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“Commitment unlocks the doors of imagination, allows vision, and gives us the right stuff to turn our dream into reality.”
– James Womack

When I think of the outstanding work of this organization, I think of the word commitment. Our commitment to NC AWWA-WEA is what fuels our efforts to fulfill the mission of our organization. We are part of an organization that is over 90 years old and it will take our commitment to keep this organization relevant for the next 90 years. The story of NC AWWA-WEA is one of commitment. By forming NC AWWA-WEA as a joint organization representing water from the American Water Works Association side, and wastewater on the Water Environment Federation side, our forefathers proved to be true visionaries. The charter members of NC AWWA-WEA realized early on that there is only “one water,” and to advance the needs of its membership required commitment and collaboration, not separation of water and wastewater. So, on the shoulders of our founders, we are committed to providing water and wastewater education, training, and service in an effort to protect public health and the environment.

At this juncture, I gladly report that I am very proud of the work we have accomplished thus far. The level of excitement is very contagious and reflective of the commitment we all have to advancing the mission of our organization. In addition to our strategic plan initiatives, our 2017 focus areas are member engagement, board engagement, and the Academy for Water Professional Development (Academy). We are progressing nicely on all three fronts.

Our year began with a unique “virtual” board orientation that was held via video conferencing rather than at a designated location. Eliminating travel meant a smaller time commitment and less disruption to schedules. This very effective “virtual” method will be used more extensively in the future.

In January, a council/committee chair workshop was held in Greensboro. The workshop was moved up from May in order to allow everyone to exchange ideas early and recalibrate goals. This gives the council chairs time to work with their committee chairs and provide tools for success. This workshop was very successful and the commitment of everyone was evident to all who attended.

At the March board meeting, the board of trustees was presented with audit results. Our organization is audited annually. All expenditures are reviewed and the internal tracking process is evaluated. I am pleased to report that NC AWWA-WEA is fiscally sound and that
our staff practices good internal controls when handling organization funds. In other words, we are committed to a fiscally strong organization.

Also, we are committed to having an organization with engaged board members. Our board members are present at board meetings and are actively engaging in the affairs of our organization. Social media is used to show the membership our engagement and the importance we place on leading our organization.

The Membership Engagement Committee has been working on an improved on-boarding process. Their objective is to engage new members quickly and facilitate committee contact within the first few months of membership. Likewise, a new document is being created that will set the framework for on-boarding, ensuring a high level of commitment to our organization well into the future.

The Academy is a great example of our members’ commitment, requiring the patience, support, effort, and collaboration of our committees and membership. This year the committees and staff have made many enhancements, including working with a local community college to deliver a three-hour public speaking course in July, and enlisting the assistance of committees to develop and review curriculum. It’s great to see our membership rally around this effort.

Hopefully, the above narrative shows that NC AWWA-WEA is an organization worth your time, effort, and commitment. We live in a society where time is short, and is the most valuable asset many of us have. Your commitment to our organization is essential to continuing the mission that was started over 90 years ago. With talented volunteers and capable staff, we can accomplish anything our collective minds and efforts want to achieve. We aim to continue to be the best provider of water/wastewater training and education in North Carolina because our collective will demand nothing less! Thanks to everyone for the outstanding work thus far. As chair of this organization, I am proud to work in water, I am proud to be a water industry professional, and, like you, I am proud to be committed to the NC AWWA-WEA.
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Auto Pilot Disabled
Catrice R. Jones, CAE, Executive Director

Often times, when you are extremely busy, you go into autopilot mode – moving routinely from one task to the next, without giving your actions conscious thought. On an individual level this may be a coping mechanism that can get you through a rough patch; however, for an organization, autopilot is not a good way to operate. When organizations are on autopilot, they are not focused on making improvements, being innovative, and remaining relevant. They risk being left behind as their industry and society undergo constant change.

I feel fortunate to say that NC AWWA-WEA’s leadership has been wise and has avoided shifting to autopilot. Remaining in a manual and active navigation mode allows us to have a renewed focus on being a relevant and innovative industry resource.

Over the past couple years, the most notable area of innovation for our organization has centered on changes to our training programs. Input from utility leaders proved that in order to meet the current and future training needs, our training model needed to be more nimble. We discovered that we could not continue to deliver training on the basis of “that’s the way we always did it.” Growing and sustaining our organization required an evolution in our approach to educating industry professionals. The Academy for Water Professional Development (Academy) has been the most noticeable evidence of our disengaging the autopilot and navigating a new course. The development and delivery of the Academy curriculum is an ongoing process.

Member and board engagement are also initiatives that the board of trustees’ has set as focus areas for 2017. As a result, we have been implementing new processes and introducing new ideas. Some of these include:

- Improved training resources for volunteers
- Development of fresh ideas for the 2017 Annual Conference
- Increased use of social media

As Chair Angela Lee mentioned in her article, we delivered our Board Orientation virtually and moved the timing of our Committee Chair Training Workshop. For both of these trainings, the training material and resources were revamped to better equip our leaders for their tenures. This included:

- Updated training manuals with a broader view of the history, purpose, and structure of the organization.
- Contact/resource lists of individuals and groups within and outside the organization that can provide assistance.
- Compiled committee documents (e.g., budgets, work plans, roles/responsibilities, and succession plans) for them to reference during their terms.
Chair Angela Lee’s article also mentioned some other ways we are working on engagement, including a focus on improving our Annual Conference. Each year the committees in the Conference Coordinating Council start planning for the next conference as soon as one ends. This year we took a different approach to this planning process by not just making plans for what we normally do, but also taking a step back to see what we can do to make improvements and get attendees more engaged. Some of the ideas that committees and staff have been collaborating on include creating a unique look for the Exhibit Hall, launching new activities to add excitement, and making some changes to normal conference activities. Be sure to keep a watch on our website as ideas continue to develop.

We have also been focusing on increasing our social media footprint and use of technology. In this day and age, technology and social media have replaced the more traditional methods of communication (e.g., mail, fax, phone). Although these other forms of communication should never go away, as an organization we have to remain nimble enough to stay relevant for the next generation. As such, NC AWWA-WEA has taken increased efforts to stay on top of different platforms (e.g., Facebook, LinkedIn, Twitter). In order to accomplish these goals, staff have been working with volunteers to use these mediums not only to advertise, but also to provide information and resources that are useful to industry professionals. We have also started using video messaging. Chair Angela Lee has recorded videos that welcome new members, invite attendees to events, and extend holiday greetings.

What I have outlined here are just a few of the changes we have made so far in 2017 to continue in our active navigation mode of making focused improvements, and remaining innovative and relevant. To see where this “plane” is heading, keep an eye on our website and our eNews emails for updates on other exciting things happening at NC AWWA-WEA.

As NC AWWA-WEA as an organization chooses to actively disengage autopilot and focus our course on our strategic direction, you can do the same as an industry professional and member. Invite someone to “board the flight” by becoming a member. Membership information can be found on our website using the following link: http://www.ncsafewater.org/page/MembershipJoin.

If you are already a member and want to take a more active role by joining our “flight crew,” search “volunteer opportunities” on our website at www.ncsafewater.org/volunteer or contact committee chairs for committees that are of interest to you at www.ncsafewater.org/committees.

Make sure you have your “boarding pass” and don’t get left behind! We would be honored to have you as a passenger or as a part of our flight crew!

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<th>Committee</th>
<th>Chair</th>
<th>Phone</th>
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<tbody>
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**Annual Conference Coordinating Council**

<table>
<thead>
<tr>
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<th>Name</th>
<th>Phone</th>
<th>Email</th>
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</thead>
<tbody>
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<tbody>
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<tr>
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Water Resources Committee: Making Connections

This spring, the Water Resources Committee was busy pulling together speakers on the importance of land management to the protection of water quality for an upcoming Committee meeting. The connection between land and water is one of many linkages members explore during seminars, face-to-face meetings, and conference calls throughout the year. “We’re interested in the relationship between the various sectors of the water industry,” explains Water Resources Committee Chair Ruth Rouse. “Ours is a more holistic look at water resources.”

The water resources industry is very diverse, broaching subjects ranging from conservation, flood control and stormwater management to drinking water, wastewater treatment, and water reuse. The committee explores these topics against a backdrop of tightening budgets, limited resources, expanding regulatory requirements, and ever-changing environmental conditions due to climate change.

In fact, climate change was the focus of a four-part session organized by the committee for the NC AWWA-WEA Annual Conference last fall. The first part featured a presentation from the State Climate Office on the state of climate research and available data from their office. The second part featured a speaker from the University of North Carolina’s Water Resources Research Institute, linking the latest research on climate change with utility-specific insights. In the third segment, a graduate student working with the Orange Water and Sewer Authority (OWASA) discussed the potential implications of climate change for water supply planning. The presentation was followed by a talk that focused on climate resiliency planning for coastal communities in North Carolina.

“We all need to be proactively preparing for the future,” notes Rouse, adding that the committee is interested in organizing a similar forward-looking session on a different topic for the 2017 NC AWWA-WEA Annual Conference this November.

As a forum for bringing experts together to share knowledge and ideas on how best to address North Carolina’s water resource challenges, the Water Resources Committee has attracted a wide variety of water industry professionals. About half of the committee’s 30 members are utility employees while the other half comes from the private sector.

“The water resources industry is very diverse, broaching subjects ranging from conservation, flood control and stormwater management to drinking water, wastewater treatment, and water reuse.”

Rouse, who works at OWASA, considers herself a water resource generalist. “I have expertise with water quality and water resources and I’ve dabbled in other related topics,” she says. “Being involved with the committee has been a way for me to get connected with specialists in other areas. It’s a way for me to keep my knowledge and ideas fresh.”

This is her second time on the Water Resources Committee, which was revived in 2016 by Leila Goodwin after several years of inactivity. Rouse recalls that the committee formerly played an active role in developing the agenda for the Confluence Conference, jointly organized by North Carolina, South Carolina, and Georgia sections of the AWWA. This year, the Water Resources Committee will again be playing an active role in shaping the topics and finding speakers. “We share many of the same issues,” says Rouse. “This is an opportunity to expand connections and engage in networking.”

The goals of the committee also include networking with other organizations, such as the North Carolina Water Resources Association (NCWRA), North Carolina American Public Works Association (NCAPWA), North Carolina Water Quality Association (NCWQA), North Carolina Department of Environment and Natural Resources (NCDENR)/Division of Water Resources (DWR) and the Stormwater Association of North Carolina (SWANC) as well as other committees of the NC AWWA-WEA. “We are a good bridge between other committees,” says Rouse, adding that members offer a valuable perspective that combines science and policy.

The Seminars Committee recently reached out to the Water Resources Committee for assistance in putting together June’s day-long seminar on emerging issues in the wastewater sector, including an afternoon panel discussion on reclaimed water. The committee identified university researchers with expertise in water reclamation and public health for the panel discussion. An attorney was also invited to provide insight on legal constraints.

Throughout the year, the Water Resources Committee also hopes to hold at least two of its own panel discussions as part of its committee meeting agendas, to be held in various locations throughout the state. “There’s an opportunity for someone to take ownership of those particular meetings,” notes Rouse. She points out that the events will be linked by webinar for those who cannot attend in person.

The goal is to meet at least four to six times a year either in person or by conference call. New members are welcome to join at any time. “I would like to encourage people to check us out on the NC AWWA-WEA website and attend our session at the conference to see what we’re all about,” says Rouse. “Please feel free to contact me to reach out.”

Ruth Rouse can be reached at (919) 537-4214 or rrouse@owasa.org.
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John Dodson always knew he did not want a desk job. “I wanted something where I could be outside,” said the Wastewater Superintendent for the City of Durham. “I toured a wastewater plant before I entered college and decided this is what I wanted to do. It was a good mix of indoor and outdoor work. I could feel like I was making a difference and it was a good, stable career.”

Dodson’s career started at the City of Durham. In 1998, after graduating from Pennsylvania State University with a Bachelor’s of Science in Environmental Resource Management, he accepted a position as a plant operator at the North Durham Water Reclamation Facility.

Not long after starting as an operator, Dodson became actively involved with the NC AWWA-WEA’s Wastewater Schools Committee, teaching at the annual Biological Wastewater Operators and Physical/Chemical Operators Schools. He has continued ever since. “I really enjoy teaching and networking with other folks in the business,” he says. “I’ve had the opportunity to meet a lot of great people at different conferences and seminars. My experience with the NC AWWA-WEA has really helped me advance in my career.”

One such opportunity for advancement arrived in 2004. After a brief stint as the reclaimed water coordinator for the Town of Cary, Dodson became the plant manager at the City of Greensboro’s T.Z. Osborne Wastewater Treatment Plant, a facility with the capacity to treat 40 million gallons per day.

Two years later, the City of Durham came calling. It was clear they wanted him back, this time for the role of Superintendent. But that did not mean that Dodson would be spending all his time behind a desk. A true hands-on leader, he serves as the Operator in Responsible Charge (ORC) for the National Pollutant Discharge Elimination System (NPDES) permit as well as the land application permit.

He also supervises a staff of 16 operators and mechanics, overseeing the day-to-day operations. Dodson is also responsible for managing the operations and maintenance budget.

Although he enjoys his work with compliance, he admits that it can also be quite challenging. “Compliance is totally dependent on the biology in the plant and what comes down the pipe,” says Dodson. “It’s something different every day.”

