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On the cover: Trustom Pond. Rhode Island's only undeveloped coastal freshwater pond—Trustom Pond National Wildlife Refuge (photo: U. S. Fish and Wildlife Service)

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NEWEA
WORKING FOR WATER QUALITY

OUR ASSOCIATION WAS ORGANIZED EIGHTY-EIGHT YEARS AGO in Hartford, Connecticut, on April 23, 1929, with the objectives of advancing the knowledge of design, construction, operation and management of waste treatment works and other water pollution control activities, and encouraging a friendly exchange of information and experience. From 40 charter members, the membership has steadily grown to more than 2,000 today. Membership is divided into the following classes:

Professional Member—shall be any individual involved or interested in water quality including any manager or other officer of a private waste treatment works; any person engaged in the design, construction, financing, operation or supervision of pollution control facilities, or in the sale or manufacture of waste treatment equipment.

Executive Member—shall be an upper level manager interested in water quality and who is interested in receiving an expanded suite of WEF products and services.

Corporate Member—shall be a sewerage board, department or commission; sanitary district; or other body, corporation or organization engaged in the design, consultation, operation or management of water quality systems.

Regulatory Member—this membership category is a NEWEA only membership reserved for New England Environmental Regulatory Agencies, including: USEPA Region 1, Connecticut Department of Energy and Environmental Protection, Maine Department of Environmental Protection, Massachusetts Department of Environmental Protection, New Hampshire Department of Environmental Services, and the Vermont Department of Environmental Conservation.

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Young Professional Member—shall be any individual with five or fewer years of experience in the water quality industry and who is less than 35 years of age.

Professional Wastewater Operations Member (PWO)—shall be any individual who is actively involved on a day-to-day basis with the operation of a wastewater collection, treatment or laboratory facility, or for facilities with a daily flow of <1 million gallons per day. Membership is limited to those actually employed in treatment and collection facilities.

Student Member—shall be a student enrolled for a minimum of six credit hours in an accredited college or university.

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PWO	$109
Dual	$40
Student	$10

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President's Message

We are working for water quality. WH$_2$O's with us?

As your president for 2017, I am honored and privileged to welcome you aboard as we embark on another exciting year and chapter in our NEWEA journey.

I look forward to seeing and connecting with you at our conferences, specialty seminars, and various other activities throughout the year. NEWEA offers us an array of opportunities to get involved; our state and federal government legislative events, Water for People, Stockholm Junior Water Prize, Operations Challenge, and Water Champions to name just a few, and I encourage you to join us by participating in any way that you can. In addition to honing our professional skills, our NEWEA activities provide us with personal fulfillment and fellowship with colleagues that will likely lead to lifelong relationships.

Our 2017 theme is the growth and development of students and our Young Professionals. Why is this important to us? Our lives involve a physical and spiritual journey to seek out and define our identity, both personal and professional, who we are, what purpose we have, what difference we can make in the lives of others, and in the world around us. Rarely is the journey straightforward or predictable, and it is oftentimes complicated with conflicting paths and difficult decisions. We find ourselves searching for signs, either real or abstract, to help us find our way. In some cases, these signs are manifested in the form of mentors, people who we meet on our journey, and are willing to share their experience and wisdom, advise and encourage us, and shape and define that identity.

In our March 2016 Planning Session, one of our working groups focused on this critical issue of mentorship and finding ways NEWEA can provide opportunities to establish and foster these relationships. The outcome was a plan for a Young Professionals Summit to be held at our 2017 Annual Conference. I am happy to report that it was a resounding success! The summit was attended by more than 60 Young Professionals, and included a half-day program of presentations on industry-related topics and a question-and-answer session with a panel of industry leaders who shared their experiences and advice with participants. As I emphasized during my remarks at the Annual Conference adjournment, this summit concept is a NEWEA activity for you, the Young Professionals, and provides you with a forum to shape professional and personal development as you see fit. I will be working closely with the Young Professionals Committee as we review this year's program, determine how we build on this incredible initial success, and establish a plan for its future as a vital and important NEWEA program.

The summit was attended by more than 60 Young Professionals, and included a half-day program of presentations on industry-related topics and a question-and-answer session with a panel of industry leaders

Our 2016 Planning Session also reviewed our student outreach. One result of these discussions was to revise our committee charges to challenge our NEWEA committees to conduct a student outreach activity each year. Admittedly, this is a lofty goal, that will take time to develop, but I believe this effort is so critical to the future success of our profession that we are best served by raising the bar high. To initiate this task, I intend to work closely with the Public Education and Student Activities committees who are already on the front lines leading this effort through collaborating with elementary, middle, and high schools, vocational schools, and colleges and universities, and have created tools, resources, and activities to assist our committees in their efforts. These student outreach opportunities can be as simple as attending a career day at your child's school, presenting aspects of our profession to a classroom, or visiting with undergraduates at your alma mater. I know from experience that teachers at all grade levels are grateful for and welcome opportunities to have us serve as guest speakers in their classrooms. You just need to be willing to contact them and volunteer your time. Our water profession is rich with opportunities with a role for anyone willing to accept the call to join us, whether it be in operations, engineering, science, product sales and development, public relations, administration, finance, media, or regulatory work. What better message to bring to young people than to challenge and inspire them to be the next generation of advocates, stewards, and protectors of the water environment, our earth's most precious resource. I urge you to be creative, have fun, and seek these opportunities, as the reward you receive will far exceed your efforts, and the students' lives will be richer for it.

In addition to our Young Professional and student outreach activities, we have many other exciting activities on the horizon for your participation. We have a full slate of specialty seminars planned this year, including Collection Systems and Sustainability, Watershed Management, Industrial Wastewater, Stormwater, and Residuals and Biosolids. Our Operations Challenge Committee will have its Training Day in April to prepare our teams for the Operations Challenge events to be held at the Spring Meeting in North Falmouth, Massachusetts, and at WEFTEC in Chicago. Over the next few months, we will be supporting our state associations with their legislative events and then nationally at the Washington, D.C., Fly-in during Water Week in March. These events provide opportunities to meet personally with and directly influence our legislators. We must continue to advocate for our water infrastructure and emphasize its importance to the day-to-day function and business of our society. Our water infrastructure is vital to all our citizens and provides a stable platform for bipartisan efforts for our legislators.

In closing, I want to acknowledge and thank Past President Ray Willis for his exemplary and steadfast service to NEWEA as our president. Mr. Willis has led us with grace, dignity, and ingenuity, and has set a tremendous example for me to follow. I look forward to working with him, President-elect Janine Burke-Wells, Vice President Ray Vermette, Treasurer Priscilla Bloomfield, the Executive Committee and all our committees, Mary Barry and our NEWEA staff, and our members, as we move forward with this year's focus on the growth and development of our students and Young Professionals. On behalf of NEWEA, I sincerely thank you for your volunteer efforts and for the work you do each day, and I anticipate many new and exciting adventures, friendships, and opportunities for us all in 2017.

With thanks and appreciation,
James Barsanti, NEWEA President

From the Editor

After perusing each edition of the *Journal* in 2016, I hope our readers were impressed with the articles, news, events, and industry information featured throughout the year. A visually attractive *Journal* filled with quality content is a positive reflection on NEWEA and its membership—we thank all who contributed. With 2016 in the books, the *Journal* team is turning its attention to 2017. Here is what is in store.

2017 *Journal* themes and submission deadlines
Summer—**Wastewater Treatment and Collection Systems Operations** (March 31)
Fall—**Municipal/Agency Topics** (June 30)
Winter—**National Issues of Regional Interest** (September 29)

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Regular readers know that a theme is typically selected for each edition of the *Journal*. As indicated on the cover, our first publication of the year features stormwater/watershed planning topics. In 2017, we will also include articles on wastewater treatment and collection systems operations, agency/municipal topics, and issues that other parts of the nation may be facing that are of interest to us in New England. Please refer to the table for each theme and the associated submission deadline.

In addition to the topics indicated above, an underlying Throwback theme will be featured throughout 2017 that we are particularly excited about (not to be confused with President Jim Barsanti's theme, which is growth and development of students and young professionals). Current plans call for reprinting articles from *Journals* of past eras (refer to the sidebar to see how the *Journal* cover has changed over the years), highlighting a historical figure in our Spotlight series, displaying photographs with scenes from our past, or commemorating special events.

In the spring issue, for our first Throwback, we are reprinting an article from the October 1969 issue, written by Walter M. Newman and titled "Water Quality Management Issues in New England." The article provides an interesting historical perspective in comparison to current stormwater and watershed planning challenges in our region, and points out the following issues of the time:

- The high cost of achieving water quality and the potential economic impacts
- The public's general acceptance of pollution and the tendency to avoid these areas (i.e., recreation and water supply) versus addressing a clean-up
- The need for public involvement in view of the preceding point
- Setting adequate water quality standards
- The importance of CSO and nutrient controls
- The lack of regulations to preserve water quality

Almost half a century later, a lot has been accomplished in these areas, and the region's water quality is significantly better, though much work remains. Interestingly, some of what Mr. Newman wrote about almost 50 years ago still resonates today, in particular:

- Gaps in funding
- Need for new technologies
- Shortage of wastewater treatment and collection system operators

Notably, though not surprisingly for the times, stormwater issues were mostly absent from the article.

Mr. Newman concluded his article with the following:

"The financial and manpower requirements are staggering. The technological elements are extremely complex. Regional cooperation at all levels of government, private industry, civic and professional action groups, and concerned citizens is essential to ensure success in achieving our objectives. Regional waste treatment facilities, regional operating districts, watershed management programs, river basin management systems, and vigorous state water pollution control programs are key elements."

Most of these words could have been written in these pages today, not just five decades ago.

As described above, we have interesting topics lined up for 2017, and we are introducing a new concept that we will explore throughout the year—an underlying Throwback theme. The *Journal* Committee and staff are excited about featuring these items, and we hope you are looking forward to reading about them.

***Journal* variations: "half-size" (left) inaugural edition and (right) 1996 to 2004 version, enlarged to "full-size"(center) 2005–2013, updated to current design in 2013**

Industry News

The Mystic River Watershed Association received $80,116 for the two-year Mystic River Herring Run project that connects city students with the herring migration

Two Massachusetts Groups are Awarded $171,116 for Environmental Education Initiatives

– EPA Region 1 Public Affairs

EPA recently awarded $171,116 to two Massachusetts organizations that will involve students in becoming smarter and better stewards of the environment.

Manomet Inc. of Plymouth and the Mystic River Watershed Association in Arlington were given EPA Environmental Education funds for programs to educate the community and students about environmental issues. The two grants were among three environmental education grants awarded by EPA in New England.

"The projects taken on by these organizations will help make a brighter future for New England communities," EPA's New England (now former) regional administrator, Curt Spalding said. "Young people, educators, and communities taught how to address the problems and challenges of environmental protection are bound to play a part in a healthier world tomorrow."

The Mystic River Watershed Association received $80,116 for the two-year Mystic River Herring Run project that connects city students with the herring migration with the goal of improving environmental literacy among students on riverine ecology, increasing knowledge of environmental stewardship of water resources, and educating communities to reduce stormwater pollution that affects the Mystic River watershed. The project creates, maintains, and shares a web portal about the Mystic River watershed, fish, and water quality, and involves the communities in helping to count fish in the river-herring migration. The association is hosting workshops in schools, field trips to fish ladders, and stewardship events along the river. With six school districts involved, some 1,500 students and 200 adults are expected to participate.

"The Mystic River Watershed Association is excited to bring the herring migration to the larger community and especially local schools through the installation of underwater video cameras," said Beth MacBlane, outreach and communications director of the Mystic River Watershed Association. "This new program will connect thousands of people to this amazing rite of spring—the herring migration."

Manomet was given $91,000 for a project that will educate students about sustainability within the small business sector. This two-year project is an expansion of a program to help college students in the environmental or business departments learn more about climate change, energy, water, and toxins, and how to apply problem-solving and analytical skills to environmental challenges. It will help students look at how sustainability strategies can be applied to business models and help small businesses reduce their environmental impact. Five universities in New Hampshire and Maine have signed on as sub-grantees for the student internship program along with sustainable business organizations who are hosting students. The students are helping local businesses operate more sustainably, enabling businesses to reduce their environmental footprints and use of toxic chemicals, increase climate resiliency, and develop greater local stewardships. Between 30 and 80 students and 12 to 15 small business owners are expected to participate.

"We are incredibly grateful to EPA for this grant to support the growth of Manomet's new experiential education program for colleges," said Lora Winslow, project manager. "Manomet will train dozens of students to address the complex environmental challenges facing their generation, and provide roughly 1,200 small businesses with tools to reduce their environmental footprint. Thanks to EPA, this program will have long-lasting and far-reaching impacts for the students, their communities, small businesses, and our planet."

The other New England organization awarded an environmental education grant was Groundwork Providence, in Providence, Rhode Island.

EPA funds environmental education projects that focus on educating teachers, students, parents, or the general public about human health problems. Examples of these projects include increasing pollution awareness, improving teaching tools and techniques for educators through workshops, building state or local capability to develop and deliver environmental education or public outreach programs, and promoting environmental careers and stewardship among students through hands-on activities.

EPA's Environmental Education grants encourage projects that educate members of a community through community-based organizations, through educational institutions, or through print, film, broadcast, or other media to be more environmentally aware and make environmentally friendly decisions.

For more information about EPA Environmental Education grants, visit: epa.gov/education/environmental-education-ee-grants.

EPA Launches Technology Challenge for an Advanced Septic System Nitrogen Sensor

– Emily Bender, EPA Region 1 News Release

On January 17, 2017, EPA and its partners launched a technology challenge for an advanced septic system nitrogen sensor. The total award pool for this phase is $55,000. The challenge was open for submissions from January 17 to March 17, 2017.

EPA has partnered with The Nature Conservancy, U.S. Geological Survey, and others to launch the Advanced Septic System Nitrogen Sensor Challenge. In Phase I, entrants were asked to design a nitrogen sensor for use in advanced nitrogen-removal onsite wastewater treatment systems (OWTS), also known as advanced septic systems, to monitor their long-term performance. The top entries will be awarded cash prizes totaling $55,000, and will be given the chance to network with industry leaders, regulators, and advanced OWTS test centers to potentially seek prototype funding.

The challenge is being managed by InnoCentive, EPA, and challenge partners. The challenge expert advisory committee who will review challenge submissions includes experts from EPA, the New England Onsite Wastewater Training Program at the University of Rhode Island, the Massachusetts Alternative Septic System Test Center (MASSTC), state onsite regulators, the National Onsite Wastewater Recycling Association, the New York State Center for Clean Water Technology at Stony Brook University, and various university engineering programs.

Conventional septic systems are not designed to remove nitrogen, which can lead to problems such as nitrogen loading to waterways. This issue is especially important to coastal communities, where excess nitrogen causes toxic algal blooms leading to beach closures and degrades water resources. EPA estimates that owing to their location in nitrogen-sensitive watersheds, around 2.6 million systems could be good candidates for advanced septic systems that treat nitrogen.

Many communities, state and local governments, and environmental NGOs are eager and motivated to prevent and reduce nitrogen pollution in sensitive areas. While some have begun requiring installation of advanced septic systems to protect sensitive areas, routinely monitoring the long-term performance of these systems is logistically challenging and requires large investments in time and resources. Currently, no sensor is available for detecting and measuring nitrogen in advanced septic system effluent.

Visit: innocentive.com/ar/challenge/9933926 for more details on the challenge.

Recently Retired MWRA Employee Recognized for Outstanding Service

– EPA New England Office

Charlie Tyler, a resident of Sherborn, Massachusetts, and a retired engineer of the Massachusetts Water Resources Authority (MWRA), is being honored with a 2016 Regional Lifetime Achievement Award by EPA. Mr. Tyler has provided training and technical assistance to wastewater professionals in New England throughout his many years of employment with MWRA. Among other things, Mr. Tyler will always be remembered for his enthusiasm while narrating tours of the MWRA Deer Island Wastewater Treatment Facility to the many public, state, and federal officials.

The EPA Regional Wastewater Awards Program recognizes personnel in the wastewater field who have provided invaluable public service managing and operating wastewater treatment facilities throughout New England. The Massachusetts Department of Environmental Protection was instrumental in Mr. Tyler's nomination.

"We are proud to acknowledge Mr. Tyler's outstanding contributions to help protect public health and water quality for so many years and to give him the credit he deserves." said Deborah Szaro, acting regional administrator of EPA's New England office.

The EPA Regional Wastewater Treatment Plant Excellence Award was established to recognize and honor the employees of publicly owned wastewater treatment plants for their commitment to improving water quality with outstanding plant operations and maintenance. EPA's New England office formally acknowledged Mr. Tyler at NEWEA's Annual Conference for his fine work.

West Haven Will Improve Stormwater System under Amended Settlement

– EPA Region 1 Public Affairs

The city of West Haven, Connecticut, will make changes to its stormwater system to ensure that local waterways are adequately protected and that the city is complying with its state permit for stormwater discharges. The stormwater system upgrades are included in a proposed agreement to amend a 2014 Clean Water Act Consent Decree among the city, EPA, and the state of Connecticut.

Under the 2014 Consent Decree, West Haven agreed to reduce illegal discharges from sanitary sewer overflows. After the Consent Decree was entered, EPA became aware of several other problems related to the city's separate storm sewer system (MS4) program. Amending the 2014 Consent

Decree will help the city consolidate its system upgrades to more efficiently improve water quality and comply with the Clean Water Act.

In an April 2015 inspection of the system, EPA documented numerous places where the city failed to follow the requirements of its storm sewer permit. In particular, it had failed to: update its stormwater management plan and submit an annual report since 2009; properly monitor its outfalls in 2011, 2012, and 2013; implement a public education program related to stormwater; adequately map its MS4 system; put in place a way to eliminate illicit discharges; and review its stormwater management plan to determine whether stormwater from the city's five outfalls that discharge into New Haven Harbor met permitted limits.

"Protecting our waterways means not only stopping direct discharges of sewage overflows from sanitary systems but also protecting our rivers, ponds, lakes, and streams from contaminated runoff by adequately managing stormwater," said EPA's Mr. Spalding. "We appreciate that the city of West Haven is going to focus its efforts on addressing both these important programs."

In an April 2015 inspection of the system, EPA documented numerous places where the city failed to follow the requirements of its storm sewer permit.

"West Haven's additional measures to ensure compliance with the Clean Water Act benefit all of us," said U.S. Attorney Deirdre M. Daly. "We are thankful for each opportunity to partner with EPA and the state of Connecticut in an effort to ensure and maintain the chemical, physical, and biological integrity of the waters of this state."

The city has hired a consulting firm to help it comply with the requirements of the 2014 Consent Decree regarding sanitary sewer overflows. The new amendments will make it more likely the city will be able to address all of its stormwater and wastewater management obligations in a coordinated and efficient manner. The proposed changes to the 2014 Consent Decree are subject to a public comment period and approval by the court. The alterations are expected to cost hundreds of thousands of dollars.

As part of the original settlement the city paid a total penalty of $125,000. The amendments to the Consent Decree would require West Haven to comply with specific provisions of the MS4 permit by specific dates. The city of West Haven owns and operates a treatment system with about 145 miles (234 kilometers) of sewers and 13 pumping stations, as well as a wastewater treatment facility that discharges to New Haven Harbor. The city estimates it has about 50 municipal separate storm sewer system outfalls.

