

# CENTRAL STATES WATER

The Official Magazine of the Central States Water Environment Association, Inc.



## GWS Summer 2019 *Service Trip*

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The City of Wisconsin Rapids'  
Wastewater Treatment Plant



### PLUS:

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# Safety First

By Doug Henrichsen



I hope all of you are enjoying the summer and fall months in the Central States region. Throughout our three states, there is a lot going on and everyone that I speak to seems very busy. This is a great time to be a water/wastewater professional. My days are filled with activities and I am very happy to work in this industry.

There have been several big events that have occurred in our area in the last three months, including CSX, the WEF Nutrient Removal and Recovery Symposium, IL Section Operator Training courses, MN Section MNX, WI Section Northwoods Collection System Seminar and Management Seminar, Global Water Stewardship's summer trip to Costa Rica, and other events.

**CSWEA CSX 2019** was held at the Kalahari Resort in the Wisconsin Dells on July 18th-19th. The CSX Meeting was a great success in that all three states were well represented from individuals actively engaged in CSWEA. CSX stands for 'Central States Exchange' and is a mechanism geared toward representatives getting together to discuss the activities that are occurring in each state. The goal is to communicate, bring both new and old ideas to the group, and to discuss ways that we can improve our events, structure, and governance for operating CSWEA. As many of us are volunteers, it is important that we communicate with each other to develop our programs and offerings so that we can be sustainable. We had a wonderful CSX discussion this year.

The **WEF 2019 Nutrient Removal and Recovery Symposium**, which was held at the Renaissance Minneapolis Hotel, The Depot, in Minneapolis on July 23rd-25th was also a success.

Individuals from the Minnesota Section worked with WEF leaders to plan, organize, and hold this seminar that was focused on nutrient removal and recovery. The symposium attracted attendees from all over the globe, and covered topics such as the future for phosphorus removal, the fundamentals of nutrient removal and recovery, and other important related topics. Our own **Patrick Haney** (MN Section Chair) represented CSWEA as he gave the welcome address. Thank you Patrick.

Two **Illinois Section Operator Training Courses** were held this summer. On June 26th, the first Operator Training Course was held at the Naperville Campus, which covered the *Fundamentals of Collection Systems*. The information covered in this course was geared at helping operators understand the basic function, maintenance, operation, and protection and preservation of the assets of the collection system. The second training was held on August 14th and covered the *Health & Safety Practices for Wastewater Systems*. This event was held at the Glenbard Wastewater Authority, and the training event focused on creating and maintaining a culture of 'safety first'. Safety first is much more than just a sign on the walls of the facility. This training program was geared toward the individual, and that each individual has the obligation to return home each day in the same condition (or better) than when they left. Operators must be trained to understand basic safety practices and then to make consistent choices to follow those practices. Both of these Illinois Section operator training courses were well attended, and the hope is that someday, these training sessions can be expanded to both Minnesota and Wisconsin.

The **Minnesota Section MNX**, which stands for 'Minnesota Exchange', was held on June 18th at the St. Cloud Water Resource Recovery Facility. The event, which is patterned after CSX, was geared at getting all of the MN Section leaders, committees, and other interested people together to discuss current activities and happenings within the State of Minnesota. MNX was well attended this year, and the event covered numerous topics, including reports from all of the individual committees, updates from the treasury, discussions on new or upcoming Young Professional networking events, Water Festival, and other ways to reach out to the university students. The event also covered numerous other topics too numerous to list here.

The Wisconsin Section conducted two seminars this summer. The first was the **Northwoods Collection System Seminar**, which was held in Marshfield on July 25th. The event had a great turnout. The seminar, which was conducted jointly with the Wisconsin Wastewater Operators' Association (WWOA), included a welcome from the Mayor of Marshfield, as well as numerous technical presentations that were focused on the collection system. The event was organized by the Collection System Committee of the Wisconsin Section. The Wisconsin Section also held a **Management Seminar** on August 7th in Milwaukee. This seminar was focused on talking to water and wastewater managers and supervisors who are focused on utility management. The seminar focused on numerous topics ranging from employee recruiting and retention to Wisconsin public bidding laws. This event was also well attended.

**Global Water Stewardship (GWS)** conducted their annual August trip to Costa Rica. These international trips are vital for GWS to turning the planned sanitation improvements into reality, as well as to strengthen and maintain relationships with the local people, municipalities, and key decision makers. This year, GWS gave educational seminars to wastewater professionals in Costa Rica. The educational seminars were again very well received. The seminars are a key part of GWS' initiative to educate people in the developing world about how to build and maintain centralized wastewater collection and treatment systems. If you would like to get involved with GWS, please visit their website at [www.globalwaterstewardship.org](http://www.globalwaterstewardship.org).

There are several activities/functions that are planned for the coming months.

Please take a look at the list below of great educational and social events already in the works and begin planning to attend:

- **2019 WEFTEC Reception (CSWEA/IWEA)**, Hilton Chicago, Chicago, IL – September 22, 2019.
- **2019 Operations Challenge, WEFTEC**, Chicago, IL – September 23-24, 2019.
- **MN Section (with MWOA) Collections Workshop**, WLSSD, Duluth, MN – September 25, 2019.
- **MN Section Conference on the Environment**, Minneapolis Convention Center, Minneapolis, MN – November 7, 2019.
- **WI Section Operations Seminar, Phosphorus/Nutrients**, UW Oshkosh Alumni Center, Oshkosh, WI – November 14, 2019.

- **WEF 2020 Residuals/Biosolids Conference and Stormwater & Green Infrastructure Symposium**, Minneapolis Convention Center, Minneapolis, MN – March 31 – April 3, 2020.
- **Midwest Student Design Competition**, Monona Terrace, Madison, WI – April 6, 2020.
- **25th Annual Education Seminar**, Monona Terrace, Madison, WI – April 7, 2020.
- **93rd Annual Meeting**, RiverCenter Convention Center, St. Paul, MN – May 18-20, 2020.

Information for these upcoming events can be found on our website, [www.cswea.org](http://www.cswea.org). These events are valued by CSWEA members, as well as by many other distinguished professionals, wastewater pioneers, operators, manufacturers, professors, and students throughout the region. See you next issue. [CS](#)

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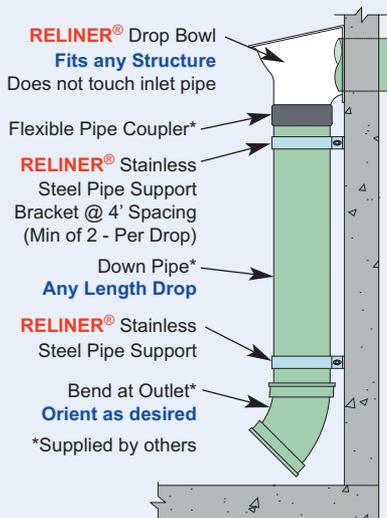
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# What a Great GWS Year it has Been

By Mohammed Haque



**F**ive years ago when we established Global Water Stewardship as a committee under CSWEA, I could not have imagined our amazing growth. This year marked one in which I had a chance to reflect on the great work we have done, the people we have touched, and how we have grown as a group of passionate volunteers. Our work is most measured by lives affected, but that is a very hard metric to explain and quantify to donors, even though it means so very much.

In five short years, we went from a concept to a movement that is beginning to take hold nationally and among our industries leaders. Our model is different than most non-profits in the

potable water and sanitation realm. We don't go and build wells and we don't install latrines. That work is important, but our niche is in knowledge exchange and education. Our volunteers are amazing at it. They love what they do, and their work loves them. We decided very early on that we wanted to empower professionals in developing countries by being catalysts for the development of a professional wastewater industry. In Costa Rica, we are doing that. Each trip is a time of reflection, and the August service trip was full of reflective moments and amazing achievements.

In August of 2014, our first group trip, there were four of us, including former CSWEA president David Arnott and the now-married Amanda and Matt Streicher.

The early support of these three was so important for the establishment of GWS. Matt was great and Amanda was the master organizer and laid the structure for the success of GWS in the coming years. In addition, David's support and devotion to the mission of GWS was critical because without CSWEA's support, the organization may have never gotten off the ground.

This last trip saw eighteen of us make the trek to the Costa Rica, and what an amazing trip it was. Like our 2014 trip to Costa Rica, a small group made the maiden trip to Guatemala as we lay the foundation for the next country that we can help.

The August 2019 trip meant a lot to me and on the final night I was able to



share my passion with the group and reflect. It had been an amazing week of memories, experiences, places, and people. The GWS family has become larger and I feel that the next iteration will be at a scale we have not seen before. This was by far the biggest trip we had, surpassing last year's head count by 50%. For the first time, we had volunteers from non-CSWEA origin on the trip – Andrew Randall from University of Central Florida; Maria Claudia Reed from Brown and Caldwell in Portland, OR; and Megan Livak, the Student and YP Manager from WEF in Alexandria, VA. My nervousness at the beginning of the trip had turned into an immense feeling of gratitude and accomplishment. We made memories, had experiences, and most importantly left with an appreciation of our careers, our work, and of the good we can do for those that lack resources.

So, while lives you touch still remains an elusive metric, here are some that we have been able to quantify in our five years of work.

Countries Engaged In	2
Community Wastewater Designs	5
Universities Engaged in GWS Designs	4
Service Trip Volunteers	41
University Students Engaged	52
GWS Volunteers	60+
Costa Rican Delegates to US	17
Schools Educated	8
Children Educated	900+
Professional Workshops	8
Workshop Attendees	150+
Biogardens Built	3
Typical Annual Budget	\$20,000
Lives Touched	Countless
ROI	AMAZING!

It's remarkable what we have done as a 100% volunteer organization completely funded by donations from individuals and

our amazing supporting organizations. As I look ahead to our next five years, I see GWS becoming a national organization with support from several WEF member associations such as CSWEA, etc. The scaling required will be tremendous and will require a level of coordination that will be daunting.

We will likely need to start adding some professional help to assist with ongoing coordination and organization. While our volunteers are amazing and devoted, the day to day work related to expansion will require some extra help in marketing, coordination and fundraising. Our biggest hurdle will be of being able to fund for that expansion. With that, I urge you to help us, help the world of wastewater development and become a donor or a volunteer and be part of the change you want to see. To learn more, please shoot an email to our Marketing & Fundraising Chair, Rich Hussey at [rhussey@lai-ltd.com](mailto:rhussey@lai-ltd.com). 

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# GWS Summer 2019 *Service Trip*



## INTRODUCTION | By Liz Heise

I went on my first GWS trip in August 2016. It was then that I began to see the real potential impact that the group could make. At that time, we had just completed our second student design competition, and had just begun to receive support from AyA, the Costa Rican water and wastewater authority. When we got back, group founder Mohammed Haque stated, "This was definitely our most productive trip yet."

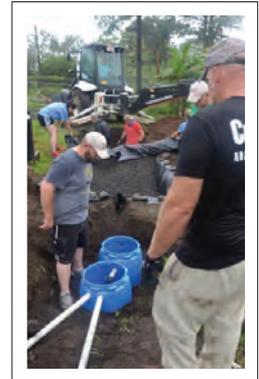
Since then, every August when we return, we have continued to be overwhelmed by what we accomplished and how much we have grown. Each year we have added a new initiative based on the needs of the communities we have partnered with. In 2017, we constructed our first biogarden at a school, an initiative that we have continued annually since then. In 2018, we held our first education/training seminar with AyA. And this year, on top of it all, we signed our first MOU with the La Fortuna Community, establishing a long-term partnership and establishing the responsibilities of each party involved. This is a huge step.

We have developed into a group that provides the missing piece the communities we partner with need – expertise, experience, and stability. We have developed a level of trust, as we remain in consistent contact with local ASADA members. It is amazing to see the support we receive from community members who understand that wastewater is a problem in their community. Once again, this was our most productive trip yet. It was hard to summarize in just a few pages, but read on to learn more about the highlights of this year's August trip.



## BIOGARDENS | By Joe Lapastora

In order to make an immediate impact and increase community education, GWS began building bio-gardens at local schools during our August service trips. The first school was Escuela Verde, near Bahia Ballena, in August of 2017. The next year, GWS professionals and students headed to Santa Elena in the mountainous region of Monteverde to install a biogarden at the Cloud Forest School.



Nestled near the Arenal Volcano in La Fortuna, Costa Rica, is a small school named Escuela Finca Zeta Trece. The natural aesthetic and beautiful ambiance surrounding this school is truly breathtaking, and perfectly encompasses Costa Rica's natural beauty. This was the site chosen for the 2019 Global Water Stewardship service trip biogarden construction.

Prior to this project, Escuela Finca Zeta Trece 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. In a single day, half of the GWS members held sanitation presentations/activities while the other half of the GWS members constructed a fully working bio-garden.

Prior to stepping foot in La Fortuna this year, the Community Design Committee held several calls to discuss some areas of improvement to ensure an efficient bio-garden construction effort. Micah Pitner (Crawford, Murphy & Tilly, Inc.), was pivotal in translating a bio-garden construction document for all first-time attendees while also creating an O&M manual to leave with the school principal.

This year's bio-garden team was led by Mike Peppin, a former Wisconsin public works employee who recently moved to Costa Rica full-time; 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-garden at the Cloud Forest School in Monteverde last year. Other team members included Christine Boland-Prom (MSOE), Alexis Countryman (MSOE), Rachel Montavon (MSOE), Sydney Shaffer (MSOE), Jason Neighbors

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(Glenbard Water Authority), and Megan Livak (WEF). The group also had some extra help from other GWS members after the student presentations wrapped up at the same school, this was one advantage to having our largest ever service group.