As for being outdoors, there are plenty of opportunities for that as well. He still remembers his first experience seeing both the inside and outside of a plant, and it’s something he wants to share. “I really enjoy giving tours, whether it’s for kids or adults,” he explains. “I love talking about what we do and how we do it.”

Dodson knows it’s important to prepare the next generation to step in and assume responsibility for keeping water and the environment safe. It is one of the reasons that he continues to teach at the wastewater schools and give tours of the plant.

Dodson realizes that he won’t be working forever. After finishing his career with Durham, he and his wife plan to retire in the mountains, either in North Carolina or in Pennsylvania. Until then, he looks forward to continuing his work as a superintendent, keeping the plant running smoothly, both inside and out.
From his time as a student at North Carolina State University (NCSU) to his current role as a civil engineer-in-training at Black & Veatch, Derek Dussek has always been devoted to helping others. He has embraced every opportunity to become involved in projects, events, and groups where he could contribute to making a difference.

Coupled with a passion for learning, it was this innate need to serve that first propelled him into Student Government as a Senator for the College of Natural Resources during his freshman year at NCSU. At the time, Dussek was enrolled in Forest Management, a program that also afforded him the opportunity to spend a month in South Africa as part of an international study program.

Then, in his sophomore year, he decided to head in a different direction. “I asked myself what kind of career could I have in which I could help a lot of people,” recalls Dussek. “I chose civil engineering, with a focus on water because it’s something all of us need on a daily basis.” With this new career path, he could help the environment as well.

Not long after switching his field of study, he decided to join the NCSU chapter of the American Society of Civil Engineers (ASCE), serving as president in his senior year. During his involvement with ASCE, he and the other students hosted presenters, organized events, and constructed both a concrete canoe as well as a bridge for their local student chapter competition. “One of the best parts was getting to learn how to interact with volunteers and communicate effectively,” notes Dussek, “including how to encourage them to stay involved and see the benefits of volunteering.”

It was obvious he was speaking from personal experience. While he was with ASCE, he was also serving on the Engineers Council as the representative for the Department of Civil, Construction, and Environmental Engineering. He also served on the Councils for both Wood and Lee Halls while he was in residence.

Even his part-time jobs revolved around helping. One year he worked as a resident advisor, facilitating programs to help build the community in the residence where he was living. The following year, he tutored students in math, physics, and civil engineering courses.

Once he graduated from college and started working in the water and wastewater industry, he became involved with the NC AWWA-WEA. After attending the Annual Conference, he assumed responsibility for the Raleigh Section of the Students & Young Professional Committee. Having co-committee chairs that divided responsibility for Charlotte area and Raleigh-area activities made it easy to reach out to a larger number of people and get them involved. “We had the opportunity to build the committee in
the direction we wanted while working with each other at the same time,” he explains.

Dussek also made the effort to sit in on various NC AWWA-WEA committee meetings by conference call to see what other opportunities he might be interested in pursuing. Today he volunteers on the Seminars and Workshops Committee, the Public Education Committee, the Membership Services Committee, and the Leadership Development Program.

“I really enjoy it,” says Dussek. “Volunteering allows me to meet new people and learn something new about our industry.”

By participating in the first class developed for the Leadership Development Program, he was able to play a role in shaping how the program would evolve. Meanwhile, his work on the Seminars and Workshop Committee has involved finding speakers for different presentation topics geared towards the seminar theme.

“The one that I’ve helped most with is contemporary topics in construction,” he notes. “I do that annually and, depending on where the conference is located, we try to cater our presentations to reach out to the expected audience.”

As a member of the Public Education Committee, Dussek has helped out with the Model Water Tower Competition. In 2016, he also volunteered with a local after school program, preparing the students to compete. “They did really well,” he recalls. “It’s really fun. At the same time, it’s wonderful to see the kids learn and apply engineering skills to complete their project.”

He has also helped with judging at the North Carolina Science and Engineering Fair for elementary, middle, and high school students. The Public Education Committee gives out special awards for water-related projects. “It helps the students become aware of our industry, while giving them the opportunity to talk about something they’ve spent the last couple of months working on,” says Dussek. “It’s fun to see that they are excited about it and have learned something. We ask them different questions about their project and encourage them to take their projects to the next level.”

Over the years, he has encouraged a number of people from other companies to help as volunteer judges.

Dussek feels fortunate to have worked for companies that have been very supportive of his involvement with professional associations and activities. “One of the things that has allowed me to do everything is receiving support from leadership,” he confirms.

His first position after graduation was with HDR, the same company where he had completed two internships during his studies. Then in December 2016, he started at Black & Veatch.

To date, his career has revolved around water treatment facility process analysis, design, and construction administration. On a daily basis, he applies his engineering knowledge to address issues related to water treatment, wastewater treatment, and everything in between, while managing client, consultant, and contractor relationships. “I’ve had the opportunity to work on multiple projects that have provided me with a strong platform of experience to walk on moving forward in my career,” notes Dussek. “One of the things I enjoy the most about my work is that I get to learn something new every day.”

After having spent many hours over the past few months studying to take and pass the PE exam, Dussek will once again have more time to devote to volunteering. There is no question that he will make ample use of every available minute!
**Plant Spotlight:**  
West Brunswick Regional Wastewater Treatment Facility

By Donald Dixon, Wastewater Superintendent, County of Brunswick Public Utilities  
Edited by John Rutledge, Smart Cover Systems, on behalf of the NC AWWA-WEA  
Plant Operations & Maintenance Committee

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**General**  
Located along the coastal portion of the state, Brunswick County borders the Cape Fear River to the east and South Carolina to the southwest. It has a population of approximately 123,000 people and is the fourth largest county in NC by geographic area. The Cape Fear River and its offshoot, the Brunswick River, provide access to the Atlantic Ocean.

Brunswick County operates six wastewater treatment facilities (WWTF), the largest being the West Brunswick Regional WWTF, which is a 6.0 mgd non-discharge facility. The facility was placed into service in 2006 as a regional facility to serve Brunswick County, Oak Island, Holden Beach and Shallotte. Additionally it treats flow from Southport and Ocean Isle Beach. The facility was originally permitted for 3.0 mgd, but with the unprecedented growth in the area, it was expanded to 6.0 mgd in 2009.

There are 54 lift stations associated with the West Brunswick WWTF. The collection system is comprised of low-pressure sewer, vacuum, and some gravity filters. The facility receives flow from as far as 25 miles away.

**Operations**  
The West Brunswick Regional WWTF serves a population of approximately 55,000, but due to the geographic region, it can see high tourist-driven flows in the summer months. The wintertime flow averages approximately 2.6-2.8 mgd. Summertime flows average 3.6-3.8 mgd, with a maximum daily rate of over 7 mgd (storm-related event). The facility’s annual operating budget is approximately $3 million and includes both the WWTF and all dispersal sites (discussed below).

The key treatment processes include:
1. Equalization basins  
2. Parkson bar screens  
3. Grit removal systems  
4. Lakeside Equipment oxidation ditches – 1.5 mgd each  
5. US Filter TowBro clarifiers  
6. Kruger tertiary disc filter systems  
7. Reuse pump station consisting of 6 pumps ranging from 100 to 150 HP  
8. Lakeside Equipment septage receiving station

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**Oxidation ditches**

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**Reuse pump station**
Solids Handling
The solids handling process consists of two gravity belt thickeners followed by four auto-thermal thermophilic aerobic digestion (ATAD) reactors (Thermal Process Systems) and an ATAD storage tank. The facility is permitted for up to 500 dry tons per year of biosolids disposal. Brunswick County administers its own land application program and contracts with Bio-Green to handle all sludge hauling and disposal of biosolids from the facility. The plant produces a Class A product that is provided to local farmers for fertilization.

SCADA
The entire facility is automated using a programmable logic controller (PLC)-based control system. The system is based around Schneider Electric Quantum and Momentum PLCs. The monitoring is based on Citect HMI Graphics. The department (encompassing both sewer and water) has an extensive SCADA system that requires a full-time SCADA programmer.

Disinfection
The disinfection system feeds sodium hypochlorite into the reuse water to maintain the required residual prior to the dispersal field. The system utilizes Blue-White feed pumps. All discharge points are sampled and tested periodically to verify that the correct residual is maintained.

Reuse Water Dispersal
1. Drip Irrigation – 1.722 MG, 497.32 acres of dedicated drip irrigation, 99 million gallons of wet weather storage. This equates to over 1 million feet of drip irrigation tubing!
3. Golf Course Irrigation – 1.746 MG, 252 acres (2 sites – St James and Winding River) 16 MG of storage at the combined sites.

The WWTF has a huge system dispersed across five different disposal sites, a total of approximately 840 acres. The reclaimed water infrastructure ranges from 2-inch to 24-inch “purple pipe” and pumps capable of up to 3,300 gpm. There are 17 different pumps associated with conveying the reclaimed water throughout the system and over 25 miles of dedicated reclaimed water discharge piping. Geographically, it takes over two hours to go site to site for daily checks – excluding the golf course options.

Personnel
The facility operates with nine full-time employees and four proportional employees – maintenance mechanics/lab personnel shared with other facilities.
The staff is proud of the fact that they have six full-time day and shift operations staff, four Grade IV WW operator certifications, one Grade II operator license and one trainee. Several staff members also have spray irrigation and land application certifications. In addition, the maintenance staff also hold spray irrigation and maintenance mechanic certifications. This is made possible through the Career Ladder program, which encourages staff development.

**Awards**
The West Brunswick Regional facility received the 2008 Pisces Award from the Clean Water State Revolving Fund (SRF) for innovative and effective use of SRF financing mechanisms.

**Safety**
The safety of the employees is something the staff takes very seriously. They are continually looking for innovative ideas and ways to improve on the overall safety program. They are very proud of the fact that they have not had a lost-time accident in the history of this facility. The weekly tailgate meetings cover a broad spectrum of safety-related topics; the monthly meetings further enforce with a safety topic. The staff has quarterly department-wide safety meetings that encourage participation in “safety challenges” that test employees’ overall safety and procedural knowledge.

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Duke University Pond – Improving the Bottom Line 54
By the year 2050, the United Nations (UN) projects the earth will be inhabited by nearly 9.7 billion people. As the world's population continues to increase, so too will the demand of fresh water for production, industry, and domestic use. One of the issues we will undoubtedly face in the coming years is making sure that everyone, everywhere, has access to fresh water because all populations need it to survive and prosper. According to the UN, the world's water systems face formidable threats with approximately a billion people living in water-scarce regions. As many as 3.5 billion individuals could experience water scarcity by 2025. Development, population growth, and aging infrastructure are major contributors to pollutants in fresh water and coastal aquatic ecosystems. However, through evolving technology, creative ideas, and hard work, the future of water availability for an increased population is attainable. Long-term, sustainable conservation methods could include potable water reuse, reclaimed water, and rainwater harvesting. These new technologies, along with social acceptance and individual commitment to conservation, can benefit generations for years to come.

About 71% of the earth's surface is covered in water, with oceans holding 96.5%. However, just 2.5% of the world's water is fresh water, and less than 1% of that is accessible – primarily through rivers, lakes, reservoirs, and underground aquifers. With such a relatively small amount available, water reuse technology is vital to sustainable water management. Sustainable water management allows water to remain in the environment and be preserved for future uses while meeting requirements of current local, state, and federal regulations. The energy required for capturing, treating, and distributing water – plus the water required to produce energy– are intricately connected. According to the US Geological Survey (USGS), in 2010, thermoelectric power accounted for 51% of the total fresh surface-water withdrawals in the US. Almost 90% of electricity in the US is produced with thermally driven, water-cooled energy conversion cycles, with most of the power plants withdrawing a tremendous amount of water, but only a small percentage being evaporated. Irrigation, according to the USGS, is the other major component of total fresh-water withdrawals, accounting for an additional 29%. With a population that is consistently growing, reducing the amount of water that is withdrawn and used for power consumption and irrigation is key to successful, long-term water conservation efforts.

One of many viable options for these conservation efforts is reclaimed water. Typically recognized today by purple pipe, reclaimed water is a sub-set of water reuse: highly treated wastewater from a municipal wastewater treatment system that can be used for beneficial purposes. Here in North Carolina, the North Carolina Division of Water Quality Water Resources, Water Quality Permitting Section allocates permits to facilities that produce reclaimed water. In 2001, the Town of Cary became the first municipality in the state to pump reclaimed water to several hundred homes and businesses for non-potable uses, such as manufacturing processes and industrial cooling. Through the use of reclaimed water, the Town of Cary has seen many benefits to its water use index. Due to the fact that more residents and community members are using reclaimed water for recreational and irrigation purposes, the water facility has seen a reduction in its maximum daily load, resulting in lower water bills for residents.

From a social acceptance standpoint, reusing treated wastewater for industrial and irrigation purposes is widely accepted. Conversely, reusing highly-treated wastewater and converting it back to potable standards for direct use is not. Direct potable reuse (DPR) is the process of treating wastewater to meet drinkable water standards, then returning it to the raw water supply without the use of an environmental buffer (i.e., discharging it back into an aquifer or reservoir). The treated water is then distributed immediately.
upstream of a drinking water treatment plant, or directly into the potable water distribution system. DPR systems provide an alternative for areas that have poor groundwater quality or do not have a reliable surface water supply. In Parker, Colorado, where groundwater levels in the Denver Basin aquifer have been steadily declining, a water purification system – the nation’s first large-scale water treatment system of its kind – has been designed to treat a combination of local surface water, alluvial water, and water recycled from wastewater for potable water distribution. There is also a DPR system in Windhoek, Namibia, where highly treated, recycled water is put into a drinking water system that serves 250,000 people. Despite proof that treated water meets standards for consumption, US communities have been slow and somewhat resistant to adapt DPR as a viable option. As future needs come into play, DPR can be a solution to water demands.

