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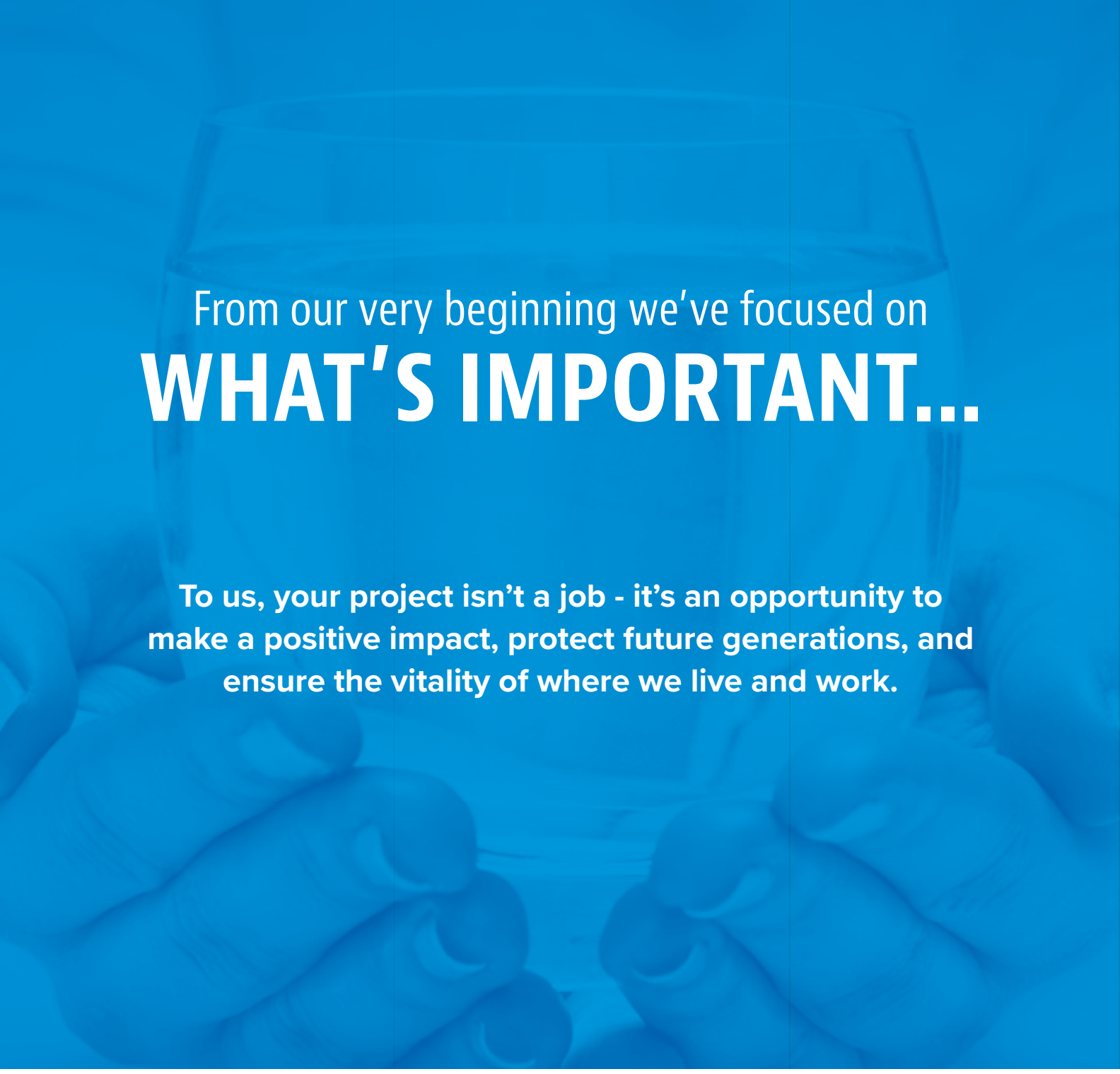

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Hopeful in Difficult Times

By Jane Carlson

Hope. That's the message that I want to convey. I've started writing this article multiple times and it didn't sound hopeful at first. Maybe it's because I've been listening to too many news reports. How does a person stay informed without getting discouraged by fires, hurricanes, famines, and civil unrest? Signs of climate change are here: It's mid-September, it's still almost 80 degrees at 9:00 pm and there's yet another severe thunderstorm coming. Rainfall has gotten much more intense and even downright scary at times. But we've rejoined the Paris Climate Agreement, so that's hopeful. Our industry is leading the way with energy and resource recovery, including clean water. As President Obama said, "We choose hope over fear. We see the future not as something out of our control, but as something we can shape for the better through concerted and collective effort." That's us. I keep reminding myself, too, that we're very fortunate in the Central States compared to elsewhere in the world. We don't have hurricanes, we tend to have enough food, and we're rich in fresh water. We can use our privilege to help others, as I know many of you are doing. My heart goes out to victims of recent climate disasters and to those of you who have had major challenges during these pandemic times. I hope you've had a chance to enjoy some simple pleasures like safely gathering with family and friends, and maybe partaking in some fresh water-related recreation recently.

Regarding CSWEA events, it's a bit like Groundhog Day the movie again: in-person, then virtual, then in-person, then virtual. As if planning committees don't have enough on their plates, now we have to plan for two options and be ready to change at a moment's notice. The Wisconsin Section YP Brewer Outing was wonderfully in-person, as were the Collection System Seminars. However, we recently had to pivot to virtual for Minnesota's Conference on the Environment and for the CSWEA Management Seminar. We need to follow CDC, local health department, and local venue requirements. But it's OKAY (right, Mo?) - our executive management team of Haque & Associates is getting really good at helping us pivot to virtual. Very importantly, they have been making sure our conference-related contracts have appropriate language in case the pandemic forces cancelations (be sure to run all future event contracts through them). WEFTEC is still planned as an in-person event in Chicago October 16 to 20, and even though our welcome reception was canceled, I'm hoping there will be small, compliant gatherings of CSWEA people in various places. Sincere thanks to our executive management team and to all of you who are helping to plan and re-plan conferences and seminars.

As of now, we fully intend to have our 95th Annual Meeting in-person at Monona Terrace, Madison, May 17 to 19, 2022. Please mark your calendars! By then this delta variant will hopefully be on a downward trend and many more people vaccinated including younger children. Exhibitor registration is open, and hotel information was eblasted with the exhibitor/sponsor brochure. The local arrangements committee is working on some great arrangements and activities for you-all, while the technical committee is putting the finishing touches on the Call for Abstracts. To borrow from the theme of Mary-Frances Klimek's last article, it's going to be a party, and you're all invited! Please consider bringing someone along, and plan to reach out and talk with at least three new people. Per day.

Another favorite pastime – CSWEA webinars – is back. Association member Patrick McNamara has generously agreed to help Haque and Associates organize the webinars. If you have an interest in helping, please let Pat know; his on-sabbatical-from-Marquette email is *mcnamarap@bv.com*. Webinar ideas may be submitted via the form on our website, too.

CSWEA is looking for assistance with CS Water magazine theme planning and articles. Please contact Mohammed Haque if you have an interest in this.

The Call for Nominations has recently been issued for CSWEA and WEF awards. You can check out all the awards and past recipients on our web site and think inclusively about who is deserving of an award. Then, make the nomination – it's easy and gratifying! Some of the state section committees are charged with making nominations, but feel free to make suggestions to them or submit your own online nomination, as well.

By the way, if you are new to a state section or association committee, or are just curious how we roll, I encourage you to check out our governance documents. These are posted on our website for the association and the three state sections under 'Resources'.

I was reminded recently of how great our organization is for networking, as I helped young engineer look for a new position in another state through contacts in CSWEA. I took the opportunity to encourage him to join CSWEA and get involved. I'm sure he'll be helping others make connections before long. While I was calling and emailing contacts, I caught up with several people I haven't seen since before the pandemic. It was so wonderful to reconnect, and it made me look forward even more to the 95th Annual Meeting and seeing everyone again. Until then, stay safe, be hopeful, and remember that we're stronger together! CS

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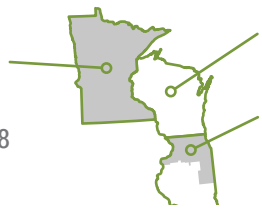

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WEFTEC and Workgroups

By WEF Delegates, David Arnott and Tracy Ekola

David Arnott

Tracy Ekola

Whether you are enjoying WEFTEC in Chicago at the McCormick Place convention center or partaking in the online sessions later in November, we hope you will find the education and networking helpful and insightful.

Our quarterly House of Delegates (HOD) meeting was held on August 18, 2021. As part of the meeting, the updated WEF bylaws were acknowledged and reviewed. With WEF bylaws now updated, WEF would like to assist MAs in also updating bylaws to provide more flexibility and align bylaws with current practices, including our virtual environment. MAs are encouraged to send their bylaws for review/comment. Each MA is responsible to decide and adopt any recommendations provided by WEF.

The WEF HOD meeting at WEFTEC takes place on October 16, 2021. For delegates that cannot attend in person, a virtual House of Delegates meeting is also available.

WEF technical committee meetings will be held online in October and also in person at WEFTEC. Joining a WEF committee is easy and can be a great way to gain and share information to bring back to your CSWEA committees or state section committees to help build and inform our industry network.

If you are interested in joining a WEF technical committee, please go to *www.wef.org* and navigate to membership then committees to review the committees. To apply to a WEF committee, send an email to *committees@wef.org* with the following information: name, WEF ID number, committee of interest, and one to two sentences explaining your interest in the committee.

Work in the WEF workgroups is wrapping up. The Conference Resources work will be publishing an infographic on best practices from WEA member associations regarding Annual Conference practices including virtual meeting best practices. This workgroup also compiled results of interviews with member associations on the successes and challenges of virtual meetings. The end product of this exercise will be recommendations to WEF and member associations on improving virtual meetings and conferences.

Financial Diversification is another workgroup at WEF. It is recognized that many MAs get most of their revenue from Annual Meetings which have been cancelled or scaled back the last couple years. Now more than ever, it is important to have financial diversification for revenue streams. Results from the MA survey will be published soon to

provide insights on how other MA's have diversified their financial resources. The purpose of the surveys is to compile the information and allow MAs to learn from others, It is hoped the results should also spur ideas and energize MAs to develop new initiatives.

Diversity, Equity, and Inclusion (DE&I) is an important initiative this year at WEF. As the results of this workgroup are published, we will provide this information to CSWEA and state sections. A DE&I toolkit is being developed to help MAs start a committee or program. To learn more about the WEF DE&I program, visit *www.wef.org/about/diversity-equity-and-inclusion*.

In addition to workgroups, WEF has initiated the following efforts to address emerging and changing needs within our organization and industry: WEF Member Engagement Transformation (see additional information below), PFAS Task Force, and Integrated Planning Task Force. Members from each of WEF's committees are included in the PFAS and Integrated Planning Task Force. These three initiatives were started in February and March 2021 and will be ongoing through 2021. Taskforce updates will be provided as part of WEFTEC. We will provide more information as available and in our next report.

> "If something is on your mind, please feel free to call or email. We are here to serve you as well as CSWEA and be a liaison to WEF leadership. We look forward to hearing from you!"

The WEF Member Engagement Taskforce (MET) strives to maximize the impact of WEF's volunteer member experience by capitalizing on the breadth, energy, and enthusiasm of WEF members. MET brings together WEF's volunteer leaders (past, present and future) and members (new and existing) to unlock ways to engage and enhance WEF's membership experience and impact by creating an environment for all levels of volunteer contributions and leadership. The purpose of the MET is to continue to evolve WEF and increase volunteer participation to enhance each member's experience.

As WEF Delegates, we are here to support you and represent the interests of the Member Associations to the House of Delegates and WEF. If something is on your mind, please feel free to call or email. We are here to serve you as well as CSWEA and be a liaison to WEF leadership. We look forward to hearing from you! CS

Click HERE to return to Table of Contents

Congratulations

to CSWEA's Professional Operators Teams

Pumpers Team: (L-R): Cody Schoepke, City of Fond du Lac; Brent Perz, Baxter & Woodman; Marc Zimmerman, City of Janesville; Tom Romza, Glenbard WW Authority; and Jason Neighbors, Glenbard WW Authority

Shovelers Team (L-R): Chris Lefebvre, Stevens Point; Wade Lagle, Urbana & Champaign SD; Tom Dickson, Oconomowoc; Joe Watson, NEW Water; and Luke Markko, Northern Moraine WRD

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It's Not Always What You Know, It's Who You Know

By Mary-Frances Klimek

Growing up, most of us focused on building what we know. Sure we wanted to have friends, but we didn't focus so much on who we knew – and at that point in our development, that was probably a good thing. Once we were adults we realized that while for many of us our formal education ended, it was important that we continue to learn. For a while our points of contact and those that we could learn from was rather limited. That's when we realized that who you know is important and, in many situations, even more-so than book knowledge.

Let's have a show of hands. How many of you dreamed of being in the industry or even planned to go into the wastewater field? Of those of you that work at a POTW, how many planned to be in the public sector? I am not surprised if few of you raised your hands. I know that some of you ended up in this field by chance – I know that I did. Maybe you saw a posting at school or online, or just maybe, a friend of yours told you about an opening at a utility or firm that he or she really enjoyed working for. Even more likely, your mom's friend told your mom and well… you know the rest of the story.

As we all started our careers and possibly moved to different positions or employers, we typically continued to build this group of people within our industry that were happy to answer our questions, help us out with operational issues, or put us in contact with someone that could. We all need those people we can contact when we have a question, need help, or want to talk through an idea with. As we continue in our careers within the wastewater industry, we become those contacts for others and this wonderful cycle continues.

The big question for many is: how do I find those people? Just last week, the Wisconsin Section had our August meeting. In order to make it work for as many as possible, we offered both in-person and Zoom options. I know that isn't perfect because meeting contacts and networking is more effective in person (at least for me) but give it a try and attend our November meeting. This meeting is unique because in addition to everything else that is discussed, we see a presentation on the annual budget and then approve it.

At the August meeting, we heard reports from all of the committees. We discussed recent events and what is coming up. Each committee had at least one representative present to report on these items. This is a great opportunity to meet these representatives in person, virtually, or simply by sending a message through the Zoom chat.

Following the meeting, many attended the Brewer tailgate that was hosted by the YPs followed by the game. Talk about a great networking opportunity! Especially since the first place Brew Crew beat the second place Reds. It was a great night with plenty of conversations about latest projects, successes, and challenges.

In addition to the quarterly meetings, the Wisconsin Section has some great conferences coming up that will offer great opportunities to learn about the latest way of doing things, as well as proposed regulations and even tricks of the trade.