The amended consent agreement will be available for public review and comment for 30 days, following posting on the Department of Justice website. For more information, visit: justice.gov/enrd/Consent_Decrees.html.

For more information on how EPA enforces the Clean Water Act, visit: epa.gov/enforcement/water-enforcement.

EPA Works with Two Rhode Island Communities to Improve Water Quality

– EPA Region 1 Public Affairs

Two recent administrative consent orders between EPA and the towns of Johnston and North Providence, Rhode Island, will result in cleaner water and improved environmental conditions. These improvements will come from the requirement that the towns identify and eliminate the causes of sewage overflows from their collection systems.

In Johnston, based on reports from the Rhode Island Department of Environmental Management (RIDEM), EPA had reason to believe that overflows were occurring from point sources in Johnston's sewage collection system and entering waters protected under the Clean Water Act. In May 2016, EPA issued an information request to the town requiring that it submit information regarding past overflows and pump station failures, and to report overflows to EPA and RIDEM in an ongoing manner in the future.

As EPA believed that Johnston needed to take additional actions regarding its sewer collection system to prevent future Clean Water Act violations, EPA has entered into an Administrative Order on Consent with the town requiring that it develop a plan to address the underlying causes of sewage overflows, including a pump station condition assessment, and conduct necessary repairs and take other actions to address deficiencies in its collection system. The town is to report its progress implementing these improvements to EPA and RIDEM in annual reports.

In North Providence, EPA had previously issued an Administrative Order to the town requiring that it develop and implement a corrective action to address basement backups. In addition, EPA had required that the town respond to several information requests requiring additional information regarding sewage overflows. To ensure that the town is taking sufficient action, EPA recently entered into an Administrative Order on Consent with the town that consolidates the requirements of the previous order and the information requests, and also requires the town to evaluate the results of its actions to date to address sewage overflows. As with Johnston, North Providence is to report its progress implementing the new order to EPA and RIDEM in annual reports.

EPA has taken a number of similar actions throughout New England to address sewage overflows. When these overflows occur, raw sewage can enter surface waters or be discharged to streets or private property, where it poses a public health risk. Sewage overflows to "waters of the United States" are not allowed under the Clean Water Act, and can be caused by a combination of factors, including failures of the system of pipes, pumps, and other equipment that municipalities use to collect and transport sewage to wastewater treatment plants; grease and other blockages, such as from disposable wipes and tree roots; or excess flows entering the collection system. Implementation of effective preventive maintenance programs have been shown to eliminate or significantly reduce the frequency and volume of these discharges.

Casco Bay Estuary Partnership Releases 2016–2021 Plan

– Submitted by Casco Bay Estuary Partnership

The Casco Bay Estuary Partnership (CBEP), one of 28 community-based partnerships engaged in EPA's National Estuary Program, recently released a plan for the next five years (2016–2021). The bay area, while serving as the end of a watershed that is only three percent of Maine's land mass, holds 18 percent of the state's population. Casco Bay is a large and diverse water body, having 575 miles (925 km) of shoreline and 785 islands and ledges.

"For two decades CBEP, with its partnership of organizations, has made great strides in sustaining a healthy Casco Bay," says Curtis Bohlen, CBEP director. "But stressors on the bay are continually changing in character as well as growing in number and magnitude." For instance, while Casco Bay enjoys good water quality when judged by national standards, the waters of the Gulf of Maine—of which it is a part—are reported to be warming faster than 99 percent of global ocean waters. Casco Bay itself has warmed 3.6˚F (2˚C) on a seasonally adjusted basis since monitoring began in 1993. Climate change has also brought increases in both annual precipitation and extreme precipitation events. This has raised concerns with stormwater impacts associated with nitrogen and phosphorus, and the potential to affect water quality issues from coastal acidification to algal blooms and lower dissolved oxygen.

Building on a Record of Accomplishments

Working with numerous partners, CBEP has invested more than $700,000 in several dozen projects since 2000, helping to conserve thousands of acres (hectares) of forested woodlands near headwater streams and hundreds of acres of coastal habitats, including salt marshes and seabird nesting islands. The amount of conserved and permanently protected land in the lower Casco Bay watershed has more than doubled from 7,300 acres (2,954 ha) in 1997 to 18,960 acres (7,673 ha) today.

The number of active CSOs discharging into Casco Bay has been reduced from 80 in 1990 to 43 in 2014, and additional CSOs were removed in 2015 and 2016.

Fish passage restoration has been another success story since the early part of the last decade. In the early 2000s, few fish were able to make the journey upstream from Casco Bay to Highland Lake in Windham (11 miles [18km]) from the Presumpscot River estuary). In 2015 and 2016, thousands of alewives were documented making the journey. This success came after more than a decade of work toward removal of the Smelt Hill Dam, fish passage improvements at the Highland Lake Dam, culvert modifications at three road crossings, riparian plantings, and streambank stabilization. More than 50 acres (20 ha) of tidal marsh habitat have been restored at several locations in Harpswell and Brunswick, in the northern end of the bay. Working with the Presumpscot River Watershed Coalition, CBEP helped develop a plan for the Presumpscot River and completed a $1 million project under EPA's targeted watershed grants program.

Ongoing Collaboration

Eliminating combined sewer overflows (CSOs) is a big and expensive effort being led by the cities of Portland and South Portland. The number of active CSOs discharging into Casco Bay has been reduced from 80 in 1990 to 43 in 2014, and additional CSOs were removed in 2015 and 2016. In terms of discharge volume normalized to rainfall, 24.9 million gallons per inch (37.1 ML per cm) of rain were released from these sources in 2000. By 2014 that number had dropped to 7.9 million gallons per inch (11.8 ML per cm) of rainfall. Pollution prevention and stormwater runoff elimination are gaining momentum as well. In 2002 the Inter-local Stormwater Working Group (ISWG) was formed, with CBEP working with the Cumberland County Soil and Water Conservation District and 14 area municipalities. In 2007, the city of South Portland received a Department of Environmental Protection grant to develop the Long Creek Watershed Management Plan, and worked closely with CBEP and CCSWCD to create the nationally recognized Long Creek Watershed Management District. This pioneering work, which involves more than 130 business and landowners (including two highway agencies and four municipalities), established the most comprehensive stream monitoring program in Maine and continues to work to improve water quality in this urban watershed.

CBEP actively supported the Friends of Casco Bay's water quality monitoring program, which engaged 80 citizen volunteers in last year's Nabbing Nitrogen program where organization volunteers simultaneously collected water samples along the Portland waterfront. The partnership also funds the Presumpscot River Watch, which has been marshalling volunteers since 1989 to monitor water quality in that major tributary to the bay.

Casco Bay was designated by EPA as Maine's first No Discharge Area, prohibiting discharge of all vessel sewage into the bay and controlling the discharge of gray water from large commercial passenger vessels. Owing to 23 shore-side pump-out facilities and the Friends of Casco Bay's mobile pump-out boat, it is now easy for boaters to comply with these important protective measures.

The effects of climate change on Casco Bay and the vulnerability of the bay's coastal wetlands to sea level rise are ongoing areas of study for the CBEP. Along with tracking the spread of invasive species, the partnership continues to work with such organizations as the Northeast Costal Acidification Network, the University of Maine, the University of New Hampshire, and others in the region. For the next five-year period, the partnership has identified four primary goals to extend the scope and impact of collective work already underway on behalf of Casco Bay:

1. **Protect, restore, and enhance key habitats that sustain ecological health**. CBEP commits to conserving priority undeveloped shorelines, protecting and restoring vital habitats such as eelgrass beds and tidal mudflats, enhancing connectivity among aquatic habitats, and strengthening the capacity of Casco Bay ecosystems to accommodate change.
2. **Improve Casco Bay's water quality by reducing nutrient pollution and its impacts, including coastal acidification**. CBEP promotes practices that reduce nutrient pollution, support public funding for improved stormwater management, and assess the dynamics of how nutrients enter and move within Casco Bay.
3. **Foster resilient communities and their connections to Casco Bay**. CBEP seeks to increase public engagement with Casco Bay and to support collaborative initiatives that illuminate the region's ecological and economic interconnections, celebrate the bay's importance, and help citizens and leaders increase the region's resilience in the face of climate disruptions.
4. **Mobilize collective knowledge and resources to support Casco Bay**. CBEP serves as a convener and catalyst, mobilizing scientific, financial, and human resources to help residents throughout the watershed effectively address the complex and evolving challenges facing Casco Bay.

The ongoing success of the CBEP is clear proof of how collaboration among community organizations can accomplish significant improvements in environmental management and public awareness. With careful execution of a long-term regional plan that includes wetlands conservation, monitoring and control of nutrient pollution sources, and promotion of community awareness and involvement, Casco Bay can continue to thrive and improve while meeting the ongoing challenges posed by competing environmental conditions.

Jaffrey Facility to Upgrade its Wastewater Treatment Systems Under Clean Water Act Settlement

– David Deegan, EPA Region 1 News Release

Under the terms of a Consent Decree lodged in federal court, EMD Millipore Corp. of Jaffrey, New Hampshire, will upgrade its on-site wastewater treatment system to comply with the terms of the company's industrial wastewater discharge permit and prevent pretreatment violations of the federal Clean Water Act. The company will also pay a civil penalty of $385,000 for alleged violations of the Clean Water Act.

EMD Millipore operates an industrial manufacturing facility in Jaffrey that produces water filtration devices. The facility operates an on-site wastewater treatment system that introduces wastewater into the Jaffrey publicly owned treatment works (POTW) through a dedicated pipe. The facility's wastewater contains pollutants including ammonia, total suspended solids, hydrogen ion concentration (pH), and oxygen demanding pollutants such as biochemical oxygen demand. The settlement resolves numerous allegations of Clean Water Act pretreatment violations, including pass through and interference violations at the Jaffrey POTW.

The Consent Decree requires EMD Millipore to upgrade the facility's wastewater treatment system to achieve compliance with the federal pretreatment regulations and the facility's industrial wastewater discharge permit. The company must also comply with certain interim wastewater management requirements. Finally, EMD Millipore must provide annual training to individuals at the facility responsible for Clean Water Act compliance and wastewater sampling and analysis, and submit quarterly reports to EPA to ensure compliance with the Consent Decree and the Clean Water Act.

The Consent Decree is the result of a federal enforcement action brought by the U.S. Department of Justice on behalf of EPA. It was lodged in the U.S. District Court for the District of New Hampshire, and was subject to a 30-day public comment period and approval by the federal court. A copy of the consent decree is available on the DOJ website: usdoj.gov/enrd/Consent_Decrees.html.

Boston Water and Sewer Commission collaborates with Boston Public Schools for integrated green infrastructure

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ABSTRACT | In 2012, the Boston Water and Sewer Commission entered into a Consent Decree with EPA to address pollutant loading from drainage system discharges to the Charles River. Since that time, the Commission has implemented a number of green infrastructure projects in collaboration with Boston city agencies. The latest such effort takes advantage of the Boston Public School systems' comprehensive Educational and Facility Master Planning process to construct green infrastructure pilot projects at five schools throughout Boston, all of which are in areas of high phosphorus loading. The projects are also integrated into the curriculum at each school, so students get hands-on experience with both the science and infrastructure involved. The overall effort won a 2015 Stormy Award from the New England Stormwater Collaborative, a joint effort of NEWEA, the New England Water Works Association, and the New England Chapter of the American Public Works Association.

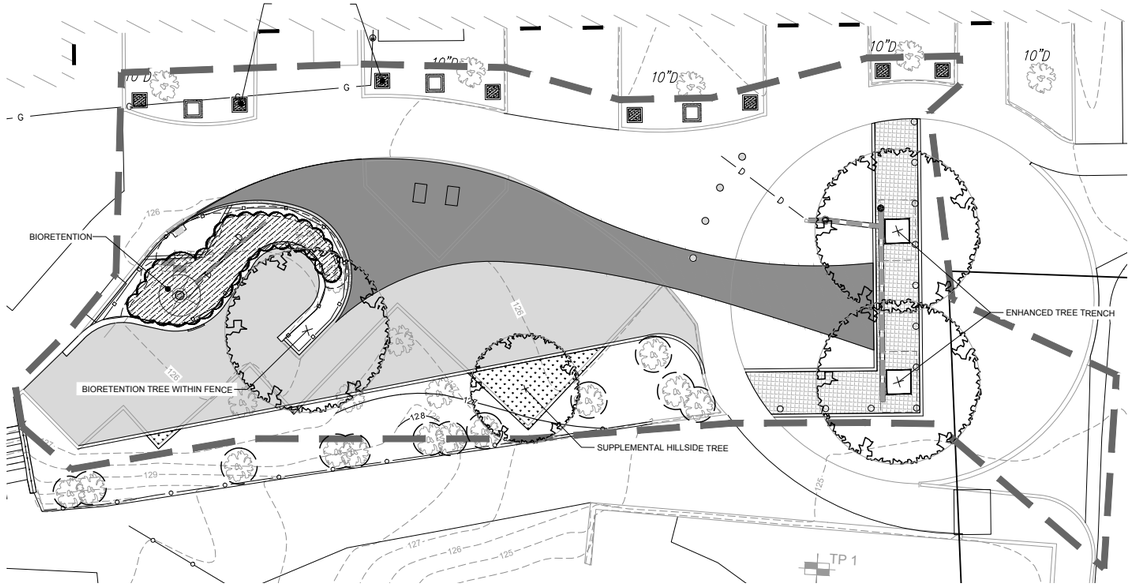
KEYWORDS | Stormwater, green infrastructure, drainage, phosphorus, TMDL

PROTECTING THE CHARLES RIVER

The Boston Water and Sewer Commission won a 2015 Stormy Award for leveraging the Boston Public Schools (BPS) master planning for green infrastructure implementation. The Commission owns and operates a system for the transport of wastewater and stormwater drainage in the city of Boston, and is responsible for most of the storm drains in the city. EPA and the Massachusetts Department of Environmental Protection (MassDEP) have prescribed total maximum daily loads (TMDLs) for nutrients (phosphorus) and pathogens (fecal coliform bacteria) for the Upper/Middle and Lower Charles River watersheds.

On August 23, 2012, the Commission entered into a Consent Decree with EPA to address pollutant loading from the Commission's drainage-system discharges. In accordance with the Consent Decree, a stormwater quality model was developed to identify and quantify pollutant loading from land areas that contribute stormwater runoff to the Commission's storm drain system. The Stormwater Model Report identified areas in Boston with high phosphorus loadings. Development and redevelopment projects within the tributary areas for the Upper/Middle and Lower Charles River must meet pollutant reduction requirements outlined by the prescribed TMDLs.

Over the past few years the Commission has established a green infrastructure/low-impact-development (GI/LID) implementation program and has started several demonstration projects, varying in scale and level of completion, to remove pollutants from stormwater runoff in the city of Boston. These projects are collaborative efforts with other city departments, such as Public Works, Transportation, and Parks and Recreation, as well as local conservation groups, for instance the Charles River Watershed Association. The Commission has initiated three large-scale demonstration projects—Central Square, Audubon Circle, and City Hall Plaza. In addition, other neighborhood-level projects, such as rain garden bump outs in Codman Square, are also at various stages of design and construction.



Stormwater tree pits were used to separate the play yard at the David A. Ellis Elementary School from the pick-up/drop-off area and other vehicle traffic from the adjacent Museum of the National Center of Afro-American Artists

TAKING ADVANTAGE OF EXISTING CAPITAL PLANNING

When it was announced that BPS were undertaking a comprehensive educational and facility master planning process, the Commission saw a chance to collaborate. The master planning process assesses the physical condition of the 133 city-owned BPS facilities, and provides a strategic planning framework for educational programming and major capital investments. The result will be a 10-year capital plan that will include renovations, repairs, or additions to facilities, new construction proposals, potential facility consolidations, and optimized facilities management operations so that every BPS facility meets district educational standards and anticipates future demand. Many of the BPS are within the tributary areas for the Upper/Middle and Lower Charles River. GI/LID as part of the master planning process would provide opportunities for the Commission to reduce phosphorus loading, improve BPS facility aesthetics, and illustrate the numerous benefits of green stormwater management.

To take advantage of BPS master planning, the Commission proposed pilot projects at five schools throughout Boston. Through collaboration with the BPS Facilities Management Department, the Commission hopes to integrate GI/LID into school yards and parking lots at BPS facilities to reduce polluted stormwater runoff and share costs for GI/LID implementation. Furthermore, the Commission also intends to build public awareness about green stormwater management. The five pilot projects are underway. The Commission has completed designs and will provide funding for the construction of GI/LID features. The goal of this collaboration is to make GI/LID part of the BPS 10-year Master Plan so that GI/LID techniques are considered for implementation at BPS facilities as they are updated and to share the cost of GI/LID implementation throughout Boston.

"This work with BPS will help us to meet our water-quality goals for the city of Boston collaboratively," says the Commission's executive director, Henry F. Vitale. "Through pilot projects with BPS, and other city agencies, we hope to get the whole city on board and foster greater receptivity to the proven effectiveness of GI/LID. The idea of having partners to help encourage and finance widespread implementation is also very appealing to the Commission."

The five schools selected to participate in the Commission's GI/LID pilot project are all in areas with high phosphorus loading. GI/LID will be constructed at each school; it was designed to be both effective at pollutant removal and aesthetically pleasing. The design team also considered school needs. For example, school yards with large, paved areas and little shade had GI/LID incorporated that uses vegetated surfaces and trees. At schools where busing/traffic patterns prevented students from playing outside, GI/LID acts as a barrier between students and vehicle traffic to help create protected play spaces. These GI/LID features will serve as demonstration projects for future redevelopment and stormwater management improvements at other BPS facilities.

Washington Irving Middle School conceptual plan: 1. Bioswale 2. Concrete swale 3. Open play area with field turf and porous pavers and trees 4. Bioretention

Construction of the concrete swale that demonstrates "grey" stormwater management

STORMWATER CURRICULUM COMPLEMENTS GI/LID IMPLEMENTATION

In addition to engaging BPS in GI/LID design and construction, and providing the BPS Facilities Management Department with design documents that can be applied or adapted for future facility capital improvements, complementary educational curricula to accompany the GI/LID features are also under development. The Commission hired a BPS curriculum consultant to assist in authoring stormwater and GI/LID science curricula. The overarching purpose of the curriculum component is to educate students about stormwater through interactive lessons and activities that use the newly constructed GI/LID features on site and throughout Boston.

With the new curricula BPS students will receive stormwater education twice before reaching high school. Individual lessons will be added to an existing unit for fifth grade, and an entire stormwater unit, including potential career path and public speaking elements, is being developed for seventh grade. The first stormwater lessons, in fifth grade, will introduce students to stormwater, the current path that stormwater travels to receiving waters, and how GI/LID changes the pathways by allowing natural hydrology to resume function. The stormwater unit taught in seventh grade will explain more in depth about the pollutants affecting stormwater and receiving-water quality, and green stormwater management and treatment techniques. It will include role-playing as various participants and stakeholders in GI/LID design, construction, and maintenance.

This curriculum is intended to be used with the new GI/LID features, and thus the five schools will include outdoor classroom spaces so that students, teachers, and community members can interact with GI/LID to better understand how stormwater is managed. The fifth- and seventh-grade teachers who will receive the GI curriculum will be able to better relay complex concepts (e.g., how infiltration removes pollutants from water, the importance of groundwater recharge, benefits of phytoremediation, etc.) using the visual and physical aids of the GI/LID features that are on the site. The curricula have been coordinated with the new Massachusetts Science and Technology/Engineering Standards, so they can be taught in any fifth- or seventh-grade classroom. Additional resources may also be assembled for teachers of other grades.