One of the more socially acceptable water conservation techniques is rainwater harvesting. In 2009, the North Carolina legislature passed State Law 243, which prevents any state, county, local building code, or regulation from prohibiting the use of cisterns for rainwater harvesting. Due to the passing of this law, the use of rainwater in homes can conserve millions of gallons and cut water bills for homes and businesses. With much of the population growth trending towards urban areas, especially here in North Carolina, rooftop rainwater harvesting has become a common technique of rainwater harvesting for domestic consumption. The process of rainwater harvesting typically involves rainwater being collected on the roof and transported by gutters to a storage reservoir or cistern where it is either used for groundwater recharge or provides water at the point of consumption. Rainwater harvesting can supplement water sources when they become scarce or are of low quality, such as polluted surface water. It can also reduce the speed and volume of stormwater runoff that can harm water quality by picking up contaminants over various surfaces. It is, however, important to note that rainwater quality may be affected by air pollution, animal droppings, insects, and dirt. Regular cleaning, as well as treatment before water consumption, are important in maintaining a proper rainwater harvesting system.

Investments in infrastructure are just as important as the aforementioned water conservation techniques. The American Society of Civil Engineers (ASCE) recently assigned the US a grade “D” ranking in its 2017 Infrastructure Report Card for Drinking Water. The report cites that approximately six billion gallons of treated water are lost every day, mostly due to water main leaks and breaks, and old pipelines that have not been replaced since the early to mid-20th century. As highlighted in recent events surrounding the water crisis in Flint, Michigan, refusing to invest time and money for clean drinking water infrastructure can have serious consequences, cost the government and individuals millions of dollars, and have lasting, negative impacts on citizens.

“As highlighted in recent events surrounding the water crisis in Flint, Michigan, refusing to invest time and money for clean drinking water infrastructure can have serious consequences, cost the government and individuals millions of dollars, and have lasting, negative impacts on citizens.”

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Save Water NC: http://www.savewaternc.org/waterreuse.php?from=bus
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ABOUT THE AUTHOR

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Meeting Nutrient Limits.

While some watersheds in North Carolina have just begun to implement nutrient limits, others already have some of the strictest in the nation.

Hazen and Sawyer has helped utilities of all sizes cost-effectively meet these strict limits, providing designs that reliably outperform the requirements.

If you are trusted to protect public health and the environment, we can help.
Water reuse is increasingly being considered as part of an integrated water resources approach to meeting water supply, resiliency, regulatory, and environmental drivers in areas throughout the country. In North Carolina, more than 40 municipal utilities are permitted to produce reclaimed water for beneficial uses. In the Triangle area, Cary, Raleigh, Durham County, Orange Water and Sewer Authority (OWASA), and Holly Springs all have active water reuse distribution programs that supply reclaimed water to residential, commercial, industrial, municipal, or university facilities for irrigation, cooling towers, industrial uses, toilet flushing, or other non-potable uses. Of these programs, the Town of Cary was the first municipality in the state to deliver reclaimed water for non-potable uses to homes and businesses, and\textcopyright\textsuperscript{32}\textsuperscript{33}\textsuperscript{33}remains one of the largest such systems statewide.

Drivers and Program Implementation
The Town began operating its reclaimed water system in 2001, with several hundred customers in target service areas identified through an analysis of high irrigation demands and proximity to the Town’s two water reclamation facilities (WRF).

The drivers for initially implementing water reuse still serve as goals for the reclaimed water system as it grows and expands with the Town’s population:

- Reducing the peak demands on the potable water system to decrease or defer water treatment plant (WTP) expansion;
- Reducing wastewater treatment plant (WWTP) discharge and nutrient loads into receiving waters;
- Assisting the Town’s efforts to reduce per capita potable water use; and
- Reducing interbasin transfer.

The use and expansion of the reclaimed water system is encouraged through the reclaimed water rates and policies for new development. Reclaimed water customers are also exempt from the Town’s year-round alternate day watering restrictions.

The per gallon reclaimed water rates are currently set at approximately 70% of the Tier 1 non-residential potable water rate and approximately 30 to 60% of the potable irrigation rates, regardless of volume of reclaimed water used. Therefore, reclaimed water represents a significant savings over the potable rates. In addition to reclaimed water sold through the Town’s reclaimed water distribution system, bulk reclaimed water is provided from fill stations at the WRFs at no charge to approved customers who take at least 250 gallons at a time and complete a training course.

The Town also implemented a policy to ensure the continued orderly expansion and effective utilization of the reclaimed water system. This policy defines reclaimed water service areas (Figure 1). For new development occurring within those service areas, developers are required to extend the reclaimed water system to the development and to install reclaimed water facilities for irrigation and other potential non-potable plumbing use within the property to the maximum extent possible. If reclaimed water is not available to the site at the time of development, the facilities may be temporarily supplied with potable water until reclaimed water is available, at which time they will be converted to the reclaimed system.

System Growth and Demands
The reclaimed water system was initially implemented within two service areas: 1) the “North” service area, which currently includes approximately 12.5 miles of reclaimed water pipeline from the North Cary WRF to provide irrigation and cooling water for commercial customers and lawn irrigation for single- and multi-family homes, and 2) the “South” service area which currently includes approximately 4.6 miles of reclaimed water pipeline from the South Cary WRF to provide irrigation for residential areas, irrigation of recreational areas, and toilet flushing at a Town-owned park. Both WRFs provide tertiary wastewater treatment and ultraviolet disinfection, along with reclaimed...
customers in the Wake County portion of Research Triangle Park and the Town’s Thomas Brooks Park, site of the USA Baseball National Training Center, as well as new subdivisions and developing portions of northwestern Cary. The West service area includes approximately 24 additional miles of reclaimed water pipeline.

Incremental system expansions have worked well and allow utility operations to adjust to changing conditions. Since the system inception, the total reclaimed water distributed within the service areas increased 120%, from 150 to 331 MG annually. In 2016, the peak day demand for the combined service areas was 2.0 MG. Although the cooling tower customers in the North and West service areas account for only a handful of the Town’s more than 830 reclaimed water customers, their demand accounted for approximately 13% of the total 2016 customer demand on the system (Figure 2). In addition, cooling towers tend to have a more constant demand pattern throughout the day, making them desirable customers both in terms of water quantity and consistency of demand. Reclaimed water used for irrigation drives the significant seasonal and hourly fluctuations seen in the system (Figure 3). The other major components of overall reclaimed water demand are WRF usage and blowoffs.

During winter, customer demands on the system remain low, typically only for cooling tower customers. Each February, the Town uses this low-demand period to conduct a reclaimed water “holiday” when all reclaimed water systems are temporarily shut down. The holiday allows staff to perform maintenance at both the WRF, as well as the distribution system. Maintenance items include inspection, cleaning, and repair, as necessary. The annual holiday is usually performed over 10 days, assuming no significant repair issues arise during the system inspection. Customers normally using reclaimed water for cooling towers are switched over to a potable water supply during the reclaimed water holiday.

**Figure 2.** Reclaimed water uses in 2016 by percent of total system demand (excludes blowoffs and non-metered usage).

**Figure 3.** Monthly reclaimed water supplied to the distribution systems 2014 through 2016 (excluding plant uses and bulk sales at WRF).
Challenges and Lessons Learned
The response to the Town’s reclaimed water program has been positive. Citizens who have reclaimed water are generally very happy with the service, especially during the summer months. The continuing operations and growth of a reclaimed water system presents several unique challenges. Over a decade and a half of providing reclaimed water to customers, the Town has learned many lessons about operating a successful reclaimed water program.

Work closely with customers and the public. Even after start-up of the program, ongoing public education on reclaimed water is still necessary. Special efforts are needed during the development process to assist year-round users, such as cooling towers. Critical customers such as these need to install and maintain a potable backup that can be used during temporary shutdowns of the system. For cooling tower or industrial uses, working with third party water management firms can be challenging as they all have different proprietary approaches for managing water treatment that need to be modified for reclaimed water use.

Challenges of retrofitting and converting existing potable users to reclaimed water.
The Town’s reclaimed water system started with installation of reclaimed water distribution lines to serve existing neighborhoods and businesses. Retrofitting existing neighborhoods with reclaimed water can be daunting and costly, however, retrofitting existing non-potable WRF water systems to the reclaimed system can present its own challenges since the pipe networks may not be designed to accommodate the higher pressures required for offsite distribution. It is also important to evaluate and analyze the water chemistry as part of a reclaimed water conversion, as it may be necessary to feed a corrosion inhibitor. When constructing new reclaimed water infrastructure, procedures should be in place to ensure reclaimed water services are correctly installed and to prevent any switched service connections with potable water.

Manage operations to maintain water quality and chlorine residual, especially during the winter months. Long residence times in the reclaimed water distribution systems are common in low-demand areas, at system dead ends, and during the winter season. This can lead to degradation of chlorine residual and overall water quality, as well as internal pipeline corrosion and buildup issues. As part of the standard operating procedures, a target chlorine residual of at
least 0.5 mg/L is set at sampling points in the distribution system. To maintain chlorine residual in the distribution system, the Town conducts a significant amount of reclaimed water flushing through blow-off valves at the extremities of the distribution system. This is one of the major operational challenges of a reclaimed water system, especially during the winter.

Reclaimed water system operation and maintenance needs are unique. A reclaimed water system does not typically have the same redundancy as the potable water systems and thus operators should be prepared for service interruptions. In addition, a reclaimed water main break is viewed as a spill under the state regulations and must be reported. Reclaimed water distribution systems therefore require greater maintenance (more valve exercising, air...
release valve inspections, etc.) to ensure the system can be isolated quickly. Providing adequate storage is also an important consideration in effectively managing reclaimed water distribution to customers. Some customers, such as irrigation at the USA Baseball fields, can utilize quite substantial demands over short periods of time. Irrigation peaks on the system are higher than typical domestic water use and tend to occur during the early morning hours when treated water flow from the WRF is at its lowest.

**Planning for the Future**
The Town conducts regular master plan updates for the reclaimed water system, guided by the Town's overall long-range water resources planning efforts. The projected reclaimed water demands and peaking factors used in the planning process are also determined through analysis of current consumption trends from the Town's advanced metering system, which records hourly consumption data.

The most recent reclaimed water master plan update evaluated various scenarios for growing the reclaimed water system, ranging from using the current infrastructure without significant expansion of the system, to maximizing the available wastewater effluent at the WRF to be put to beneficial reuse. The recommended options for expansion focused on joining the North and West service areas to increase reclaimed water demand at the North Cary WRF. In 2014, the Town’s reclaimed water policy statement was updated to expand the service area consistent with the master plan recommendations.

The reclaimed water system is a critical piece of the Town’s overall water resources and provides advantages for the Town and benefits for its customers. Like any other utility, however, it offers some unique challenges that must be considered and properly resourced to ensure operational success and growth of the system.

**About the Authors**
Sheryl Smith, PE, is an environmental engineer with CDM Smith. She focuses on water distribution, wastewater collection, and water reuse system planning and hydraulic modeling. She has performed recent reclaimed water planning studies for multiple utilities in the Triangle area and beyond.

Jeff Adkins, PE, is the Water Resources Manager for the Town of Cary. He is responsible for long-range water resources planning and the Town’s asset management program, and provides water conservation and environmental permitting support for Town projects.

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Across the US, communities have a strong interest in pursuing potable reuse to augment water supplies, address drought and water scarcity, and better manage water resources. Potable reuse, which involves recycling municipal wastewater, provides a compelling alternative for increasing water reliability, providing water resilience, and improving water resources. To address reuse questions, the Water Environment & Reuse Foundation (WE&RF) funded a wide-ranging portfolio of potable reuse research. The key findings of this 34-project research initiative are summarized in a recent WE&RF research report, *Potable Reuse Research Compilation: Synthesis of Findings* (Reuse-15-01).

The report is a valuable resource for utility managers, planners, designers, and regulators. It synthesizes a wide range of research topics critical for planning and implementing potable reuse. Although focused on direct potable reuse, or DPR (without an environmental buffer), the findings support the continuum of potable reuse options (see Figure 1). Topics include groundwater and surface water (reservoir) augmentation with recycled water (also referred to as indirect potable reuse), and raw water (for treatment by a surface water treatment plant) and drinking water augmentation (direct potable reuse).

The WE&RF report’s nine chapters (see Table 1) were authored by experts in the field, pulling together the many projects in a cohesive way.

The summary advances the science and understanding of potable reuse in states across the US. One motivation was the statewide goals in California for the use of recycled water, and a mandate from the California legislature to investigate the feasibility of developing uniform water recycling criteria for DPR. Currently, DPR does not have its own set of regulations in California. Based in part on the summaries in this report, an expert panel established by the California State Water Resources Control Board (State Water Board) determined that it is feasible to develop regulations for DPR. Consequently, the State Water Board reported to the State Legislature that DPR regulations are feasible and should be developed.