Although you may have missed it this year, the Industrial Pretreatment Seminar took place virtually August 24-25, 2021. Pretreatment departments are typically small groups and many experienced people are retiring. The theme this year was Back to Basics with a target audience of new pretreatment professionals. A lot of material was covered including an introduction to the pretreatment program, an update from the WDNR, discussions regarding emerging topics, and information on how to identify industries and conduct on-site inspections. There were also presentations on the importance of establishing sewer use ordinances, permits, limits, monitoring, and enforcement plans. This seminar and others are great opportunities to meet colleagues.

Check out the CSWEA website under the Wisconsin tab and the dropdown events. Some of those seminars and conferences that are coming up in 2021 include the Northwoods Collection System Seminar (September 9), Classic Collection Seminar (September 23), WEFTEC in Chicago (October 16-20), and the Operations Seminar (November 10). There are plenty of additional opportunities to learn and develop your network in 2022.

While you are on the CSWEA website, take a look around and pay attention to the awards that will soon be up for nomination. Consider nominating someone from your network. There is no greater honor than being recognized by one's peers and those that we network with.

If you have a question, concern or just something you want a sounding board for, feel free to contact me. I am happy to be part of your network and have you as part of mine.

Find me online at *www.linkedin.com/in/mary-frances-klimek*. CS

Click HERE to return to Table of Contents

The Importance of Water Protection

By Emma Larson

It's summer in Minnesota. It feels like we were just here, although a year has gone by and with so much going on, it has flown. Some days it feels like a lifetime since March 2020 and other times, it feels like yesterday.

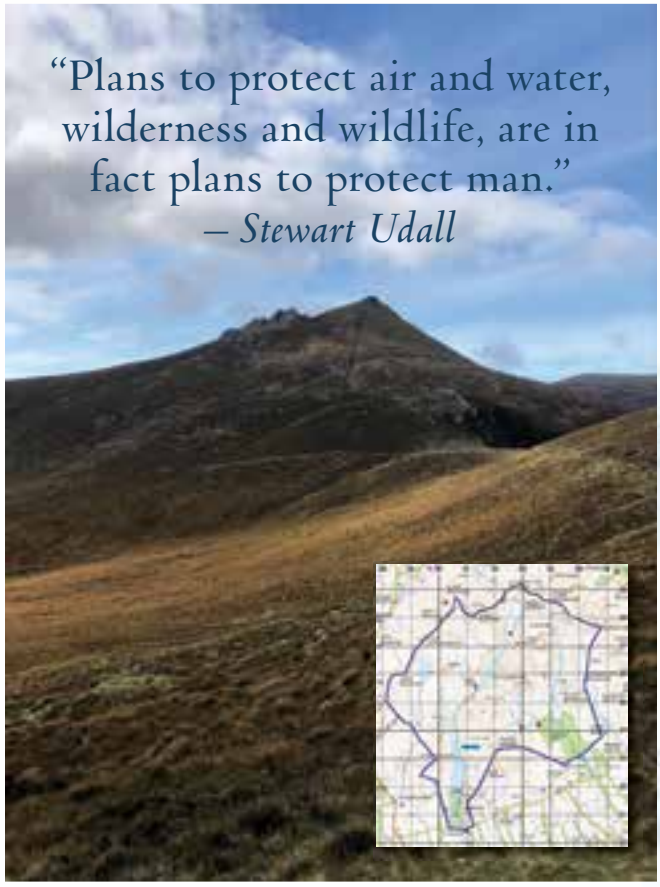
Summer brings long sunny days, gardening, barbeques, lake days, fishing, biking, boating and lots of time for… vacations… or in the case of pandemic years, dreams of vacation to somewhere you love. What a privilege it is to live somewhere we can (pre-COVID-19) essentially vacation where we desire.

Where would you go if you had no limitations? Who would you spend it with? What would you do? It takes a global pandemic to not only show how small the world is by how quickly a virus can travel, but just how large it is when you are so far from home. I have spent a lot of time over the last year and a half dreaming of 'home': the little northeast corner of the island of Ireland; Northern Ireland. It is 5,400 square miles, which fits into Minnesota about 15 times (or Wisconsin 12 times, or Illinois 10 times, for anyone interested). It is home to 1.9 million people: half of the population of the greater twin cities, seven-county metro area. Northern Ireland has a rich, complicated, and sometimes dark and conflicted history, but what a fabulous corner of God's creation. It is home to the Giants Causeway, the North Antrim Coast, Harland and Wolff, the Titanic, George Best, Van Morrison, Snow Patrol, and Bushmills Distillery. But there is one place that will probably not show up when searching for Northern Ireland, and it is one of my favorite places: Silent Valley. I loved this place before I knew it supplied drinking water for County Down, where I lived, and long before my career led to me to water quality, protection, and supply in central Minnesota.

The Silent Valley Reservoir was constructed between 1923 and 1933 by over 1,000 men, nine of whom lost their lives during construction. In 1891 the Belfast Water Commission investigated options for supplying water to the City of Belfast that was expanding exponentially because of the linen and ship building industries. They looked to the Mourne Mountain range, which is between 300 and 2,800 feet above sea level, with an average rainfall of 57 inches per year. Guaranteed Irish weather and two contributing rivers could provide more than enough water for the City and the surrounding area.

Phase one diverted two rivers through a hand-built conduit, providing 10 million imperial gallons per day (12 M US gallons). The 'Water Protector', built between 1904 and 1922, is a 22-mile, dry-stone wall, that stretches over 15 Mourne Mountain peaks, and surrounds the entire catchment area. The last phase of the project involved digging a tunnel under Slieve Binnian and was completed between 1947 and 1951. When all was said and done, the area could provide up to 30 MGD (imperial) for the north of Ireland. The Mourne Wall alone shows that nothing on earth is new. Those that went before us already knew the importance of creating source water protection areas.

Here in the US, the Minnesota Section continues to move forward into the unknowns of 2021 and 2022. Upcoming opportunities include Rochester Water Reclamation Plan Pilot Tour on September 1, and Fall and Winter Collections Workshops. And of course, planning is well underway for the Conference on the Environment on November 9. This conference is packed full of learning, networking and mentoring opportunities. Remember to check the CSWEA webpage and MN links for all the upcoming opportunities. CS



Mourne Wall over the peaks. (Photo courtesy of my dad.)

A Lot Of Things Are Happening

By Bob Swirsky

It's the end of August and I am a couple weeks late turning this article in – I guess it's been a busy summer.

The Illinois section meeting was held virtually on August 10, where the various committee chair people gave their reports and talked about the many interesting events and activities that have taken place and are being planned to take place both virtually and in person.

Here is a summary of what was reported:

- Mike gave his Treasurer's report and presented the 2021 Illinois section budget, it was put up for a vote via email and approved.
- The Public Education Committee reported that 120 essays were received for the essay contest that was held in April and we were able to be give the awards to the four winners in person. CSWEA also gave each winner a water garden/fish tank that helps them learn about the water cycle. The Public Education Committee is going to create a virtual tour of a wastewater treatment facility and then offer that service to other members that would like to create a virtual tour their facility that can be used for public relations and education. Other initiatives that are being pursued are different ways to engage students from all grade levels, diverse cultural backgrounds and communities.
- The Membership Committee reported that overall the results received back from the member survey were positive. The people responding said they really liked the operations training and that the response to training was very good. There was an interest expressed for more events to be held in the central Illinois area. The committee is also working with the other sections to do some kind of a WEFTEC giveaway.
- The Student and YP committee reported that shortly after the annual meeting a volunteer event to do maintenance on the 2019 WEFTEC project at the Maria Salsedo School in Chicago was held. Nick said the event went well and that some new plants were added and that some before and after drone photos of the maintenance being performed were posted on CSWEA social media pages. Nick is tentatively planning a trip to U of I in the beginning of September to make a presentation to the students there.
- The Collection System/Stormwater Committee is continuing to consider the possibility of an in-person seminar to be held down state in November and will plan to hold the regular in-person seminar in Naperville in June. The committee is presenting a joint Webinar with Minnesota and Wisconsin on November 18, covering a variety of topics.
- The Operations/Safety Committee is planning on moving to webinars for training through the rest of the year. Discussions with the Collections/Stormwater Committee regarding a combined downstate seminar in November will continue.
- Government Affairs reports that if IAWA is back in person in March they will team up with them for the seminar and if not they will do another virtual seminar.
- Biosolids/Energy/Resource Recovery reported the formation of an Ad Hoc regional resource recovery committee with members from all three states looking to act as a go between with WEF and local regional issues. Chris said the committee is just getting off the ground and is open to all.
- Global Water Stewardship is planning to head back to Costa Rica, and the 2022 (Montezuma) project community has been selected.
- The PWO held their first practice in Janesville in August.

With WEFTEC coming up in October in Chicago, fall looks like it will be a busy time as well. Thank you to all the committee members that keep working hard to make sure the association can provide all these opportunities for education, involvement, and networking. CS

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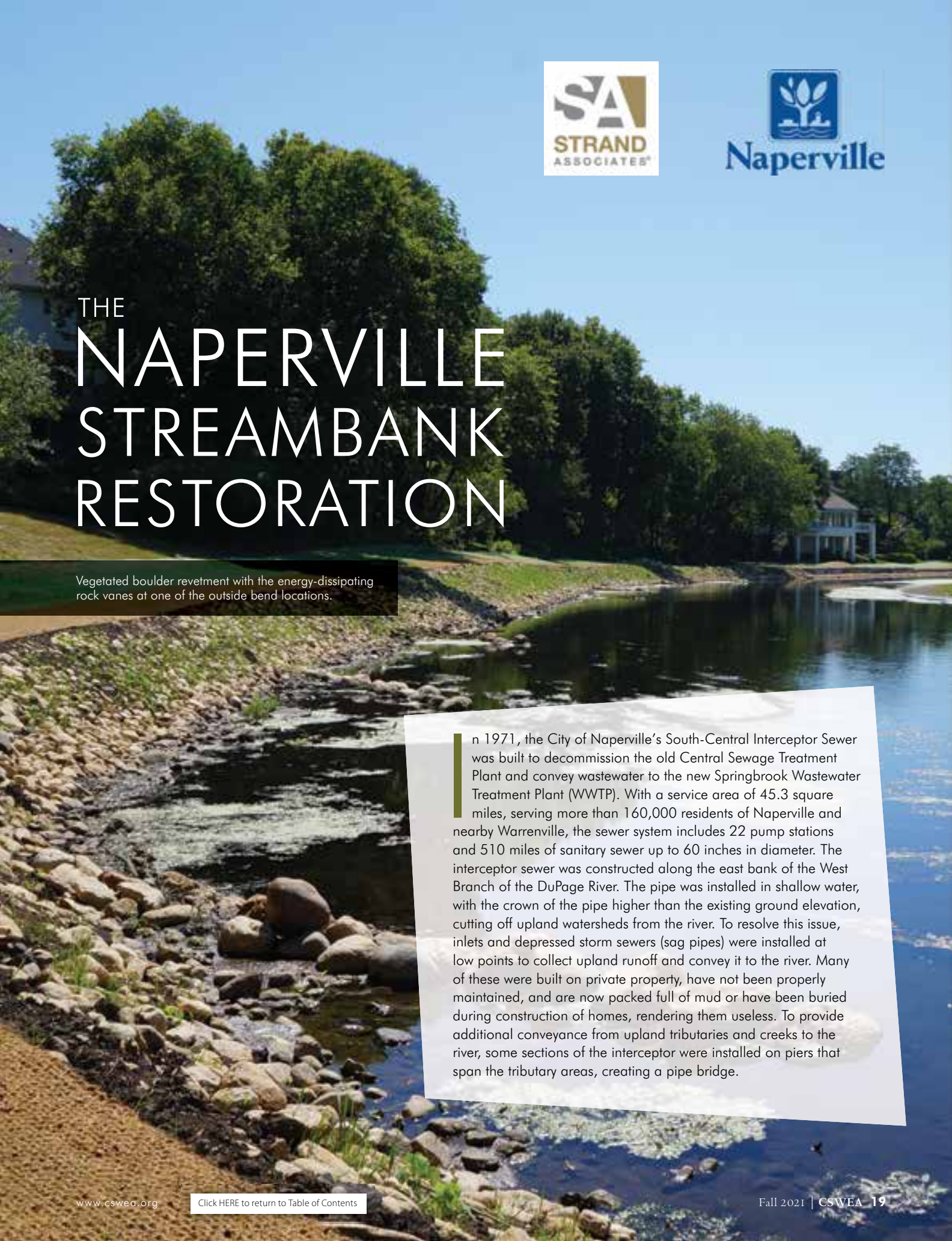

Vegetated boulder revetment with the energy-dissipating rock vanes at one of the outside bend locations.

In 1971, the City of Naperville's South-Central Interceptor Sewer was built to decommission the old Central Sewage Treatment Plant and convey wastewater to the new Springbrook Wastewater Treatment Plant (WWTP). With a service area of 45.3 square miles, serving more than 160,000 residents of Naperville and nearby Warrenville, the sewer system includes 22 pump stations and 510 miles of sanitary sewer up to 60 inches in diameter. The interceptor sewer was constructed along the east bank of the West Branch of the DuPage River. The pipe was installed in shallow water, with the crown of the pipe higher than the existing ground elevation, cutting off upland watersheds from the river. To resolve this issue, inlets and depressed storm sewers (sag pipes) were installed at low points to collect upland runoff and convey it to the river. Many of these were built on private property, have not been properly maintained, and are now packed full of mud or have been buried during construction of homes, rendering them useless. To provide additional conveyance from upland tributaries and creeks to the river, some sections of the interceptor were installed on piers that span the tributary areas, creating a pipe bridge.

The populations of both the City of Naperville and DuPage County have grown rapidly since the 1970s, with 87% of the residential housing in Naperville built after 1970. Because of the urbanized nature of the watershed, runoff volumes and water levels rise and fall quickly in response to rainfall, leading to erosion where surface flows pass over, and in some cases under, the interceptor and along the riverbank. Continued riverbank erosion has cut away more of the riverbank and adjacent land, causing the interceptor sewer to become exposed in some locations. These continuing hydromodifications threaten the interceptor and create operating problems for the City.

In 2015, the City hired Strand Associates, Inc.® (Strand) to study the relationship between the river and a 7,000-foot segment of the sewer to identify a way to stabilize and protect this valuable piece of public infrastructure. The project began with a comprehensive river corridor evaluation to identify, GPS locate, document, rate, and prioritize hydromodification issues related to the interceptor as well as the general health of the river. The severity of riverbank erosion was ranked on a scale of two (slight) to five (very severe). Segments of the river that scored a three or higher, and the adjacent segments regardless of score, would be restored. Strand developed final engineering drawings and specifications for several stabilization techniques addressing different types of riverbank erosion and five different locations where upstream tributaries drain over the top or under the interceptor in route to the river. The evaluation also included a Property Ownership Investigation, which identified land ownership along the river. A 20-foot sanitary sewer easement runs through land adjacent to the river belonging to Naperville Park District, Forest Preserve District of DuPage County, and the City, as well as private owners.