IMPLEMENTATION UPDATE

GI/LID designs are complete for each of the five pilot schools. Construction commenced at the Washington Irving Middle School, located in Boston's Roslindale neighborhood, in August 2016. Construction will commence on the four remaining schools during the summer of 2017. Washington Irving, referred to as the flagship project, is the largest and has the most GI/LID features of the five schools. Plans for Washington Irving include a large, outdoor classroom space containing an extensive bioretention feature surrounded by boulders where students can sit, play, and interact with the feature; side-by-side concrete and vegetated swales, so that students can make a visual comparison between "grey" and "green" stormwater management; and a new turf field ringed with trench drains, stormwater tree pits, and a track.

When construction on all five schools is complete, BPS will have many new GI/LID features that serve dual purposes. The first is to better manage stormwater on site and improve overall stormwater quality in Boston to meet the water-quality goals for the Charles River required by the Consent Decree. The second is to provide stormwater education opportunities for students, teachers, and community members. By educating students about GI/LID, parents will indirectly receive these important lessons when children talk about their day. Educational signage will also be installed at each of the five schools for community members to read and understand the myriad benefits of green stormwater management.

ABOUT THE AUTHORS

- Kate England is the project coordinator for GI/LID projects at the Boston Water and Sewer Commission. For the last two years, Ms. England has been cultivating the Commission's newly created GI/LID program. The Commission intends to utilize GI/LID to allow natural hydrology to improve water quality in the city of Boston. In her time at the Commission, Ms. England has worked on many GI/LID projects that are at various stages of planning, design, and construction. Prior to joining the Commission, Ms. England worked as an environmental consultant, designing and constructing GI/LID features.
- Zach Henderson is a water resources technical manager with Woodard & Curran. Mr. Henderson has spent 18 years dedicated to enhancement of municipal stormwater programs. He focuses on planning, compliance, asset management, and stormwater treatment system design across New England and works closely with several long-standing municipal clients on comprehensive stormwater management services. Mr. Henderson currently acts as tri-chair for the New England Stormwater Collaborative.

2015 STORMY AWARD WINNER

The New England Stormwater Collaborative was formed in 2013 by NEWEA, the New England Water Works Association, and the New England Chapter of the American Public Works Association, with the conceptual drivers of education, understanding, and action. The collaborative works to engage the stormwater community, provide a forum for information and education exchange, and advocate sound, stormwater management. The primary mechanism for information exchange is the annual Stormy Award program. Each year the collaborative gives out three New England Stormy awards for the best ideas in stormwater management.

In 2015, the Boston Water and Sewer Commission was one of three New England entities awarded a Stormy for its idea of leveraging a school system master plan to efficiently meet compliance and clean-water goals. Other winners included: the unique school curriculum developed by the Connecticut River Watershed Council, Enchanted Circle Theater, Suez North America, and Hitchcock Center for the Environment that integrates art and science into a program that enhances stormwater outreach; and an innovative legal arrangement between the town of Shelburne, Vermont, and nearby South Burlington, Vermont, that allows shared use of staff and equipment to meet stormwater-compliance obligations. For more information about previous award winners, see the collaborative's website at nestormwater.org.

Given the increasing concern for stormwater-generated pollution, and general lack of understanding, political support, and dedicated funding, members of the collaborative recognized the need to increase awareness of successful stormwater ideas. Through the Stormy Award, the collaborative is drawing attention to case studies that highlight effective and affordable steps which communities can take to address stormwater-management challenges.

Integrated modeling of the Mystic River watershed for climate change flood risk prediction and preparedness

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ABSTRACT | Forecasted increases in flood risk from future changes in precipitation patterns and sea level rise and storm surge events prompted the city of Cambridge to start a pilot program to assess feasible mitigation and resilience measures in the Alewife Brook area within the city. Because the potential magnitude of these inundation events extends well beyond the city's boundaries and are likely to be caused by factors mostly at the watershed or regional scale, the city has decided to build a fully integrated model of the Mystic River watershed. The Alewife Brook is one of the tributaries to the Mystic River. The integrated model includes the hydrology and riverine geometry of the entire watershed and has been greatly refined within Cambridge's boundaries to include the city's sewer system model. The sewer system model has been seamlessly integrated with the riverine model and now allows for modeling of the highly dynamic and interdependent interactions between both environments. Additionally, in the integrated platform, the floodplain within Cambridge was represented with a high-resolution, two-dimensional grid also seamlessly coupled with the riverine and sewer platforms. The integrated model of the Mystic River watershed was successfully calibrated and validated using two large historical storms known to have caused flooding in some areas within Cambridge. Calibration was performed using three different river gauges as well as photographic evidence provided by the city and others. The calibrated model is now ready for evaluating the relative benefit of proposed mitigation measures, individually or in combination, and to quantify potential impacts these measures may have on the rest of the watershed communities. This tool is now readily available to kick-start collaboration among stakeholders confronting a problem that poses a great risk moving forward.

KEYWORDS | Integrated watershed modeling, climate change, flood risk, precipitation increase, flood mitigation, model calibration

INTRODUCTION

It is no surprise to any New England community that climate change will augment the risk of flooding due to forecasted increases in precipitation. According to the 2014 report *United States National Climate Assessment*, the states in the Northeast have already experienced a 71 percent increase in heavy daily precipitation since 1958 (Walsh et al., 2014, Figure 1).

This upward shift in rainfall will inevitably cause some of the urban drainage infrastructure to become obsolete or less effective as its design frequency will be greatly diminished. For Cambridge, Massachusetts, the current 25-year, 24-hour storm is expected to become the 10-year, 24-hour storm by 2070, while the current 100-year, 24-hour storm will have approximately a 25-year frequency by that same time horizon (Figure 2).

In addition, many coastal communities will experience exacerbated coastal flooding due to predicted, more extreme sea level rise and storm surge (SLR/SS) events. Many other inland communities will become or reclaim their coastal status once their protecting infrastructure is breached during extreme events. An example of this is the Alewife Brook area within Cambridge shown in Figure 3. This area, currently an inland floodplain but formerly a salt water marsh, is subject to inundation during heavy precipitation from riverine overbank flooding as well as storm sewer system flooding caused by insufficient conveyance capacity of the drainage system during significant storm events. Overbank inundation is mostly caused by regional conveyance bottlenecks along the flow path toward the watershed outlet and is also affected by the pumping and flow sluicing operations at the watershed outlet located at the Amelia Earhart Dam (AED).

The AED, built in 1966 by the Army Corps of Engineers, sits at the confluence between the Mystic and Malden rivers. The dam has three 900-MGD (3.4 million m^3/d) pumps and three sluice gates operated by the Massachusetts Department of Conservation and Recreation (MassDCR) and regulates water levels on the upstream side of the dam. Besides regulating upstream river levels during heavy precipitation events, this critical piece of infrastructure keeps sea waters away from historically inundated coastal areas such as the salt water marshes that existed in the Alewife Brook area within Cambridge (Figure 4).

SLR/SS climate change predictions forecast that during extreme events the AED will be breached

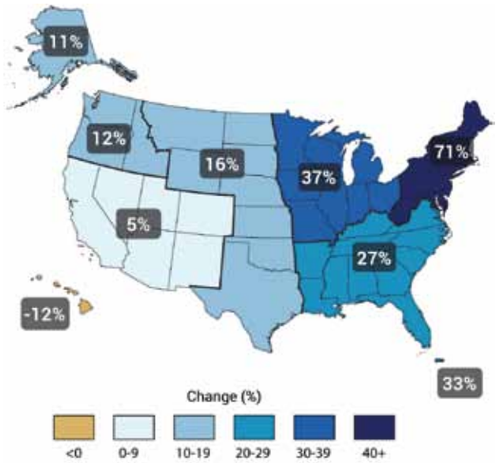

Figure 1. Increase in very heavy precipitation from 1958 to 2012—top 1 percent daily precipitation (Source: Walsh et al., 2014)

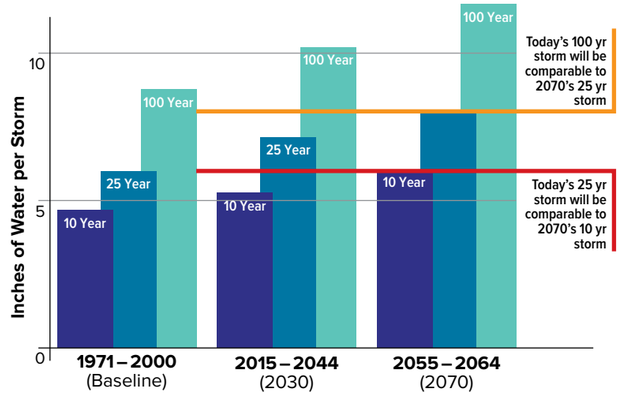

Figure 2. Expected evolution of rainfall frequencies in mid- and late-century time horizons in Cambridge (Source: Cambridge CCVA, Part 1)

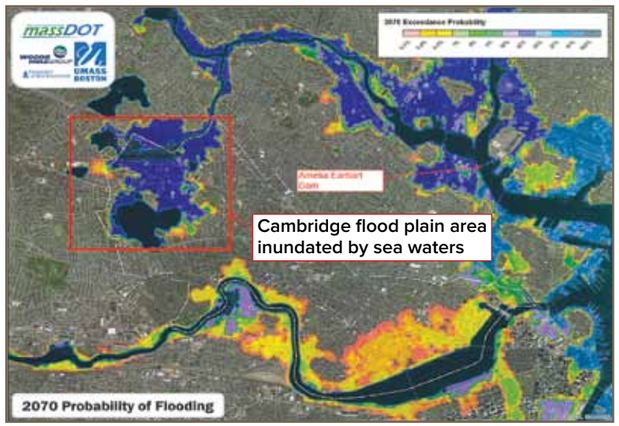

Figure 3. Inundation map of 2070 depicting the Alewife Brook historical marsh (red rectangle) that will be reclaimed by sea waters due to SLR/SS (Source: Bosma et al., 2015)

Figure 4. Historical Plan of Cambridge depicting the salt water marshes near Fresh Pond in the Alewife Brook area (courtesy of John Sullivan, Cambridge Historical Commission)

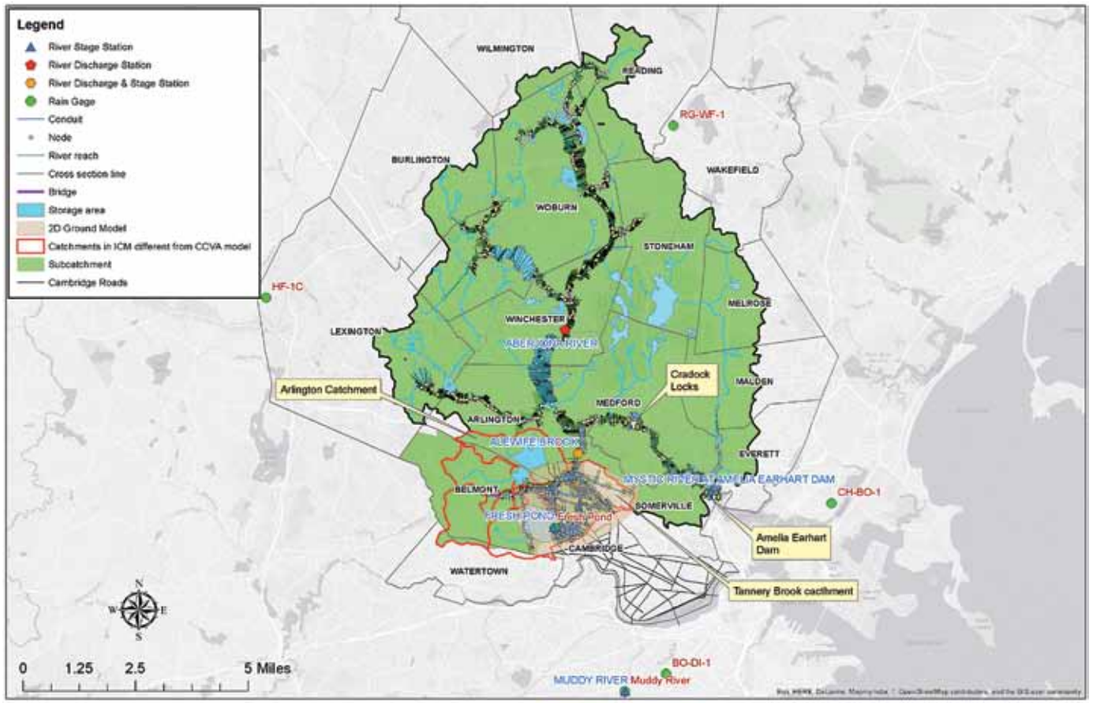

Figure 5. Integrated sewer-riverine model extent, and location of rain and river gauges

approximately once every five years by the late 21st century (Bosma et al., 2015, Figure 3) with the subsequent increase in flood risk on top of that already generated by more severe precipitation events.

As a result, areas such as the Alewife Brook in Cambridge will be subject, in the future, to four possible flooding mechanisms: (1) drainage system overflows generated by insufficient conveyance capacity due to increased precipitation; (2) drainage system overflows generated by back propagation of river waters through pipes and overflowing into low lying areas; (3) riverine overbank flooding generated by rising river levels from increased precipitation; and (4) riverine overbank flooding caused by sea water intrusion. Eash of these mechanisms has the potential to inundate Cambridge alone or in combination with the others under future climate change scenarios.

One challenge in fully capturing flood risk within urban areas affected by multiple flood mechanisms such as Cambridge is the limited capabilities of different hydraulic models used for different purposes. For example, during the initial phase of the Cambridge Climate Change Vulnerability Assessment, the Hydrologic Engineering Center-River Analysis System (HEC-RAS) riverine model by FEMA was used to capture riverine overbank flooding into Cambridge's Alewife area. The river levels forecasted by the riverine model depend, in part, on flow contributions from storm drain outfalls, which were provided by the city's sewer hydraulic model. At the same time, hydrographs at stormwater outfalls depend heavily on river backwater conditions, creating an interdependence between these two platforms that cannot be resolved without multiple iterations. Higher backwater conditions and the timing of these may preclude pipe conveyance, increasing the severity of flooding, but the timing and the relative impact of the systems on one another cannot be resolved without an integrated model.

In the case of flooding generated by sea water intrusion, the Boston Harbor Flood Risk Model used the ADCIRC[1] coastal circulation platform to simulate the riverine overbank flooding caused in the Alewife Brook area due to breaching of the AED. Similar to the HEC-RAS model, the dynamic interactions with the built environment are not captured without a significant effort in data exchange between models. Additionally, while ADCIRC is a powerful coastal circulation and hydrodynamic model, it does not include a hydrologic engine and, therefore, plausible combinations of SLR/SS events and concurrent precipitation events cannot be evaluated without making significant assumptions. Therefore, an integrated catchment model (ICM) becomes necessary

[1] ADvanced CIRCulation modeling system

Figure 6. Sewer and river interconnectivity along Alewife Brook. The yellow tinted area represents the river reach; the transverse dotted lines are river cross-sections; and the red, blue, and green circles and lines represent the sanitary, storm, and combined sewer manholes and sewers, respectively.

to evaluate the compounded inundation risk when multiple flooding sources and flooding mechanisms are plausible.

Because of the issues listed above, the city of Cambridge has proceeded with a full model integration of the Mystic River watershed to assist decision-making for the first pilot project of the Cambridge Climate Change Preparedness Plan Resilience (CCPR). The entire watershed was integrated within the city's InfoWorks ICM sewer modeling platform, because the nature of some mitigation measures go well beyond the city's boundaries and will allow for evaluation of impacts from potentially adopted measures to neighboring communities. The model includes critical regional infrastructure like the AED and its pumping station, the full hydrology of the watershed, and the entire piping system within Cambridge's Alewife area. The Alewife Brook floodplain within Cambridge is represented with a high-resolution, two-dimensional ground model, which includes physical floodplain obstructions such as buildings or road curbs. The model has been calibrated and validated using historical storms at three different river gauges, and it can now be used to assess flood risk in Cambridge and elsewhere within the watershed. The model can also help to evaluate the effectiveness of mitigation and adaptation measures at different geographic scales alone or in combination.

The main goals of this paper are as follows:

- Describe the integration of the sewer and riverine models
- Describe the model calibration and validation process
- Describe the impact of different flood mechanisms during the calibration events
- Provide examples of how the model can be used to evaluate impacts of mitigation measures at different regional scales

METHODOLOGY—MODEL INTEGRATION OF THE SEWER AND RIVERINE MODELS

Over the last two decades the city of Cambridge has built a city-wide hydraulic sewer model widely used to evaluate performance of its drainage system as well as to assist with planning for many of the city's capital improvement projects. The platform used is InfoWorks ICM by Innovyze™. The downstream boundaries of the sewer model have been traditionally located at the stormwater or combined sewer overflow (CSO) outfalls along the lower Charles River or Alewife Brook. In order to support selection of proposed mitigation measures to be identified during the first pilot program in the city's CCPR in the Alewife Brook area, FEMA's HEC-RAS Mystic River model geometry was migrated into InfoWorks ICM, including all its bridges, ponds, reservoirs, culverts, channels, and any other hydraulic features within the watershed. The extent of the integrated sewer-riverine model, including the underground sewer network in the Alewife Brook area within Cambridge's city boundaries, and tributary river reaches is illustrated in Figure 5. The only relevant difference in river geometry with respect to the FEMA model is the inclusion of the Malden River immediately upstream of the AED, which was not part of the FEMA model. This was included as it was deemed of significant relevance due to the amount of storage this water body can provide during extreme events. The AED was also included in the integrated model and featured three 1,400 cfs (40 m^3/s) pumps that activated during large storm events to keep up with the incoming flows.

The watershed hydrology was also directly migrated from the HEC-HMS model used to provide inflows to the

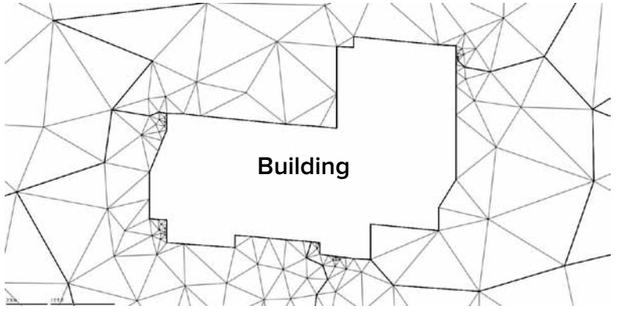

Figure 7. Example of the localized TIN refinement around buildings in the integrated sewer-riverine model

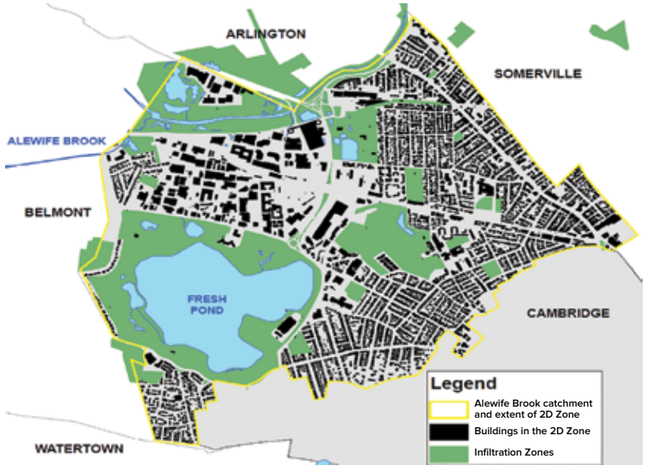

Figure 8. Extent of the two-dimensional area within Cambridge with pervious areas and building footprints

riverine model and described in the *Mystic River FIS Hydrologic and Hydraulic Modeling Report* (FEMA, 2006). FEMA model catchments in the Alewife Brook within Cambridge, Somerville, Belmont, and Arlington were modified and/or replaced with catchments from the Cambridge or the Massachusetts Water Resources Authority (MWRA) sewer models and displayed with red borders in Figure 5.

