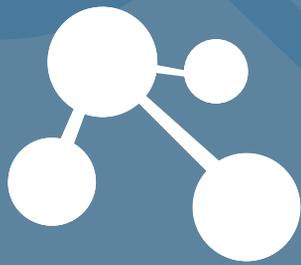
“Roger has been instrumental in shaping AE2S into the successful company that it is today. I am sad to see him go, but wish him all the best in his retirement,” says Burian. ●



**ROGER &
DEB WITH
GRANDDAUGHTER
ARIA**



**ROGER WITH
HIS 1ST PLACE
TROPHY AT
THE TRANS AM
NATIONALS**



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