GWS would like to thank the La Fortuna Asada for providing a backhoe and backhoe operator in our efforts to construct the bio-garden in one day. Although there was a bit of a hold-up, as the backhoe was needed for a watermain break, the group was able to accomplish their goal of constructing the bio-garden in one day. Kudos to the entire team as they worked through several downpours and also worked around students during a busy school day.

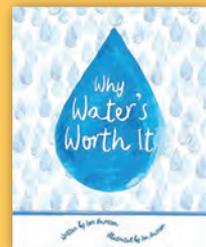
As a wrap-up to the bio-garden construction, team members also visited the Cloud Forest School in Monteverde to perform maintenance on the 2018 bio-garden. About two weeks prior to the trip, the Cloud Forest School principal reached out to GWS and stated that a storm took out a building near the bio-garden. Sometime during the storm, the bio-garden piping became clogged and the school was left with a pit rather than a functional bio-garden. Upon arriving, it was clear to our members where the clog was located, and we had the bio-garden up and running within an hour. As a final gift, GWS left the Cloud Forest School staff with the newly produced GWS O&M manual as well as a few WEF *Why Water Is Worth It* books.

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## AYA WORKSHOPS | By Liz Heise

This year was the second annual education seminar presented in Spanish by GWS for AyA staff and partners. The goal of this seminar is to provide knowledge and insight into design, construction, and operation of centralized wastewater treatment plants and collection systems. This year's audience consisted of over 30 ASADA members from throughout the country, as well as AyA engineers and operators. This seminar is part of what we have developed in partnership with AyA to help them with their wastewater initiatives and make sure our projects are both practical and sustainable.



The seminar took place over two full days, the first day was held at the AyA headquarters in San Jose. The second day was held at the Los Tajos Treatment Facility. This is the largest treatment plant in Costa Rica. It is being built in stages, and at this point consists of about 20 MGD of primary treatment only. AyA is currently working on expanding the collection system to eventually reach 60 MGD and build phase two of the project, which will include secondary treatment.

Day one presentations were focused on collections systems and lift stations. Eider Alvarez-Puras (Baxter and Woodman) presented on collection system design and maintenance. After this, Christian Aristizabal (Brown and Caldwell) presented on lift station design and maintenance. The presentations were very well received and followed by many great questions and discussion.

During the presentations, Liz Heise (Trotter and Associates) and Mohammed Haque met with Laura Torres (AyA Director of Wastewater) and Oscar Izquierdo Sandi (AyA Director of International Relations) to finalize the plans for the GWS/AyA Knowledge Exchange Scholarship program. This scholarship was developed as a way for Costa Rican engineers, treatment plant operators, and lab technicians, to get real world practical experience by spending two weeks shadowing/touring/interning at local treatment facilities. GWS hopes to host the first two participants in the scholarship in April 2020 during the Education Seminar and Student Design Competition.

On day two, the focus was more 'inside the fence'. Maria Claudia Reed (Brown and Caldwell) spent the morning presenting on preliminary and primary treatment methods. After lunch, Andy Randall (University of Central Florida) presented on secondary treatment processes. The group closed the afternoon by working through a typical flow diagram to show the impacts of recycle streams and solids processing. Overall the seminar was a great success. Both sides learned great lessons and we are looking forward to our next education seminar!

## PUBLIC EDUCATION (LA FORTUNA)

By Andy Randall and Liz Heise

While the Biogarden group worked on construction, the public education group split off to work with the students. We began in one of the classrooms, where we had a short discussion about the water cycle, how humans use water and impact the water cycle, and what happens after the water is used and goes 'away'. Students got to think about all the different ways they use water every day and learn about the current wastewater situation in La Fortuna. Right now, La Fortuna has some septic systems that are used for black water only. Grey water is discharged straight to open channels on the sides of the road. During heavy rain (which is often in the rain forest), septic runoff runs down the streets in open channels to rivers and streams that are popular swimming destinations for locals and tourist alike.

After the discussion, we conducted an activity with the students. They were separated into groups (of about eight students each). Each group received a cup of water and different items were added to the water to represent the various pollutants in wastewater. The items included colorful aquarium rocks, which represented large settleable solids, glitter, representing suspended solids, and coffee and tea, representing soluble organics. The newly created wastewater was then passed through a screen which removed some components while others passed through. This showed the students 'preliminary treatment'. After, it was allowed to settle to represent primary treatment. Secondary treatment was shown by adding an alk-seltzer tablet to the water which caused it to bubble up (like an aeration basin). Finally, it was passed through a filter and this removed most of what remained.

The students had so much fun playing with the water and got to learn about something they might not typically think about. We ended up working with four groups throughout the day totaling to about 200 students.





## STUDENT DESIGN | By Guissel Davila

As half the GWS team was in San Jose in the AyA workshops, the other half traveled to Monteverde, the 2019 Student Design community. During this visit to Monteverde, the winning student design team from Milwaukee School of Engineering presented their proposed design to the ASADA and community members. This presentation was all in Spanish, and the MSOE team presented the community members with the progress they made on the design as they were preparing for the WEFTEC competition. Team members were Guissel Davila A., Christine Boland-Prom, Jamie Sykora, Rachel Montavon, Sydney Schaffer, Miranda Durbin, and Alexis Countryman. The design proposed by the MSOE team consisted of a complete sanitary collection system, and a centralized water renewal facility. The community does not have an existing sanitary collection system or centralized treatment facilities. With the expected population and tourism growth, septic tanks will not be as efficient given the density of expected residents. The community members are very well aware of their current situation and the importance of addressing this concern, which is why they have been so proactive. They were very interactive with the presentation and were very well informed of all the progress the Monteverde ASADA has made since their visit to the US back in April of this year.

Before heading to Monteverde, GWS Members together with MSOE students visited La Fortuna, which will be the 2020 Student Design Competition community. La Fortuna is a located in the north central region of Costa Rica, in the Alajuela Province. La Fortuna is the home of the Arenal Volcano National Park, which brings a large influx of tourism to the area. Similar to other developing communities, La Fortuna is now being faced with the increased residential and tourism density, for which they are in need of a design that converts

them from a decentralized treatment community to a centralized treatment community. During our visit to La Fortuna, GWS members and student members were able to interact and exchange ideas and information with the ASADA members of the community. The ASADA welcomed the team warmly, and really expressed how eager they are to implement such project in La Fortuna. GWS provided a data request to the ASADA for information, which will be used to develop the 2020 student design competition problem statement. They also signed a 'memorandum of understanding' (MOU), establishing a partnership on this project and clearly defining the role of both GWS and the ASADA in project development.

After this, an open meeting was held for the community residents. About 20 residents came to learn about the project and GWS initiatives. They were very curious and excited about the potential for wastewater treatment in their community. The 2020 Student Design competition that will focus on La Fortuna will be held in Madison Wisconsin in April of 2020.



**GUATEMALA** | By Mohammed Haque

Following our trip to Costa Rica, Professor Doug Nelson of MSOE met with Mohammed Haque and Mike Peppin to lay the foundation of a joint venture between Engineers without Borders, MSOE, and GWS on some wastewater projects in Joyabaj, Guatemala. This is a huge step for GWS, expanding into a new country and taking our model that we have developed in Costa Rica and expanding it to another location. Amanda Streicher, who has been working closely with Doug Nelson, will be spearheading this effort going forward. The small group was able to spend two days in Joyabaj, conveniently timed at the communities' annual festival. We got to enjoy the *Dance of the Angels*, in El Palo Volador – and lucky for us, our hotel was located next to the festival, so the fireworks at 3:45 am one night were a real treat.

Joyabaj is a community of 20,000 people located in the mountains of the Quiché province. The city has a working sanitary sewer collection system that discharges raw untreated wastewater to five discharge sites. Currently they have two municipal anaerobic upflow treatment plants under construction and are seeking funding for three more plants. In addition to these plants, there is a 42-bed regional hospital that is in great need of some form of wastewater treatment. As well, the hospital has a septic system that overflows into the collection system that discharges directly to receiving waters without any centralized treatment. MSOE, along with GWS, will be presenting a problem statement for a student design competition to design a decentralized treatment system for the hospital.

In addition to visiting the municipal sites, hospital and enjoying the culturally fascinating fiesta, we also got to spend some time with the mayor of Joyabaj, Florencio Carrascoza, who welcomed GWS to the community with open arms. The town and region has a rich history of working with EWB chapters from Wisconsin (UW-Madison, MSOE, Marquette and others all have projects in the region). GWS is looking forward to this new endeavor and chapter in our drive to bring sanitation to the developing world. For more information on our Guatemalan effort, please reach out to our past chair and GWS-Guatemala Country lead, Amanda Streicher at [astreicher@baxterwoodman.com](mailto:astreicher@baxterwoodman.com).

As you can see, GWS has a TON going on right now. We are all SO excited for all the new initiatives and opportunities to make an impact in Costa Rica, Guatemala, and beyond. With everything going on, we need your help more now than ever! We are looking for support – whether that be financially, or through volunteering your time – we will not be able to keep up with this momentum without more help and funding. If you are interested in donating time and/or money, please visit our website at [www.globalwaterstewardship.org](http://www.globalwaterstewardship.org) or reach out to Liz at [chair@globalwaterstewardship.org](mailto:chair@globalwaterstewardship.org). 





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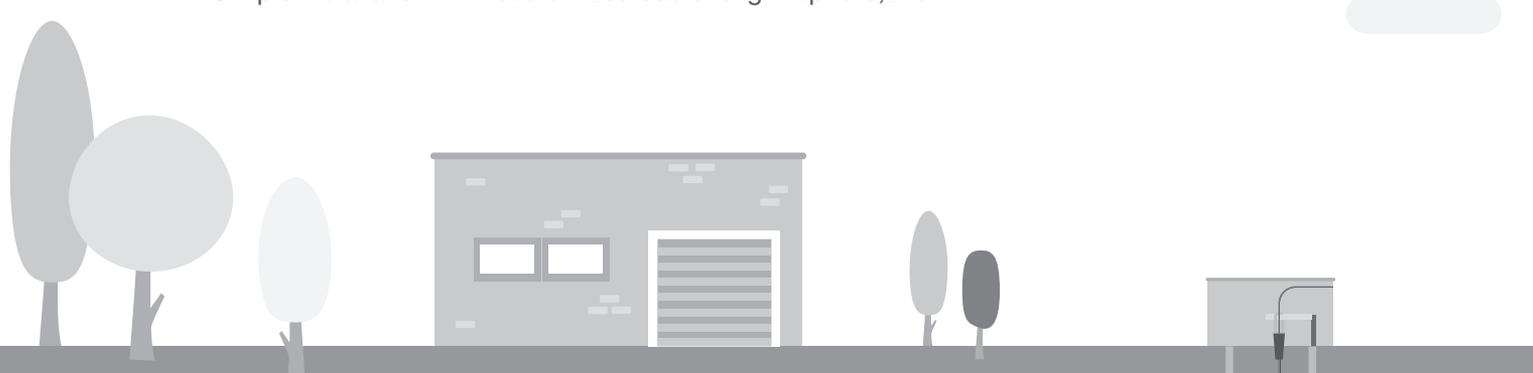
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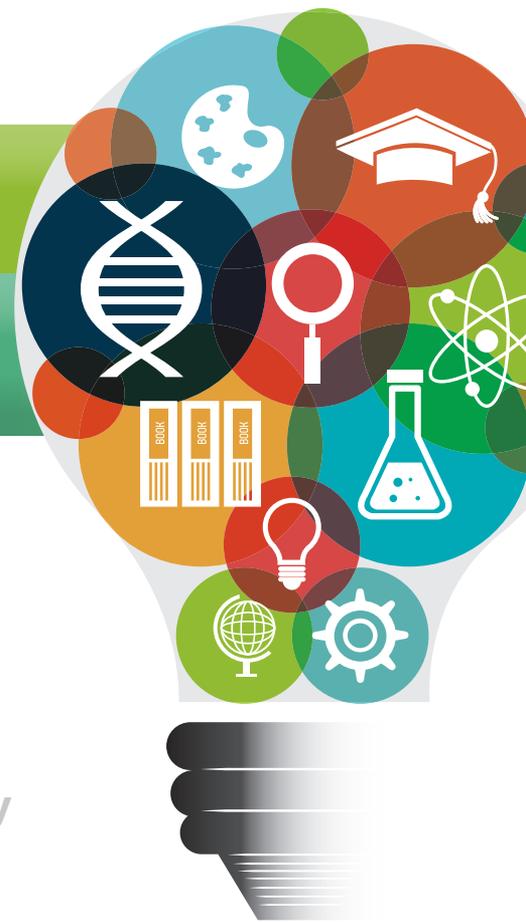
Looking Forward

# VEGA



# Education for the Next Generation

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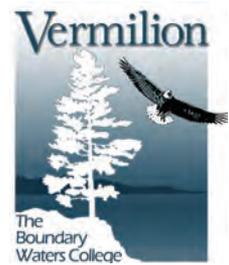


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## Vermilion Community College



### Greetings from Vermilion Community College, in Ely, MN.

The school year is off to another great start, with a great group of returning students and a fresh crop of first year students in the Water Quality program here at VCC. Each year brings in energetic students who are looking forward to eventually joining the ranks as water and wastewater operators. The future is certainly bright for the students, who graduate after two years in the program. There seems to be a lot of jobs in the industry throughout the state of Minnesota, and that's great news for these students!

Our Water Quality program incorporates both traditional classroom training as well as hands-on training with the equipment the students will be using in the industry. Between the student's first and second years of school, they are required to perform an internship. These internships are usually at municipalities, and they're an excellent opportunity for the students to really gain additional exposure to the types of work they'll eventually be performing after they graduate. Toward the end of their second year, the students have the opportunity to take the Class D MN Water and Wastewater licensure exams.