Table 1. Topics Covered in Report

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Highlights of the synthesis report include the following:

- **Advanced Treatment Trains.**
  Treatment trains can be individualized based on the complexity and functions of the facility. In addition, treatment train selection is driven by regulatory requirements. Advanced water treatment processes used at indirect potable reuse facilities are also appropriate for DPR projects, but will require additional treatment barriers. Treatment trains are imperative for potable water facilities to address contaminants and regulate constituents of emerging concern. Various treatment processes are necessary to remove all constituents of emerging concern (CECs), and one will not do everything on its own (Equivalency of Advanced Treatment Trains for Potable Reuse, Reuse-11-02).

- **Water Quality: Chemical and Pathogen Control.** Potable reuse facilities must identify potential hazardous contaminants to protect public health and to avoid damage to the integrity of DPR treatment processes. To address contamination risks, potable reuse involves a multi-barrier treatment approach. The treatment trains produce recycled water that can augment groundwater and surface water supplies, and be introduced into the raw water supply upstream of a drinking water treatment facility. Drinking water supplied to a community through potable reuse will meet the standards prescribed by the National Primary Drinking Water Regulations under the Safe
Drinking Water Act and additional state and local regulations, thereby controlling for chemicals and pathogens (Equivalency of Advanced Treatment Trains for Potable Reuse, Reuse-11-02).

- **Source Control for Water Quality.** Several of the research projects investigated paths to address contaminants in potable water systems. One preventative approach to chemical constituents is implementing a source control program to reduce or eliminate the discharge of contaminants in wastewater from point sources, rather than allow for contaminants of concern to be discharged into a collection system. To make the most out of preventative measures, the research recommends a rigorous source control program in conjunction with other applicable programs, like the National Pretreatment Program (Evaluation of Source Water Control Options and the Impact of Selected Strategies on DPR, Reuse-13-12).

- **Critical Control Points for Operations.** To ensure the performance of individual unit treatment processes, critical control points (CCPs) are monitored throughout the treatment process. CCPs are specific unit processes that provide a control method to reduce the risk presented from pathogens and chemical constituents. In addition, CCPs are assigned to individual unit processes to reduce, prevent, or eliminate process failure. Monitoring is conducted to confirm the control point is functioning correctly (Critical Control Point Assessment to Quantify Robustness and Reliability of Multiple Treatment Barriers of DPR Schemes, Reuse-13-03).

- **Pathogen Monitoring for Water Quality.** WE&RF research involved testing and evaluating microbiological detection methods used in treatment trains to monitor for harmful pathogens. In these studies, rapid and continuous monitoring techniques are used as means of improving the detection of pathogens, indicators, and surrogates to ensure that the treatment process is functioning at full capacity. These monitoring techniques are most effective in combination, and specific to the functions of the facility, to ensure the treatment train is successfully removing pathogens (Assessment of Techniques to Evaluate and Demonstrate the Safety of Water from DPR Treatment Facilities, Reuse-13-14).

- **Operator Training and Certification.** One of the most recent reports examined the gaps in operator training and education to ensure staff understand how to plan for maintenance and other daily functions. WE&RF researchers examined the development of a standard operations and maintenance plan, because there are no standards for maintenance plans for potable reuse systems. From this, the researchers developed a training and certification framework for operators. It can help operators understand facility and equipment functions with training commensurate to the capabilities of the facility (Development of Operation and Maintenance Plan and Training and Certification Framework for Direct Potable Reuse Systems, Reuse-13-13).

WE&RF’s full portfolio of potable reuse research can guide communities to a strategy to implement a water portfolio with potable reuse that protects public health. The summary report will assist regulators as they determine potable reuse criteria and regulations and water managers can use this report as a science-based rationale for their projects.

**About WE&RF**

The Water Environment & Reuse Foundation (WE&RF) is a nonprofit (501c3) organization officially formed in July 2016 as the result of the merger of Water Environment Research Foundation and the WateReuse Research Foundation. The merged research foundation, with a combined research portfolio representing over $200 million, conducts research to treat and recover beneficial materials from wastewater, stormwater, and seawater, including water, nutrients, energy, and biosolids.
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Here in North Carolina, our major metropolitan areas are continuing to grow at a very fast pace. The public utilities serving these communities are faced with many challenges in meeting future water demands and the required higher levels of wastewater treatment to protect the streams that are the very sources of our water supply. The typical view of water supply and wastewater treatment as separate utilities is giving way to a more holistic approach – treated wastewater is now considered part of the water supply portfolio. In many areas of the country where water supply is more stressed, potable reuse is beginning to be a major factor in evaluating alternative water supplies. Say what? Potable reuse in North Carolina? A distant dream? Maybe not, because, between now and 2035, the state’s population is expected to grow by almost 30% to nearly 12.8 million people. This population growth will be concentrated in our major metropolitan areas, stressing existing water supplies. Many of the utilities serving these areas are already searching for additional water supplies.

In 2010, more than 50 public utilities in North Carolina were producing reclaimed water, so there is a substantial base for the potential expansion of such facilities to produce a higher quality reclaimed water. To achieve the type of reclaimed water that could be considered an alternative water supply, it will be necessary to optimize existing wastewater treatment to produce high quality reclaimed water effluent. Traditional water and wastewater treatment methods may not provide adequate solutions given the potential water challenges North Carolina faces. To alleviate the strain on resources, municipalities and industrial facilities must rethink alternative water supplies including water reuse. Wastewater direct potable reuse (DPR) is emerging as a possible solution that is gaining acceptance as an effective way to preserve and increase our water resources.

As one might expect, the produced water from an advanced water reclamation facility is only as good as the source water that it treats. Source control of the incoming wastewater from the collection system is a critical element of any DPR program, just as it is for any indirect potable reuse (IPR) program. It is a combination of managerial and operations barriers that are implemented as part of a multi-barrier approach to eliminate or control the discharge of compounds of emerging concern (CECs) to wastewater that may be difficult to treat, impact maintenance and operations, and/or may impair the final quality of the treated water intended for DPR (APAI, 2015; Tchobanoglous et al., 2015).

This paper addresses the following issues:

- Understanding the differences between "pretreatment" and "source control" programs
- Understanding the key elements of a source control program
- Understanding the effectiveness of source control

Although often used interchangeably in the world of potable reuse, the terms "pretreatment" and "source control" are not necessarily the same thing. What are the differences in the terms?

As utilities here in North Carolina understand, pretreatment programs are mandated under sections 212 and 502(4) of the Clean Water Act (CWA) for most, but not all, Publicly Owned Treatment Works (POTWs). "Approved" pretreatment programs are a component of the National Pollutant Discharge Elimination System (NPDES) program, and provisions to implement pretreatment programs are included in NPDES permits issued by the North Carolina Department of Environmental Quality (DEQ) to POTWs. DEQ approves a POTW's pretreatment program to ensure it meets federal requirements under General Pretreatment Regulations (40 Code of Federal Regulations (CFR) 403) to define terms and set responsibilities for federal, state, local government, and industries to achieve the National Pretreatment Program objectives. The regulations only apply to industries and other non-domestic wastewater sources. The term "pretreatment" is defined in regulations as the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or introducing such pollutants into a POTW.

The objectives of the National Pretreatment Program are to:

- Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of biosolids
- Prevent the introduction of pollutants into a POTW that will pass through the treatment works or otherwise be incompatible with the treatment works
- Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges
- Protect the POTW's sewage treatment system, infrastructure, and workers

POTWs must enforce categorical pretreatment standards. These are national technology-based numeric limits that have been developed in accordance with Section 307 of the CWA to limit the pollutant discharges to POTWs from industrial users. These standards apply to an industrial user regardless of whether the POTW has an approved pretreatment program or the industrial user has been issued a control mechanism or permit. The standards are established based on the list of priority pollutants, which contains 65 entries, some of which are for groups of pollutants.
Not all POTWs with NPDES permits must develop and implement an approved pretreatment program. DEQ may require an approved pretreatment program when the POTW meets one of these conditions:

- The total design flow of the POTW is greater than 5 million gallons per day (mgd),
- Industrial or commercial customers of the POTW discharge pollutants into the wastewater system that either pass through the treatment plant or interfere with its operation, or
- One or more industrial or commercial users of the POTW meet the definition of a categorical industrial user.

**The evolution of source control programs is increasing rapidly.**
How do you go from a pretreatment program to a source control program for IPR or DPR? First, you might consider the standards and program elements of an approved pretreatment program as a baseline with the added provision that the focus be expanded to protection of the drinking water supply that is being created as part of the potable reuse program.

For most POTWs, the primary focus of operating wastewater treatment plants and their pretreatment programs is to meet discharge or non-potable reuse requirements. But, when a program becomes part of an integrated water supply project, the goals of source control must shift to providing a higher quality wastewater that in turn can improve the operations of an advanced water purification facility (AWPF) to which the wastewater facility may be providing source water.

**What are the key considerations when developing a source control program for potential potable reuse?**
- Are the program requirements mandatory or voluntary? Most states do not have a set of comprehensive source control requirements for potable reuse projects, thereby allowing for changes to approved or non-approved pretreatment programs that support potable reuse to occur on a voluntary basis.
- Should the programs be uniform? The resounding answer is no! Rather, it should be a function of the size of the community, the number of industrial and commercial dischargers, the IPR or DPR potable reuse program managerial, operational, and technical barriers selected for the project, and the type of IPR or DPR project. One important element for a source control program is the industrial inventory (the types of industries, locations within a sewershed, and the chemicals/pollutants that could be discharged). If you are a large municipality such as Charlotte or Raleigh, you have developed a GIS inventory that can be used to identify and address discharges of pollutants. Smaller communities may simply keep it in a Microsoft Excel inventory.
- Should a program for IPR be different than a program for DPR? The answer is probably no, although there may be an argument that the closer the DPR program is to the customer (e.g., pipe-to-pipe DPR), the source control program should be more enhanced.
- Tchobanoglous et al. (2015) and APAI (2015) provide principles and examples of source control for DPR. Figure 1 was developed to illustrate critical elements of a successful source control program. A detailed table that formed the basis of Figure 1 may be found in Chapter 3 of “Guidelines for Source Water Control Options and the Impact of Selected Strategies on Direct Potable Reuse,” (Rimer et al., 2017).

**Some other kindnesses to keep in mind include the following:**
- Good communication among utilities is imperative. Institutional silos can exist or develop within the same agency, leading to ineffective responses and finger pointing.
- Ghost chasing can lead to skepticism (e.g., the “chicken little” syndrome without the sky falling). One solution is to sit down after an event and go through lessons learned and make changes to the communication response plan.
- The POTW’s multijurisdictional agreements may be dated and lacking “teeth” to protect an IPR or DPR project. An out-of-service-area partner likely has no stake in such projects and thus no incentive to be proactive or helpful in situations where one of their industries is a problem. Update the jurisdictional agreements.
- A facility may want to terminate the acceptance of hauled wastes at a wastewater treatment plant that provides the feed water to an AWPF because of the difficulty in preventing and finding illegal loads in hauled wastes.
- Small communities may face situations where the economy is dominated by a large industry with...
considerable political clout. In this situation, it will be important to bring the industry into a stewardship program during the planning process.

- If a POTW is starting from scratch (i.e., no pretreatment program), it will be critical to hire at least some staff with experience and provide training.

While source control is an important barrier for all reuse applications, there are some limitations on its effectiveness. Source control programs will likely be effective in achieving reductions or resolving problems but there are obvious exceptions. Expectations should be realistic.

While there are no known potential applications pending for DPR in North Carolina, the developing source control programs that extend beyond typical pretreatment programs will be an investment in better management of the collection systems should an IPR or DPR program be developed, because such programs may not be a distant dream!

References

About the Author
Alan E. Rimer, PhD, DEE, PE, is the Director of Water Reuse, EnviroTechNovations, LLC. With a varied, 47-year career in environmental engineering, Dr. Rimer has been involved with planning and design for a variety of water reuse, water resources, wastewater treatment, solid waste management and environmental management projects for local, state, and federal governments, as well as a wide variety of industries across the United States, Asia, Europe and South America. He recently retired from Black & Veatch and joined with a friend to start a consulting firm where he continues his reuse work.
Reuse has been widely implemented in recent years, but many times capital cost is a barrier to implementing reuse systems. Even after overcoming capital cost, water suppliers are sometimes at a loss when determining appropriate reuse rate structures that will benefit both the customers and the supplier.

The American Water Works Association (AWWA) manual M1 Principles of Water Rates, Fees, and Charges has long been the gold standard for water suppliers in determining what rates to charge their potable water customers. The Seventh Edition of this manual, released in March, now provides guidance on water reuse rates. Here are highlights of this new reuse chapter.

It is no secret that reuse projects can require significant infrastructure investment, such as advanced treatment, separate distribution systems, pumping facilities, etc. Consequently, when evaluated strictly from a financial standpoint, these reuse projects tend to be more expensive than existing supplies, so water suppliers often eliminate them from consideration. The manual elaborates on the concept of also evaluating reuse projects from an “economic” standpoint by considering factors unrelated to the cost of the reuse project, such as:

- What other costs (new wells, new reservoirs, pumping costs of remote supplies, etc.) can be avoided by using reuse sources?
- How will reuse enhance the system’s drought resistance?
- What are the benefits and costs from an environmental sustainability standpoint?
- What are the benefits and costs from an energy use efficiency standpoint?
- What are the benefits and costs from economic development and societal perspectives?

Answering these “triple bottom line” questions gives a better understanding of the non-monetary benefits that the reuse project may bring to the water supply system. Those benefits potentially justify subsidies from the water fund to the reuse fund, which would affect both the potable and reuse water rates.