In areas with the most severe erosion, vegetated boulder revetment was installed consisting of large stone boulders used to stabilize the bank. Between the boulders, topsoil was returned, and native plantings were incorporated to encourage vegetation growth. At locations along the river with outside bends, rock vanes into the river were installed to create an eddy, forcing velocity away from the banks and back into the river, reducing scouring of the riverbank.

Exposed interceptor sewer pipe.

After construction of the ledge stone wall, residents were already enjoying their new backyard by placing chairs at the bank.

Many of the backyard locations featured turf grass where the shallow rooted system was not able to hold onto the soils and stabilize the riverbank from erosion, resulting in an average backyard loss of 12 feet, with some locations experiencing loss of up to 25 feet. Ledge stone walls were installed, enabling up to 4 feet of backyard to be restored. These walls consisted of large, heavy cut stone used to provide vertical stability while maintaining a natural aesthetic.

Field evaluation also identified where the sewer interceptor was exposed because of the loss of soil cover over the pipe caused by upland runoff and riverbank erosion. Some of the most significant exposure was at pipe dam locations, where upland inlets and sag

Click HERE to return to Table of Contents

One of the pipe dam locations completed during construction in 2020.

A tree repurposed as fish habitat.

pipes were no longer in use, completely plugged up, or buried. Consequently, upland flow had no choice but to flow over the pipe, scouring away the earth until the pipe was acting as a dam.

One option to remedy this problem was to excavate underneath the pipe to create a pipe bridge, but the pipes were so close to the same elevation as normal river water levels that this would essentially just bring the river up into the upland area. It was decided to leave the pipes where they were and stabilize them in place by creating a pipe cradle that would allow the runoff to continue to flow over the pipe while maintaining current flow conditions and not backing up the flow upstream or impacting the wetland area created by the pipe dam.

Some of the pipe bridges had been incorporated into nearby trails as a way of crossing the tributaries, so they were left in place. However, there were still some upstream flow concerns that needed to be addressed. The pipe restricted the flow and velocity of the runoff underneath it, causing a buildup of debris upstream which put pressure on the pipe. The 10-year flood event would flow over the top of the pipe, increasing the velocity of flow and creating a significant amount of force on the pipe. To address the high flow velocities and scour energy underneath the interceptor sewer, it was decided to use a wire-connected articulated concrete block to provide protection against scour. The run in and run out sections in the side walls were stabilized with large diameter riprap and tied into the vegetated boulder revetment. To protect the pipe from upland debris, vertical concrete piles were installed to protect the pipe while allowing the flow under the pipe to continue to the river.

Along the riverbank, trees were removed because vegetation was not able to grow underneath the tree canopy, causing further erosion along the riverbank. Some trees were repurposed as fish habitat.

A previously performed detailed Wetland and Existing Vegetation Study was reviewed. Field delineation was performed and became a critical aspect in permitting, especially with DuPage County. Final permitting included requirements for native planting restoration, wetland restoration, and permanent wetland mitigation fees. A five-year monitoring period was set up to allow the City to evaluate and improve the wetland to earn some of the wetland mitigation credit back.

Construction was separated into stages to limit the area of disturbance along the corridor. Stage 1 began in July 2020 and was completed in September 2021. Stage 2, which encompasses the north end of the project corridor, will begin in 2022. The project was imperative to public safety since its purpose was to protect a major piece of City infrastructure. The City approved additional areas of riverbank erosion as a good-faith effort to the various property owners along the river corridor, especially to those who had lost nearly 15 feet of their backyards to the river. Since construction, a resurgence in wildlife has been enjoyed by area residents, including great blue herons, egrets, orioles, red winged black birds, deer, and muskrats, among others. CS

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CONNECTING THE BIOSOLIDS COMMUNITY

New talent and resources affirm WEF's commitment to sustainable biosolids management

BY JUSTIN JACQUES

The Water Environment Federation (WEF; Alexandria, Virginia) has hired Maile Lono-Batura, former executive director of Northwest Biosolids (Gig Harbor, Washington), as its inaugural Director of Sustainable Biosolids Programs. The new position, along with other recent biosolids programs, signal WEF's growing focus on promoting biosolids recycling. Image courtesy of Lono-Batura

Water resource recovery professionals have long understood that when processed correctly, fertilizers made by repurposing wastewater biosolids can often represent a safer, cheaper, and more sustainable soil amendment compared to manure or chemical-based fertilizers. However, while biosolids reuse in the US has become more common in recent decades, its adoption has been sluggish because of inconsistent regulatory guidelines, gaps in research, and the social stigma of recycling human waste.

The Water Environment Federation (WEF; Alexandria, VI) is taking several new steps to help overcome these obstacles. In February, WEF released a new communications toolkit to help utilities and biosolids managers build support for biosolids recycling using simple, science-backed messaging. The organization also established a new staff position, hiring former Northwest Biosolids (Gig Harbor, WA) Executive Director **Maile Lono-Batura** as its first Director of Sustainable Biosolids Programs.

"Biosolids are a central product of the wastewater treatment process, a vital part of resource recovery and circular economy, and beneficial for communities in many ways," said WEF President Lynn Broaddus. "WEF is increasing our investment in biosolids programs and is thrilled to add Maile's expertise and experience to our team."

A UNIFIED VOICE

With more than 20 years of experience leading a multi-state biosolids association, Lono-Batura is uniquely suited for her new role, which will involve unifying biosolids recycling practices and regulations that vary by region and state. In a February 16 *Words on Water* podcast interview, Lono-Batura described her goal to create a "collective platform" for biosolids research, advocacy, and knowledge-sharing at the national level. Much of her work will center on sharing resources between biosolids-management groups to reduce redundancies and amplify messaging, she said.

"For those of us in the field of biosolids, we know how important it is to have a unified voice around biosolids so that we're all singing from the same sheet," Lono-Batura said. "It's going to be a challenge, for sure. But it is such a worthy challenge to me."

WEF's new Biosolids Communications Toolkit, accessible at *http://bit.ly/WEF-biosolids*, will help jumpstart Lono-Batura's work by providing customizable bill inserts, fact sheets, social media infographics, and other materials that convey key messages about biosolids in simple, accessible terms. Each resource available in the free toolkit works from cited, peer-reviewed sources and aim to reach different stakeholder groups, including those both inside and outside the wastewater sector. For example, some resources cover strategies for managing media coverage of biosolids programs, while others tout the benefits of biosolids-based fertilizers for farmers.

"We 'geek out,' and that's not a bad thing within our circle," Lono-Batura said. "But we lose people pretty quickly if we cannot relay the importance of what the

research has found, whether it be favorable or unfavorable."

Although much of WEF's existing activity in sustainable biosolids has been technical in nature, Lono-Batura's new role indicates a growing focus on the social and logistical aspects of the biosolids challenge. Lono-Batura will not only work alongside biosolids professionals among WEF's membership, but also with regulators, environmentalists, the media, and others.

"There are a whole team of people not just within WEF but within and beyond the biosolids community that we can be aligning with that part is what really excites me," Lono-Batura said. "That we can speak beyond our sector and connect with people beyond the people we normally connect with to see what common ground we have and how we can join forces on soil building, climate change, and producer responsibility."

REGULATION AND RESEARCH

WEF's new Director of Sustainable Biosolids position and communications toolkit promise to advance national coordination on biosolids recycling, but they are only the latest actions.

In November 2019, for example, WEF invited leading biosolids experts from across North America to its headquarters for a strategic conversation that identified ways to improve biosolids programs and better promote their adoption. Among other recommendations, meeting attendees described needs for better risk assessment methods for contaminants of emerging concern, new training and certification programs, and more robust communication between producers, farmers, and researchers.

Experts also called for an update to federal government guidance on biosolids use, as most US states currently implement their own biosolids regulations. The US Environmental Protection Agency (EPA) Part 503 Rule, established in 1993, remains the only federal regulation governing land application of biosolids. Despite advancements in treatment technology that result in cleaner, safer, and more viable biosolids, the Part 503 Rule has never undergone a substantial update. Read more about the meeting's outcomes at *http://bit.ly/wef-biosolids-report*.

WEF also published five new technical resources in 2020 that deal exclusively with biosolids management. Covered topics include the financial costs of managing per- and polyfluoroalkyl substances (PFAS), measuring and managing greenhouse-gas emissions during the synthesis process, bioenergy focused public-private partnerships, and more. Access these technical resources at *www.wef.org/biosolids*. CS

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Click HERE to return to Table of Contents

TRANSLATING WASTEWATER SURVEILLANCE DATA

How to ensure your wastewater-based epidemiology program provides insights that can influence public health decisions

By Rasha Maal-Bared, Mark Sobsey, Naoko Munakata, Kari Brisolara, Lee Gary Jr., Jay Swift, Samendra Sherchan, Scott Schaefer, Albert Rubin, Charles Gerba, Kyle Bibby, Robert Bastian, Lola Olabode, Akin Babatola, Robert S. Reimers, and Leonard Casson

Wastewater contains a tremendous number of resources, such as water, energy, and nutrients. The coronavirus pandemic has helped highlight one more, often-overlooked resource flowing through our sewers: information.

Faced with the need for non-invasive and scalable tools to supplement individual clinical testing and contact tracing efforts, public health officials and wastewater experts have begun turning to wastewater-based epidemiology (WBE), which is also known as wastewater surveillance. This practice can monitor substances of concern in communities by detecting and quantifying their concentrations in community wastewater.

Making the most of this potentially powerful tool requires three core tasks. First, it is essential to understand what WBE is, how it works, and its limitations. Second, the WBE team must include the right people to collect, analyze, and use the data. This includes adding a new role to the process to translate knowledge from wastewater analysis to public health decisions. And, finally, all sample collection and analysis activities need to be standardized to ensure the resulting decisions are based on comparable data.

These elements can help create a successful WBE campaign that uses information extracted from wastewater to aid and improve public health actions.

WHAT IS WASTEWATER-BASED EPIDEMIOLOGY?

Monitoring wastewater through the regular collection and analysis of wastewater samples for pathogens and chemicals has been used for decades to support public health decisions around the globe. In the 1940s, environmental virologists at Yale University

used WBE by culturing cell assays to monitor for the presence of poliovirus in communities. This approach enabled public health professionals to detect when a polio outbreak was about to occur, as well as estimate the level of infection in the community. Later, when polio vaccine became available in the 1950s and 1960s, WBE also aided evidence-based decisions about initiation and targeting of polio vaccination campaigns in communities where the virus was detected in wastewater. In 2013, WBE was able to prevent a polio outbreak in Israel, which had been polio free since 1988.

More recently, the approach has been expanded to include norovirus, hepatitis A virus, antibiotic-resistant bacteria, and the rubeola virus (which causes the measles) in countries such as Australia and the Netherlands. In 2009, WBE was implemented to trace the use of antiviral drug, oseltamivir, during the 2009 influenza pandemic in Japan. WBE also was successfully used globally for the surveillance of opioid and illicit drug use by the European Monitoring Centre for Drugs & Drug Addiction (EMCDDA) and Statistics Canada. The approach relies on the assumption that any substance that is excreted by humans and is stable in wastewater can be used to back-calculate the original concentration excreted by the serviced population, provided that excretion (or shedding), substance fate and transport and wastewater flow patterns are well understood.

HOW WBE WORKS WITH COVID

For the virus that causes COVID-19, RNA is shed from symptomatic and asymptomatic COVID-19 cases in saliva, sputum, urine and feces. These multiple shedding routes and evidence from other coronaviruses suggested early on that the likelihood of COVID-19 virus RNA detection in wastewater and collection systems is high.

This high reliability indicates that WBE can help overcome challenges faced by traditional public health tools. Scaling the conventional testing systems for mass surveillance of populations proved challenging in 2020 due to high cost of repeatedly testing large portions of the population, limitations in human, clinical and testing resources, insufficient sensitivity and inadequate throughput. In addition, research has shown that 20% to 45% of infected individuals exhibit delayed onset of symptoms or do not show symptoms at all. Even if the infection is symptomatic, the US Centers for Disease Control and Prevention (CDC) reported that only one in seven COVID-19 symptomatic illnesses in the US were reported between February and September of 2020. Finally, contact tracing has proven to be challenging due to training requirements for staffing call centers and the lack of consistency across states and regions.

The first successful report of COVID-19 monitoring by WBE came from the KWR Institute in the Netherlands. This was a proof-of-concept study to determine if current molecular biology tools are sensitive enough to detect the RNA of COVID-19 virus in untreated wastewater at the water resource recovery facility (WRRF). Since then, COVID-19 virus RNA has been found in untreated wastewater and untreated sludge worldwide. These findings have shown some correlation with number of infections in the community. In some cases, such as Italy and Brazil, retrospective analyses of wastewater confirmed the presence of the virus in wastewater before community transmission had been identified.

Many studies successfully reported the use of qualitative approaches that report the presence or absence of virus RNA in wastewater. Other work takes on a more semi-quantitative approach based on concentrations of the virus or its nucleic acid to reveal trends of infection in the population, but mainly within individual communities.

USING THE INFORMATION

While, to date, many wastewater samples have been collected and analyzed for COVID-19 RNA, the results have seldom been used to inform public health actions. Three main factors are hindering using this data:

- Public health authorities primarily deal with testing results, hospital infection and treatment data, and health outcomes; newly produced WBE data does not readily fit into their current data collection structures, risk evaluation systems, and decision-making frameworks.
- Many knowledge gaps remain when it comes to SARS-CoV-2 shedding in feces and decay in the sewershed making interpretation of results challenging.
- Not all molecular laboratories (i.e., data producers) have the expertise, public health knowledge and authority to efficiently and correctly convert viral RNA concentrations to actionable results and trends to support public health response efforts.

ASSEMBLING THE RIGHT PEOPLE

Many organizations have suggested that successful WBE-based public health decision-making requires cooperation between three main multi-disciplinary groups of collaborators with different expertise, perspectives and priorities: the sample provider, the data producer, and the knowledge users (see Figure 1, p. 27). The Water Research Foundation (WRF; Denver, CO) acknowledged this interdependence in its Spring 2020 report, *Wastewater Surveillance of the COVID-19 Genetic Signal in Sewersheds*, that emerged from the Virtual International Water Research Summit on COVID-19.