Once the river geometry and hydrologic features were migrated into InfoWorks ICM, all the stormwater and CSOs along Alewife Brook were directly connected to the river features via an outfall pipe, allowing for seamless interaction of the riverine and pipe environments as illustrated in Figure 6.

One advantage of the selected integrated platform is its ability to represent the flood plain either using traditional transects (one-dimensional approach) or using a detailed, two-dimensional terrain grid for areas of greater interest (i.e., areas requiring finer spatial resolution, such as Cambridge's floodplain in this case). An advantage of using the two-dimensional grid is that it can be built around physical obstacles such as buildings, in which case the built-in algorithms allow for automatic aggregation or disaggregation of a triangular irregular network (TIN). Figure 7 shows the fine level of TIN refinement that can be attained around an existing building. A second advantage of the two-dimensional approach is that it allows for delineation of areas with different surface roughnesses and infiltration capacities based on the ground cover and properties of the soils. A third advantage of this approach is that available, high-resolution Light Detection And Ranging (LiDAR) terrain data is readily available for many New England communities. In this study, the 2009 LiDAR dataset was used to represent terrain conditions during the calibration storms that occurred in May 2006 (a.k.a. the Mother's Day storm) and March 2010. Figure 8 depicts the two-dimensional floodplain used for Cambridge along with infiltration zones and building footprints

MODEL CALIBRATION AND VALIDATION

Past attempts to calibrate the Mystic River model have resulted in modest results with significant over-predictions of the Alewife Brook river levels during historical storm events. For example, during the May 2006 storm, the FEMA HEC-RAS model overestimated peak stage and peak flows at the United States Geological Survey (USGS) Alewife Brook gauge station near Arlington by about 35 percent (FEMA, 2006). A key goal of the integrated model was to accurately capture peak river levels and peak flows at different river gauges available across the watershed but, most importantly, at the USGS Alewife Brook gauge near Arlington, the one closest to Cambridge.

Two historical events of significant magnitude known to cause riverine and pipe flooding were selected for model calibration and validation. The March 2010 event was selected for calibration while the May 2006 storm was selected for model validation. Details of these storms are presented in Table 1.

Six rain gauges within the region had available rainfall data for the 2010 storm. Two of them are operated by the USGS (Fresh Pond in Cambridge and Muddy River in Brookline) while the remaining four are operated by the MWRA. For 2006, only one rain gauge located at the Muddy River in Brookline, Massachusetts, and south of the area of interest, had readily available data. Three river gauges were available for the 2010 event: one in the Aberjona River at Winchester, one in Alewife Brook in Arlington, and one in the reservoir upstream of the AED. For the 2006 event, river flow was readily available only from the USGS gauge at the Aberjona River in Winchester. River levels at Alewife Brook and at the AED were extracted directly from calibration charts in the *Mystic River FIS Hydrologic and Hydraulic Report* (FEMA, 2006). Figure 5 depicts the location of the rain and river gauges used for model calibration and validation.

MODEL CALIBRATION PROCESSES

The calibration compared model and meter data during individual dry weather and wet weather periods. Generally, model calibration is followed by model validation, also called verification. The primary goal of verification is to evaluate performance of the calibrated model rather than use it as a basis to make further model adjustments.

Selected catchment hydrologic and river hydraulic parameters were adjusted as necessary to get a reasonable match between observed and simulated peak flow, flow volume, and stage values. The following are the main model parameters adjusted during model calibration to achieve a reasonable match between simulated and observed hydrographs: constant inflows were input at upstream-most nodes along each tributary reach and adjusted until simulated base flow levels matched the observations, Manning's roughness coefficients of river cross-sections, subcatchment contributing areas, and directly connected impervious area.

Calibration of the March 2010 Storm Event

Table 2 compares observed and simulated peak river stages using the calibrated model. The model underestimates peak stages at both stations, by 0.58 ft (0.18 m), barely exceeding the targeted calibration bounds of +/- 0.50 ft (0.15 m), at Alewife Brook and by only 0.15 ft (.046 m) at the AED.

Table 3 lists percent differences between measured and simulated peak flows and cumulative volumes during the storm. The simulated peak flow and volume are well within the targeted level of accuracy of +/-10 percent at both locations, a clear improvement over the simulated values attained in past calibrations.

Figure 9 shows simulated versus observed river stage curves in the Alewife Brook and the AED during the storm event. The simulated stages closely resemble the observed trends during the period preceding the storm, during the storm, and after the storm, indicating the model reasonably replicates observed values. The plots evidence the improved ability of the recalibrated model to replicate measured stage and flow compared to previous models.

Figure 10 shows recorded versus simulated flow hydrographs at Alewife Brook station during the storm event. Note that the original recorded signal shows periods with missing information (possibly because of equipment malfunction) precisely during the peak of the flow (light-dotted line). See Figure 9. To better estimate the actual peak flow and

Table 1. Properties of the storm events used for calibration and validation

		March 2010*	May 2006
Start Date/Time		13/8:45	12/17:30*
End Date/Time		15/21:00	16/18:30
Total Rainfall		9.59 in.** (24.36 cm)	7.42 in.** (18.85 cm)
Peak Intensity		1.32 in./h (3.35 cm/h)	0.60 in./h (1.52 cm/h)
Return Period for Different Storm Durations	**12 hours**	5 years	>2 years
	24 hours	~20 years	6 years
	48 hours	>50 years	~20 years

*This event actually started on 05/09, but flow and stage data for calibration was available only after 05/12

** At the USGS Muddy River Brookline Station

Table 2. Comparison between metered and modeled peak river stage for the March 2010 storm event. Water elevation in Cambridge city base vertical datum

USGS Station		Meter	Model	Difference
Alewife Brook	Peak Stage	16.52 ft (5.04 m)	15.94 ft (4.86 m)	-0.58 ft -0.18 m
AED	Peak Stage	12.05 ft (3.67 m)	11.90 ft (3.63 m)	-0.15 ft (-0.04 m)

Table 3. Comparison between metered and modeled flows for the March 2010 storm event

USGS Station		Meter	Model	Difference
Aberjona River	Peak Flow	937.16 MGD (3,547 MLD)	935.96 MGD (3,540 MLD)	-0.1%
	Volume	2,957.42 MG (11,195 ML)	2341.03 MG (8,860 ML)	-20.8%
Alewife Brook	Peak Flow	142.72 MGD (540.3 MLD)	141.58 MGD (535.9 MLD)	-0.8%
	Volume	510.54 MG (1,932.6 ML)	532.14 MG (2,014.4 ML)	4.2%

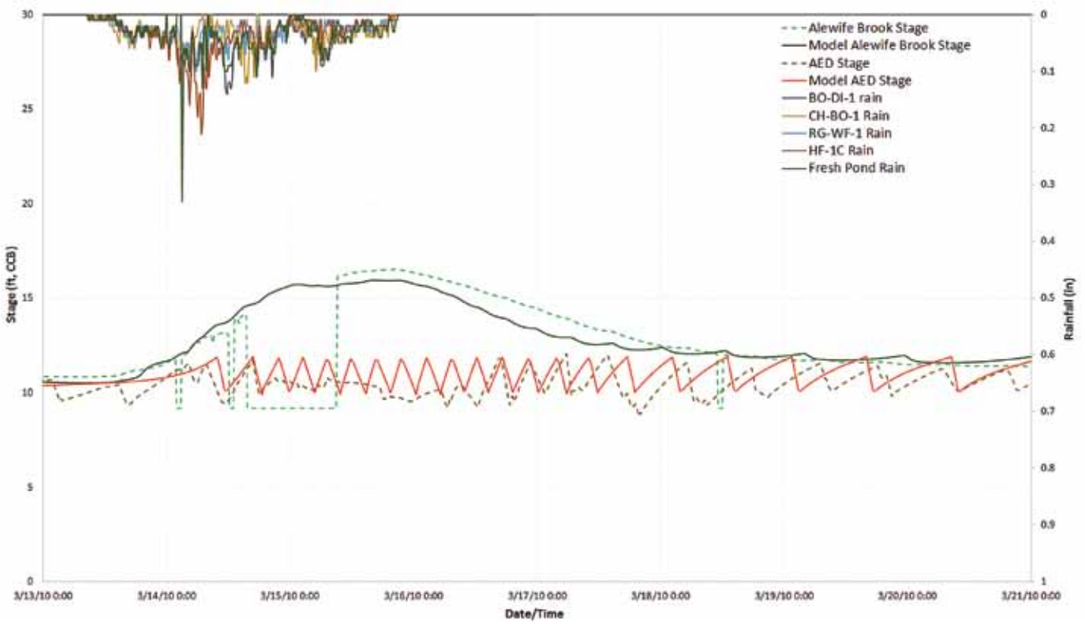

Figure 9. March 2010 storm—metered vs simulated stages in Alewife Brook and the AED

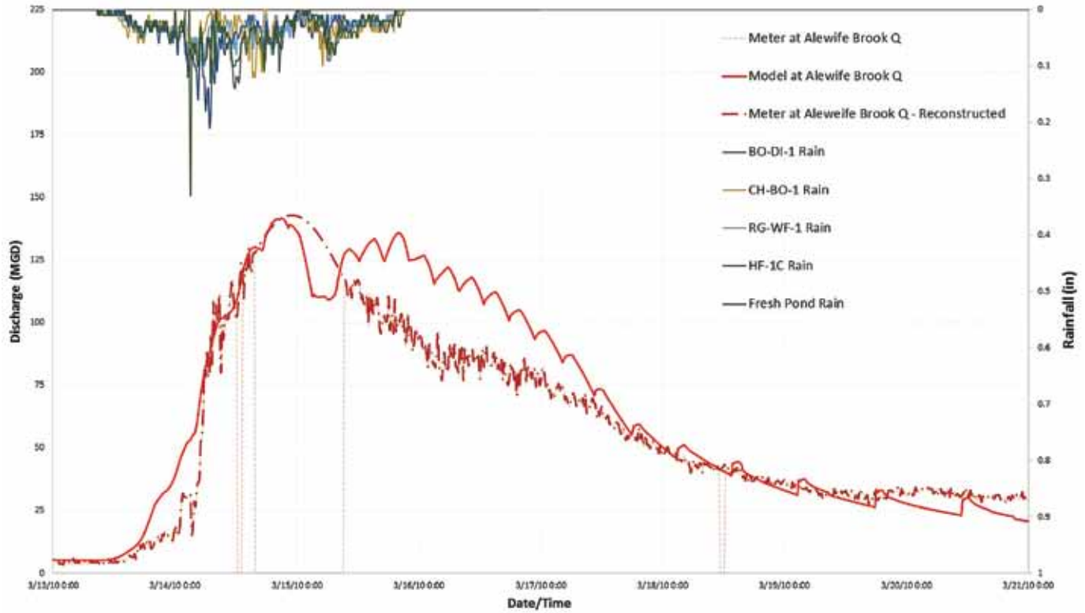

Figure 10. March 2010 storm—metered vs simulated flow discharge at Alewife Brook

Figure 11. Comparison between observed and simulated flooding along Alewife Brook Parkway during the March 2010 storm

Figure 12. Comparison between observed and simulated street flooding at Kimball Street and Columbus Avenue during the March 2010 storm

make the comparison of peak flows possible, the recorded signal was reconstructed by filling in the data gaps using pre- and post-gap data trends. The reconstructed signal is the thick-dashed red line in Figure 10. Owing to the level of uncertainty generated by the gauge malfunction and reconstruction of the signal, flow calibration results at this location should be taken with caution.

During this storm event, surface flooding occurred at multiple locations across the sewer-river system as demonstrated by complaint records of street and basement flooding (Brownsberger, W., 2010). The ability of the model to capture these problem areas was evaluated by contrasting simulated ground surface flooding extents against documented flooding at various locations, particularly in the Alewife Brook service area.

Photographs by the Cambridge Department of Public Works during the storm shows the Alewife Brook overtopping the river banks along Alewife Brook Parkway near city outfalls CAM400 and CAM401B near the intersection with Massachusetts Avenue. Comparison between simulated and observed flooding at various locations along Alewife Brook Parkway are displayed in Figure 11.

During the storm event it was observed that flooding along Alewife Brook Parkway makes its way into the city streets via a flow path along lower-elevation grounds at the parkway at Kimball Street. In this case the model accurately replicated the observed flooding at the intersection of Kimball Street and Columbus Avenue (within the city of Cambridge) as indicated in Figure 12.

In order to illustrate the integrated model capabilities, the newly calibrated engine was run for a hypothetical 100-year, 24-hour design storm in the late 21st century. Inundation "time shots" were taken at the most intense period of the storm and at the time of maximum river water elevation, which occurs at a later time. These time shots are presented in Figure 13 to illustrate the difference in magnitude between sewer system flooding and riverine overbank flooding and highlight the need to adopt different mitigation approaches for each of them as sewer system flooding is usually a localized issue while riverine flooding is usually a watershed-wide

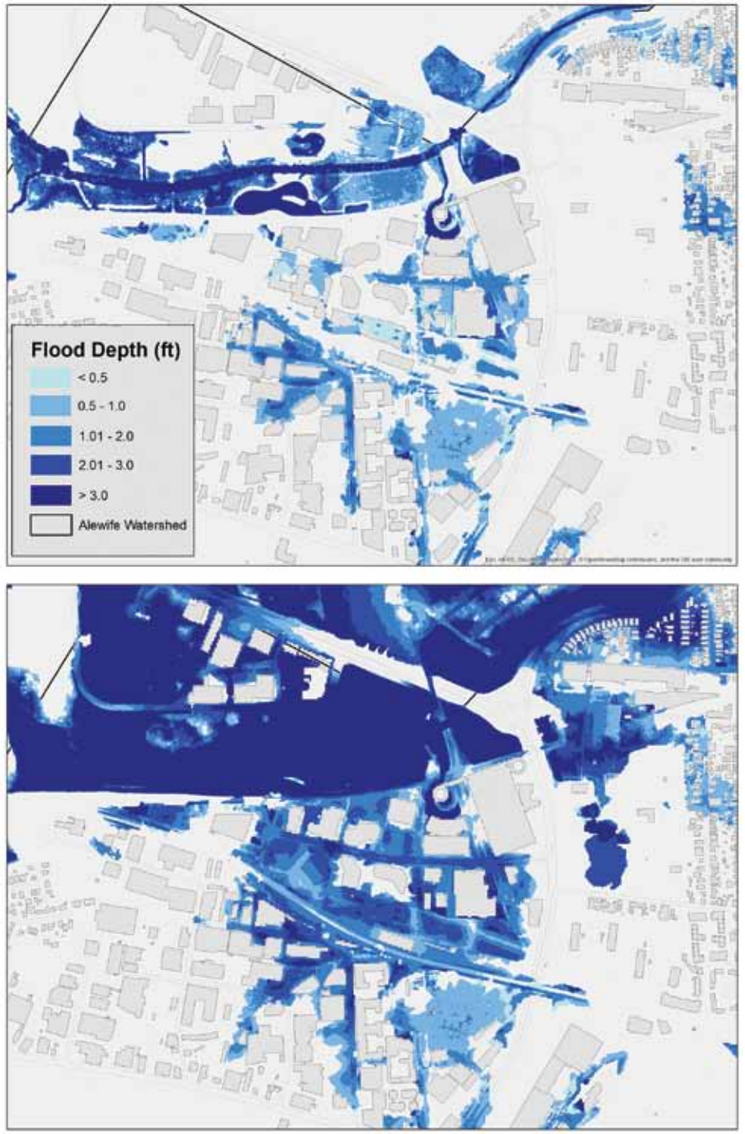

Figure 13. Simulated ground surface flooding (blue contours) for the late century, 100-year, 24-hour design storm; (top panel) sewer system-dominated flooding in the most intense period of the storm; (bottom panel) river- dominated overbank flooding at peak river stage

issue. As shown in Figure 13, the integrated model can fully capture the highly dynamic interaction of the riverine and the built environment. The duration, severity, and potential overlap of these different inundation mechanisms, which will be exacerbated in the mid- to far-future, are clearly captured, and uncertainty is reduced as much as possible.

MODEL VALIDATION

To further demonstrate the accuracy of the calibrated model in replicating observations of river stage and discharge, a second historical storm event of great magnitude was used. The selected storm event is the May 2006 Mother's Day storm (Table 1).

Table 4 lists simulated and observed peak river stages in the Alewife Brook, accounting for a difference of only 0.19 ft (0.06 m), well below the targeted bound of 0.5 ft (0.15 m). The observed value in Table 4 should be taken with caution; it was visually extracted from charts presented in the Mystic River FIS hydrologic and Hydraulic Report of 2006 (FEMA 2006) as river gauge information for this gauge could not be directly retrieved from the USGS website. Percent differences between simulated and observed peak and cumulative flows during the storm in the Alewife Brook USGS station are included in Table 4. The model replicates the observed values within the targeted level of accuracy of +/-10 percent.

Figure 14 shows simulated and observed river stages at the USGS Alewife Brook station. The model can closely match the shape and magnitude of the recorded curve. Finally, the model underestimates base flows while it slightly overestimates peak flows within a 1.2 percent margin during the storm event.

Table 4. Comparison between metered and modeled peak flow stage for the March 13, 2010 storm event. Water elevation in Cambridge city base vertical datum

USGS Station	Meter	Model	Difference
Alewife Brook Peak Stage	15.30 ft (4.66 m)	15.11 ft (4.60 m)	0.19 ft (0.06 m)

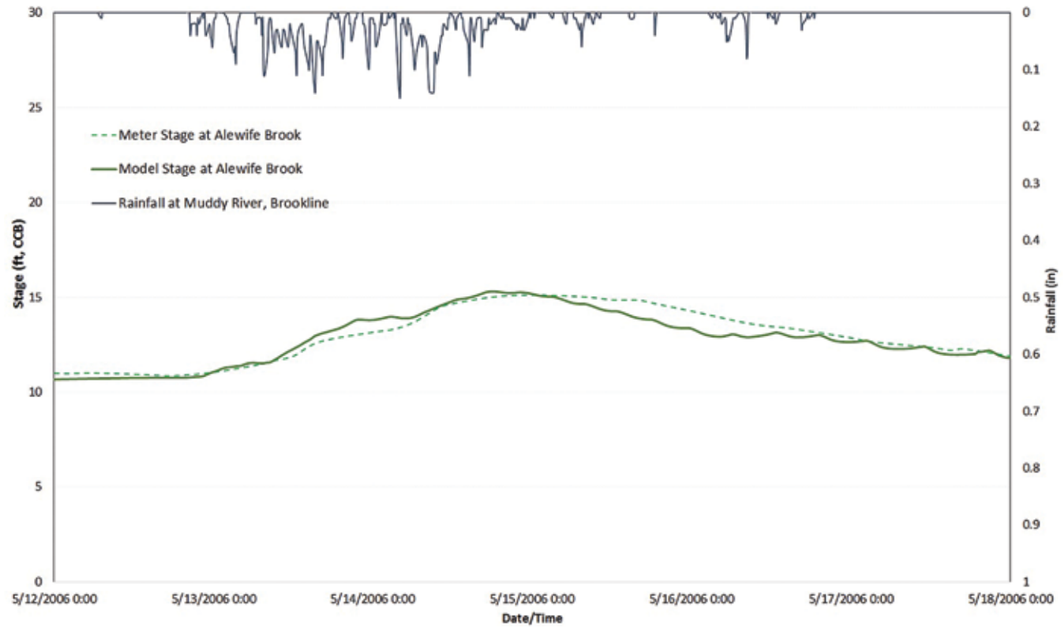

Figure 14. May 2006 storm—metered vs simulated stage at Alewife Brook

USES OF INTEGRATED WATERSHED MODEL

The integrated watershed model will now allow the city of Cambridge and the entire Mystic River watershed community to evaluate potential mitigation measures at different geographic scales tailored to different flood mechanisms and magnitude of events. In increasing order of damage potential, a non-comprehensive list of potential mitigation measures organized by type of flooding can now be evaluated alone or in combination and is presented below.