The manual also discusses the three types of customers (non-potable, indirect potable, and direct potable) served by reuse projects and the specific issues related to each type of user. Upfront financial planning provides a road map to assessing and developing a reuse project. Issues discussed are:

- Assessing which customers to target first
- Once customers are targeted, developing policies that make reuse beneficial to those customers, as well as to the water supplier
- Funding options, including debt, grants, developer-contributed assets, impact fees, and special assessments
- Assessing negative impacts to water/wastewater fund revenue due to customers substituting reuse water for potable water.

Cost allocation of water reuse rates is typically like the cost-of-service analyses for water and wastewater systems. However, reuse analyses may vary based on the type and purpose of reuse, whether reuse is a standalone fund or combined with a water/wastewater fund, public policy, and how subsidies are treated.

About the Authors
Amy Kaarlela, PH, is a hydrologist and project manager at Freese and Nichols. She is experienced in regional and local water supply planning, water rights, development of water conservation and drought plans, and water and sewer rate studies.

Bryan Jann, PE, is a Freese and Nichols vice president/principal and leads the firm’s water and wastewater utilities team in Raleigh. His extensive design experience includes trenchless and conventional technologies, as well as alternative project delivery systems to expedite projects.

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With the rise of global resource scarcity, governments, businesses, and individual communities are feeling pressure to reduce resource consumption and increase resource reuse as much as possible. Fresh water is already scarce in many places, and a lack of fresh water sources is an emerging issue for many formerly water-secure communities, as population and demand continue to grow while water use management remains unchanged. Although residential users have significantly reduced water use over the past few decades, many industrial users have not due to financial or manufacturing procedural constraints.

One such industry is ready mix concrete. A typical concrete producer requires large volumes of water for mixing concrete, cooling heavy equipment, controlling emissions, and washing down equipment such as trucks and kilns. Concrete production requires even more water when one considers the demands of cement manufacturing and aggregate mining (Blankendaal et al., 2014). While a concrete producer has limited control over adjoining markets, it can control local water use within its own facility.

Capital Ready Mix Concrete, a concrete company based in Knightdale, NC, is taking the steps necessary to make water reuse an integral part of their operation at both their Knightdale plant and their future Pittsboro location. Capital Ready Mix produces approximately 100,000 yards of concrete per year and uses approximately 6.2 million gallons of water per year. Of this annual water use, about 88% of the water is used for concrete mixing, while the remaining 12% is used for washing concrete, sediment, oil, and grease off trucks and is then discarded. The large volume of wash water requires a dedicated on-site treatment system to remove concrete and other sediment from the waste stream.

Currently, the plant uses a sedimentation basin that discharges into a stormwater management pond with a carbon dioxide injection pH control system. While this treatment process is effective, a major drawback is that the sedimentation basin must be dredged approximately every two weeks. Settled solids are removed for storage in on-site drying bins before being transported off-site by truck. This treatment process, in conjunction with the plant’s large use of potable water, has proven to be inefficient from a water resource, labor, and financial standpoint.

To reduce its water demand and mitigate the costs of treatment, Capital Ready Mix is in the process of installing an efficient water separation and reuse system at their future Pittsboro location. When trucks return from a pour, they will back up to a cleaning station where pre-processed wash water will be used to clean out the drums and chutes. After cleaning, the used wash water will flow to an agitation tank that acts a discharge buffer before reaching the sedimentation basin. Large-diameter aggregate and sand particles will settle to the bottom...
of the agitation tank for automatic removal and transportation by a screw conveyor to a drying bin. Wash water from the agitation tank will then flow to the sedimentation basin, where wash water from the first stage of the basin will be pumped to a platform-elevated plate and frame filter press. The filter press will be manually operated to reduce the high concentration of fines in the wash water and will produce a low-moisture cake that will drop into a drying bin for easy disposal. Filtered water from the filter press will then flow to the end of the sedimentation basin, where the fully processed wash water is pumped to the cleaning station, thus completing the cycle.

In addition to concrete and sediment removal from truck drums and chutes, truck cabs and engines are hosed down intermittently as part of regular maintenance. The used wash water has relatively high concentrations of oil, grease, and fines, and must be diverted to on-site treatment or sanitary sewer. In an effort to further reduce wastewater and environmental impacts, Capital Ready Mix will also install a reuse system for their truck cab and engine wash station at their existing site. When truck cabs and engines are washed down, the wash water will flow to a treatment basin consisting of three chambers. The first chamber will capture settled fines, then water will flow to the second chamber where oil- and grease-impacted water will be pumped intermittently from the top to a recycle unit. Settled water will then flow to a clean water chamber, where it will be supplemented with water from the recycle unit and an on-site well and pumped to a pressure washer. Used wash water will then drain to the sedimentation chamber and complete the cycle.

At both sites, these systems will significantly reduce Capital Ready Mix’s potable water use and the financial burden of removing and transporting aggregate sludge. At the future Pittsboro site, the company is in the process of taking water reuse a step further. The Town of Pittsboro and Capital Ready Mix will work together to use the Town’s reclaimed water system for all industrial purposes. In conjunction with its new site reuse systems, this will allow Capital Ready Mix’s entire process to use nearly 100% reuse water, reducing the burden on the Town’s potable water supply and limited sanitary sewer capacity.

While many of these treatment technologies are not new in the water and wastewater industry, they are not as widespread in the ready mix concrete industry, due to high capital costs and the volatility of local concrete markets (Collard-Wexler, 2013). However, individual initiatives of businesses like Capital Ready Mix show that resource reduction and reuse, especially water reuse, is physically and financially viable where local construction markets are stable. Investing in water reuse technology can reduce the burden on the environment, local communities’ water and sewer systems, and the industry itself.

About the Authors

J. Clark Maness is a utilities design engineer at WithersRavenel. He has worked on many different civil and environmental engineering projects, with a focus on water and wastewater treatment plant design and rehabilitation. His responsibilities include water and wastewater treatment plant analysis and design, plan production, specifications, and NCDOT/DEQ permitting.

Margaret Gresham is a utilities design engineer at WithersRavenel. She has experience in a variety of civil engineering projects with an emphasis in designing water distribution and sanitary sewer collection systems, utility rehabilitation, and pump stations. Her responsibilities include alternative alignment analysis, plan production, specifications, and NCDOT/DEQ permitting.

References


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As a result of both Duke University’s Climate Action Plan and the 2007 drought in North Carolina’s Piedmont region, Duke University constructed a 6-acre $14.4 million water harvesting facility/plant and reuse pond on its historic campus. An article was published in the Summer 2016 edition of NC Currents outlining the design and construction of the pond (“Green Issues- Duke University Water Harvesting Pond,” James W. Caldwell, PE, McAdams). The facility/plant has now been in operation for roughly one year. Duke University’s initial goal was to provide approximately 100 MG of harvested stormwater from the pond adjacent to Chiller Plant 2. Secondary goals were to provide nutrient reduction for stormwater runoff and provide a campus amenity. Even though Duke University is still optimizing the operation of the facility, the filtration requirements, and most importantly the water quality from different storm runoff events, the pond still provided 90 MG of water to the plant during the first year to supplement/replace the water for the 10 cooling towers used to dissipate heat at Chiller Plant 2. This is a direct reduction in potable water use from the City of Durham and is a savings of $540,000 of City water in one year alone. Fourteen projects on Duke University’s West Campus have used nitrogen, phosphorous, and total suspended solids (TSS) “credits” generated at the facility to meet the City of Durham’s stormwater management regulations, thereby avoiding construction of individual stormwater management facilities. The pond has also become a popular destination for students, faculty, and visitors to the campus in the short time since opening.

Duke University has been continually upgrading and adding to its campus-wide chilled water system since the completion of Chiller Plant 1 in 2004. The campus-wide system now serves 11.5 million square feet in 104 buildings through 18 miles of chilled water lines across campus. Several smaller “satellite” chilled water plants have been decommissioned in favor of a more centralized approach to chilled water through two large chilled-water plants on Duke University’s campus. This “centralized” chilled water system is much more efficient than each individual building, providing its own cooling system and an overall operational cost of approximately 60% of the cumulative cost of operation for individual building units. Duke University is continually improving safety, reliability, capacity, and efficiency of the state-of-the-art chilled water system.

A large part of these goals was the construction and commissioning of the water harvesting pond adjacent to Chiller Plant 2.
Plant 2. This pond is expected to provide up to 143 MG of water annually (based on continuous modeling of a typical rainfall year with historic rainfall data) and provide stormwater pollutant removal credits to satisfy the City of Durham’s requirements for stormwater management. The pond also has a reserve capacity of 8 MG of water that can supply the chiller plant with several days’ worth of make-up water demand in a disaster scenario, should the City of Durham’s potable water supply become unavailable. This is a critical life-safety function of the facility since the Duke Hospital must remain operational during disaster events. The emergency water that the pond provides was the last critical piece to provide Duke University’s Chiller Plant 2 with redundancy in every necessary system in the event of a disaster.

The efficiency and savings with the harvested pond water is evident by the cost-per-gallon of the different water sources used at Chiller Plant 2. In the past year, the plant used approximately 191 MG of water for cooling tower make-up water, of which 119 MG was supplied by alternate (non-City) sources, such as a reverse osmosis system to clean the tower blow-down water (70% of the blow-down water is returned to the cooling towers as clean, with only 30% being waste to the sanitary sewer system); and condensate from the individual building air handling units (each air handling unit’s condensate is collected and pumped back to Chiller Plant 2, up to 100,000 gallons per day in the summer). The pond provided 90 MG. Comparing Duke University’s internal cost of the pond water with the internal cost of the City of Durham’s potable water reveals that the pond water is $0.84 per 1,000 gallons, as compared to $7.55 per 1,000 gallons for City water.

Duke University is still optimizing the operation of the pond, filtration, and treatment systems for the use of the harvested stormwater runoff. The quality and chemical composition of the runoff can vary greatly between storm events, campus watershed changes, and seasons during the year. For example, after a snow and ice event in January 2017, de-icing fluid and salt was applied to streets and sidewalks on campus in the watershed of the pond. Once these de-icing materials reached the pond, the water could not be used for several days until the water chemistry stabilized. The forebay on the upstream side of the pond was designed to help with the quality of the water before it reached the intake structure further downstream in the pond. Summer thunderstorms, which can happen quickly and produce quick bursts of runoff into the pond, can cause turbidity problems that make the pond water unusable for a day or two after the rain event. Additional filtration and treatment options for Chiller Plant 2 are being explored by Duke University to more fully utilize the water in the pond during the course of the year and to further reduce the use of potable City water.

The pond has also become a campus amenity and destination, fulfilling the original campus master plan as envisioned by Horace Trumbauer in the 1920s. The project vision of the landscape architect was for the south side of the pond to evolve into a wetland edge, with the north side growing into a pine forest similar to the existing surroundings of the area. With a constant fluctuation of 4 feet of water in the pond for storm inflows and pumping to Chiller Plant 2, the fine grading and plant selection along the edge of the pond was important such that the facility did not appear unsightly during continued use as a water harvesting facility. Most of the landscape plantings were installed in the fall of 2014 and are continuing to grow into a fully matured and functional landscape. The facility also serves as a destination for a walk or run as part of the overall campus pedestrian plan and as an outdoor classroom and research laboratory.

The construction of the pond impacted 1,700 linear feet of ”jurisdictional” perennial stream and, therefore, Duke University was required to provide stream mitigation at a 2:1 ratio, resulting in the restoration of 3,400 linear feet of stream elsewhere within the watershed. This mitigation is provided
with a restored section of stream along Campus Drive that connects East and West Campus. As this stream section matures, the Nasher Art Museum at Duke University is planning for an expansion and sculpture garden within the area. What was initially a response to the historic drought of 2007 has become a critical piece of Duke University’s climate neutrality plan, a fundamental part of the chilled water system’s infrastructure, a significant reduction in potable water use from the City of Durham, and a true destination and campus amenity for all to enjoy.

About the Author
James W. Caldwell grew up near Asheville, NC before attending NC State University. James served in the Peace Corps El Salvador and worked at a geotechnical engineering firm and the NC Dam Safety Program prior to joining McAdams. He currently serves as Assistant Director of Water Resources & Infrastructure for McAdams.
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**BOLIVIA**

In Bolivia, the district of Villa Rivero reached every community with reliable water service – this means 42 communities now have access to water. The district of San Benito has reached every clinic and school with water and sanitation services – five clinics and 19 schools.

In 2012, Cuchumuela was the first district in Bolivia to reach Everyone at the household level with water service – igniting momentum in our other Bolivia districts and at the national level. When Cuchumuela declared Everyone, the national government came to the district to verify this achievement – they even declared October 30 Full Coverage Day. Since then, we have worked closely with the national government to support President Evo Morales’ vision of reaching universal water and sanitation coverage in Bolivia by 2025. By President Morales’ request, we are also serving in advisory roles in the departments of Tarija and Oruro – departments he prioritized to reach universal access to water and sanitation services. In the original six Water For People districts in Bolivia, we predict more Everyone milestones by the end of 2018. We have already started replicating our work in three new districts in 2017 – Arbieto, Pocona, and Toco.

**INDIA**

In India, Patharpratima and Sagar Island Districts have reached every community with reliable water service – 139 communities now have access to water.

These districts have been hovering close to reaching every community for a few years, and it’s a huge step for Water For People to be able to officially declare this milestone – the first Everyone milestones in our India districts. Reaching every community in these districts meant forming a closer partnership with the government and forming strong water user committees within communities. Proving our work in India has given us more credibility with the government, and we believe this will be a tipping point that leads to greater replication and scale, but also stronger emphasis on sustainability – the Forever portion of our work.