WBE samples are collected from WRRFs or the collection systems by public or private utilities that fill the role of sample provider. Collecting a representative sample in a standardized manner and properly storing and transporting it prior to analysis is the first step of WBE.

These samples need to be analyzed by data producers, who process, concentrate, extract, and run the polymerase chain reaction (PCR) to provide analytical results for COVID-19 nucleic acid (specifically virus RNA) presence and concentrations in the samples. The data producers often act as the project leaders by monitoring progress, addressing challenges, and managing communication activities among team members given that health authorities and utilities have other priorities and responsibilities. Data producers include laboratory personnel or research teams with expertise in molecular biology and microbiology of wastewater and can be located at the utility, an academic institution or a private sector entity.

To be used to support public health decisions, these data now must be

Click HERE to return to Table of Contents

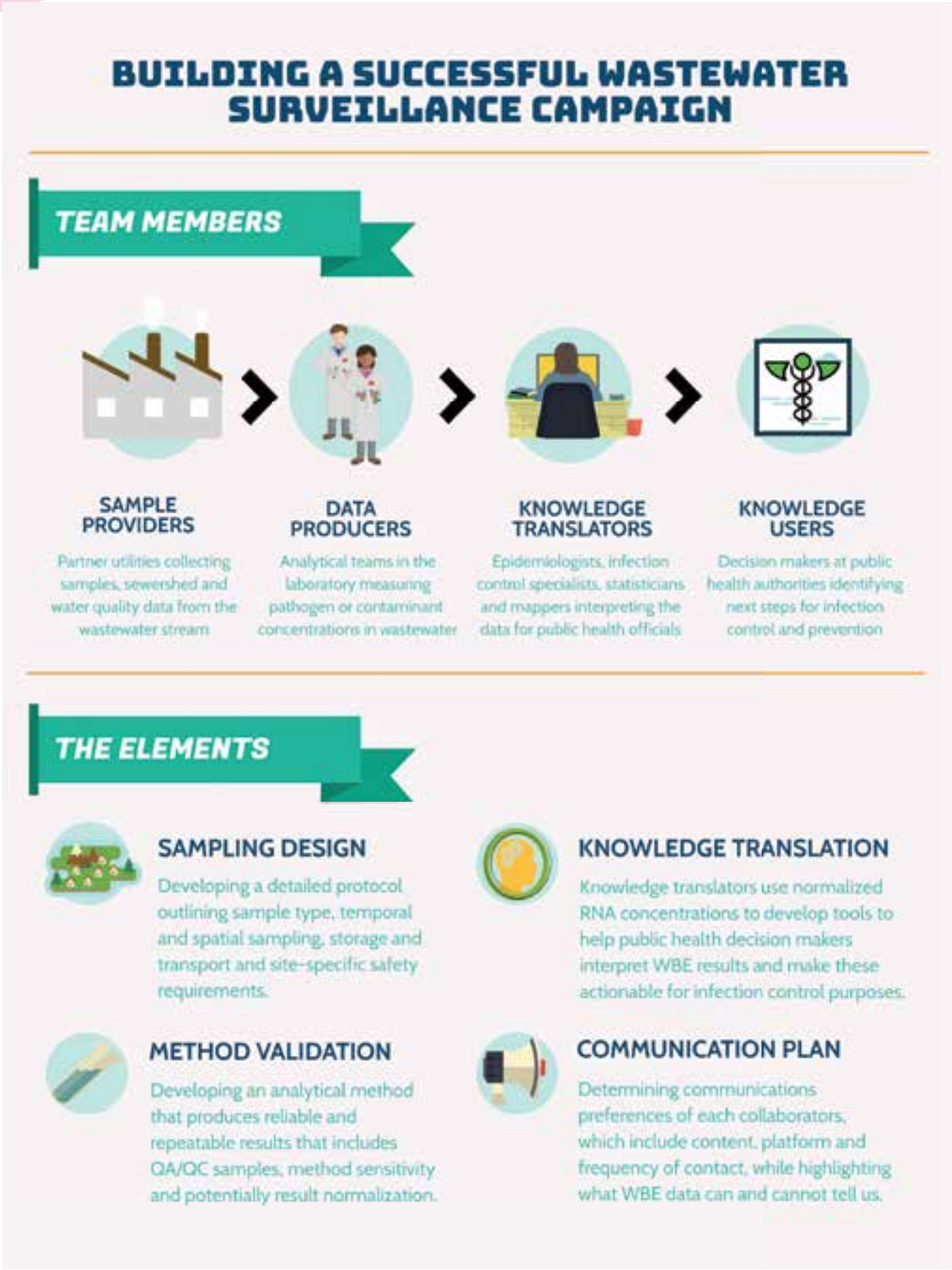

Figure 1. Building a Successful Wastewater Surveillance Campaign

	Contributor			
Needed Element for WBE Support	Sample provider	Data Producer	Knowledge translator or interpreter	Knowledge user
Develop a detailed sampling plan to assess temporal and spatial variations	X	X		
Develop a standard operating procedure (SOP) and sample submission form	X	X		
Develop a site-specific job safety assessment	X			
Develop a sample storage, handling and shipping plan	X	X		
Document hydrological changes in the sewershed	X	X	X	
Document retention and conditions in the collection system	X	X	X	
Document changes in process and influent quality	X	X	X	
Document hauled wastes added to the system	X	X	X	
Document collection system geometry	X	X	X	
Document population size and water use data	X	X	X	
Perform a thorough method validation		X		
Conduct ongoing QA/QC		X		
Determine method sensitivity and incorporating recoveries in RNA concentration calculations		X		
Normalize virus RNA concentration per mL		X	X	
Estimate viral decay rates and sorption to solids	X	X	X	
Convert data into actionable results for public health authorities			X	
Collect clinical data from positive cases			X	X
Collect clinical data related to shedding of RNA per person			X	X
Determine under what conditions WBE data follow infection trends			X	
Develop a communication plan for data and results (content, frequency, platform, duration)	X	X	X	X
Communicate that RNA concentrations do not correlate with infectivity	X	X	X	X
Communicate what WBE results can and cannot tell us	X	X	X	X
Determine and implement public health interventions				X

Table 1. Collaborator Contributions to Support WBE Efforts

converted from PCR-based measurements (such as, copies per unit volume) to sample concentration estimates and adjusted for testing reliability and efficacy and wastewater-related factors by consideration of known hydrodynamic conditions and population size, which may change from sample to sample within a wastewater system. Theoretically, this provides sample COVID-19 virus RNA concentration estimates from repeated analysis over time.

However, this knowledge translator role often remains unfilled. This gap – arguably the most important role for making WBE data useful in public health decisions – is where raw wastewater RNA results are translated to information actionable by public health authorities.

Closing this gap is key to enabling the use of WBE data to support public health actions since many public health agencies engaged in COVID-19 response are overwhelmed in identifying, tracking, and reporting COVID-19 cases and, more recently, in rolling out COVID-19 vaccination campaigns.

Armed with information created by the knowledge translators, public health authorities and decision makers – who become the knowledge users – can make public health and infection control decisions about containment efforts and mitigation responses.

All these collaborators must work together closely and transparently with defined responsibilities and obligations to the team. These roles need to be articulated at the beginning of the WBE campaign. Table 1 outlines the contributions of each collaborator group.

Click HERE to return to Table of Contents

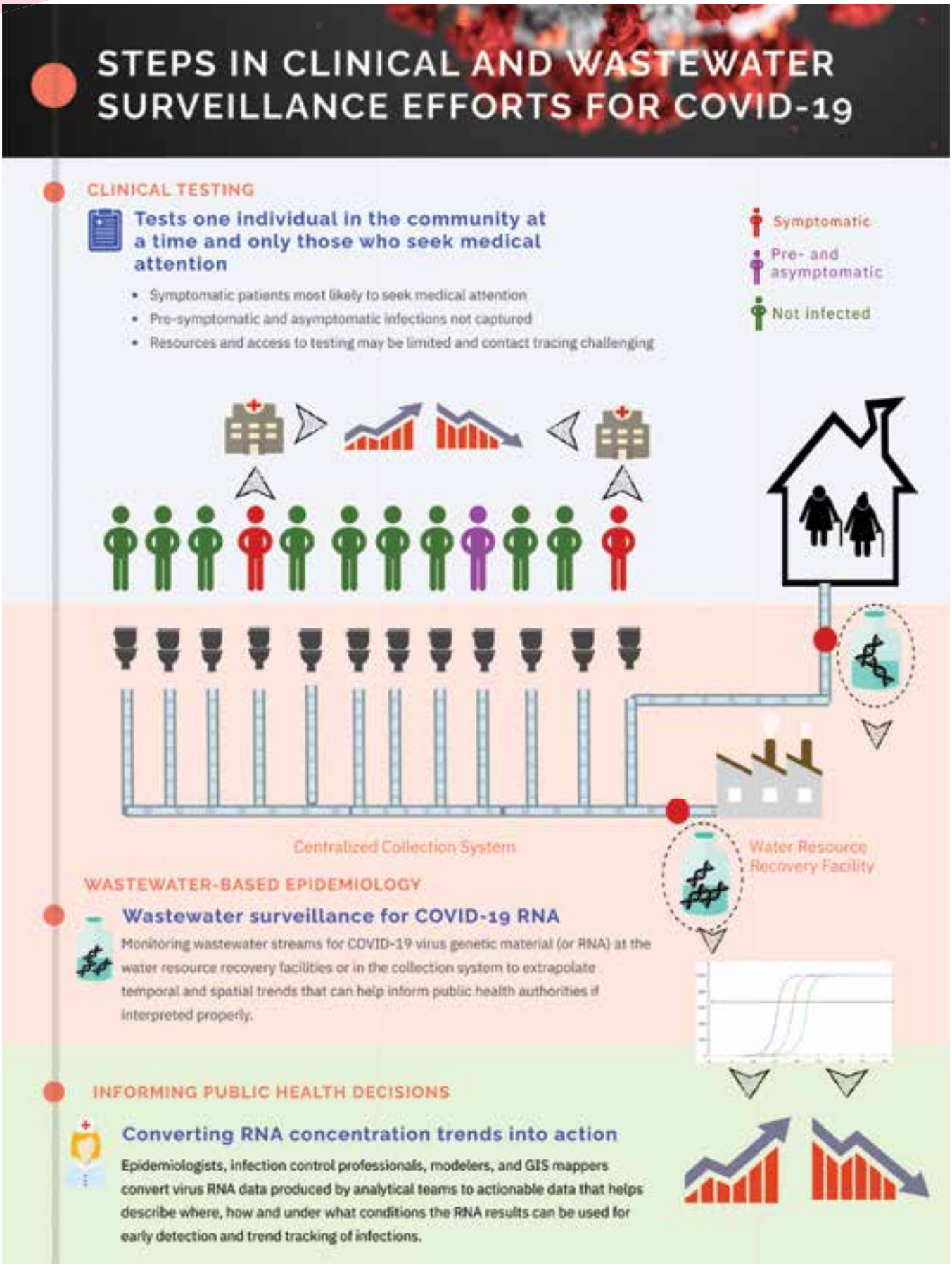

Figure 2. Steps in Clinical and Wastewater Surveillance Efforts for COVID-19

ELEMENTS OF A SUCCESSFUL WBE CAMPAIGN

Figure 2 (page 29) outlines the four critical elements of a successful WBE program: Sampling design, method validation, knowledge translation, and communication plan. Each element also contains several factors that should be considered when creating or participating in a WBE program.

SAMPLING DESIGN

The importance of collecting a representative sample with a comprehensive and informative set of associated data cannot be overemphasized. Many WRRFs support on-site laboratories for regulatory testing (*e.g.*, fecal indicator bacteria), but molecular biology and associated testing techniques are not common in these laboratories.

Having a detailed but understandable sampling plan and standard operating procedure (SOP) describing when, where, what, and how to sample wastewater for the virus that causes COVID-19 is needed. This SOP should standardize sampling collection and handling practices that allow utilities to participate by planning around other responsibilities. These plans and their implementation are essential, especially given reductions in staffing during COVID-19, to allow utilities to provide uninterrupted core services to their communities.

SOPs facilitate sampling by ensuring the sample collector knows what is required of them, what the procedures entail, and which site-specific safety precautions to use. The SOP should be accompanied by a sample submission form to encourage consistent documentation of relevant information and critical parameters, such as wastewater flow rate. Ensuring this consistency enables the knowledge translators to convert from detected RNA concentrations to trends in community COVID-19 infection burdens.

SOPs should include the following topics.

Sampling points. The sampling plan should outline sampling locations, frequency, sample volume, and duration (schedule over time). Utilities already collect samples from various points in their processes using different sampling locations. These locations often already are indexed in a utility's Laboratory Information Management System (LIMS).

If usual sampling points are not suitable for WBE sample collection, data producers need to work with the utility to identify the best sampling locations that are also safe for sample collectors.

CDC states that samples should be collected at representative locations that preferably precede addition of chemicals or mixing of different waste streams at the WRRF that may obscure or prevent the location of the contributing population. The WRF Report mentioned earlier suggests collecting samples after the headworks, but utilities should be cautioned against sampling treated primary effluent as this would lead to an underestimation of virus RNA concentrations, because the virus sorbs to solids that are removed in primary treatment.

Depending on the WRRF, representative and well-informed sampling may not always be possible. In addition, if a WBE campaign is trying to identify hotspots in the collection system (i.e., monitoring sentinel sites), sampling must occur in the collection system instead and similar considerations must be made. While privacy issues are not a concern with COVID-19 WBE given the anonymity of members of the population served, future WBE efforts may focus on illicit drug use and other controversial contaminants. Studying more contentious contaminants in collection systems or smaller WRRFs may have privacy risks that should be considered.

Sample types and containers. While data producers have reported the detection of COVID-19 virus RNA in both wastewater and solids samples for WBE assessments, major WBE initiatives are focused on method development and analysis for untreated wastewater. This is due to many reasons including the lack of simple, reliable, reproducible, and widely used methods for virus analysis in untreated sludge or biosolids, the presence of inhibiting chemicals that interfere with detection in sludge, difficulty in normalizing the data for interpretation, and the high variability in results.

If solids samples are preferred, data producers can describe desirable sample qualities to the utility partner to obtain some guidance on the best sampling locations, methods, and data needed for results interpretation.

The data producer also should discuss whether a composite sample is preferred over a grab sample. While composite samples from the WRRF may be ideal to get a representative sample, composite sampler bottles usually are reused and not disinfected. In these cases, the data producers and knowledge translators need to determine if the use of grab samples is sufficient to meet research needs. Consultation with the sample collectors is especially important if novel sampling devices, such as dialysis filters and passive samplers, are being tested.