1. Solutions for localized sewer system flooding

Sewer system flooding is, most of the time, highly localized and of smaller magnitude than overbank flooding. For this type of inundation, mitigation at the local or neighborhood scale can be highly effective as local pipe capacity is usually exceeded during the peak of the storm. Any reduction or buffering of peak flows entering the system will help diminish the impact and extent of this type of flooding.

Examples of mitigation measures at the local scale include source controls such as reduction of directly connected impervious area or peak flow reduction for new development and redevelopment that frees up capacity to an already compromised drainage system. Other potential alternatives at the local level include pathway controls such as underground flow storage or detention at strategic locations, or maximization of surface conveyance and storage, conveyance capacity increase (e.g., via sewer separation), and flow transfers to larger systems.

2. Solutions for precipitation-driven riverine overbank flooding

Once the river banks are overtopped, the magnitude and duration of the inundation in affected areas become orders of magnitude higher than that of sewer system flooding, especially with rising river levels forecasted in climate change scenarios. Partial or localized mitigation of riverine flooding is possible at the municipal scale via receptor measures such as flow isolation with berms and flood walls or by enacting policies for new development and redevelopment requiring buildings to become flood-proof up to a certain flood elevation.

However, flow source and pathway control measures to minimize river stage increases can be accomplished at the watershed scale only by optimizing storage utilization in a coordinated manner at reservoirs such as Spy Pond, Clay Pit, Upper and Lower Mystic Lakes, Horn Pond, or the Malden River; collectively reducing imperviousness across the watershed; removing hydraulic bottlenecks along the flow path such as the recently modified Cradock Locks Bridge in Medford, Massachusetts; and optimizing and/or increasing flow pumping and flow sluicing output at the AED.

3. Solutions for SLR/SS overbank flooding

The sheer magnitude of these flood events (see Figure 3 for flood extents forecasted in 2070) will greatly limit intervention opportunities at the local scale and even at the watershed scale. At the

local scale, receptor control such as enforcement of building resilience measures to "survive" the storm as well as strategic flow isolation are among the very few options available. At the watershed scale, the sheer volume that would enter the basin once the AED is breached would most likely make smart reservoir management ineffective, and even a substantial increase in pumping capacity would have marginal impact. Effective solutions for an event of this magnitude would likely include state or federal agencies to make the AED climate-change-proof and would require, most likely, raising the ground elevation of the large AED flanking corridor depicted in Figure 3 across Somerville, Chelsea, Boston, and other communities. Another potential, more radical pathway measure would consist of providing a flow isolation mechanism at the downstream reaches of the Mystic River that would prevent reverse river flows from creeping up into upstream areas within the watershed, including Cambridge.

A summary of potential mitigation measures at different scales that can now be tested with the watershed model along with their likely applications are shown in Table 5.

Table 5. Non-comprehensive list of mitigation measures at different geographic scales that can now be evaluated alone and in combination using the fully integrated riverine model

	Sewer System Flooding	River Overbank Flooding from Precipitation	River Overbank Flooding from SLR/SSS
LOCAL SCALE			
Source Controls			
Land use changes	Yes	No	No
Peak flow retention	Yes	No	No
Pathway Controls			
Flow storage	Yes	No	No
Flow transfer	Yes	Yes	No
Conveyance capacity increase	Yes	No	No
Receptor Controls			
System isolation via berms, walls	Yes	Yes	Yes
Resilient building and infrastructure design	Yes	Yes	Yes
WATERSHED SCALE			
Smart reservoir management	No	Yes	Yes
Large-scale land use changes	No	Yes	Yes
Removal of hydraulic bottlenecks	No	Yes	Yes
Increase in pumping and sluicing output	No	Yes	Yes
REGIONAL SCALE			
Topographic changes in flanking paths	No	No	Yes
Revamp of the AED	No	No	Yes
Flow isolation and real-time control flow management	No	No	Yes
Other large scale infrastructure projects	No	Unknown	Unknown

CONCLUSIONS

This study details the expansion and calibration of the sewer-riverine integrated model for the service areas tributary to the Mystic River with outfall at the downstream end of the AED pumping station.

Model calibration and verification were successfully conducted for two historical events characterized by long duration and total rainfall, namely the March 2010 and May 2006 storms, respectively. The calibration process consisted of adjusting the parameters associated with the hydrologic model to simulate and duplicate observed peak flow, flow volume, peak stages, and hydrograph shape during wet weather flow periods. Calibration and verification were conducted to verify the ability of the model to simulate a range of storms with variable rainfall volume, duration, and intensity.

Overall, integrated model predictions attained during calibration met, in most cases, the desired level of accuracy and represent a notable improvement over the FEMA HEC-RAS riverine model, demonstrating that the calibrated model is suitable for planning and system capacity assessment. The city's integrated InfoWorks ICM sewer-riverine model will enable the city to evaluate flood mitigation measures within and outside the city's boundaries, and will allow assessment of impacts to neighboring communities. Since flood mitigation measures may be well beyond the city's boundaries, the watershed model will now allow for seamless evaluation of these measures alone or in combination, representing a significant advance from a traditional, non-integrated approach.

ACKNOWLEDGMENTS

The Cambridge Department of Public Works provided the financial support for this study and photographs to assist with the model calibration and validation.

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Rhode Island's new water quality management plan—*Water Quality 2035*

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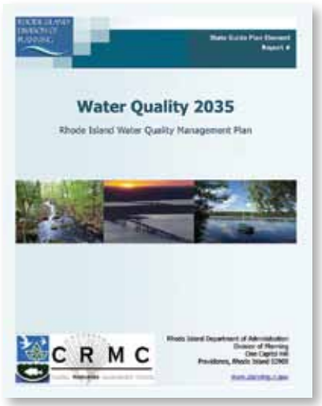
ABSTRACT | *Water Quality 2035*, Rhode Island's Water Quality Management Plan, was adopted on October 13, 2016, by the Rhode Island State Planning Council. It serves to support both the fresh and coastal waters point and nonpoint source management and watershed planning programs as required by EPA and the National Oceanic and Atmospheric Administration for the state. The plan describes existing resources, trends in water quality for the state, and current management practices, programs, and activities in major water quality areas. It also develops recommendations specific to each.

KEYWORDS | Water quality, protection, restoration, nonpoint source management, water resources and trends, water quality management, watershed planning, pollution sources, aquatic habitat

INTRODUCTION

Water quality affects every citizen, and it is an important measure of the quality of life. We depend on healthy, sustainable ecosystems to provide us with the clean water we need for drinking water, recreation, and a range of economic activities. Healthy ecosystems are often taken for granted. Rhode Island is fortunate to have abundant water resources that, when properly managed, can meet these needs while also supporting healthy, aquatic ecosystems. *Water Quality 2035* describes the goals, policies, and actions needed for effective management of Rhode Island's water resources, but it could easily serve as a model for New England and other regions. As a part of the Rhode Island State Guide Plan (SGP), *Water Quality 2035* provides direction for state program development and facilitates coordination among the many entities engaged in water quality protection and restoration actions, including municipal governments.



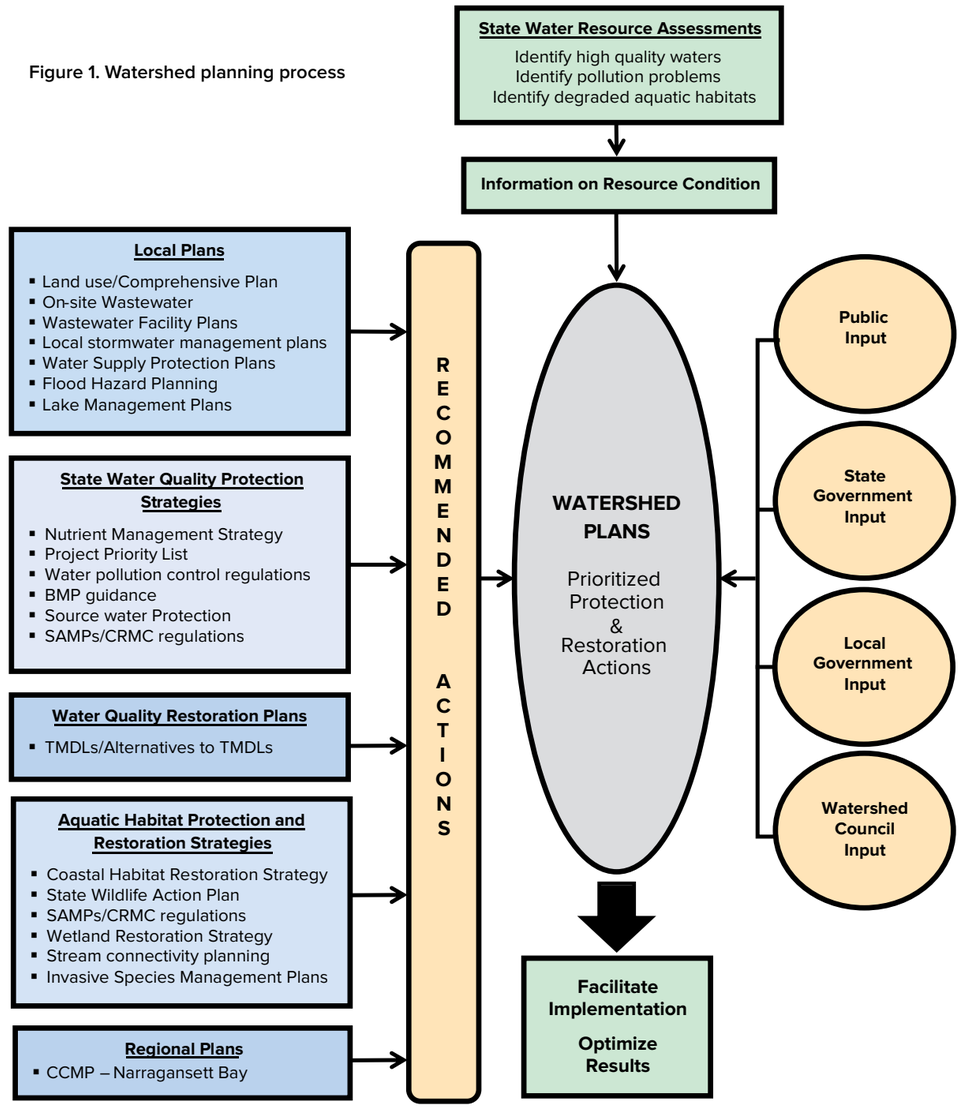
The plan arose through a Memorandum of Understanding involving Rhode Island's Coastal Resources Management Council (CRMC), Department of Environmental Management (DEM), and Statewide Planning Program. Established by Rhode Island state law, the Statewide Planning Program, which is part of the Department of Administration, Division of Planning, is the central planning agency for the state, and oversees the development and implementation of the SGP. The SGP is Rhode Island's centralized and integrated long-range planning document. It comprises 18 plans covering a range of topics including natural and water resources. *Water Quality 2035* was one of the 18 plans, and it was prepared, in part, to address the need to update the statewide nonpoint source management plans. The text was drafted by representatives of the Statewide Planning Program, CRMC, and DEM. Together with other staff from all three agencies, they guided the development of the plan and coordinated its review by an advisory committee, DEM, CRMC, and the State Planning Council.

Clean water supports Rhode Island's economy through:

- Tourism
- Recreation
- Manufacturing & Industry
- Commercial Fisheries

Water Quality 2035 was developed over a three-year period that started in 2013. The state's original water quality management plan was the *Nonpoint Source Pollution Management Plan* adopted by the State Planning Council, as part of the SGP, in 1995. *Water Quality 2035* updated and replaced this plan. In addition, *Water Quality 2035* replaced three previous SGPs related to water quality, the Rivers Policy and Classification Plan (2004), the Blackstone Region Water Resources Management Plan (1981), and the Comprehensive Conservation and Management Plan for Narragansett Bay (1992), as well as two separate DEM water quality programs, the Groundwater Protection Strategy and the Wellhead Protection Program. The development of the plan also benefited from recently completed plans by others for management of Narragansett Bay, nonpoint source pollution, and aquatic habitats.[1]

Figure 1. Watershed planning process



The plan draws together and describes in one place all the programs, state policies, and various actions related to water quality and aquatic habitat protection and restoration. Figure 1 illustrates the watershed planning process.

VISION AND GOALS

The goals of the plan resulted from an evaluation of issues by the advisory committee. Responsibility for addressing these issues is shared by CRMC, DEM, municipalities, and others. Pertinent information

[1] Rhode Island Aquatic Invasive Species Management Plan, CRMC et al, 2007, Rhode Island State Wildlife Action Plan, DEM 2015, and Rhode Island Nonpoint Source Management Program Plan, DEM 2014.

from various stakeholders was brought forth to define the issues, develop goals, and recommend strategies in an Implementation Matrix. Issues from all the previous SGP elements were reviewed and updated, consolidated, or removed, depending on whether they were a continuing concern or had been acted upon. Specific goals and strategies were proposed to implement the plan as developed by the advisory committee and approved by the State Planning Council.

WATER RESOURCES AND TRENDS

Water Quality 2035 describes the various water quality and aquatic habitat conditions in Rhode Island. It highlights the hydrologic connectivity among components of Rhode Island's water resources—surface waters, groundwaters, and wetlands—pointing to the need for watershed-based approaches to managing water quality. The plan recognizes the significant progress made through the statewide implementation of water pollution, water quality management, and wetland protection programs over the last four decades. Rhode Island's waters are cleaner as a result of programs that successfully curbed the discharge of sanitary waste and industrial (toxic) pollutants from specific sources due to implementation of federal and state programs, including those mandated by the federal Clean Water Act. One example is the downward trend of nitrogen loading from wastewater treatment facilities as indicated in Figure 2. However, managing the more diffuse sources of pollution associated with human land uses, including the generation of stormwater runoff, continues to present significant challenges. Available data indicate significant portions of Rhode Island's surface waters continue to exhibit degraded conditions. The percent of the surface waters that do not meet water quality standards that protect the beneficial uses of the resources include: 36 percent of coastal (estuarine) waters, 39 percent of river and stream miles, and 43 percent of lake acreage in Rhode Island.

Thirty-six percent of coastal (estuarine) waters, 39 percent of river and stream miles, and 43 percent of lake acreage do not meet water quality standards

The most prevalent pollutants adversely affecting surface water quality are pathogens and nutrients. Other pollution concerns include toxics, sedimentation, and the emerging concerns about personal care and pharmaceutical products. In addition, cyanobacteria blooms in freshwaters are a growing public health and management concern. Groundwater resources are most commonly affected by nitrate and toxic compounds, including various volatile organic compounds. In addition to the effects of pollution, aquatic habitats face significant threats from other stressors such as hydro-modification, including historical dams from our industrial past and current water withdrawals, the spread of invasive species, and fragmentation due to land development. More mitigation is also needed of the historic alterations of many aquatic habitats.

IMPLEMENTATION

Noted throughout the plan are opportunities for the state to work closely with municipal governments to strengthen the implementation of Rhode Island's management of water quality and aquatic habitats. These include improving coordination and integration of infrastructure planning for water supply, public, and on-site wastewater disposal, and stormwater and floodplain management. In addition, fostering close alignment of comprehensive community plans with infrastructure planning will facilitate sustainable economic growth. The Implementation Matrix of the plan contains the goals, policies, and strategies (actions) for 24 overarching general topics and various other water quality topics described in the plan. Actions were developed for each policy and have a lead agency, supporting agencies, and time frames. Time frames are as necessary, ongoing, short-term (one to two years), medium-term (three to five years), and long-term (more than five years). Major implementation actions are to:

- Collaborate and integrate planning, using the EPA watershed approach to address water quality management concerns across governmental levels
- Continue existing protection and prevention programs while addressing capacity issues
- Assist municipalities with delegated responsibilities for:
  - Stormwater management activities
  - Adoption of "green infrastructure" approaches
  - Water quality restoration projects
  - Wastewater facility planning updates
  - Local on-site wastewater programs
  - Low impact development (LID)
- Complete development of a comprehensive environmental monitoring strategy
- Enforce all federal, state, and local laws and regulations for water quality protection
- Improve agency effectiveness through better data management and improve public access to the data
- Ensure climate change is considered in water quality protection and restoration projects
- Promote the removal of cesspools, especially in riparian areas
- Implement, and update as necessary, the Rhode Island Stormwater Design and Installation Standards Manual and the Erosion and Sediment Control Handbook
- Incorporate LID in municipal development review ordinances
- Train agency water resource staff to better communicate water science and policy to the public