**PERU**

In Peru, every clinic and school in the district of Asunción has reliable water and sanitation services – four clinics and 51 schools! Water For People created a school curriculum in Peru that focuses on water, sanitation, hygiene, and water resource management. Alongside this curriculum, schools in Asunción have built handwashing stations and toilet blocks with separate sections for boys and girls. The regional government has now adopted the curriculum we created and is replicating it beyond the districts where Water For People works. Reaching every clinic and school in Asunción is the first Everyone milestone reached in Peru, and we project we will reach the same milestone in the district of Cascas this year.

In 2016, six districts reached or maintained reliable water service for every community:

- Cuchumuela, Bolivia
- San Pedro, Bolivia
- Villa Rivero, Bolivia

In the future, we expect similar momentum in our Bolivia districts and in Bolivia overall. In India, we are excited to see how this new implementation will help strengthen our work with the government and spread the concept of Everyone further.
In 2016, five districts reached or maintained reliable water and sanitation services for every clinic and school:

- Cuchumuela, Bolivia
- San Benito, Bolivia
- San Pedro, Bolivia
- Villa Rivero, Bolivia
- Asunción, Peru

REACHING EVERY COMMUNITY WITH WATER

When Don Anacleto came to the community of Frontera in the district of Villa Rivero, Bolivia, the only way his community members could get water was from a hand-dug well at his home. Every day, all his neighbors would have to come to his house to get the water they needed.

Now, all that has changed.

The community was able to finance a drinking water system with support from Water For People’s partnership with the national government program Mi Agua. One hundred people in Frontera now have access to drinking water from an improved drinking water system – every day of the year, every hour of each day.

Doña Esperanza, Anacleto’s wife, says each family pays about $2 per month for water access, which is affordable for most families. To keep the water system running smoothly, every three months the families get together to clean and maintain the system. Don Anacleto is Vice President of the local water committee, and he says he’s happy to lead his community in this way, which ensures his children will have safe and reliable water for years to come.

In 2016, the district of Villa Rivero reached a critical Everyone milestone: every community in the district achieved access to reliable water service. This means 42 communities just like Frontera can now depend on water for generations to come.

About Water For People

Founded in 1991, Denver, CO based Water For People is a global nonprofit working across nine countries in Latin America, India, and Africa to achieve lasting quality water and sanitation services. Water For People brings together communities, local entrepreneurs, and governments to build, operate, and maintain their own reliable water and sanitation systems and services.

Currently working in 30 districts with 4 million people, Water For People is growing to deliver services to over 7 million people in 50 districts globally over the next 10 years. Water For People is also working at the national level in Rwanda, Uganda, Bolivia and Honduras.
Over 30 years of experience in offering fine products and services within the water and wastewater pumping and treatment industry.

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Taking Stock of Our Current Endowment Program

Since its creation in 2009, the NC Safewater Endowment Program has awarded and funded 38 scholarships totaling $37,000. We are scheduled to award another 13 scholarships totaling approximately $16,000 in 2017. Each scholarship is currently averaging approximately $1000. The Endowment fund has grown from its initial "seed" allocation of $25,000 from the NC AWWA-WEA to over $400,000 thanks to the continued support and contributions from the Organization and individual donors. The current size of the investment corpus and funding protocols allows a level of annual scholarship giving of approximately $16,000. The endowment’s growth, thus far, can be attributed to the strong support of the Organization and a small cross section of hardworking and dedicated water professionals. In 2016, the Safewater Endowment Committee recognized the need to evaluate the status of the endowment and to take necessary steps to ensure sustainable growth, as well as a funding level necessary to support the education and development of water professionals for generations to come.

How Do We Improve and Build a Sustainable Endowment Program?

The committee evaluated the attractiveness and popularity of the scholarship program for future and potential candidate recipients, and identified a path forward to grow the endowment to support the demand for scholarships. The committee found that: 1) attracting, retaining, and developing top talent is a top priority in any water industry company or agency; 2) it is necessary to engage our NC AWWA-WEA membership in an awareness campaign regarding the significant and positive impact water professionals have on human life and the environment; and 3), the size and diversity of the scholarships is of considerable importance to the candidate recipients.

Industry studies show – and today’s “new normal” market environment requires – a sound strategy that will attract, retain, and develop top talent in our respective water industry companies and agencies. Most likely this is already a top priority and an imperative strategy for desired success in your company or agency organization.

It can be argued that the water profession is a very noble profession, necessary for the quality of life and the clean environment desired and needed to ensure a sustainable world for future generations. Generally speaking, industries and industry professionals thrive when passion and love for what they do drive desired success and results. Water industry professionals who embrace the importance of their role help to ensure clean and safe water for the world’s population, become effective ambassadors for the water industry, and produce lasting results that raise awareness for everyone involved. This leads to a proactive effort to promote goodwill and human welfare, which is the definition of philanthropy. Creating a philanthropic culture within NC AWWA-WEA is an essential ingredient in the overall growth strategy for the endowment.

Applicants and awarded recipients want more choices and larger scholarships. Studies show scholarships should be in the $2500 – $3500 range in order to compete in today’s market. To this end, the Committee has established a target-level goal of $1M for the Endowment corpus to establish a competitive scholarship program that meets the competitive demands of future generation recipients. A clear vision, mission, and growth strategy is required to guide our efforts to build a sustainable Endowment that will meet these future demands.

In 2016, the Committee developed and adopted a new vision, mission, and growth strategy for the Endowment:

- Our Vision: Develop a philanthropic culture within the NC AWWA-WEA that will inspire all of our members to contribute annually to the NC Safewater Endowment Program.
- Our Mission: Develop and implement a corpus growth strategy that will build a sustainable Safewater Endowment.
Fund of approximately $1M dollars, capable of allowing for distribution of multiple scholarships with a total value of $40,000 – $50,000 annually.

- **Growth Strategies:** Providing a mechanism for and creating a philanthropic culture within the NC AWWA-WEA that will result in annual giving by a majority of members and will be the foundation of the growth strategy. Other strategies and actions include annual auctions, fundraising events, partnerships with corporate sponsors and industry leaders, and securing additional “named” donors (minimum $25,000 level). Leveraging the power of social media and effective communication platforms to inform members on current and future activities will also be an important tactic.

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**A Vibrant Philanthropic Culture Will Fuel Sustainable Growth for the Endowment Program**

Staying true to our vision to build a philanthropic culture within the NC AWWA-WEA is a strategic initiative. If just half of our current membership gifted a modest sum of money to the endowment on an annual basis, the investment corpus would grow as much as $25,000 each year. This level of giving to the general fund through membership, annual fundraisers, corporate donors, and “named” donors, will allow the endowment program to grow to a substantial and sustainable level, resulting in the awarding of competitive scholarships for our future candidate recipients.

---

**Proposing a Challenge**

The committee is challenging each individual organizational member to consider the gravity of their profession and the impacts one can make by giving back. Become active and engaged. Make a difference in a profession and organization we all love. Everyone’s role in ensuring we have safe water and a clean environment is important, and the strength of a fully engaged organization of water ambassadors who support the endowment will help equip and enable water professionals for future generations to come. We invite you to contact a committee member and visit our website for complete details on how to get involved with the NC Safewater Endowment Program. The future success and sustainability of our water industry is depending on you!

---

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[Image of various water measurement instruments]

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WASTEWATER CERTIFICATION QUESTIONS

Submitted by the NC AWWA-WEA Wastewater Board of Education & Examiners

1. Major areas of potential safety hazards while monitoring industrial wastes include:
   a) traffic safety       b) confined spaces       c) equipment storage
   d) battery charging    e) all the above

2. A sewer-use ordinance should provide legal authority for the following activities:
   a) inspecting and monitoring    b) picnic areas
   c) billing for sewer service charges  d) garden club visits

3. The two basic types of flow systems are:
   a) clean and dirty           b) open channel and open pipe
   c) open channel and closed channel   d) multi-channel and single channel

4. Chemical metering pumps and meters measuring small pumped flow rates are calibrated with the use of a:
   a) staff gauge       b) dye solution     c) yard stick
   d) calibration cylinder

Answers:
2. a) and c) Industrial Waste Treatment, Vol.1, 3rd ed. p. 184.

WATER CERTIFICATION QUESTIONS

Submitted by the NC AWWA-WEA Water Board of Education & Examiners

1. When digging in average soils, the angle of repose to prevent cave-ins should be 1:1.
   a) True   b) False

2. The butterfly valves are especially useful during water main pigging operations because they
   will not slow the pig down as it goes through the water main.
   a) True   b) False

3. Machinery should always be stopped before which of the following?
   a) Cleaning   b) Oiling   c) Adjusting   d) All of the above

4. If a mechanical seal is leaking a lot of water, you would ___________.
   a) Tighten the packing nut  b) Twist the lantern ring 90 degrees
   c) Replace the main bearing  d) Replace the mechanical seal

5. Calcium hypochlorite (HTH) is supplied as a dry powder, crystals, or tablets; is very corrosive when mixed with a
   small amount of water; and can support combustion.
   a) True   b) False

Answers:
MAINTENANCE TECHNOLOGIST QUESTIONS

Submitted by the Plant Operations & Maintenance Committee

1. Class ___ fires are those that burn oil, gas, grease, paint or other flammable liquid.
   a) Class A   b) Class B   c) Class C   d) Class D

2. How are witness marks used in regards to the removal, repair and assembly of the volute case of a centrifugal pump?
   a) to create a permanent record of component clearances
   b) to record the date of a repair
   c) to allow proper alignment of components when they are reinstalled
   d) to signify that all components have been lubricated

3. Power factor is the ratio of __________ to __________.
   a) amperage to voltage   b) true power to apparent power
   c) apparent power to true power   d) horsepower to voltage

4. Which is a potential energy source that must be locked out or blocked before equipment can be safely worked on according to OSHA 29 CFR 1910.147 – The Control of Hazardous Energy?
   a) electrical   b) pneumatic
   c) hydraulic   d) mechanical plus all of the above

5. The scheduled repair of a known problem before breakdown occurs is what type of work?
   a) Corrective   b) Periodic
   c) Emergency   d) Project

Answers:
1. b) Water should never be used to extinguish this type of fire because it can cause the fuel to scatter, spreading the flames. Class B fires are extinguished by inhibiting the chemical reaction or by smothering the fire with carbon dioxide or foam. (Industrial Maintenance, Chapter 2).
2. c) Witness Marks are typically made with a center punch, one mark on the stuffing box flange and another on the volute case flange next to the stuffing box. The marks are referenced during assembly to assure proper alignment. (Pumps & Pumping, Lesson 4).
3. b) (Electrical Fundamentals for Water & Wastewater, Lesson 3).
4. d) (Industrial Maintenance, Chapter 1).

CERTIFICATION INFORMATION

If you have any questions regarding operator/engineering certification and exams, please contact the appropriate agency.

NC Board of Examiners for Engineers & Surveyors
919-791-2000
www.ncbels.org
Exam Dates: 4/21/17 and 10/27/17
Responsible for Professional Engineers and Professional Surveyors

NC Water Treatment Facility Operators Certification Board
919-707-9040
http://www.ncwater.org/pws
Traditional Exam Dates: 5/25/17, and 8/31/17
Electronic Exam dates: 7/25/17, and 9/26/17
Responsible for Drinking Water Certifications
(Surface, Well, Distribution, & Backflow/Cross-Connection)

Water Pollution Control System Operators Certification Commission
919-807-6353
http://portal.ncdenr.org/web/wq/admin/tacu
Exam Dates: 6/8/17, and 9/14/17
Responsible for Wastewater Certifications
(Animal Waste, Biological WW, Physical/Chemical, Land Application, Spray Irrigation, Collections, Subsurface, and OIT)
Welcome New Members!

The following people became members of NC AWWA-WEA in January, February, and March of 2017 by joining AWWA or WEF and choosing NC as their home state or as an additional membership state, or by joining at the state level with a NC SLAM membership. We welcome these professionals to NC AWWA-WEA and look forward to seeing them at future events and working with them on various projects and committees.

For information on how to join, and the membership options available, please visit www.ncsafewater.org/page/Membership. Most of NC AWWA-WEA’s work is carried out through committees. To learn more about each committee review the list of active committees at www.ncsafewater.org/page/Committees. To express your interest in learning more about a committee, contact the committee chair directly, contact the NC AWWA-WEA office, or complete the online volunteer form.