Required sample volumes are based on the analytical procedure and whether additional concentration steps are needed prior to RNA extraction. Utilities also should consider several other factors:

- Is the collected sample volume sufficient for meeting facility regulatory purposes and archiving in addition to COVID-19 testing?
- Are there enough sampling bottles on hand for the additional samples?
- Are these sample bottles and their composition are suitable for collecting, transporting, storing and analyzing WBE samples?

Sample storage, shipping, and transport. CDC recommends refrigeration of samples during collection and sample storage at temperatures between 0°C and 4°C. CDC cautions that freezing-thawing cycles result in signal loss. CDC also recommends that samples be processed within 24 hours of collection, as effective actionable wastewater surveillance relies on rapid data collection. Many WRRFs will not be able to meet these requirements, given how expensive refrigerated composite samplers are. This is particularly challenging for smaller facilities, where coolers may not be readily available or incorporated into the operating budget and where winter temperatures will result in freezing even if precautions are taken.

If samples are expected to be shipped on a weekly basis, the data producers may need to discuss returning and circulation of coolers to sample providers. Also, if the WRRF is collecting weekly samples and shipping overnight, hold times and logistics will need to be discussed as well as shipping costs. If a smaller WRRF is being recruited, but shipping and handling logistics are prohibitive, data producers must

Click HERE to return to Table of Contents

consider if involving the WRRF is worth the additional workload to the operations team in place, especially if hold times compromise data quality.

Samples also must include sufficient supporting meta-data for the team to understand, process, analyze, and make use of the samples; this includes chain-of-custody documentation and tracking.

Facility flow patterns, rainfall data, and additional flow contributions affecting sample quality. Most WRRFs are subject to diurnal variations and have periods of high and low influent flow. They also may have extensive collection systems with high retention times, lift stations, surface water intrusions, and ground water infiltration contributions. These factors, along with volume and type of industrial dischargers, affect the volume and quality of influent, which, in turn, affects COVID-19 RNA detection in samples and the interpretation of COVID-19 trends over time in the community.

Best practices would encourage collecting rainfall, hauled septage loading, landfill leachate flow, and diurnal variations in flow. In addition, in some cases collection system boundaries may not be clearly delineated. For example, interconnected, regional collection systems can exchange flows. These exchanges change the served population size, demographics, and COVID-19 case numbers that need to be used for the data analysis and modeling approach for samples.

Similarly, if only grab samples are collected, the data producers must consult with WRRF staff (sampler providers) to collect representative samples that capture peak times of human fecal loading and to understand the solids residence time for solids.

Water quality variables. Many smaller WRRFs will not be able to provide much detail about wastewater quality parameters other than those listed in their discharge and/or reuse permits. They also will have limited staffing and personnel to support extra sampling. It would be helpful to clarify with data producers and knowledge translators which variables are essential and which ones are "nice to have." Making these distinctions can help ensure the research demands do not deter smaller WRRFs from participating.

METHOD VALIDATION

To use WBE as an effective early warning system, virus nucleic acid recovery and concentration methods must be sufficiently effective and sensitive enough to detect very low levels in a wastewater sample. This can be challenging since most methods were historically optimized for the more resilient non-enveloped viruses, but COVID-19 virus is an enveloped virus and potentially sensitive to various techniques and conditions that may change during sample handling, processing, and concentration. Variables such as temperature, pH, and organic solvents (chloroform or cesium chloride solutions) and partitioning methods such as filtration, solids separation, sedimentation, and centrifugation all could reduce the amount of virus in the sample during analytical procedures resulting in underestimates or non-detects.

In addition, many labs have more experience with non-enveloped viruses, or may have no experience with wastewater sampling and testing. Thus, performing a full method validation and optimization and developing an SOP is imperative. This should include the following considerations:

Quality assurance and quality controls (QA/QC). QA/QC plays an important role during data production in laboratories because many variables can affect the amount of COVID-19 virus RNA recovered and measured in a wastewater sample. QA/QC components ensure the production of reliable, repeatable, and useful data that can be utilized by public health officials. QA/QC characterizes the quality of the data produced, determine the limit of detection of the method (LoD) and what ongoing QA/QC parameters are needed to monitor method performance.

QA/QC parameters should include method and extraction blanks, field replicates, positive and negative nucleic acid amplification controls, reagent and matrix spikes, standard curves, and dilutions. Replicates ensure the reproducibility of the data. Blanks confirm the absence of contamination. Spikes and dilutions control for inhibition of nucleic acid amplification and control for matrix interferences. Analyst proficiency also is critical and must be accounted for with initial and on-going proficiency evaluation of analytical method performance.

Method sensitivity. Method sensitivity is calculated using the sample concentration factor and the matrix spike recovery. Virus detection in wastewater often requires a sample concentration step to improve detection limits, such as combinations of filtrations; ultra-centrifugation and polyethylene glycol (PEG) precipitation with a range of pH values, chemicals, filter types, centrifuge speeds; and purification steps. A matrix recovery control is used to calculate virus loss and involves adding a known amount of non-COVID-19 virus with comparable properties to a wastewater sample prior to processing. Some consideration must be given to what organism (e.g., human coronavirus or other phage) will be used for matrix spikes to determine the recovery efficiency of the method. Method sensitivity can change with every sampling campaign due to changes in wastewater chemical and physical properties. These considerations are important for comparing COVID-19 concentrations in wastewater over time as well as for conversion of results into a useful parameter.

Normalization of data. Normalization (or data conversion) remains a very challenging area for WBE studies with no accepted standards. Some data producers do not normalize RNA concentrations and provide data users with raw RNA trends, keeping all sample collection and analysis variables constant. However, COVID-19 virus concentrations are measured by PCR in units of gene copies per reaction volume, a measure that is not necessarily actionable or familiar to decision makers.

To convert this into a concentration that potentially reflects COVID-19 infections in the population, this measurement can be adjusted to account for both flow conditions into the facility at the time of sample collection — that is, daily flow if using a composite sample, the percentage of infections (or cases) in the population, and the population size served. Ultimately, the data would be converted to viral gene copies per person contributing to the sewershed per day.

If flows and population sizes are unknown, research teams may choose to use other fecal normalization variables to estimate them. These variables are microbes or chemicals that are excreted

or otherwise present in wastewater in a more uniform and predictable manner. Examples include chemical biomarkers such as BOD, COD, creatinine, cholesterol, coprostanol, nicotine, and cortisol, or such viral indicators as crAssphage, pepper mild mosaic virus, or specific coliphage groups and adenoviruses in the same samples analyzed for COVID-19 virus RNA.

KNOWLEDGE TRANSLATION

Whether the chosen WBE approach aims to provide qualitative or semi-quantitative results, wastewater surveillance needs to reliably make connections between the measured COVID-19 virus RNA concentrations at the WRRF, hydrological and environmental conditions, COVID-19 RNA concentrations shed per capita, the burden of infection in the population served, and the size of the contributing population.

The easiest way to integrate WBE data into the public health decision framework would be to translate the measured virus gene copies into a number of infected individuals. These data could be more readily used by decision makers in determining where, when, and what types of public health interventions are needed. However, this approach is extremely challenging in practice.

Even when researchers can follow a step-by-step data normalization protocol based on recommendations made by national agencies and organizations, findings may be difficult to compare spatially or longitudinally since so many unmonitored factors can impact the result. It is essential to better understand when a spike in predicted case numbers or RNA concentrations is considered a problem that needs to be remediated with public health interventions. The current approach provides no triggers or thresholds for action and thus cannot inform decision-making directly.

Most local public health agencies do not know what to do with WBE data. They do not know how to interpret WBE data or make it actionable for their purposes. These agencies have a system that to manage public health crises – one based on testing and tracking infections, reporting infections, illnesses, and death and rolling out immunization programs – and often do not have the time in the

midst of a pandemic to integrate a new source of information.

This gap highlights the need to publicize success stories to the public health community and generate specific recommendations of how best to integrate WBE data into current reporting systems.

It also is the gap that could be filled by knowledge translators. Knowledge translators, such as epidemiologists, infection control professionals, modelers, and GIS mappers, should create tools from the data produced by the WBE analytical teams.

These tools would help describe where, how, and under what conditions the RNA results can be used for early detection and trend tracking of infections. The tools need to identify when and under what conditions RNA presence and concentrations are consistent with infections and what thresholds should trigger immediate public health responses. They may also want to characterize changes in RNA levels from sentinel sites as the vaccine is rolled out, especially in targeted settings like nursing homes, prisons and other high-risk facilities.

Once these tools are developed, training and workshops will be needed to educate a new generation of public health professionals in their application to make the most of wastewater surveillance.

COMMUNICATION PLAN

Content, platform, and frequency. Timely, transparent, and open communication among all collaborators will be critical to WBE effort success. The data producers should determine preferred result reporting platforms and communication practices of all team members. This should include a discussion about types of results communicated (RNA concentrations versus trends), communication platform (e-mail versus meetings), and update frequency (immediate, weekly, monthly). These meetings should be structured with a multidisciplinary audience in mind.

Some discussion should focus on whether the WRRF would like to see its WBE results and how those data will be used internally or externally. The team also needs to identify conditions under which immediate corrective actions may be required. For example, unexpected non-detects or unusually high results could signal a problem with sample collection or analysis. Interpreting these outliers may require some interaction with the sample provider to better understand process fluctuations, flow disturbances, and influent characteristics on that sampling date.

How the data can be used. Distinguishing what WBE results can and cannot do early on can help collaborators better understand how their contribution will help the fight against the COVID-19 pandemic.

To date, WBE data has been used in three effective ways:

- Individual wastewater samples have been used to represent a snapshot of community infections. These snapshots provide qualitative (presence or absence) results and help monitor the occurrence of infection in the community.
- A more structured, longitudinal sampling approach, on the other hand, has provided information related to COVID-19 trends of infection (increasing or decreasing).
- Screening at targeted sites (senior living homes, correctional facilities, or college dormitories) has been the trigger for additional individual-based testing and mitigation measures.

What the data cannot tell us. At the moment, the actual number of infections in the community cannot be calculated with any certainty. To measure the number of cases using WBE requires additional data, including the patterns and variability of fecal shedding of COVID-19 virus RNA from infected individuals, RNA decay rates in wastewater, and often, more complete characterization of sewersheds.

Risk. As interest in measuring COVID-19 RNA concentrations in treated effluent and biosolids grows, it is important to emphasize to collaborators and utility staff that the detection of RNA does not imply that infective virus is present, nor is it related to the effectiveness of wastewater treatment process. A growing number of peer-reviewed publications are using RNA data to assess risk to wastewater workers, public health and wildlife. These papers often overestimate risk and should be read with caution.

WBE FORECASTS

WBE is not a new public health decision support tool, but the current mobilization scale and standardization of COVID-19

wastewater surveillance efforts have surpassed all previous attempts to monitor infectious agents in wastewater. How these efforts could be translated to meet the constantly evolving infection transmission dynamics of a large city, like Los Angeles or Toronto, remains a dauting and very challenging task.

What is certain is that successful WBE campaigns require the implementation of a formalized and organized strategy. This strategy needs to include a detailed sampling design, analytical method validation, a knowledge translation strategy, and a communication plan.

Today, three main multi-disciplinary groups of collaborators make up WBE programs: Sample providers, data producers, and knowledge users. This trio would benefit from the support and expertise of a fourth group: knowledge translators or interpreters. Their contribution will be to develop the tools necessary to operationalize WBE results and determine when, where, and how findings correlate with actual infection levels in the community. Only then can local health agencies truly use WBE data to combat COVID-19 in communities.

This feature was prepared by the WEF Disinfection and Public Health Committee's (DPHC) Waterborne Infectious Disease Outbreak Control (WIDOC) Working Group.

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Charles Gerba is a Professor of epidemiology and biostatistics, Department of Environmental Science, University of Arizona (Tuczon, AZ).

Kyle Bibby is an Associate Professor and the Wanzek Collegiate Chair in the Department of Civil and Environmental Engineering and Earth Sciences at the University of Notre Dame (Notre Dame, IN).

Robert Bastian is a water expert and 2016 WEF Fellow (Washington, DC).

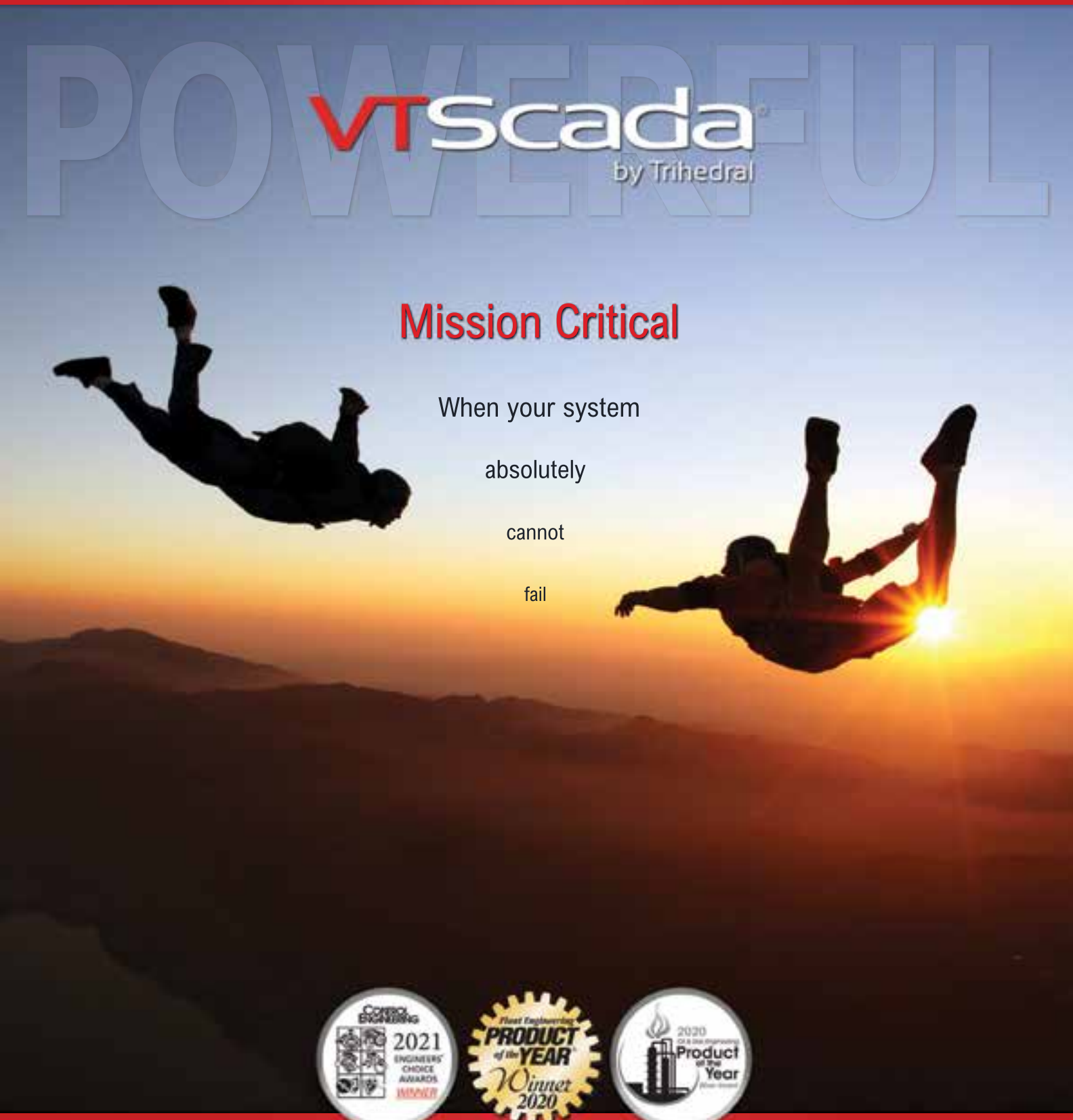
Lola Olabode is a Program Director at the Water Research Foundation (Washington, DC).