One thing that is strongly emphasized here at VCC is networking. We go to several conferences throughout the year, and we have several guest speakers come in. I strongly encourage students to meet as many people in the industry as they can. If you see any of the students at any of the conferences that you're attending, please introduce yourself to them. It's not always easy as an 18-year-old to walk up to someone and strike up a conversation, but I also encourage them to do so. If you happen to be planning on going to the Innovative conference in January, you'll have the opportunity to meet some of the current VCC students. They will again be presenting at the conference.

If you ever have any interest in coming up to beautiful Ely to visit our college, I'd love to show you around, or if you have a topic that you feel would be beneficial for the students to hear about, we're always looking for guest speakers. Also, if you'd be willing to host an intern for the summer at your facility, please contact me and let me know. Our program wouldn't survive without the support of the folks that work in the industry. I tell the students all of the time that they've made an excellent decision to choose the water and wastewater industry. It is a VERY rewarding career. Not many people can say that what they do for their job helps not only the environment, but also human health.

For those of you working in the industry, keep up the great work, and thank you for supporting these young, up and coming operators!

Wade Klingsporn, Vermilion Community College, Water Quality program coordinator/instructor



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*Two Bismarck State College graduates discuss gravity filter operation at a municipal water treatment facility.*

There are many opportunities within this program, including individual course offerings for professional development, non-credit training classes, or a certificate of completion. This program can be completed in two semesters and is endorsed by the North Dakota Rural Water Association. Brief on-campus courses or shadowing at an approved facility is required for completion of the certificate program.

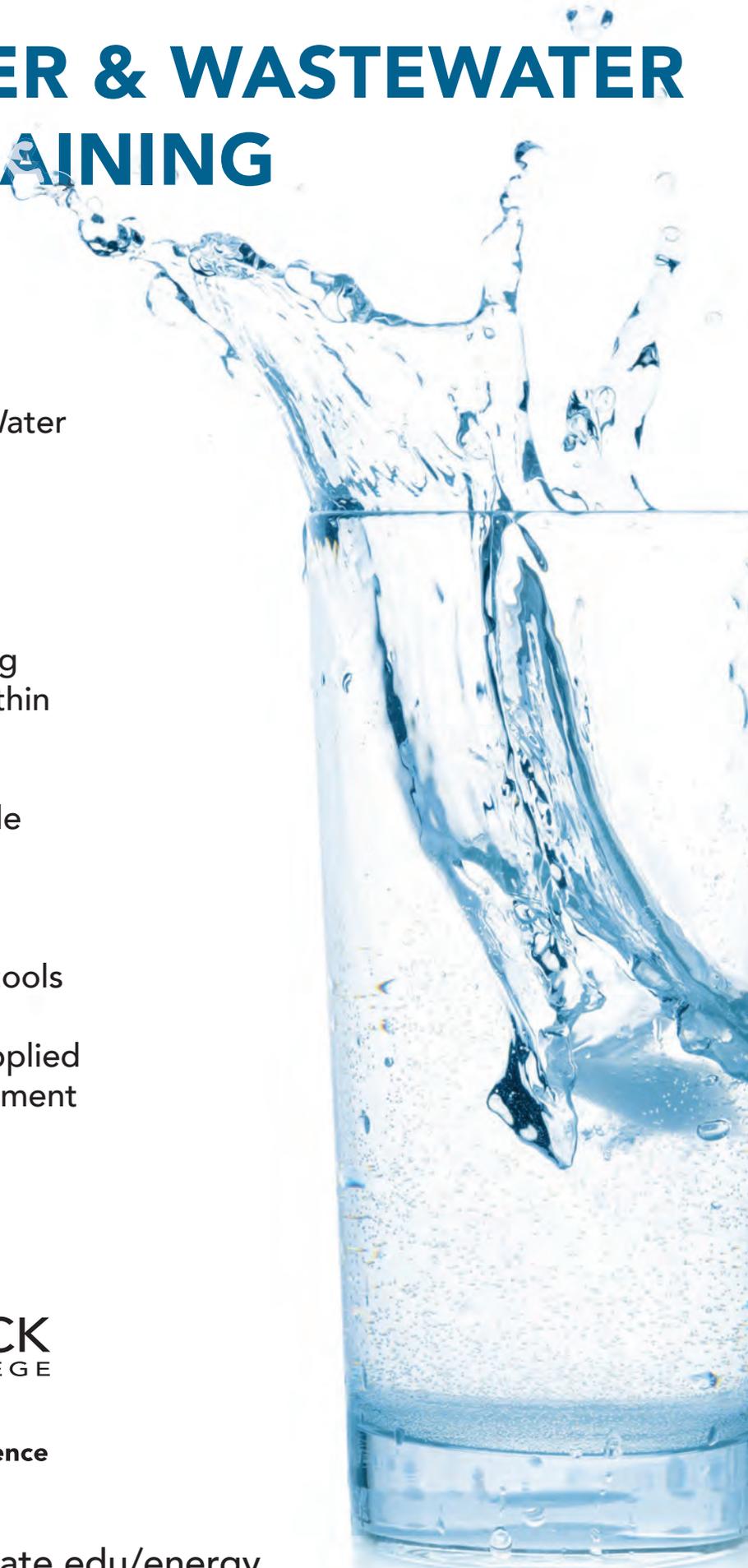
In addition to credit offerings, there are opportunities for customized training or access to online interactive learning tools (ILTs) developed specifically for the water and wastewater industry. These ILTs are valuable resources that can enhance a company's existing enhance training programs. ILTs are animations and simulations that provide visual and simulated exposure to equipment and scenarios from the industry. Industry trainers, supervisors or operators find these very helpful as learning aids for in-house training of experienced and new employees. Licenses are affordably priced and are valid for six months, granting access for up to 25 concurrent users at a single location.

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# The Season of Transitions

By Eric Lynne and Derek Wold



Eric Lynne



Derek Wold

This fall, Eric Lynne will have rotated off of the WEF House of Delegates (HOD) after the first half of the HOD meeting at WEFTEC. Eric has served Central States and WEF in many roles during his time as a member and looks forward to finding new ways to stay involved. In fact, he's somewhat nervous to know that nominating committee members are reading this opportunity. Eric's role as a Delegate has bolstered his understanding of the way these two organizations (WEF and CSWEA) work together, and will use these memories to help guide our future leaders. CSWEA is proud to have had Eric serve as their voice at local, regional, and national meetings, committees, and work groups, as he has worked hard to push our sector to the next level.

Delegate Derek Wold will continue to serve as a WEF Delegate. Incoming WEF Delegate Tracy Ekola's term begins during the second half of the HOD meeting during WEFTEC and she will replace Eric Lynne on the Central States Executive Committee. Although a steep task, Tracy's no stranger to the House of Delegates. She served from 2015 to 2018 as a WEF Delegate-at-Large. This was a thankless task that deserves a ton of respect, as it will help catapult Tracy into the HOD hall of fame (if there was one). Reach out to Derek or Tracy with any ongoing Delegate questions during this lame-duck transition period.

A major change on the WEF level is our new Executive Director. Please welcome Walter Marlowe, as he begins to lead our organization. Walter has

been involved with similar service oriented groups, and will be starting early September – just in time for WEFTEC.

The WEF House of Delegates (HOD) will hold their annual meeting on Saturday, September 21, 2019 in Chicago during WEFTEC. CSWEA's outgoing WEF Delegate Eric Lynne, Derek Wold, and incoming Delegate Tracy Ekola will attend. In the morning, outgoing Speaker of the House Keith Hobson will chair the HOD meeting with reports from all committees and workgroups. Table Talk discussions between various MAs will also be conducted to allow for better communication on specific ideas. The morning session will also include confirmation of the incoming WEF President, Board of Trustees, and Delegates. Later on, the Delegates will put on their blue jeans to go help our very own CSWEA all-star, Natalie Cook, to put the finishing touches on a WEF Community Service Project for Chicago. In the afternoon, the incoming Speaker of the House, Dean Miller from the Pennsylvania WEA, will lead sessions covering the WEF

Business and Committee Meetings to set the course for the coming year.

The HOD Standing Committees for 2019-20 include the following committees:

- Budget
- Outreach
- Nominations
- Steering

Each delegate will join a task-force style workgroup at the HOD meeting during WEFTEC. These workgroups serve as a primary way our delegates implement quick changes in the organization.

For the third year, the Committee Leadership Council will present awards for top-notch members. Watch for the announcement of winners after WEFTEC. If anyone has been identified for nomination in 2020, the deadline is June 1.

Future WEFMAX conferences will be held in Hawaii, South Carolina, New York/New Jersey, and North Dakota. Look for an update to the timing and location of each at WEFTEC during the Leadership Day Luncheon presentations. CS



To learn more, contact **Matt Holub** at **630.332.9292** or **mholub@esg.email**.

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# Adjusting to the Fall

By Rachel Lee

The change from summer to fall always seems like such a big adjustment in my life. Part of me craves the routine and structure that fall brings, but I will miss the long days of summer. Back to school time brings a certain discipline and predictability. The relaxed days of summer are behind us and a chill is in the air. Just like the animals preparing for winter, we are hard at work too. CSWEA's annual CSX meeting was quite fun, as people from each section came together to share ideas. This year's meeting included a lot of great discussions. There's not room here to share everything, but topics that garnered more discussion included: the continued refinement of our annual meeting, the Midwest Student Design Competition, our Operator Training Program, and Section resource recovery committees. Those topics can be summarized in four paragraphs:

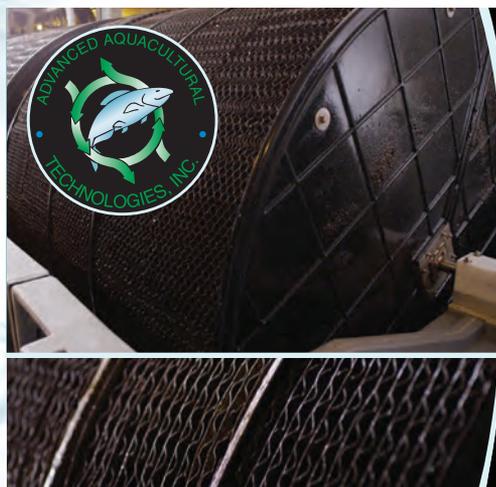


- The annual meeting feedback was positive. There seem to be a few details that we are still working on, but next year's planning committee has a lot of great ideas.
- This year's Student Design Competition involved teams from states outside of the Central States area. The additional teams added to the competition's energy and allowed teams that might not be able to participate in their home state and opportunity to do so. Keep a eye on how this competition may grow and bring more students into our industry.

- CSWEA has purchased materials for an operator training program through WEF and has initiated the CSWEA Certified Operator Training program. The program is intended to prepare operators for certification exams, to provide recognition for those who have completed the program, and can be used in Wisconsin if desired.
- We also discussed the idea of resource recovery committees for the sections. Minnesota and Illinois both have committees with a resource recovery focus and our section discussed how to implement one (More on that below), the Wisconsin Section hosted several successful events this summer as well. The Classic Collection System Seminar, the Northwoods Collection System Seminar, and the Management Conference were all successful. There were nearly 500 attendees that participated in these events throughout the summer. With events located in Watertown, Marshfield, and Milwaukee, many could find something nearby.

With fall comes WEFTEC. This conference brings together people in our industry from across the nation. Because it is in Chicago this year, the Wisconsin Section will be well-represented in the Operations Challenge, on the exhibit floor, and in the technical program. Take a moment to support your peers by

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cheering on our CSWEA Operations Challenge teams, visiting our vendors, or listening to a great presentation. If you have never watched the ops challenge, the competition is the best spectator sport in our industry. WEF's focus is ReGeneration at the conference this year. This incorporates workforce, which WEF describes as harnessing the power of individuals, coming together to regenerate and reinvigorate the water workforce, and providing solutions for workforce development, diversity, and inclusion in the water sector. Perhaps we can use these tools to continue to develop our water workforce at home.

More updates for our section include our committees. Resource recovery has been a big part of the conversation in our industry for many years. After discussion, we are implementing a Resource Recovery committee, led by Lindsey Busch and Matt Seib. This committee will be establishing itself throughout this year and into the future. They will be developing a committee plan for the section to discuss at the November Section Meeting.

Our Government Affairs committee has been hard at work this year. There are many pending legislative changes proposed which impact water and wastewater. The committee has been gathering comments from our membership and will

“It is clear that we have a lot of great things happening in our section to be proud of.”

be responding to WDNR on several topics. Chris Tippery can help direct comments that could be added to the CSWEA response, if needed. The Operations committee will be hosting a Phosphorus/Nutrients Operations Seminar on November 14 in Oshkosh. The agenda will feature talks and discussions about operations and maintenance issues related to a wide array of phosphorus and nitrogen management practices in the wastewater field. It is a great opportunity to gain insightful information so make sure to register.

Please take a moment to reach out to me or Autumn Fisher, our Membership committee Chair, if you would like to get more involved in one of our committees. As summer turns to fall, it is clear that we have a lot of great things happening in our section to be proud of. [CS](#)

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As the publisher of *Central States Water* magazine, we at Craig Kelman & Associates have a deep appreciation for our readers and members of CSWEA whose task it is to ensure that water taken from and put back into our precious Mother Earth is clean and safe for the people, animals and plants whose very existence depends upon it.

To demonstrate our admiration and respect for the association, its members and the water industry as a whole, we have established a yearly educational scholarship of \$1,000 to be funded through a percentage of advertising sales generated in *Central States Water*.

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# Engagement, the Fruits of our Labor



By Patrick Haney

It's been an exciting and busy summer for the Minnesota Section of CSWEA. We've hosted or conducted a major event each month, thriving with the help of our amazing MN CSWEA members.