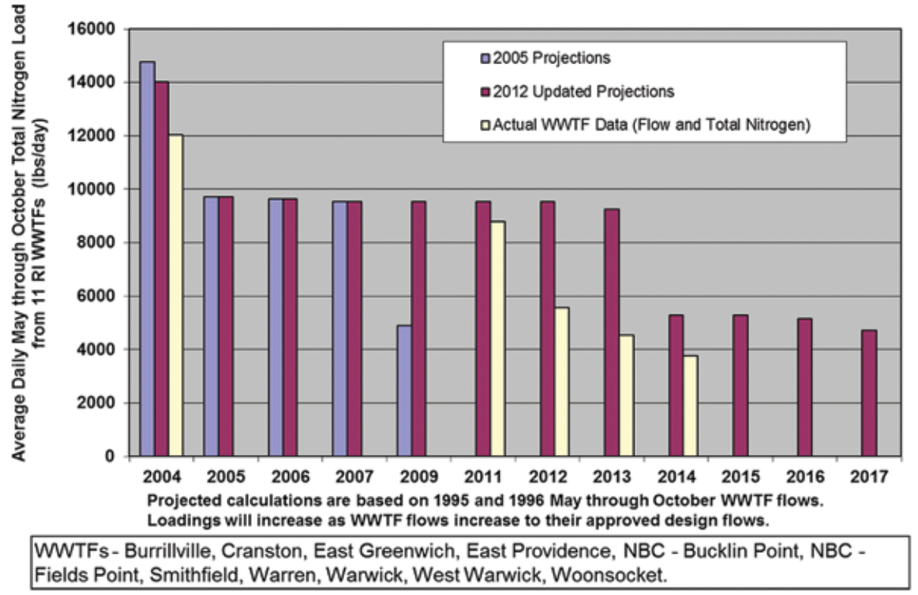


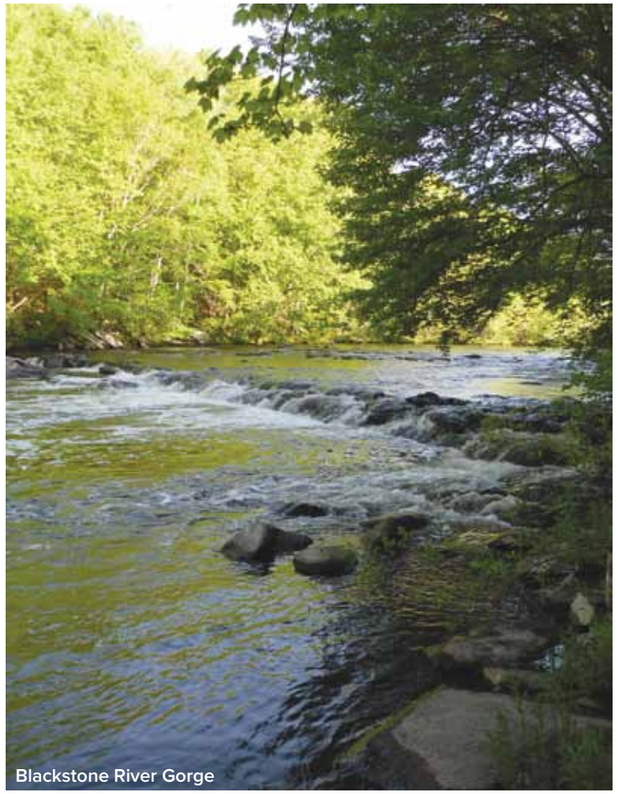
Figure 2. Downward trend of nitrogen load discharged from 11 wastewater treatment facilities in Rhode Island

CONCLUSION

Achieving healthy aquatic ecosystems and other water quality goals will require sustained and expanded efforts to prevent and abate pollution and habitat degradation in Rhode Island. Through the implementation of the Clean Water Act and other programs, substantial progress has been made controlling the discharge of pollutants associated with sanitary and industrial wastewater. Managing the more diffuse sources of pollution associated with human land uses, including the generation of stormwater runoff, continues to present significant challenges. More mitigation is also needed of the historic alterations made to many aquatic habitats. As indicated in the plan, a wide range of actions will be needed to advance progress toward water quality goals. Applying watershed approaches is recognized as the most effective approach to long-term

The plan identifies as priorities protection and restoration of fresh and salt water used for:

- Shellfish Growing Areas
- Public Recreation
- Aquatic Habitats
- Drinking Water Supplies


Blackstone River Gorge

The plan has actions for different pollution sources such as:

- Wastewater Treatment Facilities
- Onsite Wastewater Treatment
- Stormwater Management
- Road Salt & Sand Application
- Other Discharges to Groundwater
- Agriculture
- Lawn/Turf Management
- Pesticide Application
- Boating & Marinas
- Storage of Hazardous Materials
- Petroleum Product Spills
- Aboveground Storage Tanks
- Solid Waste Management
- Contaminated Site Clean-ups
- Dredging and Dredge Material
- Pet Waste Management
- Water Fowl
- Land Application of WWTF Solids
- Surface Mining
- Silviculture
- Atmospheric Deposition
- Marine & Riverine Debris
- Aquaculture

management of water resources. A collaborative effort is necessary across all governmental jurisdictions, agencies, and programs to ensure success and efficiency in protecting and restoring Rhode Island's waters. It is understood that achieving these goals will take sustained effort over the next several decades.

ACKNOWLEDGMENTS

The plan is a product of many hard-working and dedicated stakeholders who served on an advisory committee. This committee helped to define major issues, and set goals, policies, and actions on a broad range of water quality topics. A key member of the committee was from the Narragansett Water Pollution Control Association. Working with the association helped in getting the plan out to all of Rhode Island's wastewater professionals for feedback before submitting it for formal approval. The association also featured a presentation on the plan at its annual legislative event at the Rhode Island State House in 2016.

Developing the plan was not easy. It required time, energy, patience, many long hours of deliberation, and a strong interest on personal and professional levels to come to a consensus with the committee. It could not have been accomplished without the two dozen individuals who contributed numerous hours of their time, and provided technical and editorial review of the plan as it developed through its various draft stages. Nancy Hess from the Rhode Island Department of Administration Division of Planning Statewide Planning Program manages the plan, which was developed with key contributions from Susan Kiernan and Ernie Panciera of DEM, and Jeff Willis of the Coastal Resources Management Council. Copies of the plan are on the following website: planning.ri.gov.

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NEWEA ARCHIVES

FROM THE *JOURNAL* ARCHIVES

WATER QUALITY MANAGEMENT ISSUES IN NEW ENGLAND

By WALTER NEWMAN
Senior Staff Associate, New England River Basins Commission.

Originally published in October 1969

NEW ENGLAND AND ITS WATER RESOURCES

The water and related land resources of New England have shaped the social, economic and environmental contour of the region, and have served as a framework for regional growth and opportunity. The economic development of New England has been closely linked to its water resources. Major cities have flourished along the larger waterways and coastline. Fishing, maritime trade and waterpower have a clear significance in the region's past.

Now, industrialization, urbanization and an expanded population which has more affluence and leisure time have brought with them additional uses for the region's water resources and have produced water use conflicts including water quality degradation resulting from pollution. Current primary uses of water in New England are for municipal and industrial water supply, hydropower generation, power cooling, recreation, fish and wildlife propagation, and aesthetic enjoyment.

The pressures on the region's water and related land resources are mounting and the sound management of these resources is becoming increasingly complex. Of particular complexity is the pivotal issue of water quality control. Water is New England's most important natural resource. The region is assured of an adequate quantity of water to meet present and future foreseeable needs; however, the quality of the water is the most important single constraint in the conservation, development, and utilization of the region's water resources. The responsibility for managing and controlling the quality of New England's water is segmented between several levels of government and the private sector. Water quality control will only be achieved If the segments are integrated and viewed in proper perspective.

This paper examines some of the problems and possible alternative solutions which must be recognized and understood to achieve unified water quality objectives for our rivers, lakes, streams and coastal waters. Also covered are some of the strengths and deficiencies in the framework for managing water quality.

DEFINITION OF THE SYSTEM

We must recognize the importance of the river basin and sub-basin systems, and the interaction of the hydrologic components for these constitute the basic unit for development of a functional water quality management scheme. To gain perspective and insight into the water quality problems of the region, let us view New England and its water resources as a series of river basins running in a general north-south direction to the Atlantic Ocean, with the exception of the Lake Champlain and Lake Memphremagog drainages, as shown in Figure 1. In addition, consider the lengthy coastal waters which run from Long Island Sound to the northern Maine coastal drainage.

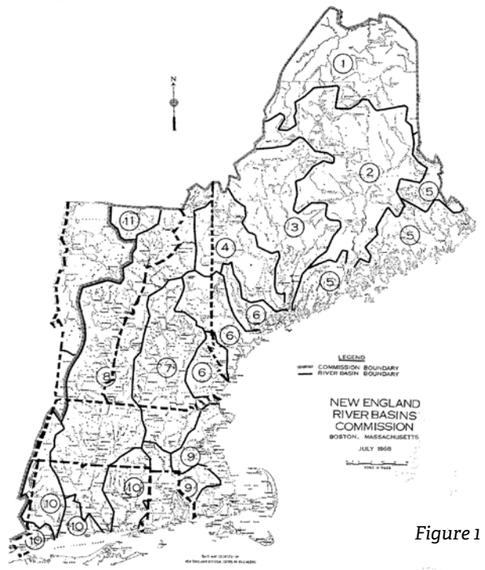

Figure 1

Approximately 11.5 million people live in this area of about 63,000 square miles. All of the major cities in the region lie along the coastline or astride the major rivers. From socioeconomic point of view, the region may be divided into northern New England (Maine, New Hampshire and Vermont), and southern New England (Massachusetts, Rhode Island and Connecticut. These areas are differentiated graphically in Figure 1. The three southern states contain nearly 9.5 million people, or roughly 85 percent of the population of the region.

These persons, almost five percent of the nation's

population, reside in an area which represents less than one-half of one percent of the area of the continental United States. In 1966, there were 590 and 687 people per square mile in Connecticut and Massachusetts, respectively, at densities three and four times as high as the New England average. Rhode Island, the most densely populated state in the nation, contained 854 persons per square mile, a density five times that of New England and approximately 13 times that of the nation.

The three southern states represent for the most part the present urban, technical and industrial complex of the region. Primary water resource needs of this southern region include adequate municipal and industrial water supply for the urban complex, power cooling to meet the power generation needs of the population, and outdoor recreation opportunity including fishing, boating and swimming.

Northern New England is mostly rural in character with limited technical and industrial development, although it should be noted that industrial development is occurring at a rapid rate in some sections. The land area of the northern region is nearly four times that of the southern region, but the population is less than 20 percent of the New England total. The population of the northern New England States is approximately 2.1 million persons, less than the population of either Connecticut or Massachusetts.

Water resources are playing a significant role in shaping the economy of the northern region, oriented towards increasing industrialization with tourism and recreational development having an equally important role. A generalized summary profile of New England is shown in Table 1. It is also interesting and significant to our discussion to consider land use in New England. Land use patterns in the region are shown in Figure 2.

Figure 2. Generalized Land Use in New England

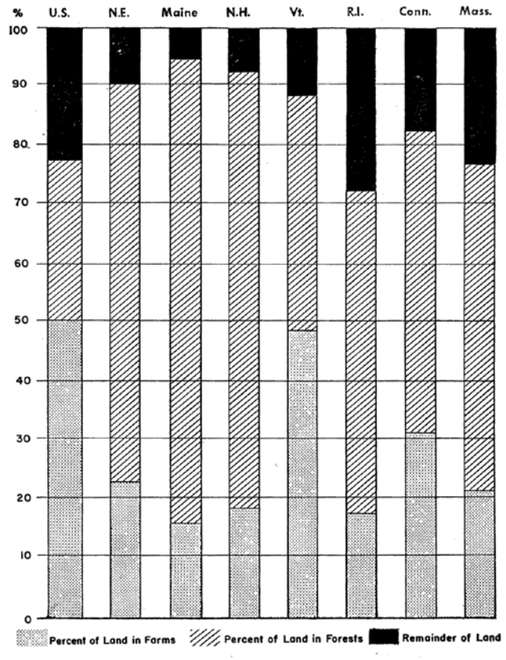

Table 1. Summary Profile of New England

	Area sq. mi.	1968 Population thousands	1968 Per Capita Income
Maine	33,200	976	$2,245
New Hampshire	9,300	702	2,570
Vermont	9,600	425	2,340
Rhode Island	1,214	914	2,817
Connecticut	5,000	2,963	3,796
Massachusetts	8,300	5,469	3,023

The complexity of water quality management in New England requires that we define and clearly understand the job that needs to be done and how it might be accomplished in a near optimum manner.

All of the major rivers in the region and many of their tributaries are degraded by untreated or inadequately treated municipal and industrial wastes. Industrial waste problems in the New England region include pulp and paper processing; textile processing, including scouring, washing and dyeing; food processing; leather tanning and finishing and metal processing. The additional unresolved major issues of water quality include:

1. Control of combined sewer overflows
2. Regulation of streamflows
3. Control of nutrients and associated lake management problems
4. Control of land use affecting water quality
5. Pollution control in the marine environment including coastal waste disposal, oil pollution, watercraft pollution and off-shore waste dumps

There are three basic methods of water quality control all of which must be employed to achieve a balanced system if we are to achieve our water quality objectives. These methods are:

1. Alteration or control of land use, manufacturing processes and public practices to reduce the amounts of wastes entering the water body
2. Collection, diversion and treatment of municipal and industrial wastewater to reduce the amount of wastes discharged to the water body
3. Regulation of streamflow or other modifications of the waterway to receive residual wastes and still meet water quality objectives

ALTERNATIVES

The alternatives to water quality control have had and continue to exert a strong influence on public policy and public support. It is apparent that our past inaction towards water quality control and lack of clear public mandate and interest has been engendered by the availability of alternatives. The public has been conditioned to accept the mainstem rivers and many tributaries as polluted and undesirable for most uses.

The water supply policy in New England is clearly at a point of moving to alternatives rather than proceeding with a sound water quality control program. Only two major cities in New England, Lawrence and Lowell, Massachusetts, draw their water supplies from main stem rivers.

Our water supply policy is directed toward developing clean upland protected sources of water as an alternative to water pollution control. There is little doubt that the alternatives have been available and will continue to be available; however, the alternatives are being foreclosed as we face the future.

A clear indication of this is that the Metropolitan District Commission of Boston is planning to divert flood flows of the Connecticut River into Quabbin Reservoir for transmission to the Boston metropolitan area. A recent report recommended that Hartford, Connecticut look to the mainstem Connecticut for additional water supply. A reservoir near the mouth of the Taunton River has been proposed for meeting water supply demands of southeastern Massachusetts. A National Recreation Area requiring swimmable waters the entire length of the Connecticut River has been proposed and is moving toward realization.

The New England Regional Commission, an economic development commission for New England composed of a Presidential appointment and the New England Governors, has developed priorities for regional action. The priorities are environmental management (including water quality), manpower and job development, transportation, and education, health and government services. The relationship of adequate water quality to the economic well being of New England has been firmly established and is further reinforced by the position of the Commission.

In the past, a citizen in search of recreation such as fishing or swimming confronted with a polluted stream needed only to go to an alternative stream a short distance away to find clear water and suitable environment for his pleasure. As our population and affluence grow, however, streams and lakes that were once clean are now polluted and the demand for recreational opportunities is increasing.

Recreation is becoming increasingly significant to the New England region. A recent report on the Connecticut River Basin indicated that recreators spent $80 million during the summer season of 1960 and are expected to spend. $133 million in 1980 and $233 million in the year 2000. Tourism is the second largest industry in the State of Maine.

In short, the alternatives to water pollution control are becoming increasingly limited and recognition must be given to the necessity of abating pollution and preserving existing high water quality to maintain the viability of the economy and environment of the region.

WATER QUALITY STANDARDS

The water quality standards developed by the New England states in cooperation with the New England Interstate Water Pollution Control Commission and approved by the Secretary of Interior (with exceptions) provide the framework for water quality control and management decisions on interstate and coastal waters. In addition, all of the states have developed water quality standards for intrastate streams. The standards package includes water quality goals for desired uses of the stream such as water supply, swimming, fisheries, etc.; water quality criteria which transform the uses to water quality and subsequent financial implications were generally requirements such as numbers of coliform organisms, mg/l of oxygen, etc.; and an implementation time schedule indicating the water pollution controls required for each polluter. The development of the standards is shown in Figure 3.

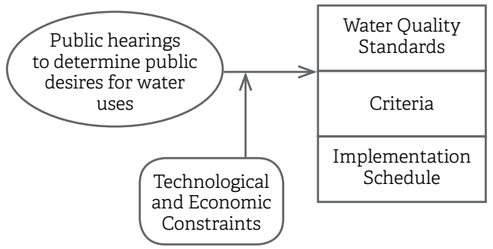

Figure 3. Development of Water Quality Standards

Although the water quality standards are an imperfect device in our present stage of technological development concerning water and its management, they do nonetheless provide a point of beginning and a basis for action toward controlling water quality.

The standards represent a social goal that is the desire of that segment of the public concerned with the use and management of the water resource. In addition, water pollution control agencies developed judgments on technological and financial constraints which were a major consideration in the formulation of the standards. Public hearings were held to determine public water quality objectives. Generally speaking, citizens at the hearings expressed a desire for a swimmable quality

NEWEA ARCHIVES

WATER QUALITY MANAGEMENT ISSUES IN NEW ENGLAND—October 1969

for most waters in the region. It is important to note, however, that technological information concerning alternative levels of water quality and subsequent financial implications were generally not presented at these hearings. Clearly then, the views expressed by the public at the hearing were social objectives and did not provide indication of a willingness to pay to attain the desired objectives.

The use of water quality standards is not a new management tool in New England. Since the 1950's, the New England states and the State of New York, working through the New England Interstate Water Pollution Control Commission, have been developing water quality standards for interstate streams. One of the primary purposes of this Commission is to "establish reasonable physical, chemical and technological standards of water quality satisfactory for various classifications of use." The Commission has provided a vehicle for interstate cooperation in water pollution control through the classification of interstate streams insuring the compatibility of water quality goals for waters crossing state boundaries. The Commission is strengthening its role to include training water pollution control facilities operators, and possibly water quality monitoring and enforcement.

WATER QUALITY RESTORATION

The thrust of water quality management may be directed toward two major efforts: restoration of those waters which are currently degraded, and preservation of those waters which are currently of high quality.

At the moment we seem to be overcome with the task of restoration, but it should be recognized that the problem of preservation is equally significant and complex. One need only look at the rapid recreational development occurring around major lakes to realize the implications they hold.

The major segment of the restoration effort will be focused on financing, construction, operation and maintenance of municipal and industrial waste treatment facilities. The estimated cost of waste treatment and intercepting facilities in New England is shown in Table 2. The estimated total cost is approximately 1.2 billion dollars.

The estimated per capita costs for water pollution control facilities indicate that the financial impact of these facilities is likely to be more significant in the three northern states than in the three southern states, particularly considering the reduced economic strengths in the northern states. Several factors may be accountable for the differential in per capita costs including economies of scale, concentration or dispersion of population, industrial inclusion, and past progress or action.

The rate of water pollution control progress in New England has been paced by the availability of federal

Table 2. Estimated Cost of Waste Treatment and Interceptor Facilities for New England

	Percent Annual Allocation, millions of dollars	Estimated Costs, millions of dollars*	Estimated Costs, per capita
Maine	$1.9	$270	$260
New Hampshire	1.4	120	170
Vermont	1.3	45	100
Rhode Island	1.6	55	60
Connecticut	2.9	200	65
Massachusetts	5.4	400–500	70–90

*Industrial costs are included where industry is expected to discharge to a municipal system

funds. Although most of the New England states have successfully attempted to develop alternative financial arrangements to circumvent the constraints of limited federal funding, a national commitment, including federal, state and local government, is a pivotal issue in a water quality management system for the region.

If current trends and patterns continue, the policy of industry will in most cases be to connect to a municipal waste system. In this regard, a recent report prepared for the New England Regional Commission on the economic impact of environment control in New England states:

> In summary, it appears that while water waste abatement will not greatly affect aggregate industrial growth in New England, its effects may be very severe for particular industries and sub-regions. Control requirements which do not make special provision for these special cases may cause local economic dislocations which might last for many years. *The industries most severely affected by control measures will, in general, be industries which would otherwise be declining.* Public action would probably be needed anyway in these industries to alleviate local dislocations.

This evaluation can provide us with an insight into the impact of water pollution control on the region's industrial community.

The most critical element of the water quality management effort will be the successful operation of the required system of water pollution control facilities. If we assume that the cost of operation and maintenance may approach 10 percent of the total capital cost of the facilities, the annual cost would exceed $100 million. It is essential that the operators for these facilities be competent, technically skilled and dedicated if the complex secondary waste treatment plants that are being proposed are to serve as the foundation for the water quality control program. We are now confronted with the prospect of a shortage of qualified operators as shown in Table 3.