Akin Babatola is the Laboratory and Environmental Compliance Manager, City of Santa Cruz (San Francisco Bay Area, CA).

Robert S. Reimers is a Professor Emeritus at Tulane University's School of Public Health and Tropical Medicine (New Orleans, LA).

Leonard Casson is an Associate Professor at the Swanson School of Engineering at the University of Pittsburgh and maintains an active research partnership with the Pittsburgh Water and Sewer Authority. CS

Click HERE to return to Table of Contents



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GWS 2021 AUGUST TRIP REPORT

By Liz Heise and Joe Lapastora

Wow! After a missed year of travel, it felt so great to be back in Costa Rica, breathing the Pura Vida air. We finally were able to meet many of the local partners we have been working with virtually, and also reconnect with long term collaborators. This year's trip we visited the Samara Beach region, the 2021 Student Design Competition Community, and Montezuma, the 2022 Student Design Competition Community. We also had the opportunity to meet with local officials from Santa Teresa, a town in the Nicoya Region, that has expressed interest in working with us for 2023. The trip had a few main goals that were accomplished. These included:

1. Constructing a bio-garden and conducting student education in the Samara Community
2. Presenting the winning Student Design to the Samara and Cangregal ASADAs
3. Collecting data required for development of the 2022 Montezuma Problem Statement and signing the Memorandum of Understanding to establish our partnership with the Montezuma ASADA.

This year's trip participants included Mohammed Haque, Joe Lapastora (Northern Moraine WRD), Liz Heise (Trotter and Associates), Megan Livak (WEF), Manuel de los Santos (Aqua Aerobics), and Guissel Davila (Baxter and Woodman). We were also joined by Jonessa Haas, one of the members of the the UW Platteville Student Design Competition Team and the winners Student Design Competition from Universidad de TEC, Alex Brenes, Ashley Pinero, and Britney Ramos. This is the first year that we were joined by Costa Rican university students as well. Read on to learn more about what we did while we were there!

BIO-GARDENS

In order to make an immediate impact and increase community education efforts during our annual August Service Trips, Global Water Stewardship (GWS) volunteers began building bio-gardens at local Costa Rican schools in 2017. Since then, GWS volunteers have designed and built three bio-gardens for Costa Rican elementary schools. The first school selected for a bio-garden construction project was Escuela Verde, near Bahia Ballena, in August of 2017. The following year, in 2018, GWS professionals traveled to Santa Elena in the mountainous region of Monteverde to construct a bio-garden at the Cloud Forest School. Finally, GWS volunteers constructed a bio-garden at the Escuela Finca Zeta Trece, nestled near the Arenal Volcano in La Fortuna, Costa Rica, in August of 2019. GWS volunteers were on pace to construct a fourth bio-garden during our August 2020 Service Trip, but … [Record Scratch] we all know that 2020 did not go according to plan. So that brings us to August of 2021, as a handful of motivated GWS volunteers landed in San Jose and travelled to Samara, Costa Rica to construct our fourth bio-garden!

Thanks to our reliable "boots-on-the-ground" volunteer, Mike (Miguel) Peppin, we were scheduled to construct a bio-garden over two days at the Centro Educavtivo San Fernando located just outside the Samara District. Prior to this project, Centro Educavtivo San Fernando school was discharging kitchen gray-water directly overland in an area frequently occupied by students. GWS saw this as an opportunity to both fix an imminent sanitation problem while also having the opportunity to educate the youth via student presentations. Over the course of two days, half of the GWS members held sanitation presentations/activities for Centro Educavtivo San Fernando students while the other half of the GWS members constructed a fully working bio-garden.

This year, GWS welcomed volunteers from the Samara ASADA and Cangrejal ASADA, TEC University students who won the Costa Rica 2021 Student Design Competition and a UW-Platteville team member who won the US 2021 Student Design Competition to help with the bio-garden construction. Our volunteers learned that the ASADAs possessed a special interest in observing the construction of a bio-garden to expand their understanding and knowledge so that they could continue constructing these structures throughout the Samara District. It was later discovered on our Service Trip, that the Samara ASADA had successfully constructed a functioning bio-garden within the community of Samara that spurred community interest and led to a call for more of these treatment structures to be constructed. Prior to stepping foot in Samara, the Community Design Committee held several calls to discuss some areas of improvement to ensure an efficient bio-garden construction effort.

This year's bio-garden team was led by Mike Peppin, a former Wisconsin public works employee who now calls Costa Rica home; and Joe Lapastora, a staff engineer at Northern Moraine WRD and former GWS student design competition winner. Both Mike and Joe helped construct the bio-gardens at the Cloud Forest School in Monteverde and at the Escuela Finca Zeta Trece School in La Fortuna. Other bio-garden volunteers included Alexander Brenes Poras (TEC), Ashley María Piñeiro Conejo (TEC), Brittany Ramos Castellón (TEC), Diana Zambrano (TEC Professor), Jonessa Haas (UWP), Liz Heise (Trotter and Associates, Inc.), Megan Livak (WEF), Guissel Davila (Baxter and Woodman), and Mohammed Haque (Northern Moraine WRD). GWS would like to thank the ASADAs for providing a backhoe and a backhoe operator as well as several volunteers in our efforts to construct the bio-garden. The group was able to accomplish their goal of constructing the bio-garden in two days with no setbacks.

Kudos to the entire team as they worked around students during a busy school day. As a wrap-up to the bio-garden construction, GWS left the Centro Educavtivo San Fernando staff with the newly produced GWS O&M manual thank to Micah Pitner (Crawford, Murphy & Tilly, Inc.), who was pivotal in translating bio-garden construction documents for all first-time attendees while also creating an O&M manual to leave with the school principal. All in all, the bio-garden construction was successful, complete with a 90-foot conduit run from the kitchen to the bio-garden pit with grease traps installed prior to and immediately following the pit. New to this year's design included supplementary pit lining and grease trap venting to route unfavorable odors away from the kitchen.

Click HERE to return to Table of Contents

STUDENT EDUCATION

In tandem, GWS volunteers were able to present to the students (Kindergarten through grade eight) in the schools courtyard about how wastewater treatment works, why it is important, and what the bio-garden is going to do! They even performed a fun demonstration using water, cups, coffee grinds, aquarium rocks, and glitter to show students how wastewater can be cleaned. Students were very curious and engaged in the discussion! This discussion will allow them to understand the purpose of the bio-garden that they will see daily and serve as a reminder for why it is important to treat wastewater!

SAMARA DESIGN COMPETITION

One of the highlights of the trip was the student presentation of their design for a collection system and treatment facility in the Samara Beach region. This was the first regional design that we have done with partnership between two ASADAs and provisions to add on an area served by a 3rd ASADA in the future. We met in the community center where the TEC students presented their design to ASADA leaders, community members, local government, the Office of Development, AyA members, among others. The ASADA also will receive the reports that all of the teams who participated put together.

We also got the chance to go to dinner with the ASADA leaders where we discussed our next steps.

MONTEZUMA

After Samara, the group traveled to Montezuma, a small coastal town in the Nicoya region. Montezuma is the community selected for the 2022 Student Design Competition. We met with ASADA members in the town center. At this meeting we reviewed the GWS Memorandum of Understanding that identifies the responsibilities of GWS and the ASADA, and the phases that we will progress through as part of our project partnership. Both GWS and ASADA leaders signed the document.

After this meeting we walked through the community to the proposed WWTF site so we could take pictures and get an idea of the available space. The ASADA had previously sent GWS the majority of the data that is required to develop the problem statement, so with that we were ready to go. Alejandro Quiros, Laura Torres, and Fernando Vilchez of AyA (the Costa Rican water and sewer authority) also were in attendance for this meeting. They offered to provide a topographical survey of the community to be used for design of the collection system. Joe Lapastora (Community Design Committee Chair) noted that he would have the problem statement finalized before the end of September so that the Costa Rican universities can work on the statement as part of their fall semester that ends in November.

Click HERE to return to Table of Contents

OTHER HIGHLIGHTS

In addition to our work in Samara and Montezuma, we had the chance to sit down with representatives from the Nicoya Waterkeepers, Nicoya Ministry of Health, and Nicoya Municipality Development Group. These groups have been working on development of a "Shit Flow Diagram" (yes, this is what it is called) to identify how sewage, and specifically Black Water, is managed within the Santa Teresa Community. The results of this analysis showed that though many of the homes and buildings are connected to septic systems, over 50% of the sewage in the community is not properly managed. They are concerned that without proper mitigation that this will lead to issues with water quality and inhibit further development. They are hoping that Santa Teresa will be selected for the 2023 Student Design Competition. GWS is excited at the opportunity to work with this group! They present a few challenges as there is no local ASADA and no land that has been selected for a site. We will continue these discussions over the next several months while we work to determine who the 2023 community will be.

Another highlight of the trip was our final night in San Jose. We were able to enjoy dinner with Paola Vidal, the wastewater professor at Universidad de Costa Rica and Paolo Rodriguez, our local media manager. We have been working for both Paolo and Paola extensively over the past year and a half but most of the group had not had the opportunity to meet in person. It was great to finally sit down and discuss our plans for the next year with them. Paola will be using the GWS Montezuma Problem Statement for her classes design project. UCR students will compete in November with TEC University students for a chance to compete with the USA university students in April.

Paolo has been instrumental to our success in Costa Rica. He has worked with local media and also managed our Social Media accounts to help with local recognition of the projects we are working on. Last year he was able to secure a spot on the National News for the TEC University winners of the La Fortuna problem statement. This attention on the project helped La Fortuna to receive additional grant funding to move their wastewater treatment plant forward with design.

Overall, it was an extremely busy week! After almost two years, it was great to be back in country and rejuvenate our mission and work with our local partners. We have a busy year ahead with the TEC/UCR Competition in November of 2021 and TICOSAN planned in-person in March of 2022. We are always looking for more volunteers! If you would like to join us, reach out to *chair@globalwaterstewardship.org*. Pura Vida! CS

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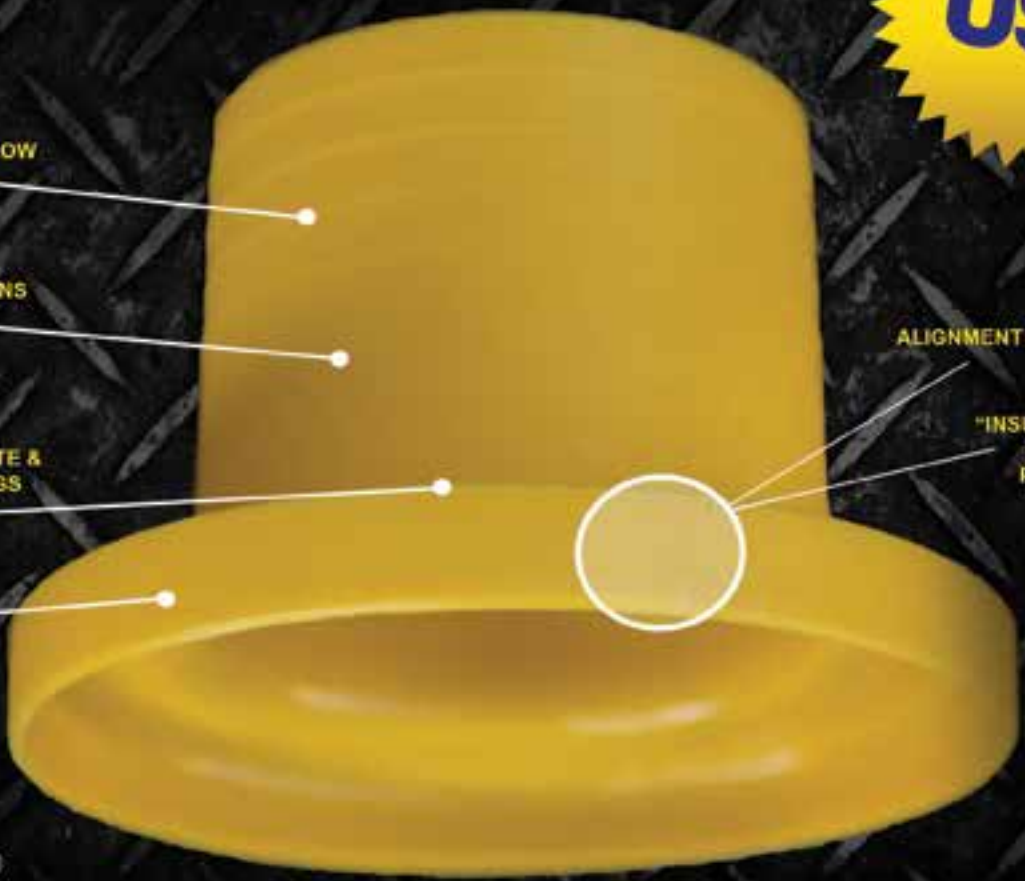

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CALL FOR ABSTRACTS

95TH ANNUAL MEETING

Stronger Together

MAY 17-19, 2022

This is a request for abstracts of papers to be considered for presentation at the 95th Annual Meeting of the Central States Water Environment Association, Inc., which will be held May 17-19, 2022 at the Monona Terrace, Madison, WI. To receive consideration, abstracts must be submitted online by **November 1, 2021.**

Submittals that will be given highest credit will include:

- Submittals with a focus on day-to-day treatment, by people with hands-on experience at facilities.
- Topics in new emerging concerns (PFAS, Chlorides etc.).
- Case studies presented from an operations perspective, young professionals, leadership skills, and middle management.
- Research topics and case studies related to new and innovative technologies.