In June, we conducted our annual Minnesota Exchange Workshop, which allows our leadership to spend a day together shaping the direction of our section for the year. The MN section continues to perform well financially. This will allow our section to engage in sponsorships and promoting our members. Additionally, we are considering sending a member to WEFMAX this upcoming year. A main focus point of our conversations included how to be an open and inclusive organization. While this will be an ongoing discussion, we hope to find more ways to advertise our committee meetings and encourage curious professionals to join our phone calls. We are also focusing on new outreach and membership initiatives, knowing that active and engaged membership opens up opportunities for the professionals in our field.

The WEF Nutrient Symposium was conducted in July. It's always a pleasure to listen to the greatest minds in the industry, especially when they're presenting in our backyard. Speaking of the greatest minds in the industry, CSWEA was well represented at the conference with several presentations. I'd like to personally thank all the volunteers that helped WEF make this symposium a success. CSWEA had volunteers on the Steering Committee, Program Committee, and as Room Monitors during the event.

In August, the Minnesota Section hosted its first Effective Utility Management (EUM) Workshop. The Wisconsin Section has conducted this workshop successfully for several years. Rachel Lee was able to share previous workshop agenda and provided feedback on successful approaches to the event. To that end, I'd like to thank the Wisconsin Section. It's a prime example of how the Sections can work together to forward the interests of our professional community. The 1st Annual MN CSWEA EUM Workshop was well attended by 50 people and the feedback we received on the presentations was extremely positive. I'd like to thank the presenters, the planning committee, and WSB for hosting the event.



Looking forward, the Conference on the Environment will be held on November 7th at the Minneapolis Convention Center. The conference truly takes a 'One Environment' perspective. The MN CSWEA combines with the Upper Midwest Section of Air and Waste Management Association, which allows conference attendees to learn about a variety of environmental topics including water, wastewater, stormwater, residual, air emissions, clean energy, and landfill management. We will soon begin planning for the 37th Annual Innovative

Approaches to Wastewater Operational Problems Workshop, most recently hosted by the St. Cloud Rivers Edge Convention Center. In addition, planning continues for the 2020 CSWEA Annual Meeting in St. Paul. If you'd like to volunteer and help plan either event, please feel free to contact me.

CSWEA welcomes the WEF Residuals and Biosolids Conference to the Minneapolis Convention Center March 31st through April 3rd, with the Exhibition April 1st and 2nd. CSWEA is hosting the Friends of Biosolids social at the Conference on March 31st. Volunteers are needed to plan and host the event. This is a highlight of the conference and always well attended. I encourage all CSWEA members to consider serving as room monitors for the Conference technical sessions. Typically room monitors receive free access to the Conference for the day of their attendance. Feel free to reach out to George Sprouse, [george.sprouse@metc.state.mn.us](mailto:george.sprouse@metc.state.mn.us) (Metropolitan Council Environmental Services) or Anna Munson, [munsona@bv.com](mailto:munsona@bv.com) (Black & Veatch) to volunteer your time.

Be on the lookout for additional announcements for social events and the Collections Systems Workshop co-hosted with the Minnesota Wastewater Operators Association. As you can see, there are no shortages of meaningful opportunities to engage in CSWEA in the coming months. Please reach out to myself or other members of the MN CSWEA Section if you'd like to volunteer your time, network, and engage with your peers. It's been a rewarding summer and I hope members continue to engage, learn, and have fun in the coming months.

Patrick Haney  
MN Section Chair [CS](#)

*“It's been a rewarding summer and I hope members continue to engage, learn, and have fun in the coming months.”*



# Doing More with Less, and Learning from Others

By James Kerrigan

**Y**ikes! It seems like summer went by faster than usual, and with that comes another missive from yours truly. It has become obvious that with the new and more stringent regulations being brought upon the industry, and with less and less real estate available, we are having to get more creative in how we plan, design, and build. In other words, we have to dial it in a little tighter in how we operate our facilities.



We all hear about the design life of new equipment being around 20 years, which seems like a long time. But in reality, with budget restraints and the unflattering nature of our business, facilities often get pushed far beyond their design life, frequently outliving the people who installed them.

Concrete lasts decades and one of the challenges for all of us is to ensure we do things the right way now and avoid any 'regret capital' by having to redo something already built to meet a new need. A wise man once told me, "Someone designed a perfect project; it was beautiful but never implemented. It was perfect all right, but only in his mind." It was perfect because it was never questioned or challenged and was never put to the test. Nothing ever goes perfectly according to plan, and if it does you can bet some things may not be right. Few people remember the projects that went well – there are no good stories from them. Almost everyone remembers the ones that didn't go well, the frantic calls pleading for help or when everything went dark. These are the ones that kept us up at night. We all need to do a better job of being critical and sharing our knowledge, both the good experiences and often more important the bad, so we learn how to do more with less and put the new concepts into practice.

At the end of the day it's everyone's challenge to run the facility. We must all share the sleepless nights when a severe storm threatens any weak link in the chain, potentially causing a permit violation. When the contractors have packed up their tools and moved on, and the engineers are working on the next design, it is the managers and operators that are left to live with the new facility. Operators are tasked with the challenge of keeping the water flowing and meeting the permits day in day out. They must do this regardless of what is being built at the time, what improvements are being made, or how the facilities are being torn up. If we miss our permits none of us are doing our jobs.

We need to engage this group more both as an organization and in our own roles in the industry. Operators know the facilities better than anyone else does; they know what valve sends flow where and it is critical that this group be more involved in the planning of the improvements. The conversations on implementing new ideas into existing facilities needs to flow both from the designers to the plant and vice versa, the knowledge and experience of everyone contributing to a successful solution.

A wealth of knowledge is available in CSWEA and WEF, in the conferences, meetings, committees, seminars, and training courses. These training courses are a resource that we can highlight more to our peers as a way to share knowledge. This is what CSWEA's operations certification program does without explicitly trying. What started out as a training program for operators to meet the IEPA's requirements for CEU's is also a great venue for sharing knowledge. This knowledge sharing is one of the fundamental goals of CSWEA, not just for operators, but for engineers too. It provides a great opportunity for engineers and operators to figure out how we do more with less, to learn from others and work cohesively to determine what we are really trying to accomplish. Think of how we can get a bit more out of CSWEA, learn a different perspective on what we do, communicate with others who we might not normally see at a conference, and expand your own venues for leaning.

Let's all work together to broadcast this program to our operators and others as a stepping stone to seeing what CSWEA is about. Use it to get to know more about the conferences coming up, and, most importantly, discover more thoroughly from our coordination what works and what doesn't work so we don't recreate old mistakes.

So what's the next topic? The next session is the Purpose and Fundamentals of Wastewater Treatment being held in Urbana Champaign Sanitary District on October 24th. The CSWEA website has this and other upcoming events listed at: [www.cswea.org/illinois/events/upcoming-events](http://www.cswea.org/illinois/events/upcoming-events)

Also, don't forget the upcoming Operations Seminar next month at the Fox River WRD. With a focus on Data collection and SCADA at facilities it will have a little something for everybody. These are some of the most immediate opportunities with more to come. In the next issue, we'll rundown the training sessions to date, provide some feedback, and provide a sneak peek on what to expect in each of the future sessions.

Slainte!

James CS

# The City of Wisconsin Rapids' Wastewater Treatment Plant



In 1900, the once rivaled towns, Centralia (located on the west side of the Wisconsin River) and Grand Rapids (located on the east side of the river) merged as one and adopted the name 'Wisconsin Rapids'. The name came naturally due to a 45 foot descent the river has over an irregular shaped rock bed. Coupled with a number of small islands, the city makes for an aesthetically pleasing place to live.

The Wastewater Treatment Plant serves a population of about 20,000 people as well as two large cranberry operations, Ocean Spray and Mariani, which make up about 50% of the plants total BOD loadings. Wisconsin Rapids Wastewater also treats wastewater from two outlying communities Biron and Rudolph, WI. In order to effectively treat the city's growing industry, the plant was



upgraded in 2011 by Foth Engineering. The facility treats on average 3.5 millions gallons of wastewater on a daily basis. Peak monthly flow is 5.27 MGD. Peak daily flow is 8.71 MGD. The plant treats 12,000 lbs of BOD per day on average, and meets an effluent phosphorus limit of <1.0 mg/l monthly average. The treatment train consists of 17 lift stations located throughout the city, with the four largest lifts pumping directly to the plant headworks, to start the gravity flowing treatment process.



The WWTP has nine full time employees including a Superintendent, Chief Operator, three Operators, Maintenance Technician, Relief Operator/Assistant Maintenance, Collections Crew Leader, and Collections Operator. The staff works together to efficiently and effectively operate, maintain, and manage the treatment facility as well as the collection/conveyance system.

## PRIMARY TREATMENT/ SOLIDS SEPARATION

At the treatment plant, influent wastewater flows through two 5 mm mechanical screens that remove inorganic material like large coarse solids and rags.

Wastewater flows from the screens to the grit removal system, which consists of a grit vortex working simultaneously with a grit washer to settle out and remove heavy inorganic solids from the raw wastewater. The wastewater is then gravity fed to two 95 foot primary clarifiers where solids are encouraged to settle. Two primary clarifiers effectively remove settled organic solids and reduce downstream BOD load by 30%. This helps lessen the BOD and nutrient load sent to the Integrated Fixed-Film Activated Sludge Process (IFAS).

## SECONDARY/ BIOLOGICAL TREATMENT

The IFAS system is similar to a conventional activated sludge process, but with the addition of plastic disks that increase the surface area of the tank and allow organisms to bio-accumulate on the disks. The mixed liquor and the fixed film media disks work in conjunction to effectively treat high loads of BOD and nutrients in the wastewater. The IFAS system consists of two concrete tanks filled with plastic media disks. Three ABS high-speed turbo blowers diffuse air from the bottom of the tank to provide oxygen for biomass as well as keep the mixed liquor and media disks well mixed. The disks allow a better environment for fixed film to thrive in the wastewater treatment process. Other benefits include a more diverse population of organisms, the ability to treat fluctuating loadings from day to day, and the ability to keep a larger biomass on-hand at all times.

The IFAS system is followed by up to four aeration basins that allow for polishing and further reduction of BOD and nutrients in the wastewater. Water then flows into a splitter box where flow is split between two final clarifiers. Floc is settled out and clear effluent water is passed over the clarifier weirs where it is passed through a Trojan 3000+ UV disinfection system before being discharged into the Wisconsin River. Settled activated sludge from the final clarifiers is either returned back to the IFAS system for continued biological treatment or wasted out of the system for thickening prior to digestion.



## SOLIDS TREATMENT AND HANDLING/DIGESTION

Waste activated sludge is thickened with two rotary drum thickeners before it is sent to digestion. Two 400 GPM RDTs use an emulsion flocculent to allow water to be filtered out of the WAS, and reduce supernatant load to the digestion process. A thermophilic batch digestion process (TPAD) is used to treat the solids portion of the treatment process, which produces an DNR approved 'Exceptional Quality Class A' biosolid. In the TPAD process both Digesters are heated to 135 degree Fahrenheit and continuously mixed with biogas cannons. The biogas produced is collected and held in the floating digester covers. The two covers allow for gas storage up to 50,000 cubic ft. On average the digestion process produces 110,000 cuft/day. The bio gas is then used to power a 330 kw Jenbacher generator that supplies power to the plant and heat for the digesters.



At times the facility is able to produce as much power as is demanded, making the facility energy neutral during these periods. Digested sludge is dewatered with a Fourier fan press to 15% solids and sent to a drying pad for further drying until it is land applied as a soil amendment fertilizer.

## LABORATORY

The Wisconsin Rapids Wastewater Treatment Plant staff also operate a Wisconsin State certified Laboratory.

The banner features the Greeley and Hansen logo on the left, which consists of three blue wavy lines above the company name. The background is a blue and white image of water with a reflection. The text 'designing better urban environments worldwide' is written in a white, sans-serif font across the middle. Below this, the words 'water', 'wastewater', and 'infrastructure' are written in orange. At the bottom, the phone number '800-837-9779' and website 'greeley-hansen.com' are listed, followed by social media icons for Facebook, LinkedIn, Twitter, and YouTube.

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Certified Laboratory Operators run daily tests on influent wastewater, treatment process checks, and effluent wastewater. These tests are performed to ensure compliance with the WPDES discharge permit parameters issued by the Wisconsin DNR. The main areas of compliance relate to Biochemical Oxygen Demand (BOD) which correlates to biological load the wastewater will put on our treatment process, Total Suspended Solids (TSS) which is the solids content of the wastewater that needs to be treated, Total Phosphorus (TP) which is the main nutrient of concern for the receiving body of water, and pH which is the acidity or alkalinity of the wastewater. Operators rotate through the Laboratory on a weekly basis, ensuring complete staff proficiency for environmental compliance. [CS](#)

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# OPERATIONS CHALLENGE 2019

By Kathy Crowson



**W**EFTEC 2019 hosted the 32nd Annual Operations Challenge Competition, where teams compete to be recognized as the best wastewater collection and treatment personnel in the world. Each team is sponsored by a WEF Member Association or other recognized Operator Association and thus represent a variety of countries. In addition to Canada and the US, teams come from Latin America, Asia, Europe, and Africa.

There are five events that test the precision, speed and safety of wastewater operators as they work as a coordinated team to complete events with tightly prescribed requirements.

For the collection system event, the teams repair a broken 8" PVC sewer main and install a 4" sewer lateral connection to the repaired pipe with nothing but hand tools. This event is particularly exciting to witness, and for a team to win they must finish in a 100 seconds.