Table 3. Additional Wastewater Treatment Plant Operators Required in New England by 1971

	Chief Operator	Operator	Assistant Operator	Total	Present Resource
Maine	40	210	150	400	65
New Hampshire	15	100	65	180	70
Vermont	5	30	25	60	110
Rhode Island	5	15	10	30	140
Connecticut	20	190	90	300	435
Massachusetts	50	270	160	480	380
New England	135	815	500	1,450	408

The New England Interstate Water Pollution Control Commission and the states have initiated limited training efforts to develop the needed manpower. A broader, more intensive effort will be required if we achieve our water quality goals. In addition, salaries for water pollution control facility operators must be competitive with private industry to attract and retain qualified personnel

COMBINED SEWER OVERFLOWS

One of the major unresolved issues of water quality control in the region is the problem of combined sewer overflows. These overflows are a major limiting factor in the water use of almost every mainstem river in the region, since nearly every major city is served by a combined system. An estimate of population served by combined sewers and costs of complete separation are shown in Table 4.

Table 4. Estimated Populations Served by Combined Sewers In New England States, 1967

	Combined Sewer Population	Sewered Population	Percentage Served by Combined Sewers	Estimated Cost of Complete Separation, $ millions
Maine	293,000	619,000	47	243
New Hampshire	236,000	335,000	70	196
Vermont	139,000	208,000	67	116.5
Rhode Island	277,000	574,000	48	231
Connecticut	447,000	1,776,000	25	373
Massachusetts	1,707,000	3,710,000	46	1,425
Total	3,099,000	7,222,000	43	4,188.5

Sewer separation programs have already been initiated in several cities, and research and demonstration programs are underway by both FWPCA and the state water pollution control agencies seeking a feasible solution. Control or elimination of these overflows is essential to the realization of a successful water quality management program.

REGULATION OF STREAM FLOWS

All of the major rivers in New England and some of the tributaries are regulated for the use of peaking hydropower developments. During hours of peak electrical demand of perhaps 4-6 hours per day, water is released from the impounding reservoirs. During hours of low electrical demand, during the nights and on Saturdays, Sundays and holidays, the streamflow is shut off. The net effect is an irregular streamflow pattern and a resulting irregularity of water quality.

In addition to streamflow regulation for power production: natural flows are often insufficient to maintain desired levels of water quality. Efforts to modify current streamflow patterns have been initiated through Federal Power Commission licensing procedures and action by the New England River Basins Commission.

Reservoir storage for streamflow regulation for water quality control purposes is being proposed by the Corps of Engineers, the Department of Agriculture, and state water resource agencies. A dramatic illustration of the effects of peaking power production on the streamflow of the Connecticut River is shown in Figure 4.

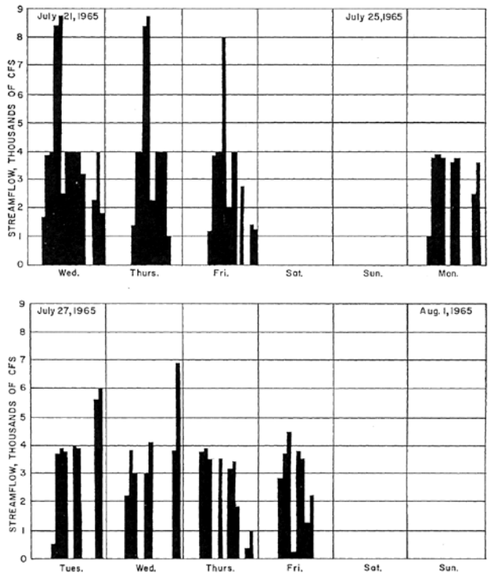

Figure 4. Regulation of Streamflow Connecticut River at Wilder Dam, Hanover, New Hampshire

WATER QUALITY PRESERVATION

A crucial element of an effective water quality management system for New England is the preservation of those waters which are currently of good quality.

New England has an abundance of priceless clear lakes and reservoir water quality must be protected and preserved to maintain their value. A major part of our future activities must be pointed towards preserving these resources. It is the testing ground on which the effectiveness of water quality control efforts may be measured.

Unfortunately, this preservation is also our most vulnerable point. At the present time, we do not have the legal tools to effectively deal with the problem.

A major step forward has been taken by the State of New Hampshire. There, state approval is required of all waste disposal systems within 1,000 feet of a body of surface water. The state has imposed increased lot size requirements in several developments and has prohibited subsurface disposal in some instances necessitating chemical toilets.

The licensing of treated waste discharges by state agencies is also helpful. It is essential and urgent that near absolute control of water quality using such tools as zoning, land use management controls and requirements to prohibit waste discharges are needed to successfully accomplish the task.

The problems of lake eutrophication, nutrient control, and lake management represent a significant segment of the requirement for preserving water quality levels and deserve special note. Insight into the problem can be gained by viewing the case of Lake Winnipesaukee in New Hampshire.

The watershed of the lake has been subject to intense recreational development which for the most part was not guided or planned development. As a result, inadequate subsurface disposal systems are emerging as important problems. The communities of Meredith, Center Harbor and Wolfboro discharge treated waste nutrients to the lake without nutrient removal.

A solution to this and comparable complex situations must be developed if we hope to save the lake from extinction. It is essential that we find a solution because the future of New England is dependent on it.

COASTAL WATERS

New England's coastal waters are perhaps the most important waters of the region. Because of their ability to accept wastes without readily apparent effects we have used them as convement waste disposal grounds. We have reached a point where we must re-examine past policies and judgments to determine a positive course of action. The effects of offshore toxic waste dumps, thermal pollution, municipal and industrial waste discharges, watercraft pollution and oil pollution must be technologically delineated and appropriate programs developed for control. Action is already underway in several states.

SUMMARY

The preparation of this paper has made it quite clear to the author that more issues and problems have yet to be resolved than have been successfully confronted. Major efforts and development of significant elements of the program lie ahead of us. This paper has attempted to clarify the nature and magnitude of these efforts, because a problem must first be thoroughly understood before it can be solved.

The financial and manpower requirements are staggering. The technological elements are extremely complex. Regional cooperation at all levels of government, private industry, civic and professional action groups and concerned citizens is essential to ensure success in achieving our objectives. Regional waste treatment facilities, regional operating districts, watershed management programs, river basin management systems and vigorous state water pollution control programs are key elements.

NEBRA Highlights

EPA has decided that struvite fertilizers and other products made for land application are, by default, "derived from sewage sludge" and thus subject to the requirements of 40 CFR Part 503

Celebrating 20 Years

Formed in December 1997, NEBRA is celebrating its 20th year. With the help of NEWEA (and its Residuals Management Committee) and many dedicated members, we have made it—and made a difference.

NEBRA's board of directors and staff have completed a year-long strategic planning process. In the next five years, NEBRA will build on our successes, addressing regulations and guidance, advancing best practices, reporting the news, and supporting members in their environmentally sound and publicly supported recycling efforts. And we will grow to new heights, expanding our membership, our staff, our outreach and training, and the visibility of biosolids management in support of sustainability.

For more information about NEBRA's history or Vision 2021, visit our website: nebiosolids.org (access to Vision 2021 is for members only).

Mac Richardson received the 2016 NEWEA Biosolids Management Achievement Award

Award Winners

At the NEWEA Annual Conference in January, several NEBRA luminaries were awarded.

Mac Richardson, superintendent of Lewiston-Auburn Water Pollution Control Authority (LAWPCA) in Lewiston, Maine, received the 2016 NEWEA Biosolids Management Achievement Award. Mr. Richardson was a founder of NEBRA, and a signer of the Articles of Incorporation 20 years ago. See the new LAWPCA Member Highlight on NEBRA's website.

Charlie Tyler, recently retired from the Massachusetts Water Resources Authority (MWRA), was appropriately honored twice, with standing ovation, for his decades of work at MWRA, and for his involvement in NEWEA and other professional organizations. Mr. Tyler has been a member of NEBRA for many years, providing photos from NEBRA events, just as he has done for NEWEA and others. He was given the prestigious Founders Award.

Other NEBRA members winning NEWEA awards included:

- Scott Firmin, E. Sherman Chase Award
- Tim Levasseur, Alfred E. Peloquin Award
- Dan Bisson, Arthur Sidney Bedell Award

Jeff McBurnie, Casella Organics, was honored by the Maine Water Environment Association with the 2016 Roger Gagne Award for Long Term Service. Mr. McBurnie is also the chair of the NEBRA Regulatory and Legislative Committee.

And special congratulations to Ernie Kelley, long-time residuals program manager at the Vermont Department of Environmental Conservation, for winning the NEWEA Alfred E. Peloquin Award. Mr. Kelley is planning to retire this year, but, first—to leave with a flourish—he plans to see through an update of the Green Mountain State's biosolids regulations.

Perfluorinated Alkyl Substances in Biosolids

NEBRA has just published an Information Update on perfluorinated alkyl substances (PFASs) in biosolids. These chemicals, the most famous of which are PFOS and PFOA, have been in the headlines, as they have contaminated groundwater in several locales in New York, Vermont, and New Hampshire where there were past releases around manufacturing facilities that used them. These chemicals were designed to repel spills, are part of non-stick surfaces and fire-fighting foams, and have been used for decades in a variety of consumer products.

The concern with PFASs is that their unique, engineered chemistry makes them persistent and leachable. They can also be transported by air, so they are now found around the world in a variety of media, from rain to soils to groundwater. Biosolids, which reflect our community environments, contain traces of PFASs. Research to date indicates that "Land application of biosolids may release trace levels of PFCs into the agricultural soils but it doesn't seem to be a major source of human exposure (Hundal et al., 2011)."

Regulatory and Legislative Developments

- **EPA electronic reporting**. Congratulations to biosolids managers for making it through the first annual electronic submission of Part 503 biosolids reports, as required by EPA for this year's February 19 deadline. There were many challenges, as expected with such a major change. It usually gets easier the second time around.
- **EPA dental effluent limitations**. in mid-December, EPA finalized and signed off on Dental Effluent Limitation guidelines and was preparing them for publication in the Federal Register. This rule helps protect biosolids quality from an easily controlled source of mercury (Hg). In January, under the Trump administration, the rule was withdrawn, its future uncertain. The Natural Resources Defense Council filed suit, seeking a court "order vacating EPA's withdrawal of the final mercury rule" and noting "EPA's rescission of the final rule without any public process violates the notice and comment requirements of the Administrative Procedure Act."
- **EPA and struvite products**. EPA has decided that struvite fertilizers and other products made for land application are, by default, "derived from sewage sludge" and thus subject to the requirements of 40 CFR Part 503. However, the agency "is willing to consider on an individual case-by-case basis whether a particular product recovered from sewage sludge is beyond the scope of Part 503." This EPA decision was conveyed in a January 2017 letter to the National Association of Clean Water Agencies (NACWA).
  For a few years, producers of struvite fertilizers, NACWA, NEBRA, and others have discussed with EPA the question of 503 applicability. Struvite fertilizers are generated by engineered precipitation from thickened and/or digested solids or centrate/filtrate. Such processes are increasingly important in protecting treatment facility equipment from struvite (and/or vivianite) build-up and reducing total phosphorus (P) in final biosolids products.
  As part of its determination, which the agency stresses is subject to change, EPA does make it clear that products "extracted" from sewage sludge that are not land applied, land disposed, or incinerated are not subject to Part 503. An example used in the EPA letter is an element such as silver.
- **Massachusetts plant nutrient regulations**. These regulations are still in flux. No further information is available from the the Massachusetts Department of Agricultural Resources (MDAR) about what the final revised regulations will contain and when they will be finalized. MDAR clarified to NEBRA that it does not plan to release a new draft for public comment, even though the last draft had a substantive error that made it challenging to review. NEBRA continues to urge MDAR to ensure the final regulations adequately address numerous concerns regarding their applicability to organic residuals such as biosolids and composts. NEBRA comments are available at our "members only" page.
- **New York solid waste regulations**. These regulations, which cover biosolids, are under revision. The New York Department of Environmental Conservation is reviewing comments on the proposed draft from last September and is expected to finalize the new rules in the next few months.
- **Vermont solid waste regulations**, which cover biosolids (residuals), are being updated. NEBRA submitted comments to the Vermont Department of Environmental Conservation (DEC) in January, encouraging removal of duplicative and excessive requirements for land application of biosolids that stymy biosolids use in the state. For example, despite decades of data showing no significant groundwater impacts at biosolids farm land application sites, Vermont DEC still requires groundwater monitoring—an expensive disincentive.
  Even before the ink dries on the solid waste regulations, Vermont DEC has said it will be opening up a process to substantially revise the residuals (biosolids) management rules. Vermont DEC has invited NEBRA staff to serve on the advisory committee for that process.... However, at press time, there is new Vermont legislation.
- **Vermont legislation**. Water quality remains a core focus of the Vermont Legislature, with several bills addressing implementation and funding of programs related to the Water Quality Act of 2015 (Act 64). One bill, H.211, includes a stipulation to phase out land application of biosolids and septage. NEBRA is working with the Green Mountain Water Environment Association and other stakeholders to provide information to legislators and defeat this initiative.

Training: NEBRA is again collaborating on state and regional accredited trainings, providing solids management expertise. Recent classes were held with the New Hampshire Department of Environment Services and the New Hampshire Water Pollution Control Association on biosolids nutrient management and best field practices and, with the New England Interstate Water Pollution Control Commission, the annual regional sewage sludge incinerator operator training. Other classes are being planned throughout the year.

Biosolids Use Upheld by Courts in California and Virginia

Two major legal battles—one lasting a decade—were resolved this winter in favor of biosolids recycling to soils. On December 5, 2016, a Tulare County California Superior Court judge ruled in favor of biosolids management plaintiffs who had argued that a Kern County ban on biosolids

Biosolids land application

was illegal. He wrote that so-called "Measure E," passed by voter initiative in 2006, "is invalid and void for all purposes, for the dual reasons that it exceeds Kern's police power authority and is pre-empted by state law."

This is one of only a handful of major legal cases in North America that have delved into the detailed science of why biosolids use on soils is beneficial and, when properly regulated, creates minimal risk. The court's decision states that "the overwhelming weight of the evidence is that there is no basis in fact for any determination that land application of biosolids poses any risk to Kern County residents, let alone a real and substantial risk that would be alleviated by banning such land application.... Los Angeles has met its burden of producing evidence to the effect that there is no basis in fact for Measure E's public welfare claims.... There is no evidence of risk to human health."

Greg Kester of the California Association of Sanitation Agencies said, "The decision is well written. The judge really understood and articulated well the issues. He recognized that if Kern were to prevail, it could have a snowball effect in other counties. Congratulations and appreciation go to the city of Los Angeles, Orange County Sanitation districts, Los Angeles County Sanitation districts, and trucking and farm interests who supported this case. This is a large victory for all well-managed biosolids products and programs."

Also in December, the Richmond, Virginia Circuit Court upheld the new Virginia Department of Environmental Quality (DEQ) and Water Board Biosolids Regulations against a legal challenge brought by the Potomac and Shenandoah Riverkeeper organizations. These organizations challenged the state biosolids regulations, claiming that the lengthy process by which they were updated from 2008 to 2013 was inadequate and that the regulations do not do enough to protect human health and the environment.

In reviewing the Riverkeeper groups' claims, the Circuit Court found clear and convincing evidence in the records of numerous meetings and deliberations that the state agencies were thorough in developing the amended regulations. The court found that "the record reflects substantial evidence supporting the board's decision to approve the amended regulations." The court's decision addressed both technical questions, which were matters of law, as well as substantive questions regarding the safety of regulated biosolids use. The court supported DEQ conclusions that "the regulations are designed to manage the land application of biosolids in a manner that prevents runoff into surface waters and groundwater; that biosolids do not contribute to local nitrogen and phosphorus allocation any more than other well-managed agricultural operations; that organic matter in the biosolids helps to build and stabilize the soil thereby reducing erosion and runoff in the long term; that established buffer, setback, and slope restrictions were protective of state waters and karst topography; and that land application could occur under established conditions without negative environmental impact."

These major court decisions add to the legal precedent in support of biosolids use on land.

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North East Biosolids & Residuals Association

Spotlight: Facility

Concord, Massachusetts Wastewater Treatment Facility

Built in 1985; upgraded to advanced treatment in 2007; discharges to the Concord River; permit #MA0100668; process components include septage receiving and pumping, influent fine screen, grit removal, primary clari-thickeners for settling and thickening solids, trickling filters for biological treatment, CoMag® for phosphorus removal, ultraviolet disinfection, an odor control system, and advanced SCADA.

Concord, Massachusetts Wastewater Treatment Facility

Alan Cathcart
Concord Public Works Water & Sewer Division Superintendent
Woodard & Curran
Contract Operator
Nick Tranghese
Chief Operator

COLLECTION SYSTEM

The collection system consists of 33 miles (53 km) of gravity and low-pressure collection mains from 2 to 27 in. (5 to 68.5 cm) in diameter with two pump stations and six neighborhood lift stations. Concord's sewer system directly serves approximately 35 percent of the town, representing approximately 1,860 customers. Those not directly connected to the sewer system have the option to have their Title 5 system waste disposed at the Concord Wastewater Treatment Facility (WWTF). Most of the users are residential customers, with a modest volume of flow from restaurants and light commercial users.

OPERATIONS

Woodard & Curran has operated the WWTF since 1995 and employs three full- and one part-time operators and one part-time one. This team handles all day-to-day operations of the facility, including routine and predictive maintenance, and laboratory testing for compliance monitoring; it also assists the town of Concord with outreach by offering facility tours for school groups and local technical school students. Facility staff support the Concord Board of Health by assisting with coliform analysis of surface water samples. The WWTF has not had an OSHA recordable injury or incident for more than 15 years.

COMMUNITY AND FACILITY OVERVIEW

Concord is known for its historic charm and natural beauty of rivers, ponds, and rolling fields and woods. This connection with history and nature is evident in the town's WWTF. The lobby walls are covered with educational plaques, and a section of the lobby floor is inlaid with hand-painted tiles illustrating local plants and animals to express the interrelationship between the WWTF and the local environment.

The site of the WWTF has been used for wastewater treatment since at least 1900. The location is only half a mile downstream from the North Bridge, where part of the Battles of Lexington and Concord occurred that began the Revolutionary War. After the war, Concord focused on advances in civil society, including development of Concord's first municipal wastewater collection and treatment systems.

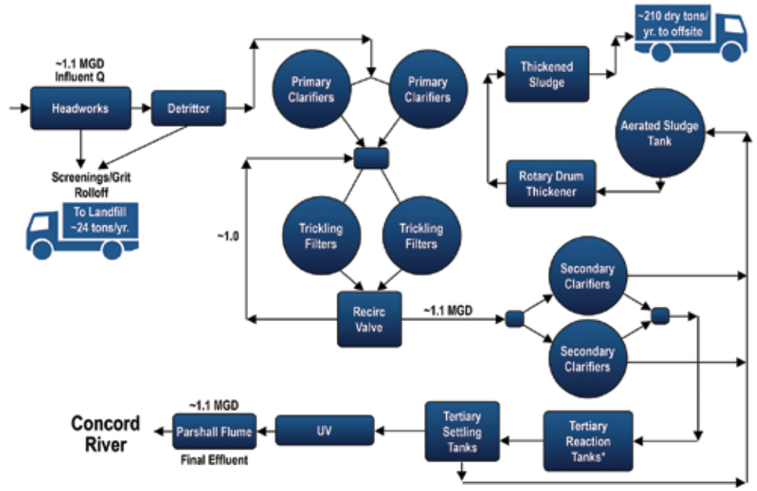
The current WWTF was part of another historic first in 2007, when it was upgraded from secondary treatment to advanced treatment, and became one of the first full-scale CoMag® processes in the world. Between 1999 and 2006, the WWTF provided space for a collaborative effort between the town, operator, and a small group of engineers and scientists developing the CoMag® process, which uses ballasted flocculation to capture and remove suspended and dissolved phosphorus from the wastewater stream.