Two hours of ethics training will be on the program as well for engineers that require this to maintain their license.

Papers on other subjects which you feel may be of interest to members are, of course, always welcome. All written papers submitted are eligible for the Radebaugh Award. Submittals may also include the following topics:

OPERATIONS and MAINTENANCE by OPERATORS and MAINTENANCE:

- Time management or new process startup
- Efficiency (pumps, motors, lights, UV disinfection, HVAC, etc.)
- Technology/SCADA/Web-Based maintenance programs/GIS applications
- Troubleshooting – Traditional facilities (activated sludge, BNR), new processes (nutrient recovery) etc.
- Case studies of retrofitted facilities
- Case studies of completed projects
- Optimization
- Prioritization – wastewater treatment and new processes, operations perspective
- Nutrient removal
- Process control
- Start-up case studies

WATERSHEDS and STORMWATER MANAGEMENT:

- Implementing new MS4 permit requirements
- Adopt a storm drain, pond etc. program case studies
- Anti-degradation and other regulatory issues
- Using grants and other funding sources to implement stormwater management as part of CIP projects
- Habitat or groundwater protection or restoration
- Non-point pollution source modeling
- Water quality trading and watershed management issues and initiatives, including adaptive management
- Green infrastructure solutions and best management practices
- Total maximum daily loads involving point and non-point sources
- Education and outreach

UTILITY MANAGEMENT:

- Communications
- Employee retention and development
- Succession planning
- Project funding
- Utility rate development and reviews
- *America's Water Infrastructure Act* (AWIA) – Risk and Resilience
- Dental office category regulation (40 CFR Part 441) program implementation
- Hazardous waste pharmaceuticals program implementation

ENHANCED RESOURCE and ENERGY RECOVERY:

- Resource recovery – sourcing raw materials, nutrient recovery
- High strength waste and pretreatment programs
- Digester gas production and treatment technologies
- Lessons learnt from co-digestion
- Heat recovery case studies
- Alternative energy use
- Energy management and savings to utility management or enhanced RER

COLLECTION SYSTEMS:

- Collection system rehabilitation technologies/methods
- Collection system rehabilitation case studies
- Educating the public on how to protect the system
- CMOM program development and implementation
- Collection system design and operation
- Green infrastructure case studies
- Infiltration/inflow management case studies
- Stormwater and combined sewer overflow management

RESEARCH and DESIGN:

- New/innovative technology research and application
- Nutrient removal technologies
- Sustainability in Design and construction
- Toxics/emerging pollutants monitoring and control
- Treatment design
- Wastewater reuse, applications, technology and regulatory issues

RESIDUALS, SOLIDS and BIOSOLIDS:

- Pollutants of Emerging Concern – PFAS
- Environmental management systems – National Biosolids Partnership
- Public education and awareness, case studies
- Fertilizer production – Class A case studies
- Standard or advanced treatment and stabilization

GENERAL:

- Laboratory issues and bench-scale studies
- Pretreatment, industrial treatment, and pollution prevention
- Pollutants of emerging concern – PFAS, chlorides etc.
- Public education to address emerging concerns – chlorides; water softener use, leachate, flushable wipes, etc.
- Regulatory issues
- Security issues
- Engineering ethics training

SOFT SKILLS/LEADERSHIP:

- Leadership skills
- Managing the ill or injured employee
- Generational integration
- Anti-harassment and discrimination training for managers
- Getting the most out of employee performance evaluations
- Union negotiations
- Handling the grievance and arbitration process
- Managing in a union environment
- Labor Law
- Management rights for Managers
- Social media and the workplace

To receive consideration, please submit your abstract via the online submittal process that can be accessed from the CSWEA website. To submit your abstract, please go to *www.cswea.org* and then to the 95th Annual Meeting Abstract Submittal area. Once you start the abstract submittal process using the online form, you cannot come back to it later. It is important to have all materials ready to submit before submitting. As a reminder, an abstract is meant to **summarize** the presentation. The summary should include objectives, scope, and general procedures, as the limited length of the abstract permits. An indication of results or conclusions is required. Submittal of presentations (slides) or a generic product brochure in place of an abstract, will not be considered. Thank you.

Ryan Giefer
Chair, Technical Program Committee
City of Wisconsin Rapids
715-421-8237
rgiefer@wirapids.org

INSTRUCTIONS FOR THE SUBMISSION OF ABSTRACTS AND CRITERIA FOR PAPER SELECTION

The Central States Water Environment Association (CSWEA) Technical Program Committee has the responsibility for technical sessions at the Annual Meeting. Participants in any sector of the water environment field are cordially invited to submit abstracts for evaluation. The basis for selection will be the excellence of the abstracts as judged by the committee.

The abstract should be submitted online at *www.cswea.org*. Through the online submittal process, you will enter the title and abstract, import your credentials, choose your topic area, and select your presentation format. Abstracts must contain a summary of no more than 500 words, with the full abstract (including all tables, figures, and references) not to exceed six (6) pages. Abstracts that are not in the required format will not be given equal credit.

The presenting author(s) of each abstract will be notified in January of the acceptance or rejection of the abstract.

The following should serve as a guide in the preparation of the abstract and will serve as a guide for the reviewers of the abstracts.

1. Originality and status of subject:

The paper should deal with new concepts or with new and novel applications of established concepts (operations and maintenance, collection systems, stormwater, utility management and leadership, research and development etc.). It also may describe substantial improvements of existing theories or present significant data in support or extension of those theories. Studies of incomplete or ill-defined problem situations should be avoided. Previously published data should be introduced only in summary form and for comparative or supportive purpose.

2. Technical content:

A summary of the conditions under which data were obtained should be presented along with the methodology used. The conclusions should be presented in the abstract and should follow directly from the investigation or evaluation as it was conducted or a project as it developed. The abstract should include whether the project has been fully developed, whether the theory or experimental procedure has been firmly established and if the data was collected and subjected to analysis. It should be evident that the abstract clearly describes the entire content of the conclusions of the paper to be presented.

3. Water environment significance:

The paper should relate clearly and significantly to the water environment field. The author should make evident the relationships of the work to a practical problem area or situation in water quality and wastewater control.

4. Adequacy of abstract preparation:

The committee has noted that historically the adequacy of an abstract is often indicative of the quality of the final presentation. As a result, authors are urged to prepare their abstracts with care, following the instructions noted above. As a reminder, an abstract is meant to **summarize** the presentation. The summary should include objectives, scope, and general procedures, as the limited length of the abstract permits. An indication of results or conclusions is required. Submittal of presentations (slides) or a generic product brochure in place of an abstract will not be considered.

Abstracts are due by November 1, 2021
https://bit.ly/3zPuutB

95TH ANNUAL CALL FOR AWARDS

95TH ANNUAL MEETING

Stronger Together

MAY 17-19, 2022

Our role in protecting the public and the environment are often undervalued and invisible to the very public that we protect. Whether in design, academia, equipment manufacture and supply, management, or operations, we all know individuals who have successfully addressed unique and challenging issues. Our awards program offers the opportunity to receive recognition for these deserving professionals.

Each year, one of CSWEA's top priorities is to recognize the efforts of our members and water and wastewater professionals at all levels. We also seek to provide top-quality nominees to the Water Environment Federation (WEF) each year for national level recognition. Don't miss this opportunity to provide recognition to deserving water quality professionals.

It's time to brag a little about the accomplishments of our members. To nominate someone is straightforward: fill out the nomination form at *https://bit.ly/39KRsaE* with as much information as possible and submit it to CSWEA.

In order for you or a deserving colleague to be recognized, please submit a nomination to the Central States Water Environment Association and/or WEF for one of the many awards available.

Below is a listing of the award opportunities. Please carefully review the various awards available and nominate one of our many deserving members. Please note that award submittals need to be made by November 13, 2021 for awards presented by CSWEA to allow distribution to the respective CSWEA or WEF Awards Committees for consideration. CSWEA will present the winners with their awards at the 95th Annual Meeting Awards Banquet.

2021 CSWEA & WEF Award nominations now being accepted

Nominations are now being accepted for the following CSWEA and WEF awards and should you be aware of a worthy nominee we ask that you please nominate them. Note that it is OK to self-nominate. Each award is briefly described below and complete information may be found on *www.cswea.org*.

WEF AWARDS presented at CSWEA Awards Banquet

Arthur Sidney Bedell Award:

The Bedell is a federation award that is given annually to one recipient in recognition of outstanding achievement in the sewerage and wastewater treatment works field, as related particularly to the problems and activities of the member association. The Bedell Award Subcommittee selects the nominations, and the award is presented at the CSWEA Annual Meeting.

William D. Hatfield Award:

The Hatfield Award is a federation award given annually to one recipient in recognition of outstanding operation of a wastewater treatment plant. Each State Section may nominate one person per year and submit it to the Hatfield subcommittee. This award is presented at the CSWEA Annual Meeting.

George W. Burke Safety Award:

The Burke Award is made annually by WEF to a municipal or industrial wastewater facility for promoting an active and effective safety program. Each State Section Committee can nominate a facility and the nominations are then sent to the general awards committee. The winner will be presented with the Burke Safety Award at the CSWEA Annual Meeting.

Lab Analyst Excellence Award:

This is a WEF award that is given annually to one recipient in recognition of outstanding achievement in the area of water quality analysis. Each State Section Laboratory Committee may nominate one person. This award is presented at the CSWEA Annual Meeting.

CSWEA AWARDS presented at CSWEA Awards Banquet

Radebaugh Award:

The Radebaugh Award is given to the author of a deserving paper presented at the previous year's annual meeting. The Radebaugh Award Subcommittee selects the winner and the award is presented at the CSWEA Annual Meeting.

Operations Award:

The Operations Award is a Central States award that is given annually to one recipient in each state. The purpose of this award is to recognize operators of wastewater treatment facilities who are performing their duties in an outstanding manner and are demonstrating distinguished professionalism. The States Sections'

Committee makes the selection and each State Section winner will receive the award at the CSWEA Annual Meeting.

Industrial Water Quality Achievement Award:
The award is given at the CSWEA Annual Meeting to one industry per year in recognition of outstanding contributions in waste minimization, pollution prevention, environmental compliance, and environmental stewardship. Each State Section Industrial Committee may nominate one facility per year.

Bill Boyle Educator of the Year Award:
This award is given to one teacher per year in recognition of outstanding education assistance to students of any level in the study of the water environment. The award is presented at the CSWEA Annual Meeting.

Collection System Award:
This award is given annually to one member from each section in recognition of outstanding contributions in advancing collection system knowledge and direct or indirect improvement in water quality. Each State Section Collection System Committee can nominate one individual per year with the selected candidate receiving the award at the CSWEA Annual Meeting. The recipient of the Association Award shall be nominated annually for the WEF Collection System Award.

CSWEA Outstanding Young Professional Award:
This award is given annually to one member from each state section in recognition of the contributions of young water environment professionals to CSWEA and to the wastewater collection and treatment industry. This award is presented at the CSWEA Annual Meeting.

Academic Excellence Award:
The Academic Excellence Award is given to one student per year from each eligible institution in the state section hosting the Annual Conference. (Minnesota is hosting the next conference.) An eligible institution shall be a college or university having a recognized graduate or under- graduate program in engineering as accredited by the Accreditation Board for Engineering and Technology. The candidate shall be selected by the department chair or other designated person at the eligible institution. Selected candidates are able to attend the CSWEA Annual Meeting with expenses paid, to receive their award and scholarship.

Central State Section Safety Award:
The CSWEA Facility Safety Award is made annually by CSWEA to a municipal or industrial wastewater facility within each State Section in recognition of active and effective safety programs from Burke Award submissions and the awards are presented at the CSWEA Annual Meeting.

Water Stewardship Award: This award recognizes and honors the contributions of an individual for outstanding humanitarian service to improving and sustaining our global water environment.

Sustainability + Green Infrastructure Award:
Established in 2017, this award recognizes and honors the contributions of an individual for projects at their organization that support sustainability in the water environment or make use of green infrastructure in the design of water reclamation facilities or in water treatment processes.

Water Technology Innovator Award:
Established in 2019, this award recognizes individuals or groups that look beyond the traditional water and wastewater operational models and incorporate or advance sustainable principles and cutting-edge practices, with a focus on resource recovery, efficiency, and sustainability.

WEF AWARDS presented at WEFTEC

Charles Alvin Emerson Medal:
This award is presented by WEF to an individual whose contributions to the wastewater collection and treatment industry most deserve recognition. Areas of involvement include membership growth, water resource protection, improved techniques of wastewater treatment and fundamental research.

Harry E. Schlenz Medal:
This award is presented by WEF and recognizes the achievements of an individual outside of the water environment profession, who takes up the banner of environmental public education. This person is typically in the journalism, film or video production field.

Richard S. Englebrecht International Activities Service Award:
This award is presented by WEF and recognizes sustained and significant contributions to the furtherance and improvement of the activities of the Water Environment Federation in the international field. CS

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2021-2022

CSWEA Buyers' Guide

Welcome to the annual Central States Water Buyers' Guide. When making purchasing decisions about products and services in the wastewater industry throughout the Central States region, please support the companies whose advertising makes Central States Water possible.

OUR CSWEA BUYERS' GUIDE CONSISTS OF TWO SECTIONS:

1. A categorical listing of products and services, including a list of companies which provide them.
2. An alphabetical listing of the companies appearing in the first section. This listing includes name, contact info, website, and more.

LISTINGS BY CATEGORY

ACOUSTIC INSPECTION
InfoSense, Inc.

ACTIVATED CARBON
CEI Carbon Enterprises Inc.
ECS Municipal
Purafil, Inc.
Unison Solutions, Inc.

ARCHITECTURE
McMahon Associates, Inc.

ASSET MANAGEMENT
AE2S
Bolton & Menk, Inc.
Brown and Caldwell
McMahon Associates, Inc.
Process Equipment Repair Services, Inc.
Ruekert & Mielke, Inc.
WSB
Ziegler CAT Power Systems

BIOGAS FLARES
Energenecs

BIOSOLID COMPLIANCE MONITORING
Deuchler Engineering Corporation

BIOGAS CONDITIONING EQUIPMENT
Unison Solutions, Inc.

CHEMICAL PROCESSING & FEED SYSTEMS
Boerger, LLC
Energenecs

CHLORINE & CHEMICAL TANK SCALES
Force Flow/Halogen Valve Systems

COATINGS, LINING & CORROSION CONTROL
Bolton & Menk, Inc.
Purafil, Inc.
Process Equipment Repair Services, Inc.

CONSTRUCTION MANAGEMENT
Staab Construction Corp.