To test the wastewater operators' process control skills, the team combines their knowledge and analytical skills to complete a written exam that includes a computer simulation within 20 minutes. This is one of the quieter of the competitive events. To be the best operators in the laboratory event, which requires a team to work together to analyze 12 samples for alkalinity and ammonia as quickly as possible while maintaining the precision and following the strict protocols required by laboratory practices.

The maintenance event is one of the longer competitive events, requiring the team to troubleshoot lift station controls while replacing the impeller on the submersible pump from the lift station. Extremely strenuous, the teams are expected to demonstrate their ability to safely isolate and lock out equipment prior to performing the maintenance activities.

The safety event is a simulated confined space rescue requiring the team to demonstrate vast knowledge and skills to address various hazards encountered in wastewater treatment. Following proper procedures for lock out tag out, fall protection, confined space entry, ventilation and atmospheric monitoring, emergency rescue, and use of emergency showers are all part of this event.

CSWEA sponsors two teams each year, the Pumpers and the Shovelers. The five-member teams consist of award winning operators and facilities from Illinois, Wisconsin, and Minnesota. Up until a couple months before the competition, most of the participants haven't even met each other.

The teams prepare by intensive practice and team building over four to five days spent at the Janesville Wastewater Utility in Wisconsin.

## 2019 TEAM MEMBERS:

### CSWEA PUMPERS

- Marc Zimmerman (Coach) – Janesville WWTP, WI
- Aaron Berry – Trotter & Associates, Inc., IL
- Brian Schoenecker – City of St. Cloud, MN
- Joe Watson – NEW Water, WI
- Mark Knuth – Racine WWTP, WI

### CSWEA SHOVELERS

- Chris Lefebvre (Coach) – Stevens Point, WI
- Brandon Stall – WLSRD, MN
- Brent Perz – Baxter & Woodman, IL
- Jason Robbins – Kishwaukee WRD, IL
- Wade Lagle – Urbana & Champaign SD, IL

### TRAINER

- Brian Skaife – Janesville WWTP, WI 



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 October 30  
 Fox River Wastewater Reclamation District  
 South Elgin, IL

NOVEMBER



**MN Conference on the Environment**  
 November 7  
 Minneapolis Convention Center  
 Minneapolis, MN

**Operator Training Course #14477:  
 Fundamentals of Anaerobic Digestion**  
 November 13  
 Bloomington Normal Wrd (SE Plant)  
 Heyworth, IL



**WI Operations Seminar –  
 Phosphorous & Nutrients**  
 November 14  
 Culver Family Welcome Center  
 Oshkosh, WI



**WI Industrial Pretreatment Seminar**  
 November 19  
 University Of Wisconsin Green Bay  
 Green Bay, WI



**IL 2019 B.E.E.R. Seminar**  
 November 19  
 Reserve 22 | Glen Ellyn, IL

**WI Stormwater and  
 Watershed Webinar**  
 November 21  
 Global Water Center | Milwaukee, WI



APRIL 2020



**Midwest Student Design Competition**  
 April 6  
 Monona Terrace | Madison, WI



**25th Annual Education Seminar**  
 April 7  
 Monona Terrace | Madison, WI

MAY 2020



**CSWEA 93rd Annual Meeting**  
 May 18-20  
 River Centre | Saint Paul, MN

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# Designing Resilient Infrastructure for Flood Mitigation in Houston, TX

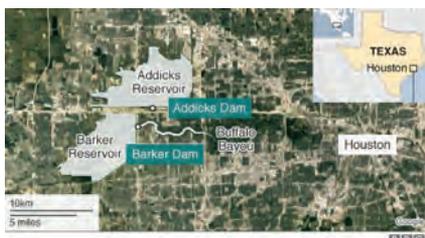


By Jinglin Duan, Megan Fox, Jonathan Kolweier, Lindsay Muth, Alana Rosenbaum, Abhijeet Saraf, and Justin Shen



## EXISTING FLOOD MITIGATION INFRASTRUCTURE

The US Army Corps of Engineers (USACE) built the Addicks and Barker Reservoirs, located just west of Houston, in the 1940s to prevent flooding. The reservoirs are still owned, operated, and maintained by the USACE. The main purpose of the reservoirs is to prevent flooding during heavy rainfall events of the Buffalo Bayou, which leads to downtown Houston. The location of the reservoirs with respect to the rest of the Houston area is shown in Figure 1.

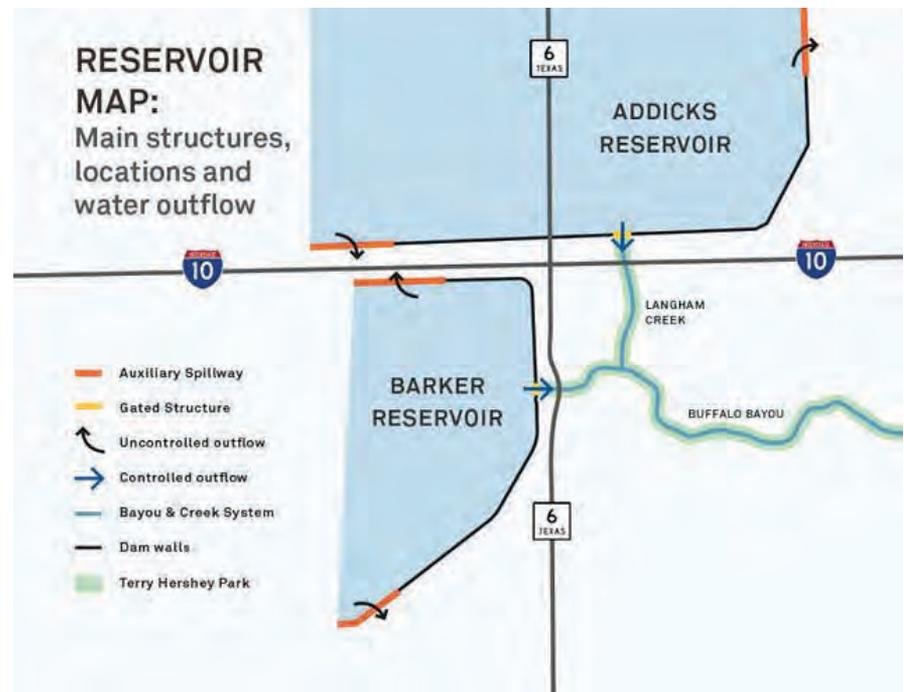


**Figure 1** Location of Addicks and Barker Reservoirs with respect to the greater Houston area

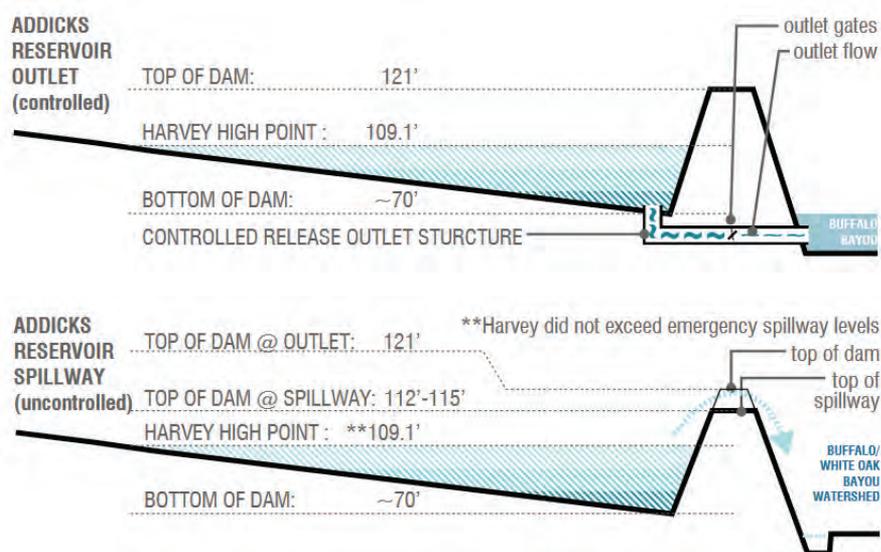
The northern reservoir, Addicks, is fed from the northwest by four creeks: Bear Creek, South Mayde Creek, Langham Creek, and Horsepen Creek. Water flows out of Addicks to Langham Creek and Buffalo Bayou. Barker Reservoir, located south of Addicks, is fed by Mason Creek and the Upper Buffalo Bayou.

Both reservoirs are designed to be dry reservoirs, only holding water during a large rainfall event. The bottom of the reservoir has around a 1% grade from the edge of the reservoir towards the embankments. The dams are meant to control the flow of water in the Buffalo Bayou to prevent flooding in downtown Houston and the surrounding suburbs.

The Addicks reservoir features 61,000 feet of embankment to the south and east, creating its borders, pictured in Figure 2. A control gate designed to monitor and control flow out of the reservoir into Langham Creek lies to the south to maintain an average discharge rate of 2000 ft<sup>3</sup>/s. Auxiliary spillways located at the edge of each embankment



**Figure 2** Map of Addicks and Barker Reservoir structures



**Figure 3** Addicks Reservoir outlet and spillway dimensions

ensure that during extreme conditions where the control gate cannot keep up with the flow of water into the reservoir, water can flow out of Addicks in spots other than the main control gate to prevent damage to the embankments.

### HURRICANE HARVEY FLOODING

In August of 2017, Hurricane Harvey poured historic amounts of rainfall over the Addicks reservoir watershed and its surrounding areas, and is generally classified as a 500-year rainfall event, though the flooding and damage – especially in the Addicks Reservoir watershed – was more in-line with a 1000-year-storm. This coupled with silt buildup in the reservoir and neighboring rivers leading up to Harvey meant that the reservoirs, especially Addicks, were filling up faster than they could safely drain. In addition, the western section of the reservoir has become land featuring both residential and recreational development. The USACE only owns the land in the 100-year floodplain, and private development has occurred within the 500 and 1000 year floodplains. To the north and south, suburbs have sprung up along the borders. To the west of the reservoir lies additional housing impeding on the floodplain of Addicks along with a small, private airport also within the floodplain. Development in Addicks both increased water runoff and decreased infiltration into the soil effectively limiting the overall capacity of the reservoir. The combination of these factors greatly contributed to forcing the USACE to open the control gates in an attempt to limit potential damage to the

reservoir and prevent water from running over the spillways (Greater Houston Flood Mitigation Consortium, n.d.).

To prevent an uncontrolled release through the spillways, the USACE decided to open the Addicks and Barker control gates and release 15,000  $\text{ft}^3/\text{s}$  downstream – an amount that Langham Creek and the Buffalo Bayou simply could not handle. This meant that on top of heavy rainfall everywhere, areas upstream of the reservoirs were flooded due to overflow from rivers, and areas downstream leading to Houston were flooded due to the large control gate releases. The increased release from the control gate was to prevent flow over the top of the embankments and prevent damage to the dam (Greater Houston Flood Mitigation Consortium, n.d.).

The embankments of Addicks reservoir, mainly formed by earthen berms, have a height of about 50 feet as shown in Figure 3. All measurements in Figure 3 are taken as height above sea level. It is important to note that rainfall from Harvey did not exceed the emergency spillway heights, but rather the USACE chose to release excess water through the control gates to prevent stress to the embankment walls. The bottom of the dam is 70 feet above sea level, and the top of the walls at the control gate is 121 feet above sea level. At the emergency spillways, the height of the walls is only 112-115 feet above sea level, and the highest the water was allowed to rise during Hurricane Harvey was to 109.1 feet above sea level (Greater Houston Flood Mitigation Consortium, n.d.).

### DESIGN RECOMMENDATION

Several alternative solutions were examined to prevent major flooding in the Houston area for future storms as extreme as a 1000-year rain event. All potential solutions were options that the USACE had considered in the wake of the damages by Hurricane Harvey.

In order to provide some flood relief in the short term while mitigating larger storms in the future, a two stage solution was determined to be the best option. In the short term, Addicks Reservoir will be deepened. In the long term, a third reservoir will be built upstream of Addicks and Barker to reduce the stress on the existing reservoirs. This third reservoir, which would store water from the Cypress and Addicks watersheds, would be able to handle larger flood events. By holding water from Addicks watershed, less additional capacity will be needed from the excavation of Addicks Reservoir.

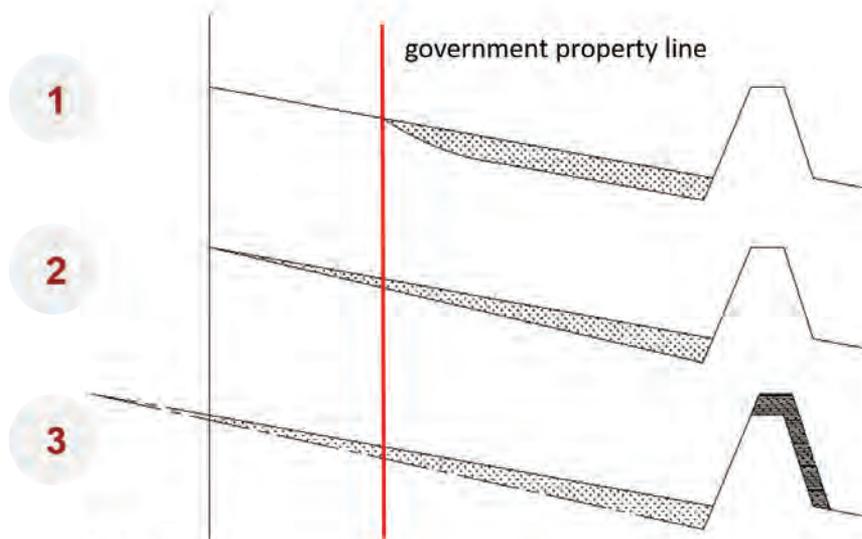
### ADDITIONAL CAPACITY REQUIRED IN EXISTING RESERVOIRS

When considering the option to deepen the reservoirs, data from Hurricane Harvey was used to determine the amount of additional storage needed. Barker Reservoir has a capacity of 209,000 acre-ft, but was only impounding 171,000 acre-ft during its peak. From these numbers, it was determined that Barker had sufficient capacity to handle the amount of water flowing through its watershed (Lindner & Fitzgerald, 2018).