American Water Works Association (AWWA)
- Marius Basson, Aladon
- Alaa Bazuhay
- Matthew Benfield, UNC-Charlotte
- Alexander Biemann
- Austin Blackmon, City of Winston-Salem
- Sarah Braman, Town of Cary
- Mark Breen, WSP/Parsons Brinckerhoff
- Stephanie Brixey, Durham County TWWTP
- Jason Bromirski, Charlotte Water
- Rudy Broschinski, Town of Boone
- Rebecca Cramer, Cape Fear Public Utility Authority
- Jill Deaney, Cape Fear Public Utility Authority
- Carl Debrosse
- Katherine Diprete
- Jane Greenwood
- Margaret Gresham, Withers & Ravenel Engineering
- Dustin Guyer
- Bobby Hardy, Town of Ocean Isle
- Sean Hartung
- Seola Hill, III, Bogue Banks Water Corp
- Sabrina Hornbuckle, Cherokee Water & Sewer
- Carl Johnston
- Jim Lee
- Josh Legg, City of Concord
- Megan Lott
- Marvin Maldonado
- John Maness, Withers & Ravenel
- James Manning
- Mike McGill
- Alexander McGirt
- Jasmine Mira
- John Moore, Town of Tarboro
- Joseph Moore
- Pierre Oneal
- Kim Panian, Utility Metering Solutions (UMS)

Vivek Pulikkal, Judy Redwine, City of Albemarle
Chris Ritchie, City of Kannapolis
Joe Rubisch
Patrick Sheehan, Huber Technology, Inc.
Marcia Staunton, Aladon
Fred Wagner
Travis Welborn, Town of Winterville
Tyler Wilson
Glenn Zeblo, Alpha & Omega Group

Water Environment Federation (WEF)
- Adam Belcher, Water Guard, Inc.
- Michael Gallant, Michael C Gallant PE PA
- Mike Lingerfelt, Charlotte Water
- Sheri Smith, CDM Smith
- Steve Stewart, City of Durham
- Jeremy Nance, Charlotte Water
- Kasia Grzebyk, UNC Chapel Hill
- John Gosnell, Metropolitan Sewerage District of Buncombe County
- Stan Bryson, Tuckasegee Water & Sewer Authority
- Jason Bromirski, Charlotte Water
- Sudhakar Viswanathan, Veolia Water Technologies
- Eric Crump
- Mark Sobsey, University of North Carolina
- Xintong Qiu

NC SLAM
- Roy Alons, Perquimans County Water
- Landon Altman, City of Asheville
- Cody Austin, Two River Utilities
- Mike Boerstler, City of Raleigh
- Joe Boyd, WithersRavenel Inc.
- Ron Branson, City of Goldsboro
- Byan Brooks, Town of Plymouth
- Kim Burkhart, City of Lexington
- Marcus Byrant, City Of Raleigh
- Jacob Candler, City of Asheville
- Essandi Chambers, City of Durham
- Carl Cheek, City of Durham
- Brian Craver, City of Raleigh
- Brooks Creech, City of Raleigh NRRRF
- Drew Culp, Two River Utilities City of Gastonia
- Adele Duterte, City of Raleigh
- Caleb Edmondson, City Of Washington
- Pedro Escamilla, Sampson County Public Works
- Bill Fay, Town of Wrightsville Beach
- David Fox, City of Southport
- Brian Gay, City of Raleigh
- Janeen Goodwin, City of Raleigh
- Sarah Gornick, City of Raleigh
- Howard Hall, City of Raleigh
- Warren Harris, City of Raleigh NRRRF
- Frank Hawley, City Of Raleigh Public Utilities
- William Henley, City of Raleigh NRRRF
- Billy Hollowell, City of Durham
- Andy Honeycutt, MeterSYS
- Derek Human, City of Winston Salem
- Juan Hurtado, City of Raleigh
- Justin Johnston, City of Raleigh
- Alfonso Jones, Charlotte Water
- Chris Kell, City of Durham
- Jesseca Ketchum, City of Raleigh
- Tamarus King, City of Goldsboro
- Donna Lankford, City of Winston Salem
- Nick Lories, Perquimans County Water
- Jesse Luper
- Greg Maready, TA Loving Construction Co.
- Jason Martin, City Of Raleigh Public Utilities
- Mike McClain, Charlotte Water
- Mike McFarland, Jr., City of Raleigh
- Alex McMillan, W. K. Dickson & Co., Inc.
- Richelle Meek, City of Kings Mountain
- Joseph Miller, City of Raleigh
- Tyrone Moore, Greenville Utilities Commission
- Tripp Morgan, Greenville Utilities Commission
- Johnny Nance, Jr., City of Durham
Welcome!

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Meet Our Members
Ted Credle, PE
Director of Public Utilities, Town of Smithfield
North Carolina Section American Water Works Association Member

Where did you grow up?
Durham, NC

What was your first job?
Working for my father – a civil engineer and surveyor.

What is something interesting about your younger years?
I was a foreign exchange student. I spent part of my junior year of high school in Lucerne, Switzerland.

What do you do outside of work?
I dance a mean paso doble.

Where do you get your ideas?
From everywhere. Other small towns, news articles in journals, and networking at trade shows. I look to see how these other organizations use ideas and how I may use them in my position.

What did you want to be when you grew up?
Like every little boy, I wanted to be a professional athlete, but, I was not gifted with such ability.

What’s the best thing you’ve ever done/best idea you’ve ever had?
My three children – (17, 16, and 13)

What advice would you give young professionals?
Go in the field. All young professionals should observe how things are built before they are asked to design. It would save much heartache.

If you had a million dollars, how would you spend it?
Take a long trip somewhere warm, tropical, and with a slow pace.

If you could speak to one type of animal, what would it be?
A chicken. Finally, we would get the answer of why it tried to cross the road.

Who has been the biggest influence on your career?
My father (now deceased). He always provided common sense advice and gave me a point of view that I respected.

If you could have any career in the world (other than the one you have now), what would it be?
Meteorologist. You can be wrong most of the time and there is virtually no accountability.

What is one thing most people don’t know about you?
I am fluent in six languages.

In addition to being paid money, how else has your career created value in your life?
It is intrinsically rewarding. You provide good, clean, reliable water to the public.

What do you consider the best possible work environment?
To have support from your supervisor; to have staff that is hard working and dedicated; and to have the confidence of the stakeholders.

What makes you happiest?
My family and friends.

Who would you want to play you in a movie?
Chris Pratt. I don’t look anything like him, but I have enjoyed his roles tremendously.

If you could meet anyone (dead or alive), who would it be and why?
For obvious reasons, Jesus Christ.
Meet Our Members
Chonticha McDaniel
NC Division of Water Infrastructure
NC State Level Association Member (NC SLAM)

Where did you grow up?
Bangkok, Thailand

What advice would you give young professionals?
Find a job that you are passionate about and can be proud of your work.

If you could speak to one type of animal, what would it be?
Deer – so I can tell them not to cross the road, or to watch before they do!

If you could have any career in the world (other than the one you have now), what would it be?
A race car driver.

In addition to being paid money, how else has your career created value in your life?
It is worthwhile and rewarding to me to serve the public, knowing that what we do in the North Carolina Department of Environmental Quality has a positive impact on our natural resources and the environment as well as increasing quality of life for people in our state.

What makes you happiest?
Music, especially when I can dance to it too!

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The water and wastewater industries have changed and evolved in so many ways over the past twenty years and just keeping up has been a monumental task for utilities and their staff.

Add the additional challenges of reduced staffing, lower budgets, increased regulations and you have a very challenging environment to operate in.

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Let our professionals help you and your professionals find out why!
The Water Environment Federation (WEF) proudly announces that 59 high school students have been selected as the 2017 state winners of the US Stockholm Junior Water Prize, the nation’s most prestigious youth award for a water-related science project.

The student winners from 48 states and Puerto Rico competed in the national finals June 16-17 at the University of North Carolina at Charlotte. The exhibition and judging took place at the Cone University Center from 8:30 am–12:00 pm on Saturday, June 16, and was open to the public.

North Carolina was represented by Kenny Hoang, a senior at the North Carolina School of Science and Mathematics who presented his project "Photocatalytically Degrading Organic Pollutants from Aqueous Environments using Solar-Powered Palladium-end-capped Gold Nanorods." Mr. Hoang’s science teacher is Myra Halpin.

The national winner(s) receive $10,000 and an all-expenses-paid trip to Stockholm, Sweden to represent the United States at the international competition during World Water Week on August 27 to September 1.

The international winner(s) receive $15,000 presented during a royal ceremony by the prize’s Patron HRH Crown Princess Victoria of Sweden.

"WEF is very proud to shine a spotlight on some of our country’s brightest high school students, who impress us all with their innovative projects that focus on protecting our precious water resources," said WEF Executive Director Eileen O’Neill. "These students give us great confidence in the future of water science and research."

In the US, WEF and its Member Associations organize the regional, state, and national competitions with support from Xylem Inc., who also sponsors the international competition. The Bjorn von Euler Innovation in Water Scholarship Award, a $1,000 scholarship sponsored by Xylem Inc., will also be awarded to the state winner who demonstrates a passion for education as well as a spirit of creativity and innovation.

For more information on the Stockholm Junior Water Prize and to see the 2017 state winners: www.wef.org/resources/for-the-public/SJWP/.

On March 22-24, 2017, NC AWWA-WEA was represented at the AWWA-Fly-In in Washington, DC by Brian Tripp (W.K. Dickson), David Saunders (HDR Inc.), Kenny Waldroup (City of Raleigh), and

For more information or to volunteer with the 5k planning committee for the 2018 Water For People 5k races, please contact Justin Nielsen (nielsenjc@cdmsmith.com), Will Rice (wrice@ci.charlotte.nc.us), or Lamya King (king@hazenandsawyer.com).

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Robert Walters (Davidson Water), NC’s representatives met with 13 of 15 of our NC legislators and/or their staff to advance AWWA’s legislative issues on Capitol Hill, utilizing the broad grassroots power of AWWA.

Topics discussed included the following:

- Support EPA and unintended consequences of a reduced EPA budget
- Support tax-exempt status of municipal bonds
- Support full authorization funding for the Water Infrastructure Finance and Innovation Act (WIFIA) – from $20M to $45M – for every $1 spent on water and wastewater through WIFIA there is the potential to leverage $60 Support at least $1.8 billion in funding for the drinking water and $2.8 billion for the wastewater state revolving loan fund programs.
- Remove the annual volume caps for private activity bonds for water infrastructure projects.

The City of Raleigh Receives 2017 LIFT SEE IT Scholarship

Eleven public water resource recovery facilities were awarded travel scholarships for utility staff under the LIFT Scholarship Exchange Experience for Innovation & Technology (SEE IT). The scholarship program, launched in 2016, is a joint initiative spearheaded by the Water Environment Federation (WEF), the National Association of Clean Water Agencies (NACWA), and the Water Environment & Reuse Foundation (WE&RF). As a part of the Leaders Innovation Forum for Technology (LIFT), SEE IT provides scholarships for utility personnel to visit other utilities that are using innovations of interest and share their experience with peers. The awardees are staff from:

- City of Boulder, CO
- City of Jackson, MO
- City of Raleigh, NC
- City of San Luis Obispo, CA
- Greeley Water Pollution Control Facility, CO
- Louisville and Jefferson County Metropolitan Sewer District, KY
- Metropolitan Sewer District of Greater Cincinnati, OH
- San Francisco Public Utilities Commission, CA
- Soquel Creek Water District, CA
- Trinity River Authority, TX
- Washoe County Community Services, NV

Thinking of water in new ways

We are engineers, scientists, consultants and constructors working to safeguard water, maintain vital infrastructure and restore habitats to keep our Carolina communities thriving.

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Staff from the awarded facilities will travel to utilities across the country and abroad to learn about new technologies and processes, as well as gain new perspectives that will enable them to accelerate innovation and adoption at their own facilities. LIFT SEE IT provides the tools to help transform water resource recovery facilities into utilities of the future. A new round of applications will open in the fall of 2017.

Members Update Profile for 2017 Directory

NC AWWA-WEA’s next Membership Directory & Buyers Guide will be available in January 2018 as a part of the Winter 2018 issue of NC Currents. So that we can print the most accurate information for all of our members, we are asking you to verify and update your contact information by October 1st.

The easiest way to view and update the information we have for you is to log in to your NC AWWA-WEA profile at www.ncsafewater.org and 1.) Review your profile to make sure the information is correct, and 2.) Respond to the “Information to include in Annual Printed Member Directory” field available in your profile under the Professional Information heading. Your response in this field will determine what information we print for distribution to other NC AWWA-WEA members. The default is to include your name, employer, professional address, email address, and professional phone number.

If you have forgotten your username or password, use the “Forgot your password” option to look them up using your email address. If you are unable to log in, contact the NC AWWA-WEA office at (919) 784-9030.

Sixth Annual Photo Contest

Get your cameras ready! The NC AWWA-WEA Communication Committee is hosting their annual photo contest again this year! Photos submitted will appear in our publications, on our website, and in our emails.

The Communication Committee will judge photos based on four categories:

- Our Members at Work, Environment, Structures, and Critters Around Us.
- Environment, Structures, and Critters Around Us.
- Our Members at Work, Environment, Structures, and Critters Around Us.
- Environment, Structures, and Critters Around Us.

The top entries in each category will be posted online, and NC AWWA-WEA members will be able to vote and select one photo to receive a Members Choice Award. Winning photos/photographers in each category will receive a $50 gift card and will be recognized at the Annual Conference.

Each submittal must be accompanied by a completed NC AWWA-WEA Entry/Photo Release Form, which also contains additional contest details. Please ensure photos represent activities compliant with safety and environmental regulations. Photos and entry/release form must be received by September 1, 2017, to be considered for the competition.

McKim & Creed Charlotte Office Adds Expertise in Civil Engineering and Buried Infrastructure

Four professionals have joined the growing Charlotte staff of McKim & Creed, Inc., a national engineering, geomatics, and planning firm.

Patrick Needham, PE has joined McKim & Creed as a project engineer. He brings five years’ experience in civil engineering, project management, and construction. Needham served four years as a civil engineering officer in the US Air Force and then worked as a Department of Defense (DoD) civilian civil engineer, where he managed the Portfolio Optimization Element. This consisted of project programming, community planning, and energy management for Seymour Johnson Air Force Base. He has extensive experience programming and designing new construction, maintenance, and repair projects for DoD installations. Needham has a degree in civil engineering from Clemson University.