CONTRACTORS
InfoSense, Inc.

CSO & STORMWATER EQUIPMENT
Glasco UV
Homa Pump Technology
Metropolitan Industries, Inc.
VEGA Americas, Inc.

CSO/SSO CONTROLS, WATER RESOURCES, DISTRIBUTION & COLLECTION
InfoSense, Inc.
Strand Associates, Inc.

DESIGN-BUILD SERVICES
Baxter & Woodman, Inc.
ECS Municipal
WSB
Ziegler CAT Power Systems

DISINFECTION/EQUIPMENT
Force Flow/Halogen Valve Systems

ELECTRICAL, INSTRUMENTATION/ CONTROLS/GENERATORS
AE2S
Allied Industrial Marketing / Mangoldt Power Quality Products
Baxter & Woodman, Inc.
Deuchler Engineering Corporation
Energenecs
Gasvoda & Associates, Inc.
Iowa Pump Works
LW Allen, LLC
McMahon Associates, Inc.
Metropolitan Industries, Inc.
VEGA Americas, Inc.
Ziegler CAT Power Systems

ELECTRICAL POWER QUALITY
Allied Industrial Marketing / Mangoldt Power Quality Products

ENGINEERS/CONSULTANTS
AE2S
AECOM
Barr Engineering Co.
Baxter & Woodman, Inc.
Bolton & Menk, Inc.
Brown and Caldwell
Clark Dietz, Inc.
Deuchler Engineering Corporation
ECS Municipal
Hazen and Sawyer
HR Green, Inc.
Ruekert & Mielke, Inc.
Strand Associates, Inc.
Trotter and Associates, Inc.
WSB
Ziegler CAT Power Systems

ENVIRONMENTAL CONTAMINANT TREATMENT
Barr Engineering Co.
Glasco UV
Purafil, Inc.

EQUIPMENT REPAIR, REHAB, & INSTALLATION
Process Equipment Repair Services, Inc.

FILTER MEDIA
Purafil, Inc.

FILTRATION
AECOM
CEI Carbon Enterprises Inc.
Purafil, Inc.

FINE SCREENS/SLIDE GATES
Gasvoda & Associates, Inc.
LW Allen, LLC
Process Equipment Repair Services, Inc.

FLOW CONTROL
American Flow Control

FRP BUILDINGS/ENCLOSURES
Mekco Manufacturing

GIS AND MS4
Baxter & Woodman, Inc.
Bolton & Menk, Inc.
Deuchler Engineering Corporation
McMahon Associates, Inc.
Ruekert & Mielke, Inc.

GRIT REMOVAL
JDV Equipment Corporation
Lakeside Equipment Corporation
Process Equipment Repair Services, Inc.

GRIT REMOVAL SYSTEMS/SCREENS
Clark Dietz, Inc.
Energenecs
Gasvoda & Associates, Inc.
JDV Equipment Corporation
Process Equipment Repair Services, Inc.

INFRASTRUCTURE REHABILITATION
RELINER/Duran Inc.

INSTRUMENTATION
LW Allen, LLC

LAND SURVEYING
McMahon Associates, Inc.

LEVEL INSTRUMENTATION
VEGA Americas, Inc.

MANAGEMENT CONSULTING
WSB

MANHOLE REHABILITATION
RELINER/Duran Inc.
Strike Products

MANHOLE INSPECTION/ LOCATING/MAPPING
Deuchler Engineering Corporation
WSB

MANUFACTURER
Boerger, LLC
ECS Municipal
Process Equipment Repair Services, Inc.
Siemens Large Drives
Ziegler CAT Power Systems

METER READING SYSTEMS
Badger Meter

METERS/METER TESTING
Badger Meter

MIXING SYSTEMS
JDV Equipment Corporation

NUTRIENT REMOVAL
Brown and Caldwell
Gasvoda & Associates, Inc.

ODOR CONTROL
AECOM
Brown and Caldwell
ECS Municipal
Gasvoda & Associates, Inc.
Purafil, Inc.

OPERATION SERVICES
Barr Engineering Co.
Baxter & Woodman, Inc.
Ziegler CAT Power Systems

PROCESS MECHANICAL
AECOM
Brown and Caldwell
ECS Municipal
Glasco UV
JDV Equipment Corporation
McMahon Associates, Inc.
Process Equipment Repair Services, Inc.
Siemens Large Drives
Staab Construction Corp.

PUBLIC INFORMATION/ COMMUNICATION
AE2S

PUMPS/PUMP SYSTEMS
Barr Engineering Co.
Boerger, LLC
Brown and Caldwell
Gasvoda & Associates, Inc.
Iowa Pump Works
LW Allen, LLC
Metropolitan Industries, Inc.
Ruekert & Mielke, Inc.
Staab Construction Corp.
Strand Associates, Inc.

PUMP STATIONS & METER VAULTS
Clark Dietz, Inc.
Iowa Pump Works
LW Allen, LLC

RATES/FINANCIAL ADVISORY
AE2S

REAL TIME MONITORING & CONTROL
Iowa Pump Works

REGULATORY COMPLIANCE
AE2S
Bolton & Menk, Inc.
Brown and Caldwell
Clark Dietz, Inc.
Deuchler Engineering Corporation

RENEWABLE ENERGY SOLUTIONS
Ziegler CAT Power Systems

RESIDUALS/WASTE MANAGEMENT
AECOM
Bolton & Menk, Inc.

SAFETY PRODUCTS
Force Flow/Halogen Valve Systems

SEWER FLOW MONITORING (SANITARY, STORM, & CSO)
VEGA Americas, Inc.

SCADA
AE2S
Baxter & Woodman, Inc.
Energenecs
Gasvoda & Associates, Inc.
LW Allen, LLC
McMahon Associates, Inc.
Metropolitan Industries, Inc.
Ruekert & Mielke, Inc.

SCREENING EQUIPMENT
Energenecs
JDV Equipment Corporation.
LW Allen, LLC
Process Equipment Repair Services, Inc.

STORAGE TANKS/ RESERVOIR SYSTEMS
Strand Associates, Inc.

STORMWATER DETENTION
Brown and Caldwell
Clark Dietz, Inc.
Ruekert & Mielke, Inc.
Strand Associates, Inc.

STORMWATER TREATMENT & CONVEYANCE
AE2S
Barr Engineering Co.
Bolton & Menk, Inc.
Deuchler Engineering Corporation
LW Allen, LLC
Ruekert & Mielke, Inc.
Strand Associates, Inc.

SYSTEMS INTEGRATOR
Energenecs

TANK MAINTENANCE & INSPECTIONS
Pittsburg Tank & Tower Maintenance Co.

TANK RETROFIT & REHAB
Process Equipment Repair Services, Inc.
WSB

ULTRAVIOLET DISENFECTION
Gasvoda & Associates, Inc.
Glasco UV
Iowa Pump Works

VALUE ASSESSMENT
Iowa Pump Works

VALVES
American Flow Control
Iowa Pump Works

WATER QUALITY TESTING
Barr Engineering Co.

WATER STORAGE TANK CONSTRUCTION
AECOM
Clark Dietz, Inc.

WATER/WASTEWATER COLLECTION & DISTRIBUTION SYSTEMS
AE2S
AECOM
Bolton & Menk, Inc.
Brown and Caldwell
Clark Dietz, Inc.
Deuchler Engineering Corporation
ECS Municipal
Iowa Pump Works
LW Allen, LLC
McMahon Associates, Inc.
RELINER/Duran Inc.
Strand Associates, Inc.
WSB
Ziegler CAT Power Systems

WATER/WASTEWATER PUMPS & SYSTEMS
Barr Engineering Co.
Baxter & Woodman, Inc.
Boerger, LLC
Clark Dietz, Inc.
Deuchler Engineering Corporation
Energenecs
Gasvoda & Associates, Inc.
Iowa Pump Works
LW Allen, LLC
Ruekert & Mielke, Inc.
Staab Construction Corp.
WSB
Ziegler CAT Power Systems

WATER/WASTEWATER STORAGE TANKS
AECOM
Barr Engineering Co.
Baxter & Woodman, Inc.
Clark Dietz, Inc.
Ruekert & Mielke, Inc.
Staab Construction Corp.
Strand Associates, Inc.
WSB

WATER/WASTEWATER TREATMENT SYSTEMS
AE2S
Barr Engineering Co.
Baxter & Woodman, Inc.
Bolton & Menk, Inc.
Brown and Caldwell
CEI Carbon Enterprises Inc.
Clark Dietz, Inc.
Deuchler Engineering Corporation
Energenecs
Gasvoda & Associates, Inc.
Glasco UV
Iowa Pump Works
McMahon Associates, Inc.
Metropolitan Industries, Inc.
Ruekert & Mielke, Inc.
Strand Associates, Inc.
WSB
Ziegler CAT Power Systems

LISTINGS BY COMPANY NAME

AE2S
901 E Fish Lake Road, Suite 184
Maple Grove, MN 55369
763-463-5036
abbie.browen@ae2s.com
www.ae2s.com

AECOM
303 East Wacker Drive, Suite 1400
Chicago, IL 60601
312-373-7700 Fax: 312-373-6800
businessinquiry.americas@aecom.com
www.aecom.com

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afcsales@american-usa.com
www.american-usa.com

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info@alliedindustrialmarketing.com
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www.baxterwoodman.com

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america@boerger.com
www.boerger.com

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jim.weidler@ecs-env.com
www.ecs-env.com

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www.forceflowscales.com

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www.infosense.com

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www.iowapumpworks.com

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perslamont@aol.com

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sales@unisonsolutions.com
www.unisonsolutions.com

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4170 Rosslyn Drive
Cincinnati, OH 45209
513-272-0131Fax: 513-272-0133
americas@vega.com
www.vega.com

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NOVEMBER 9

2021 MN CONFERENCE ON THE ENVIRONMENT
Virtual Event

NOVEMBER 9

WISCONSIN SECTION MEETING
Virtual or In-person | Milwaukee, WI

NOVEMBER 10

2021 WI OPERATIONS SEMINAR
Green Lake Conference Center | Green Lake, WI

NOVEMBER 18

CSWEA WEBINAR SERIES:
CLIMATE ADAPTATION AND RESILIENCY IN THE MIDWEST
Virtual Event

DECEMBER 8-9

WI OPERATIONS SEMINAR
Virtual Event

For up-to-date CSWEA events, visit our website ***www.cswea.org***.

ADVERTISER PRODUCT & SERVICE CENTER

Central States Water is made possible by the companies below who convey their important messages on our pages. We thank them for their support of CSWEA and its publication and encourage you to contact them when making your purchasing decisions. To make it easier to contact these companies, we have included the page number of their advertisement, their phone number, and, where applicable, their website.

COMPANY	PAGE	TELEPHONE	WEBSITE
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AECOM	16	312-373-7700	www.aecom.com
Badger Meter, Inc.	17	800-876-3837	www.badgermeter.com
Baxter & Woodman, Inc.	35	815-459-1260	www.baxterwoodman.com
Berryman Equipment Company	41	630-543-6604 | 800-605-0099	www.berrymanequipment.com
Boerger, LLC	58	877-726-3743	www.boerger.com
Bolton & Menk, Inc.	52	507-625-4171	www.bolton-menk.com
Brown and Caldwell	17	651-298-0710	www.brownandcaldwell.com
Burns & McDonnell	56		www.burnsmcd.com
CDM Smith	35	651-772-1313	www.cdmsmith.com
CEI Carbon Enterprises, Inc.	62	800-344-5770	www.ceifiltration.com
Clark Dietz, Inc.	40	262-657-1550	www.clark-dietz.com
Crawford, Murphy & Tilly, Inc.	62	217-787-8050	www.cmtengr.com
Deuchler Engineering	60	630-897-4651	www.deuchler.com
Donohue & Associates, Inc.	64	920-208-0296	www.donohue-associates.com
ECS Environmental Solutions	59	254-933-2270	www.ecs-env.com
EDI - A Nexom Brand	8	573-474-9456 | 888-426-8180	www.wastewater.com | www.nexom.com
Electric Pump, Inc.	33	800-211-6432	www.electricpump.com
Energenecs	17	262-377-6360	www.energenecs.com
Energy Systems Group	32		www.energysystemsgroup.com
Force Flow	9	800-893-6723	www.forceflowscales.com
Foth Infrastructure & Environmental	55	920-497-2500	www.foth.com
Gasvoda and Associates	63	708-891-4400	www.gasvoda.com
Hazen and Sawyer	35	651-256-9534	www.hazenandsawyer.com
HR Green, Inc.	48	800-728-7805	www.hrgreen.com
InfoSense, Inc.	12	877-747-3245	www.infosense.com
Integrated Process Solutions (IPS), Inc.	60	218-435-1703	www.ipsamerica.biz
Iowa Pump Works	47	855-228-6383	www.iowapumpworks.com
JDV Equipment Corporation	57	973-366-6556	www.jdvequipment.com
KROHNE, INC.	14	800-356-9464	www.krohne.com
Lakeside Equipment	2	630-837-5640	www.lakeside-equipment.com
L.W. Allen, Inc.	18	608-222-8622	www.lwallen.com
McMahon Associates, Inc.	24	920-751-4200	www.mcmgrp.com
Mekco Manufacturing Inc.	3	920-698-8163	www.mekco.com
Metropolitan Industries	22	815-886-9200	www.metropolitanind.com
Minnesota Pump Works	47	877-645-8004	www.minnesotapumpworks.com
PAXXO	10	770-502-0055	www.paxxo.com
Pittsburg Tank & Tower	62	270-826-9000	www.pttg.com
Process Equipment Repair Services, Inc.	58	262-629-1059	
RELINER/Duran Inc.	14	800-508-6001	www.reliner.com
Ruekert & Mielke, Inc	62	262-542-5733	www.ruekertmielke.com
SEH	32	651-490-2000	www.sehinc.com
Starnet Technologies	34	262-886-0228	www.starnettech.com
Strand Associates, Inc.	48	608-251-4843	www.strand.com
Strike Products	42	800-262-4129	www.stiketool.com
TKDA	46	800-247-1714	www.tkda.com
Trotter & Associates Inc.	55	630-587-0470	www.taiengr.com
Unison Solutions, Inc.	48	563-585-0967	www.unisonsolutions.com
VEGA Americas, Inc.	4	1-800-FOR-LEVEL	www.vega.com
VTScada by Trihedral	36	800-463-2782	www.vtscada.com
Wisconsin Pump Works	47	877-645-8004	www.wisconsinpumpworks.com
WSB	41	763-541-4800	www.wsbeng.com
Xylem	57		www.xyleminc.com
ZIEGLER CAT	35	952-887-4520	www.zieglercat.com

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