The capacity of Addicks Reservoir is 204,500 acre-ft, and the reservoir was impounding 217,700 acre-ft at its peak during Harvey (Lindner & Fitzgerald, 2018). To handle the peak flow during Harvey, at least 13,200 acre-ft of additional capacity would have been needed in Addicks Reservoir. The amount of additional capacity needed in Addicks Reservoir can be decreased from 13,200 acre-ft discussed to 10,000 acre-ft in light of the long-term solution.

### METHODS TO EXCAVATE ADDICKS RESERVOIR

There are multiple approaches to deepening the reservoir. As previously stated, the reservoir is essentially a sloped area in the shape of a bowl with three borders to contain the water



\* Not to scale

Figure 4 Three methods of excavating Addicks Reservoir

in this bowl. The excavation can occur either evenly across the entire surface area of the reservoir, or over a section of the reservoir to a greater depth. To excavate 10,000 ft over the entire surface area of the Addicks reservoir, it would only need to be excavated by 0.6 ft. This is not the most effective option since the surface area of the Addicks Reservoir is large. Therefore, a construction project covering the entire expanse of the reservoir with including trees, debris, and dirt, is not a likely option. Furthermore, the government only owns the property in the area up to the 100-year floodplain, which is marked with a red line in Figure 4. The bounds of the reservoir is symbolized by the black line, and there has been private development in the area between the reservoir boundary and the government property line.

Three options for excavating the reservoir are depicted in Figure 4. The first option considers excavating the federal government (USACE) owned property to an increased depth, greater than 0.6 feet. The second option is excavating over a larger area and effectively increasing the overall grade of the soil. The third option is to increase the height of the embankments and excavate the dam over a greater area, to increase the total capacity of the Addicks Reservoir. The dam's ability to hold back water will increase, as it will also be increased in height from the soil

excavated in the process of deepening the reservoir. The first option would be relatively straightforward compared to the other two, as it does not require the government to buy out homes and purchase additional property. Options two and three would require buying out homes within this floodplain to allow the excavation to occur, increasing the time and cost of the project. Option three also would also increase the number of homes within the reservoir.

The first option is the simplest to execute as it does not involve buying out privately owned land. However, maintaining a near 1% grade of the reservoir is necessary to maintain a dry reservoir. The USACE would need to assess the costs of buying out property in making a final decision, but the first excavation option is likely the best.

### BUILD AN ADDITIONAL RESERVOIR

A third reservoir would alleviate some of the strain on Addicks Reservoir by retaining a portion of the water flowing through Addicks watershed. This option built off of findings from a 2015 Cypress Creek Overflow Study, which examined overflow from the Cypress Creek watershed into Addicks and Barker watersheds during large storm events. The study explored several options for locations of such a third reservoir.

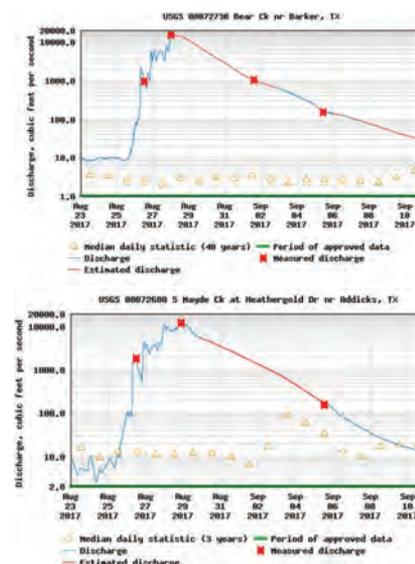


Figure 5 Hydrographs of flow through Bear Creek and South Mayde Creek from August 23 to September 10, 2017

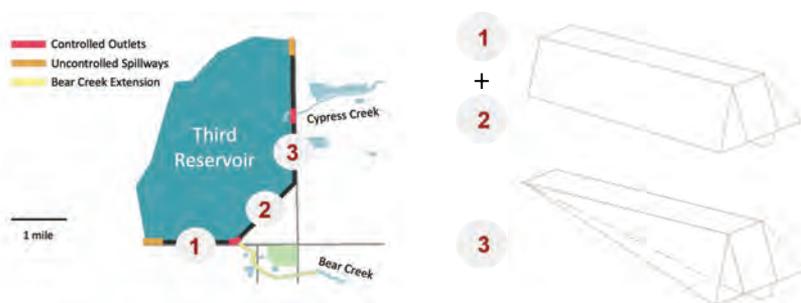
### ADDITIONAL FLOOD VOLUME STORAGE ESTIMATION

To assess the reservoir storage required to mitigate the future risk of similar events to Harvey, a flood volume estimate for the 1000 year flood event in Addicks reservoir due to Hurricane Harvey was needed. The water flowing into the Addicks reservoir, with a maximum flood storage volume of 204,500 acre-ft, is chiefly due to contributions from the four creeks discussed in before – namely Bear Creek, South Mayde Creek, Langham Creek, and Horsepen Creek.

To estimate the water flowing into the Addicks reservoir during the event of Hurricane Harvey, available flood hydrographs for the contributing creeks during the period of flooding due to Hurricane Harvey were downloaded from the National Water Information System (NWIS) of the United States Geological Survey (USGS). The duration of data needed was from August 25, 2017 to September 10, 2017. Harrison County was hit by Hurricane Harvey on August 25th and water levels started to rise above the average flow. The water levels receded to average flow levels starting September 11th in the analyzed creeks. Therefore, the water flowing into Addicks reservoir during this time period can be attributed to Hurricane Harvey. Definite flood hydrographs were available for Bear Creek and South Mayde Creek and are shown

Normalized Flood Volume	340,000 acre-ft
Cypress Creek overflow	65,000 acre-ft
Total flow into Addicks Reservoir	405,000 acre-ft
Addicks Reservoir capacity	204,500 acre-ft
Maximum allowable discharge from Addicks	4000 ft <sup>3</sup> /s
Total water discharge permissible from Addicks Reservoir	120,000 acre-ft
<b>Minimum Third Reservoir Capacity</b>	<b>81,500 acre-ft</b>

**Table 1** Minimum Capacity for Third Reservoir Estimation



**Figure 6** Proposed embankment structure and locations for third reservoir

in Figure 5, while flood hydrographs were not available for Langham Creek and Horsepen Creek (United States Geological Survey, n.d.).

The flood volume flowing into Addicks Reservoir due to Bear Creek and South Mayde Creek was calculated directly from the above flood hydrographs. The flood volume for the other major creek, Langham Creek, was estimated as the average of the other two major creeks. The total area of the Addicks Reservoir watershed is 138 square miles, while the combined area of the respective watersheds of Langham Creek, Bear Creek, and South Mayde Creek is 101 square miles. The total flood volume flowing into Addicks Reservoir due to the three mentioned watersheds was calculated to be about 249,000 acre-ft. This value was normalized over the entire Addicks Reservoir watershed, including unaccounted areas, and was calculated to be 340,000 acre-ft. The overflow from Cypress Creek watershed into Addicks Reservoir watershed during the event of Hurricane Harvey was reported to be 65,000 acre-ft in the final report prepared by the Harris County Flood Control District (Lindner & Fitzgerald, 2018). Thus, the total amount of water flowing into the Addicks Reservoir was estimated to be 405,000 acre-ft.

The maximum allowable discharge from Addicks reservoir into Buffalo Bayou is 4000 ft<sup>3</sup>/s. So, the maximum allowable discharge out of Addicks reservoir was estimated as the product of

discharge and the time duration, which was calculated to be 119,000 acre-ft.

The total additional flood storage required for a 1000-year event was thus calculated as the difference between the estimated flood volume flowing into Addicks Reservoir during Hurricane Harvey and the sum of the maximum flood storage of Addicks reservoir and maximum flood volume allowed to be discharged. This value was calculated to be 81,500 acre-ft, and would be the minimum capacity that a third reservoir would need. This information is summarized in Table 1.

## DESIGN OF THIRD RESERVOIR

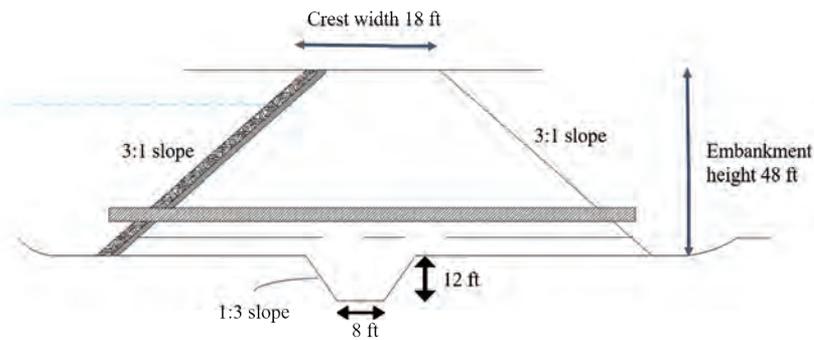
The long term solution for flood mitigation includes four elements from the previously mentioned 2015 Cypress Creek Overflow Study and a revised fifth element. The first element of the plan is the construction of an interim collection channel extending Bear Creek to the southern outlet of the third reservoir. Secondly, the Bear Creek corridor into which the interim collection channel feeds will be widened to increase capacity. Fill, levees, and channels will act as interim measures against overflow during the construction. The approximately one mile section of Bear Creek widened as well as the construction of the interim channel will protect 9,000 acres from inundation during a 100-year event. The third element of the plan is the installation of a park spanning 400 acres of lakes with significant detention capacity underground, and the construction of an additional channel to bring water east to the detention basins. As a result, 3,500 acres will be protected from a 100-year event. The fourth element of the long term solution covers acquiring and converting temporary flood easements into permanent flood easements as well as securing land for the reservoir. The 1,600 acres of land over these easements are required for the implementation of the first element. The final revised fifth element includes the hauling of materials from the excavation of Addicks Reservoir, and the construction of the embankments

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**Figure 7** Design of embankments and key trench

and key trench of the reservoir (Harris County Flood Control District, 2015).

Figure 6 is the proposed new reservoir. The dark blue represents the pooling area and the black borders are the embankments. The design will have two controlled outlets, shown in red, that would spill into Cypress Creek and Bear Creek. The first element of this plan connects Bear Creek to the southern outlet of the reservoir.

The third reservoir is located in an area that accounts for the natural flow of Addicks Reservoir, which was under more stress than Barker during Hurricane Harvey. It will hold water upstream of the Addicks and Barker watersheds, which will relieve stress on the reservoirs and decrease the pooling height in Addicks during periods of high rainfall. As calculated previously, the third reservoir requires at least 81,500 acre-ft. This design can hold a maximum of 90,000 acre-ft. The material used in the embankment walls will come from the excavation of Addicks, where soil will be brought 20 miles to the third reservoir.

To construct this reservoir, three embankments will be erected to construct a similar structure to that of both the Addicks and Barker Reservoirs. Given the natural grade of the soil and the general topography of Houston area, the entire land slopes towards the southeast side of the city. This means that the three embankments can act as dams and hold back water as well, without any excavation needed for the third reservoir. The embankments were split into three different sections to simplify the calculation of how much soil is needed for construction. The sections labeled 1 and 2 in Figure 6 will be a constant height and will serve as a wall to hold back the high levels of water.

In section 3, however, the length of the embankment will have to be varied to account for the angle that the grade of the land slopes at. As the land slopes upwards, the embankment top needs to be horizontal to a reference point. The slope of the embankment is constant as it moves upwards towards the north side of the reservoir. The major components of the embankments are as shown on the right side of Figure 6.

The design of the embankment shape is based on that of Addicks Reservoir. The dam will have an average height of 48 ft, a crest width of 18 ft, a trench height of 12 ft, and a trench width of 8 ft. The outer walls would have a 3:1 slope. These dimensions are shown in Figure 7. The material used for the trench will need to be dense and compacted heavy clay from the Addicks Reservoir. This part of the embankment was split into four sections and simplified into the following shapes: a rectangular prism sliced diagonally, a trapezoidal prism, and two triangular pyramids. This allows for proper visualization and the ability to calculate the volume of soil needed for these embankments. The three walls/embankment of the reservoirs will ultimately require 7.2 million yd<sup>3</sup> of compacted soil. With a compaction factor of 1.25, this will require 9 million yd<sup>3</sup> of non-compacted soil.

## COSTS

The preliminary cost estimate for deepening Addicks Reservoir is based on the actual volume of soil excavated. Since this is a preliminary estimate, the method of excavating mentioned in the prior paragraphs was not considered. The estimate is based on the total expected bulk cubic yards of soil excavated. The assumption was made that the soil has been compacted over the years, and has not been touched. The highest efficiency excavator was assumed, because it is reasonable to assign the most efficient machinery to a project of such scale. Under the 2019 RSMeans Item 31 23 16.42 0305, the item of 'Excavator, hydraulic, crawler mtd. 3-1/2 C.Y. cap = 300 C.Y./hr.' is used in the estimate. Given the total number of bulk cubic yards converted from 13,200 acre ft (16.1 million B.C.Y), the labor costs, equipment costs, and total costs were calculated, with overhead and operation costs included. The labor factors were calculated from the operating crew of this excavator. The total cost of the excavation was calculated to be \$21.4 million. A detailed table of the specific costs is shown in Table 2.