Craig Watts. He has more than 25 years’ experience in sanitary and storm sewer flow metering projects and condition assessment programs. His specific experience includes the management and analysis of all aspects of sewer studies, including flow metering, manhole inspection, smoke testing, flow isolation, dye testing, closed circuit television inspection, data analysis, and report preparation. Watts has also prepared sewer rehabilitation strategies, developed project schedules, and supervised sewer rehabilitation contractors. He is a graduate of the University of Tennessee with a degree in aerospace engineering.

Preston Johnson, EI, comes to McKim & Creed as an engineer intern with experience in civil and construction engineering. He has been involved in such complex projects as the planning and development of a 20-acre acid-generating materials storage facility and a 325-acre tailings storage facility at a gold mine, and engineering the construction of dry fly ash disposal facilities. Johnson is a graduate of the University of Tennessee, Knoxville with a degree in civil engineering and a concentration in environmental and water resource engineering. He is a member of Engineers Without Borders.

James Kalski brings to McKim & Creed’s Charlotte team experience and expertise in producing plans, profiles, cross-sections, elevations, structure sections, construction details, references and perspective drawings. A CAD technician specializing in the water and wastewater industry, Kalski is proficient in a plethora of applications, including AutoCAD/Land Desktop, AutoDESK Map, AutoCAD Civil 3D, Microstation, Raster Design, and ArcGIS.

McKim & Creed established its Charlotte office in 1994. Notable projects for which McKim & Creed has provided engineering services include UNC Charlotte’s award-winning Partnership, Outreach and Research to Accelerate Learning (PORTAL) building, Carolina Healthcare System’s medical office and healthplex in Waxhaw, and the Ramah Creek Sanitary Sewer Interceptor.

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Raleigh-based McKim & Creed, Inc., a national engineering, geomatics and planning firm, continues to expand its presence in the Triangle with the addition of five professionals specializing in the fields of electrical engineering, civil and environmental engineering, and business development for the energy and environmental consulting industries.

Jessica Graber has joined the company as a business development director for McKim & Creed's Buildings, Energy, and Infrastructure business unit. She has a proven ability to develop and execute strategic sales plans and is a former chair of the NC Sustainable Energy Association (NCSEA), a nationally recognized clean energy policy and advocacy organization. She serves on the Wake County Education Committee of the Greater Raleigh Chamber of Commerce and is a member of the Wake Forest Rotary Club. Graber earned a degree in English from the State University of New York at Brockport.

Addison Dee, PE, comes to McKim & Creed as a project engineer specializing in electrical engineering, design, and management. He has extensive experience in the commercial, industrial and healthcare industries, and has been involved in a variety of project types, from facility master planning to new construction to plant renovations. Dee has a vast working knowledge of current electrical, fire alarm and building codes, and offers strong analytical and problem-solving skills for design and risk management challenges. He is a graduate of Arizona State University with undergraduate and graduate degrees in electrical engineering.

Adam Paukovich, PE, PACP, is a new project manager with McKim & Creed, specializing in municipal, federal and industrial water and wastewater projects. He brings 15 years' experience in the areas of wastewater collection and conveyance systems, water and reclaimed water distribution systems, wastewater lift stations, and water booster pumping stations. Earlier in his career, Paukovich worked as a wastewater treatment plant operator, which gives him unique perspectives in utility design, operations, and implementation. He has a degree in civil engineering from the University of Dayton.

Also joining McKim & Creed's Raleigh staff is Andrea Vetrone, EI. She is a graduate of the Georgia Institute of Technology with a degree in environmental engineering.
Her specialties include hydraulic engineering, hydrology, environmental systems design, water quality and air pollution engineering. As an engineer intern with McKim & Creed, Vetrone provides technical and design services, conducts technical evaluations projects, prepares design computations and assessments, and produces design/construction drawings, technical specifications, and bid documents.

**Jacob Bowes, EI,** comes to McKim & Creed as an engineer intern, focusing on civil/site engineering and construction administration. He worked with McKim & Creed as a student intern for nearly one year and joined the Raleigh staff full time upon graduation from North Carolina State University with a degree in civil engineering. He has been involved with numerous project types, including residential land planning, commercial development, water infrastructure, and structural design for pipe supports.

**About McKim & Creed**

McKim & Creed is an employee-owned engineering, surveying, and planning firm with nearly 400 staff members in offices throughout the US, including North Carolina, Florida, Virginia, Georgia, Texas, and Pennsylvania. McKim & Creed specializes in civil, environmental, mechanical, electrical, plumbing, and structural engineering; industrial design-build services; airborne and mobile LiDAR/scanning; unmanned aerial systems; subsurface utility engineering; and hydrographic and conventional surveying services for the energy, transportation, federal, land development, water, and building markets. For more information about McKim & Creed, visit www.mckimcreed.com.

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**Freese and Nichols Expands North Carolina Presence with Greensboro Office**

Freese and Nichols, Inc., a consulting firm that serves municipalities, counties, and utilities across the Southeast, has expanded its presence in North Carolina by opening an office in Greensboro. This increased regional investment enhances the capabilities and services provided by the firm's team in Raleigh.

“Our new office strengthens our ability to serve clients and foster new relationships in the Triad, as well as in western North Carolina and southern Virginia,” said Mike Wayts, North Carolina division manager. “Freese and Nichols has built a solid reputation throughout the region, and I am confident that the Greensboro team will provide the same outstanding service that our partners have come to expect from us.”

Freese and Nichols provides a broad range of services to plan, design, and manage public infrastructure projects. In 2016, the firm acquired Lotic Solutions, based in Graham, which specializes in geomorphology, stormwater management, and environmental science.

A sampling of Freese and Nichols’ recent and ongoing projects:

- Developing a watershed protection plan for three streams for the Town of Kernersville
- Providing program management for the Town of Chapel Hill’s $40.3 million bond and capital improvement program
- Designing wastewater treatment plant improvements for the City of Morganton
- Restoring an impaired trout stream – including 5,000 feet of bank stabilization – for Roanoke County, Virginia
- Analyzing sediment transport for the relocation of a raw water intake for the Town of Pulaski, Virginia
- The Greensboro office is at 717 Green Valley Road, Suite 200; its phone number is 336-790-6744.

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**Freese and Nichols acquires Lotic Solutions**

Freese and Nichols, Inc., a consulting firm that plans, designs, and manages infrastructure projects, has expanded its capabilities by acquiring Lotic Solutions, LLC. Lotic provides specialized services in geomorphology, stormwater, and environmental science.

Lotic has built a reputation for tailored solutions on a wide range of ecological projects nationwide. In Virginia, the team helped Roanoke County meet its water quality goals through design-build stream restoration. Outside Greenville, NC, they are developing a master plan for outdoor recreational use of a 3,000-acre former federal facility. In Kauai, Hawaii, the team helped restore the Hanalei River to protect taro farms and restore critical habitat.

“Freese and Nichols has partnered with Lotic on a number of projects, and we recognized that their culture and services match up well with ours,” said Mike Wayts, Freese and Nichols’ North Carolina division manager. “We’re excited to have them join our team, and their expertise will strengthen our service for our clients across North Carolina and the Southeast.”

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**Joining Freese and Nichols’ North Carolina team are Bryan Dick, PE, PH, and Ian Jewell, JD, who bring national expertise in ecological design and construction management, as well as the water quality aspects of stormwater management. Their resumes include Dick, who was president of Lotic, is an engineer and hydrologist with 20 years’ experience in water resources and geomorphology. Before founding Lotic, he served as national practice lead for ecological engineering at an international consulting firm. Dick’s experience in water resources includes more than 200,000 feet of stream restoration and bank stabilization design and construction. He has also served as the project manager or technical lead for several thousand miles of watershed/stream geomorphic assessments.

Dick has bachelor’s degrees in forest resource management and civil engineering, and a master’s degree in fluid mechanics and hydrology, all from...
WK Dickson Welcomes New Manager to the Wilmington Regional Office

WK Dickson & Co., Inc. is pleased to announce the addition of Julie Hellmann, PE, as the firm’s newest vice president and regional manager. Julie assumes responsibility for the operation of the firm’s Wilmington, NC area office and will play a significant role in directing much of the growth of WK Dickson’s overall infrastructure consulting services throughout the Carolinas.

About Freese and Nichols
Freese and Nichols, Inc. is a professional consulting firm serving clients across the Southeast and Southwest United States. With sustainability in mind, Freese and Nichols plans designs and manages infrastructure projects. It is the only engineering/architecture firm to receive the Malcolm Baldrige National Quality Award. Learn more at www.freese.com.

About WK Dickson
WK Dickson is a multi-disciplinary consulting firm specializing in total community infrastructure solutions including airport planning and design; environmental and water resources engineering; community planning and site development; and geospatial technology. Our goal is to help communities improve the lives of their citizens through sound, ecologically responsible design principals. The firm has been headquartered in Charlotte, North Carolina since its founding in 1929 and has steadily grown to operate eight regional offices, strategically located throughout the Southeastern United States.

About Dewberry
Dewberry is a leading, market-facing firm with a proven history of providing professional services to a wide variety of public and private sector clients. Recognized for combining unsurpassed commitment to client service with deep subject matter expertise, Dewberry is dedicated to solving clients’ most complex challenges and transforming their communities. Established in 1956, Dewberry is headquartered in Fairfax, Virginia, with more than 50 locations and 2,000 professionals nationwide. To learn more, visit www.dewberry.com.

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2017 Schedule of Events

The following schedule is current as of April 2017. For updates or more information, please contact the organization listed with each event. If a listed event does not reference a specific organization, the item listed is a NC AWWA-WEA event. For further details concerning all NC AWWA-WEA events, visit the NC AWWA-WEA website at www.ncsafewater.org or contact the NC AWWA-WEA office directly at (919) 784-9030.

July 2017

20  **Membership Engagement Committee G.R.O.W. Event**  
Asheville, NC

27  **Drinking Water Rules & Regulations Seminar**  
Raleigh, NC

31-Aug. 2  **Utility Management Institute, Phase III Leadership Class**  
Carrboro, NC

August 2017

9  **Risk Management Seminar**  
Greensboro, NC

24  **Automation Committee Seminar**  
Greensboro, NC

29  **Rural Community Assistance Program (RCAP) Small System Seminar**  
Fayetteville, NC

September 2017

5-7  **Raleigh Institute**  
Raleigh, NC

14  **Charlotte Water Institute**  
Charlotte, NC

20  **Sustainability Seminar**  
Cary, NC

21  **Membership Engagement Committee G.R.O.W. Event**  
Charlotte, NC

October 2017

2-6  **Central Collection & Distribution School**  
Raleigh, NC

10  **Wastewater Laboratory Analyst Exam**  
Wilson, NC

November 2017

12-15  **Annual Conference**  
Raleigh, NC

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**NC Currents Future Themes & Submission Deadlines**

*NC Currents* is the official publication of NC AWWA-WEA. Members, individuals, and committees are encouraged to submit content for the magazine. If you would like to submit an article to be considered for publication in *NC Currents*, please complete the Submission Form & Publication Agreement (available at www.ncsafewater.org/page/NCC) and email both the completed form and your article to Nicole Banks at nbanks@ncsafewater.org. Articles must be received by 5:00 pm EST on the listed submission deadline. The editors of *NC Currents* welcome the submission of all articles related to the water and wastewater industry. Themes serve as general guidance for each issue, but articles are not limited to an issue’s specific theme. Submission of an article does not guarantee publication. The editorial committee will review and select all articles, and authors will be notified of the status of their submission.

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<tr>
<th>FALL 2017</th>
<th><strong>Condition Assessment</strong> (Submission Deadline July 10, 2017)</th>
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<tr>
<td>As America’s infrastructure continues to age and deteriorate, we must decide how to invest time and money to assess an asset’s condition and then repair or replace it. Many utilities have programs that regularly inspect a buried pipe and/or structure’s condition. Buildings, tanks, and equipment at our treatment facilities are also aging and require reinvestment as well. This issue of NC Currents will explore the options available for assessing the condition and management of your infrastructure, how to prioritize renewal and replacement programs, and the best way to maximize limited funds for important projects that are too often “out of sight, out of mind.” Articles can include those that focus on methods or technologies to visually or otherwise determine an asset’s condition, programs or technology that establish an asset’s life expectancy, and the means to repair/replace those assets.</td>
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<td><strong>Theme Leaders:</strong> Marianna Boucher, Steve Hilderhoff, Kara Meyers</td>
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<th>WINTER 2018</th>
<th><strong>Geomatic Assessment</strong> (Submission Deadline September 11, 2017)</th>
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<td>Geospatial information systems (GIS) has become an important tool for water and wastewater utilities, providing valuable insight into how we use, manage, and optimize our limited water resources. GIS is a geomatics-based user interface that enables the water industry to analyze large data sets, and can be greatly improved with the use of other geomatics technologies. Unmanned aerial systems (aka drones), aerial and mobile LiDAR, robotics, bathymetry, and laser scanning are survey methods that can accurately collect large amounts of data quickly and safely. This geospatial data can then be classified to serve as the foundation for modeling, capital improvement plans, asset management programs, etc. In this issue of NC Currents, we will explore how these technologies are currently being used by utilities and their potential for future use.</td>
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