The total cost of implementing the third reservoir plan is derived from the five previously mentioned elements, much of which is based off of the Cypress Creek study. All calculations account for inflation, as the study took place in 2015. The cost of the first element is estimated to be \$39 million, the second element is estimated to cost \$74 million, the third is approximately \$16 million, and the fourth would be \$193 million. Much of the costs for the fifth element will come from embankment construction and hauling. Construction of the embankments will cost \$130 million. All of the soil will be hauled from the excavation of Addicks to the construction site in trucks that hold a maximum of 18 yd<sup>3</sup>. Cost estimates were obtained using 2019 RSMeans, and

**Table 3** Construction Costs of Third Reservoir

Embankments	8,880,000 yd <sup>3</sup> * \$15/yd <sup>3</sup>	\$133,000,000
Key Trench Excavation	188,000 yd <sup>3</sup> * \$7.5/yd <sup>3</sup>	\$1,410,000
Hauling	2019 RS Means Item 31 23 16.42 0305	\$57,600,000
<b>Total</b>	(includes costs from study and scaled costs – all with inflation)	<b>\$664,000,000</b>

Quantity	Unit	Daily Output	Duration Days	Material (\$/Unit)	Material WTC	Material Cost	Crew	Labor (\$/Unit)	Labor FC	Labor Cost	Equip. (\$/Unit)	Equip FC	Equip. Cost	Total Cost \$
8,880,000	L.C.Y	180	49,348	0	1.028	0	B-34I	2.09	1.33	24,700,000	3.92	0.946	32,900,000	57,600,000
Quantity	Unit	Daily Output	Duration Days	Material (\$/Unit)	Material WTC	Material Cost	Crew	Labor (\$/Unit)	Labor FC	Labor Cost	Equip. (\$/Unit)	Equip FC	Equip. Cost	Total Cost \$
16,100,000	B.C.Y.	2400	6,708.33	\$0	1.028	0	B-12D	0.33	1.33	7,080,000	0.94	0.946	14,300,000	21,400,000

B-12D (Pg. 745)	Hourly	Bare Cost	Worker's Comp	Ave. Fixed Overhead	Overhead	Labor Factor	Total Wage	Total Ave. Labor Overhead for Crew (Total Wage/Total Bare Cost)
1 Equip. Oper. (crane)	57.45	459.6	0.078	0.183	0.14	0.401	643.8996	1.41
1 Laborer	41.05	328.4	0.12	0.183	0.11	0.413	464.0292	

**Table 2** Costs of excavating Addicks Reservoir

came out to be \$58 million. As a result of combining these numbers with the remaining sufficiently scaled costs in the 2015 study, the fifth element costs roughly \$340 million. All in all, the cost of the long term plan would be \$664 million. Table 3 is a summary of the cost calculations.

#### ADDITIONAL FACTORS CONSIDERED

Before any work starts, a Phase I Environmental Site Assessment will be done to determine soil quality to ensure it can be used in construction. Through correspondence with Andrew Weber, the project manager for the USACE in Houston, this soil has been determined to be proper for construction. Environmental permitting is also required, which delves into the soil being transported from Addicks to the third reservoir. Soil quality will have been tested and approved for use. Finally, before any excavation is done, a Stormwater Pollution Prevention Plan will be in place to ensure pollution is mitigated if a storm were to come during construction. This would involve silt fencing and native vegetation.

Even with the construction of the third reservoir from the excavated soil in Addicks, there are still 7 million cubic yards of usable soil left over. To avoid the extra costs of landfilling the soil, construction companies are offering to use the soil for development projects. Houston is rapidly sprawling and the demand for new housing has remained consistent. Selling the soil to companies for use is a feasible and cost-effective method to make use of the excess soil. **CS**

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# LIFT Spotlight: Stevens Point, WI



The INNOVATION & TECHNOLOGY COMMITTEE will regularly solicit articles for publication in the *Central States Water* magazine regarding new water technologies and innovation in the water field and will help promote CSWEA Leaders Innovation Forum for Technology (LIFT) engagement. This first article focuses on an innovative activated sludge process, a granular sludge process, which allows for multiple process benefits to be realized. This is one of the innovative technologies in LIFT Link. LIFT Link was developed by the Water Research Foundation (WRF), then known as the Water Environment Research Foundation. LIFT Link is part of the WRF/WEF LIFT ([www.werf.org/lift](http://www.werf.org/lift)) program to accelerate innovation into practice. LIFT Link is an online platform which serves as a conduit of interaction among municipal and industrial water, wastewater, and stormwater agencies, technology providers, consultants, academics, investors, federal agencies, and others for advancing innovation. LIFT Link allows its users to discover new technologies and research needs; connect with others with similar needs, technology interests, and desired expertise; and collaborate on research and technology ideas, proposals, projects, demonstrations, and implementation. If interested in accessing LIFT and gaining a login please reach out to Mohammed Haque at [mhaque@cswea.org](mailto:mhaque@cswea.org).



Stevens Point is a quiet, picturesque college-town located in the center of Wisconsin. Promoted as the *Gateway to the Pinerias* in a nod to its logging roots, it is also known as the *City of Wonderful Water*, after being aptly judged the nation's best tasting tap water by the American Water Works Association (AWWA) in 2010. The City's water and wastewater department did not stop at merely great tasting tap water. They have achieved high quality wastewater effluent with a strong biological phosphorus removal system, efficiently operated with near net zero power consumption. Achieving these sustainability dreams of net zero could not be possible without the anaerobic treatment system and operators that maximize the system's capacity.

Although Stevens Point had many sustainable elements in place, the biosolids program was a major challenge a few times a year. Attention became sharply focused on improving biosolids management with a focus on three main issues: 1) capacity, 2) regulatory, and 3) reliability.

### Definitions of These System Needs:

**Capacity:** (noun) The desire to handle more solids than the system is intended for.

**Regulatory:** (verb) When government agencies indirectly consume a utility's budget without asking.

**Reliability:** (noun) The feeling of not being in control of what happens next.

The biosolids handling and disposal program operated beyond rated capacity for many years. Higher sludge loadings to digestion were observed to increase tipping fees and digester biogas, but also had a tendency to increase solids for land application. As the hauled-in waste system increases in capacity to match demand, replacement thickening and increased liquid storage tank volume is required to obtain the necessary days of storage between seasons.

Merely addressing the physical limitations at the WWTP is not an alternative that the City wanted to accept. Non-economic factors for the current land application program demanded the



consideration of a broader perspective. Issues with groundwater protection, soil types, land use, food-crop agriculture, competition from outside biosolids, and future TMDL restrictions heavily influenced the City's decision to evaluate solutions to change up the status quo.

Many times, this scenario of having a large liquid land application program is blindly converted to a dewatering facility. However, rather than applying a band-aid solution, the City wanted to do it right. They began touring existing biosolids handling installations to learn from other operators. The proposed concept resulted in a large cake biosolids storage addition. This concept was difficult to cost-justify as it still did not address many of the land application limitations, especially the limited acres available to biosolids due to food crops. This drove the team to review additional solids processing techniques that would be appended to a dewatering facility, specifically Class A technologies.

Among the Class A options available and evaluated, heat-drying was selected for its reliability in achieving a quality product consistently. Pilot testing showed the City's sludge was amenable to meeting a Class A exceptional quality product, which set them on a course to find a demand for the dried product. Ranging from the status quo of land application, to the ability to bag product and distribute it as residential fertilizer, the staff knew this was going to be easier to manage than the existing liquid product.

Heat drying in itself is a mammoth sector of the industry with many proprietary ways to create a Class A product. Some technologies have decades of experience while others are just barely touching the municipal sludge marketplace. The project team selected a paddle dryer system, as it has a long track record of quality and could fit best within an existing building. Conveniently, the utility had just built a new larger garage, so the collections system garage was available and large enough to house the proposed new facilities.

Now that the technology was set, the team drew upon those discussions with various operators, vendors, and engineers to establish guidelines for operations. They would need to minimize staffing needs, yet not exceed the City's capital budget. A major compromise on the operations versus budget battle was to run the system continuously. This approach allowed a smaller dryer (lower cost) that could also take advantage of the continuous nature of the digester biogas. The system would be

operated without personnel on site and monitored remotely by an on-call operator. The team was specifically interested in making the system amenable to shut-downs and delayed response, so minor issues could be dealt with in the morning if needed.

Aside from the drying technology itself, the second most critical component to this system is the dewatering. This is often the most cost-effective fraction of water removed, so cake dryness is very important for dryer sizing and operation. As mentioned above, the chosen operation is near-continuous, thus a dewatering system with near-continuous runtime was also targeted. This was not an easy decision, as each technology has pros and cons. After weeks of piloting various dewatering technologies, a high-solids belt filter press was selected. The belt press was selected primarily for its proven, slow, low-energy operation such that if it failed or needed service the staff felt comfortable making repairs. Secondly, the high solids version proved an ability to reach cake solids numbers that were better than basic belt presses, but not quite as high as a tuned centrifuge.

During the evaluation, the team identified that sufficient biogas was available to heat the slightly larger dryer when at steady state. In order to feel comfortable that the belt press was performing adequately at night, the team decided to rely on visual cameras instead of elaborate sensors. This worked since much of the final product on a belt press can be ascertained by a quick visual of the gravity table. This allows the operators to know at a glance what material is going to the drying system and how that may impact temperatures and solids handling for the coming hours. Flow rate and polymer adjustments can quickly and remotely remedy a poor dewatering situation. Providing an operator-friendly visual relationship to minor operational adjustments is lesser available on a screw press or centrifuge system. Lastly, the modern belt filter press provides isolated filtrate and wash water drains, which helps the City towards their inevitable struvite encounters and likely future nutrient control. The polymer system feeding this belt press was originally selected as a dry-polymer make-down system as it was predicted to provide long-term cost savings. After a review of the dewatering system pilot testing, however, the ideal polymer was unavailable in dry form, so the team resorted back to the familiarity of an emulsion system.



Biogas use was reviewed, as the City already burns the majority of their biogas in a cogeneration engine for heat and electricity. After assessing the cost and intangible factors, the project team selected the new digester to be interconnected with the gas-grid, and to prioritize fuel the new drying system with biogas. This resulted in a simple system to extract moisture and minor compression to fuel the dryer's dual-fuel boiler. With the high strength waste loads projected, the associated biogas mass balance is anticipated to provide an autonomous (self-heating) system for average daily solids loadings. Depending on the costs of electricity and natural gas, the City now has flexibility to preference heat-first or electric-first goals to minimize their utility costs.

The dewatered and dried product is conveyed to a storage silo capable of holding several weeks worth. This allows the hauler the ability to schedule loads and not restrict biosolids handling. Silo storage is expensive, which is why the team established final product demand certainty prior to sizing in order to minimize costs. Product off-take will be a routine weekly task that consumes

a few minutes of the day instead of a seasonal push that requires all staff and significant overtime.

Across these new solids handling train unit processes, there are numerous single point failure points. Rather than include redundant units for the entire system, only key parts (polymer feed, temperature probes, etc.) were deemed necessary to have redundant system. Consequently, the staff would have been faced with repairing an offline system quickly. This is not normally preferred, but when considering the enormous cost of a redundant solids train, the project team quickly identified a better solution. The team turned to the millions of gallons in liquid storage tanks that would now be abandoned with the dewatering and drying facility. The team developed flexibility for these two tanks to serve multiple purposes: 1) additional anaerobic digestion volume, 2) sludge storage during equipment repair, and 3) sidestream equalization.

### **Reuse of Liquid Storage Tank No. 1:**

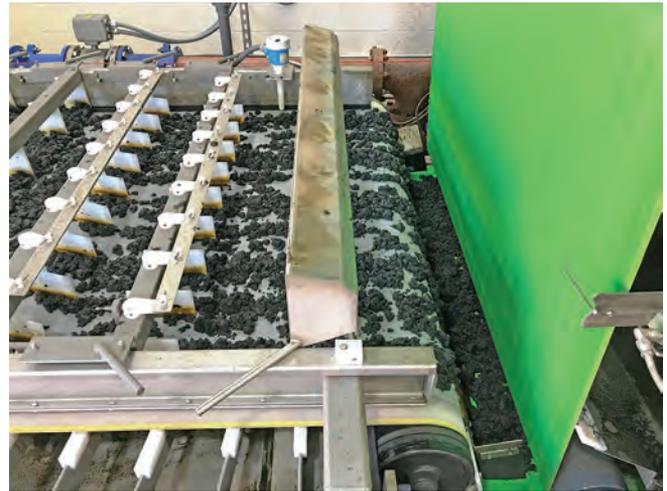
Converting the liquid storage tank to an anaerobic digester was not the team's preferred choice compared to new silo dimensioned tanks, but it made economic sense. The additional anaerobic digester volume is tremendous, making the existing digesters seem inconsequential now. The volume is much larger than if this tank were built from scratch for anaerobic digestion, which gives the City many options. In the coming months, the operators will have a nearly bottomless appetite for high strength waste and biogas production. The additional digester volume provides much needed capacity relief for the current digester tanks, now enabling units to be taken offline for cleaning. Converting this tank to a digester involves adding a 100-foot gas holding cover. This cover captures biogas that is then chilled and compressed for moisture removal and transfer to the dryer's heating system.

**Reuse of Liquid Storage Tank No. 2:**

The second liquid storage tank was reserved for digested sludge storage prior to the dewatering and drying system for up to one month of unplanned maintenance. However, when the system is operating properly, this tankage would go unused. To put this system to active use, the team plans to use the excess tankage for filtrate equalization. By diverting the nutrient-rich flowstreams, the plant is able to balance nutrient loadings headed to the biological phosphorus removal activated sludge process, facilitating optimal effluent quality. This arrangement is now pre-arranged to readily adapt towards a nutrient harvesting technology when additional nutrient removal is required.

Sustainability permeates through the new facilities, just as does the smell of dried biosolids (akin to Milorganite). The existing effluent reuse system was increased for this project and to serve a new utility garage. The treated water has residual heat that is captured and pumped through heat pumps served by a make-up air unit and a radiant in-floor heat system in the new garage. The effluent water is also reused for multiple spray systems at dewatering and drying. A key sustainability piece for the silo was identified during the site visits, wherein the team recommended to minimize nitrogen purge gas by only calling for nitrogen to smother a smoldering fire. Paired with the nitrogen system are temperature gauges – highly sensitive temperature rope sensors that monitor the entire height of the silo – which enable the City to monitor temperature changes as the product is held before distribution.

The City released a competitive RFP for businesses interested in providing the last few steps in the biosolids recycling process.



The selected entity is responsible for hauling product offsite to receive ownership of the useful fertilizer. The City reviewed each proposal and considered multiple factors, with two main focus points: 1) cost/revenue to the City, and 2) ability to improve public relations within the community. The goal is to minimize efforts by the City for land application, and prevent odors and fires such that the program is not viewed poorly if mis-handled.

The systems are fully functioning today with operational adjustments being made to maximize performance. The City is working with the Innovation and Technology Committee to plan a tour highlighting these innovative features. [CS](#)

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By Lisa Dirksen

# Reimagine Credentialing with the Professional Operator Program

Two letters after a name can have a big impact on a career – just look at the RN or PE. Those designations add a level of credibility to the professional, impact their pay scale, and show they have the knowledge necessary to perform their jobs to the best of their ability.

With the support of the American Water Works Association (AWWA) and the Water Environment Federation (WEF), the Association of Boards of Certification (ABC) recognized the need for a similar designation that gives water and wastewater operators credit where credit is due.

Operators are front line protectors of human health, either through ensuring safe drinking water or the safety of waterways through effective wastewater management. They are the lifeblood of every community and deserve a way to be showcased as professionals. And so – built by operators for operators – the Professional Operator (PO) program was born.

## Join the Community

POs are an elite group of like-minded individuals, deeply committed to serving the public and growing in the industry. Having a supportive community for sharing industry knowledge is absolutely invaluable. The designation opens doors for international networking, connects operators with opportunities to be industry advocates, and qualifies operators to attend some fun industry events along the way.

## Grow as a Professional

Becoming a certified PO signals to employers that the operator is an achiever – committed to their profession long-term and ready to go above and beyond.

“I became a Professional Operator because of the chance to test my knowledge and accelerate my career,” said Brian Faist, Professional Operator in Rivergrove, OR. “The PO designation has made me a more appealing candidate for promotion.”

Whether looking to grow within a company or trying to find a job, being a PO makes the operator stand out in a crowd.

## Ensure Accountability

The PO program is the first internationally recognized professional designation for water and wastewater operators. With the designation, peers, customers, and the public can feel confident that a Professional Operator has mastered the most rigorous standards of their vocation and industry.

“I wanted a challenge and I tackled it,” said Georginna Lockett, Professional Operator in Atlanta, GA. “Being a PO certifies me in the industry as a top-level operator and that has been my goal since I started in the field.”

All POs must also adhere to a code of conduct, which bolsters an operator’s reputation and builds additional community trust.

## Increase Mobility

Industry adopters of the PO program are continuing to grow and it’s helping to mold an expansive future for operators.

“Broad acceptance of a standard certification can make water professional credentials portable across state or country lines,” said Paul Bishop, President and CEO of ABC. “With many benefits and potential solutions also come some challenges, but industry leaders at WEF, AWWA, and ABC are up to the task.”

The PO program is a great leap toward an industry credential standard. It includes uniform and transparent credentialing that is recognizable by any employer or certification body.

## Begin Your Journey

PO certification is offered to operators in four levels (from Class I through Class IV) for water treatment, water distribution, wastewater collection, and wastewater treatment. Joining the PO movement is simple and the entire process can take as little as a few weeks.

### Step One: Create an Online Profile

The path to becoming a PO starts by creating a profile at [www.portal.abccert.org](http://www.portal.abccert.org). An operator will be asked to add information like work history and education.

### Step Two: Submit an Application

The operator submits an application and ABC reviews the operator’s profile to ensure basic criteria have been met. Applications are accepted from anywhere in the world, any day of the year.

### Step Three: The Exam

In some cases, operators may have already passed a certification exam that ABC will accept. If not, the operator will schedule a time to take an ABC certification exam. Once the exam is passed, the operator will receive a certificate, be invited to a **POWER** event to be formally recognized, and join the PO community.

For additional information, visit [www.professionalooperator.org](http://www.professionalooperator.org) or email [info@professionalooperator.org](mailto:info@professionalooperator.org) [CS](#)

The PO program is administered by the Certification Commission for Environmental Professionals (C2EP), an organization of volunteer water environment operations subject matter experts created by the Association of Boards of Certification (ABC).



Georginna Lockett, PO, from Atlanta, GA.



Brian Faist, PO, from Rivergrove, OR



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# 2019 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

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CEI Carbon Enterprises Inc.

### AMI Communications

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Sensus

### AMR

Badger Meter  
Sensus

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### Automatic Meter Reading Systems

Sensus

### Biogas Upgrading

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Force Flow

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### Contractors

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InfoSense, Inc.  
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Pump Company

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### General Industrial

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Integrated Process Solutions

### Geographic Information Systems/Screens

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Deuchler Engineering Corporation  
McMahon Associates, Inc.  
Ruekert & Mielke, Inc.

### Grit Removal

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Smith & Loveless Inc.

### Hydrants

American Flow Control

### Intake Screens

Lakeside Equipment Corporation

### Leak Detection

Sensus

### Level Instrumentation

VEGA Americas, Inc.

### Manhole Inside Drops

RELINER/Duran Inc.

### Manhole Rehab

RELINER/Duran Inc.

### Meter Reading Systems

Badger Meter

### Meters/Meter Testing

Badger Meter  
Sensus  
Starnet Technologies,  
An Electric Pump Company

### Mixing Systems

JDV Equipment Corporation

### Odor Control Solutions

Brown and Caldwell  
CEI Carbon Enterprises Inc.  
Hawkins Inc.  
Mekco Manufacturing

### Operation Services

AE2S  
Brown and Caldwell  
Environmental Dynamics International, Inc.  
Mekco Manufacturing

### Packaged Treatment Plants

Lakeside Equipment Corporation

### Pipe & Pipe Appurtenances

RELINER/Duran Inc.

### Process Mechanical

Donohue & Associates, Inc.  
Energenex  
JDV Equipment Corporation  
LW Allen, LLC  
Process Equipment Repair Services, Inc.

### Pumps/Pump Systems

AECOM  
Brown and Caldwell  
Donohue & Associates, Inc.  
Gasvoda & Associates  
Hawkins Inc.  
JDV Equipment Corporation  
LW Allen, LLC  
Ruekert & Mielke, Inc.  
Smith & Loveless Inc.  
Strand Associates, Inc.  
TKDA

### Rehab, Repair, Fabricate Equipment

Process Equipment Repair Services, Inc.

### Residuals/Waste Management

Mekco Manufacturing

### Safety Products

Force Flow

### Septage Receiving Facility/Systems

JDV Equipment Corporation  
Lakeside Equipment Corporation  
LW Allen, LLC

### Services

Energenex

### Sewer Flow Monitoring (Sanitary, Storm, and CSO)

VEGA Americas, Inc.

### Storage Tanks/Reservoir Systems

AECOM  
Pittsburg Tank & Tower Maintenance Co.  
Strand Associates, Inc.

### Survey

Bolton & Menk, Inc.  
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American Flow Control  
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### Water Quality Monitors

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### Water Treatment Chemicals

Hawkins Inc.

### Water/Wastewater Treatment Systems

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AECOM  
Brown and Caldwell  
CEI Carbon Enterprises Inc.  
Deuchler Engineering Corporation  
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Environmental Dynamics International, Inc.  
Force Flow  
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Hawkins Inc.  
Integrated Process Solutions  
JDV Equipment Corporation  
Lakeside Equipment Corporation  
LW Allen, LLC  
McMahon Associates, Inc.  
Mekco Manufacturing  
Process Equipment Repair Services, Inc.  
Ruekert & Mielke, Inc.  
Smith & Loveless Inc.  
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An Electric Pump Company  
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TKDA



The banner features the TKDA logo on the left, which consists of a stylized 'T' and 'K' in red and grey above the letters 'TKDA' in red. To the right of the logo is a large, dynamic splash of blue water. Below the logo, the text 'Water/Wastewater Supply, Treatment, Reclamation, Reuse Solutions' is displayed in a bold, dark blue font. On the right side of the banner, there are two smaller images: the top one shows an industrial facility with a large blue building and green equipment, and the bottom one shows a large, cylindrical, light-colored storage tank or reservoir situated in a green, landscaped area.

# LISTINGS BY COMPANY NAME



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marketing@strand.com  
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**Unison Solutions, Inc.**

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## CALL FOR ABSTRACTS

# 93rd ANNUAL MEETING 2020 CSWEA ANNUAL MEETING

ST. PAUL RIVERCENTRE – ST. PAUL, MN  
MAY 18-20, 2020

This is a request for abstracts of papers to be considered for presentation at the 93rd Annual Meeting of the Central States Water Environment Association, Inc., which will be held May 18-20, 2020 at the St. Paul RiverCentre, St. Paul, MN. To receive consideration, abstracts must be submitted online by **November 1, 2019**.

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, 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](http://www.cswea.org) and then to the 93rd 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.

### Emma Larson

Chair, Technical Program Committee  
St. Cloud Public Utilities  
Phone: 320-255-7225  
[emma.larson@ci.stcloud.mn.us](mailto:emma.larson@ci.stcloud.mn.us)

## 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](http://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. [CS](#)

Abstracts are due by  
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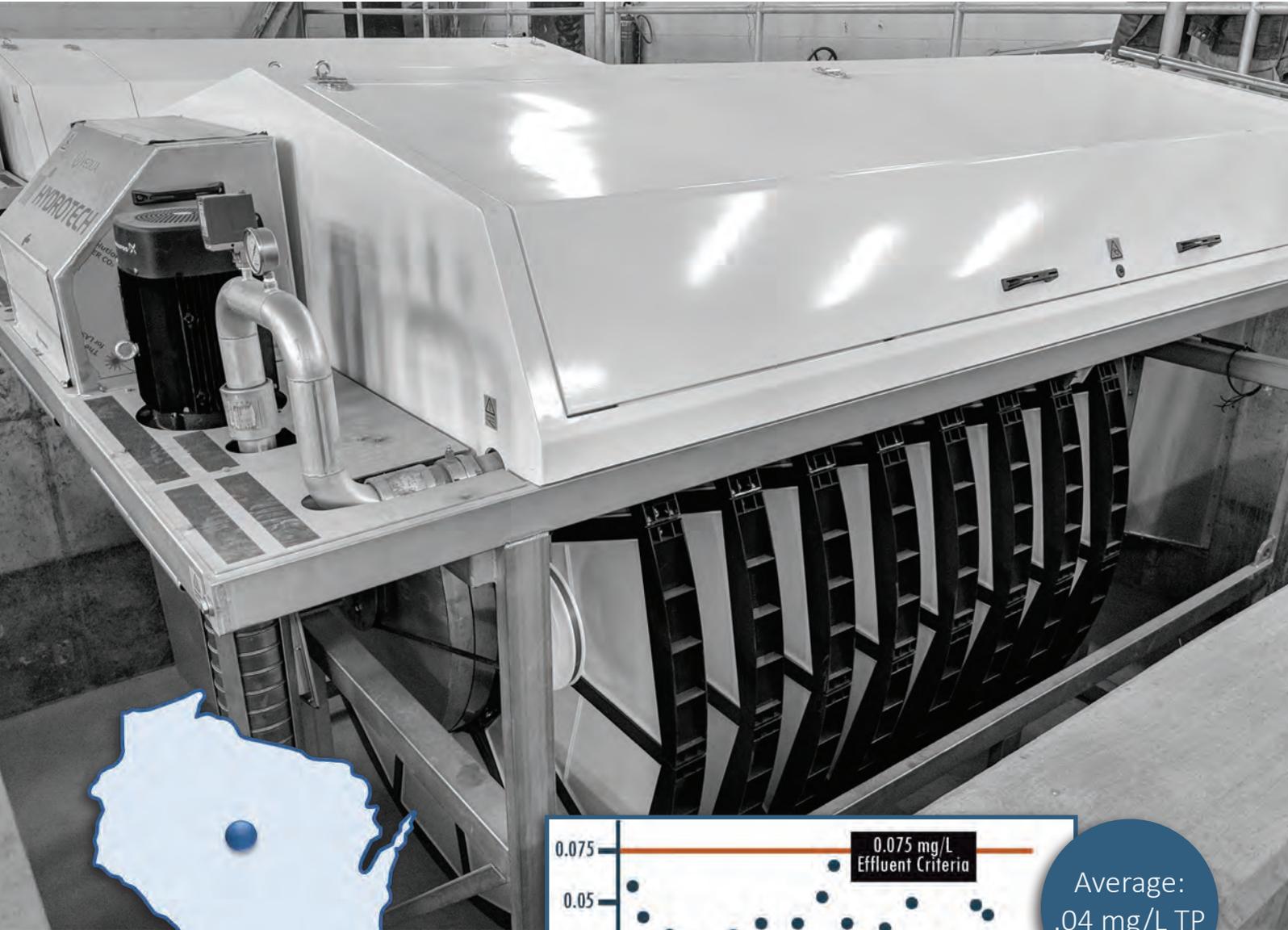
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