Concord's CoMag® system has been highly effective at removing a wide range of contaminants including BOD, TSS, metals, and phosphorus, and vital to protecting the surrounding wetlands in the Great Meadows National Wildlife Refuge and the historic Concord River. After coming online in 2008, it has reliably met both summer and winter phosphorus limits of 200 ug/l and 1,000 ug/l, respectively. Since CoMag is a chemical treatment system, adjustments made to chemical doses and wasting rates can be observed in effluent quality in minutes rather than days as for some biological systems.

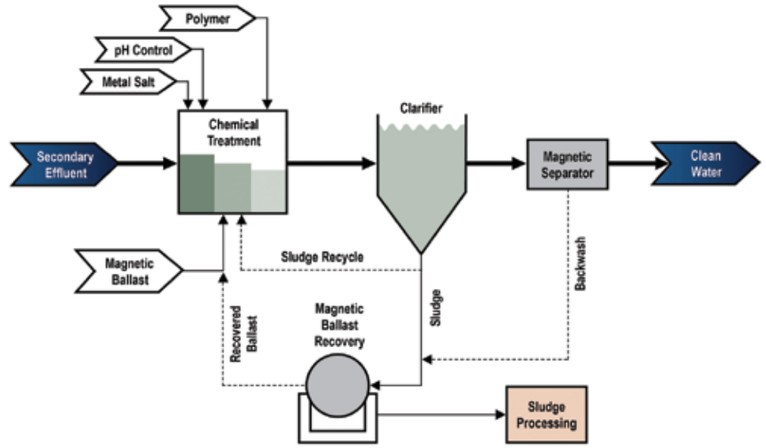
The WWTF treats an average flow of 0.8 mgd (3 ML/d) with diurnal flow variations typical of a predominately residential service area. During the recent severe drought, wastewater flow into the facility dropped to historic lows. This presented challenges to treat a more concentrated waste stream with higher-than-normal influent pH, problems that many facilities in the region have had to address.

The WWTF has a SCADA system designed with much operator input and user flexibility in mind. The facility is staffed using a single shift, yet operators are only a few keystrokes away from logging into the SCADA system from virtually anywhere with internet access. Concord has proactively adopted advances in technology, meaning that operators use tablets or smartphones to document their inspections, maintenance, and data collection at the facility, saving time and money.

The WWTF has established a reputation as an interesting and rewarding field trip with many nearby schools. One local technical high school brings its environmental program students to the WWTF as part of its preparation for a state wastewater operator licensing exam. For 10 consecutive years, the WWTF has hosted a tour for Concord eighth graders as part of the town's Public Works Day celebration. Nearly 2,000 eighth-grade students have now toured the facility, helping them see the relationship between wastewater treatment and their community's way of life. Perhaps a few may have been inspired by their visit to the WWTF to pursue further education or work in the water pollution control field.



Wastewater Treatment Process Flow



CoMag® Tertiary Treatment Process Flow

Connecticut State Director Report

by Virgil Lloyd
vlloyd@fando.com

As newly installed state director, I extend a hearty congratulations and thanks to Jay Sheehan for his dedicated service as state director for the past three years. He has worked tirelessly on behalf of the Connecticut wastewater industry, helping advance the goals and programs of CWPAA and CAWPCA. Thank you, Mr. Sheehan, for all of your time and dedication to our industry—you have set the bar pretty high!

Manager's Forum

The Manager's Forum was held on November 17, 2016, and was again jointly sponsored by New England Interstate Water Pollution Control Commission and Connecticut Water Pollution Abatement Association (CWPAA). This annual event has grown into one of the most popular educational programs on the calendar for operators in Connecticut. Program highlights included a regulatory update by Department of Energy and Environmental Protection (DEEP) staff, addressing topics such as the recent DEEP reorganization, the new edition of the nitrogen trading program, and updates on the Clean Water Fund, CMOM, and the Right to Know program, among other topics.

Manager's Forum

Afternoon program highlights included updates on legislative issues and development of the Continuing Education Program for operators, and advice on contingency planning for alternative options for sludge disposal.

One highlight of the day was the ceremony for the 24 graduates of the Manager Leadership Program. This is the fourth consecutive class of this highly successful program, which boasts 83 graduates over the past four years. The program spans 10 months and includes instruction in many of the skills necessary to become a successful manager at a water resource reclamation facility. Many of the graduates have since been promoted to both supervisory and superintendent positions. CWPAA and the Connecticut Association of Water Pollution Control Authorities (CAWPCA) recognizes the vision and effort of Jim Clifton in starting this program in 2011, and to Art Enderle and Kevin Shlatz for continuing and further developing this distinctive program.

CAWPCA Fall Workshop

CAWPCA held its annual Fall Workshop on November 4, 2016, at a new spacious location, the Aqua Turf Club in Southington. More than 160 attendees included representatives from about 50 municipal entities, Connecticut DEEP staff, and 24 wastewater professionals, contractors, and vendors. The program featured a timely panel discussion on the future of sludge management and disposal in Connecticut, as well as a presentation of an innovative Call Before You Dig (CBYD) response system developed by the Greater New Haven Water Pollution Control Authority that significantly reduces the resources and response time to CBYD requests.

The 24 graduates of the Manager Leadership Program

Continuing Education Program Update

Based on the feedback from Connecticut's operators, for the past several years CWPAA and CAWPCA have advocated for the creation of a Continuing Education Program in Connecticut, one of only three states without such a program. Implementing this program will require a modification to state statutes. In January, Representative John Hampton of Simsbury submitted HB 6315, an Act Requiring Continuing Education Requirements for Operators at Water Pollution Abatement Facilities. This bill, if passed, will allow for the creation of the necessary regulations. At the time of this writing the bill is in committee. If the bill survives the legislative process and ultimately reaches the floor for a vote, it will likely come near the end of the legislative session, which is scheduled to adjourn on June 6, 2017. For updates on the status of this bill, please go to CWPAA's website at ctwpaa.org.

Government Affairs Update

CWPAA and CAWPCA were busy again this winter in actively promoting the interests of clean water on both a state and national level. Locally, instead of hosting a breakfast at the Legislative Office Building as we have for many years, this year a group of 11 volunteers from the two associations held a series of one-on-one meetings with nearly 30 legislators on February 15 and 22. Having a presence in Hartford, at a time when the legislature is grappling with record deficits, is vital to maintaining an awareness among legislators of the value of continued support of Connecticut's Clean Water Fund to create valuable jobs while also creating a cleaner water environment.

Connecticut will again have strong participation along with the other New England states for the Washington Fly-in scheduled for March 21–22. A group of seven volunteers from CAWPCA and CWPAA representing all five congressional districts will be attending, with meetings scheduled with our five congressmen and two senators, to support the goal of clean water.

Ski Classic

On February 10, CWPAA held its seventh annual Ski Classic. The weather was sunny but cold. The ski conditions were fantastic, as Stratton Mountain Resort in Vermont had received 17 inches of snow in the prior two days. Eighteen people attended the event, and a good time was had by all. Many thanks go out to our sponsors of this event, including Aqua Solutions, Blake Equipment, Momar Chemical, Pond Technical Services, and Myers Pump.

CWPAA Product Show

Mark your calendars for the Annual CWPAA Product Show on April 27 at New Life Church in Wallingford. This year's program features the Annual Meeting, including elections as well as an update on the Continuing Education Program development.

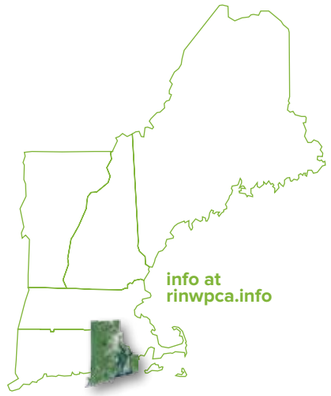
CWPAA Welcomes New Board Member

If you start to notice CWPAA on Facebook, LinkedIn, or other social media, it is due to the hard work of our newest board member, Serdar Umur. Welcome! Mr. Umur is with GA Fleet and will continue to boldly lead the association into the 21st century of social media communications, as well as help with many other duties.

2016 NEWEA award recipients: (top) Rian Savage, Operator; Thomas Sgroi, Alfred E. Peloquin

Rhode Island State Director Report

by Michael Spring
mspring@narrabay.com



Established in 1952, the Narragansett Water Pollution Control Association (NWPCA) is a non-profit organization created to promote the advancement of knowledge concerning the nature, collection, treatment, and disposal of domestic and industrial wastewaters.

Bernie Bishop congratulates scholarship winner Haley Koehler as her father Cliff looks on

NWPCA is an advocate for wastewater operators, providing training, technical information, and networking opportunities with the goal of improving water quality in Narragansett Bay and all the waters of the state of Rhode Island. Comprising wastewater operators, engineers, and vendors of wastewater products and services, NWPCA membership has grown to more than 200 professionals. NWPCA is an affiliated association of NEWEA and WEF.

One of our best years was 2016. NWPCA had a total membership of 300 in 2016. We continued with our training goals and completed several training courses, such as Laboratory Information Management Systems (LIMS) and Basic Microbiology for Activated Sludge Process, and assisted with the Rhode Island Department of Environmental Management (DEM) Operator Boot Camp training. Other successful events were our Hot Dog Roast at the Smithfield wastewater treatment plant; NWPCA Annual Golf Classic at Potowomut Golf Club; Annual Trade Show and Clam Bake at Twelve Anchors, Operations Challenge in New Orleans; Poo and Brew; and the Holiday Party, Food Drive, and Elections of New Officers, held at Potowomut Golf Club.

2016 Event Roundup

The 2016 Annual Golf Classic was held at Potowomut Golf Club on June 27. It was a Texas-style format that was a sellout with 144 attendees and 15 volunteers. The fee covered green fees, golf cart, barbecue lunch, and dinner, as well as many prizes.

The 3rd Annual Chowder Cook-off was held at the Narragansett-Scarborough treatment facility on August 9. Seven chowders were entered in the contest and 38 "judges" attended. David J. Arpin of RT Group, Inc., of North Kingstown had the winning chowder for 2016.

The Annual Trade Show and Clam Bake was on September 9 at Twelve Acres Banquet House in Smithfield. We had more than 40 vendors exhibiting wastewater-related products and equipment. At this event we announced our scholarship winners. The Operations Challenge team hosted a pipe-cutting competition. There were also raffles, a horseshoe tournament, and the graduation ceremony for the Rhode Island DEM Boot Camp attendees.

Rhode Island's Operations Challenge team, Ocean State Alliance, participated at WEFTEC in New Orleans for the third year in a row. Our team members are Captain Vinnie Russo, Eddie Davies, Sam Sullivan, Ryan Patnode, and Coach Michael Spring. Our team continued to make progress with a 2016 score of 309.51 overall and a rank of 19/32 for the team. Ocean State Alliance also finished in fourth place in the lab event. We thank our members, Rhode Island DEM, and NEWEA for their support, and our vendors who monetarily donated to our team.

Rhode Island also hosted our first NEWEA Young Professionals' Poo and Brew event at the Narragansett Bay Commission Fields Point facility, attended by 36 Young Professionals. The event started with a tour of the new lab building and of the Fields Point wastewater facility. After the tours, the attendees assembled at Foolproof Brewery in Pawtucket to enjoy refreshments and pizza. NWPCA is looking forward to hosting this event again in the upcoming years.

In 2016 David J. Arpin of RT Group, Inc. (left), won the 3rd Annual Chowder Cook-off

Thirty-six Young Professionals attended our first NEWEA Poo and Brew event at Narragansett Bay Commission Fields Point and Foolproof Brewery in Pawtucket

At the Holiday Party, Food Drive, and Elections meeting, 836 pounds of food was collected and donated for the Rhode Island Food Bank to distribute to families in need throughout the state. NWPCA also welcomed two new board members, Anthony Calenda and Jason Trenholm. Our 2017 board members are: President Scott Goodinson; Past President Douglas Nettleton; Vice President Peter Eldridge; Treasurer Peter Connell; Secretary Nora Lough; NEWEA State Director Michael Spring; Operator Certification Board Representative Paul Derosiers; Executive Director Bernard Bishop; Executive Director Anthony Calenda; Executive Director Jason Trenholm; Executive Director Michael Bedard; and Directors of Vendor/Consultant Coordination, Bob Mack and Steve Buckley.

NWPCA has added a new event to our 2017 Calendar. We will be having a Wine and Jazz night on July 29 at Carolyn's Sakonnet Vineyard in Little Compton.

Upcoming 2017 NWPCA events		
Board of Directors Meeting	May 9	Warwick Sewer Authority, 7 PM
Annual Awards Banquet	May 25	Potowomut Golf Club, 7 PM
Pawtucket Red Sox Event	June 17	McCoy Stadium, Pawtucket
Annual Golf Classic	June 26	Potowomut Golf Club
Hot Dog Roast/Meeting	July 11	Warwick Sewer Authority, 7 PM
Wine and Jazz Event	July 29	Carolyn's Sakinnet Vineyard, Little Compton
Chowder Cook-off/Meeting	August 8	Warwick Sewer Authority, 7 PM
Annual Clambake and Exhibition	Sept 8	Twelve Acres, Smithfield
General Business Meeting	Oct 10	Warwick Sewer Authority, 7 PM
Meeting & Nomination of Officers	Nov 14	Warwick Sewer Authority, 7 PM
Annual Holiday Party	Dec 7	Potowomut Golf Club, 7 PM

Please check www.rinwpca.org for association news and updates as well as our Facebook page @ facebook.com/NWPCA.

Graduation ceremony for the Rhode Island DEM Boot Camp attendees

U.S. EPA Region 1 O&M Excellence Award recipients: (left) Quonset Development Corporation, North Kingstown, represented by Dennis Colberg and Bill Young; (right) South Kingstown Regional Wastewater Treatment Plant, represented by Kathy Pierce and John Mackenzie

Massachusetts State Director Report

by Justin deMello
jdemello@woodardcurran.com

I would like to start by thanking my mentor and predecessor, Mike Moreau, for his commitment and accomplishments in his recent term as Massachusetts state director. His energy and dedication to the association and the wastewater industry as a whole are second to none. Mike leaves some very large shoes to fill, but I am confident that with his guidance, along with the support of the Massachusetts Water Pollution Control Association (MWPCA) membership, I can build upon his recent successes.

For those who do not know me, I was born and raised in Massachusetts. From running around Pleasure Bay of Castle Island to bike riding along the Cape Cod Canal to fishing in the Quabbin Reservoir to kayaking around Plum Island, I have always been drawn to the water. I expanded that into a passion for water as I began my professional career as an environmental engineer and wastewater treatment plant operator. Over the last 12 years, I have had the opportunity to visit and assess dozens of the commonwealth's 2,200 licensed municipal and industrial wastewater treatment facilities, and to meet and collaborate with countless professionals dedicated to ensuring that Massachusetts has clean water. In the last 30 years, we have seen vast improvements in water quality across the state. While there is still room to improve, the successes to date can be credited to the thousands of wastewater professionals who call Massachusetts home.

In Massachusetts, MWPCA brings these water quality professionals together. With 720 members spanning the state, MWPCA is still the leading provider of education and training opportunities, and serves as a place for operators and water quality professionals to exchange information and network. With President Bob Greene, President-elect Eric Smith, and the other Executive Committee members, we are poised for another successful year. For those of you interested in joining the association or being more active on a committee, please reach out to us. This year, the association is committed to making steady progress on several key initiatives, including expanding training and education, advocating the importance of the industry and funding, and expanding membership—and growing younger overall as an industry.

Past Events

MWPCA hosted 90 members in Mansfield for its December Quarterly Meeting. The meeting headlined presentations from the Massachusetts Department of Environmental Protection (MassDEP), covering topics including the Water Utility Resilience Program, Saving Energy and Reducing Your Operating Costs, NPDES Permitting Program, Requirements for Infiltration/Inflow Programs, and promotion of the Operators Management School Certification program.

MWPCA was well represented in January at the NEWEA Annual Conference in Boston with 14 members taking advantage of the free pass (paid for by MWPCA) on Operator's Day and several others taking home NEWEA, EPA, and WEF awards.

MWPCA hosted its spring meeting on March 28 at the Devens Common Center. The meeting included technical presentations on wastewater treatment facility structural assessments and concrete repairs, hydrogen sulfide attack in collection systems, and informative presentations from pump and valve manufacturers.

Upcoming Events

A friendly reminder to operators that this year is a Massachusetts Wastewater Operator License renewal year. For those who have fallen behind or could use a few more training contact hours (TCHs) in advance of December, MWPCA has several upcoming events and training programs to help fill your coffers.

MWPCA, together with Massachusetts Water Works Association (MWWA) and the American Council of Engineering Companies of Massachusetts (ACEC/MA), will host an annual legislative day on May 23, 2017, at the State House in Boston. In an improvement on past years, we are combining forces this year to create a stronger message around the importance of water and infrastructure investment. This year the event will include morning meetings with state representatives and senators followed by a networking luncheon that will include informational display areas and presentations from local elected officials.

Training

The New England Interstate Water Pollution Control Commission, MassDEP, and the MWPCA will be kicked off the revitalized Massachusetts Wastewater Management Training Program on March 9, 2017. The program has attracted 28 registrants from facilities all over Massachusetts.

This one-year program intends to develop essential skills to propel candidates into management positions. The program is based on the successful management training programs that have been delivered in Maine, Rhode Island, and Connecticut. Participants will meet as a group once a month for 12 months, addressing a new topic each month. Topics to be covered during the program include Introduction to Management, Advanced Process Control, Working with the Media, NPDES Permitting and State Regulations, Engineering Design and Blueprint Reading, Preventive Maintenance, Microbiology, Finance and Budgeting, and Job Shadowing.

As an increasing number of operators approach retirement, the sponsoring organizations have constructed this program to help ensure that the next generation of operators is prepared to fill these opening managerial positions across the state. The program encourages all wastewater operators interested in furthering their careers, and one day assuming a management or superintendent position, to consider joining a future management program.

For questions or suggestions regarding MWPCA activities, please contact me at jdemello@woodardcurran.com.

U.S. EPA Region 1 O&M Excellence Award—Athol, Massachusetts Wastewater Treatment Plant

U.S. EPA Region 1 O&M Excellence Award—Belchertown, Massachusetts Wastewater Treatment Plant

Asset Management Award—Town of Canton DPW

Quarter Century Operator Club—Robert Dunn, Jr.

Operator Award—Michael Hughes

Alfred E. Peloquin Award—Evangelos Manoloulis

Upcoming 2017 MWPCA events		
Annual Legislative Day	May 23	Boston State House
Quarterly Meeting	June 14	Log Cabin, Holyoke
Golf Tournament	June 20	Shaker Hills, Harvard
Annual Trade Show	September 13	Wachusett Mountain Resort

Vermont State Director Report

by Nathan Lavallee
nlavallee@town.milton.vt.us

Many exciting things happened at the Green Mountain Water Environment Association (GMWEA) in 2016 and now in 2017. We have been busy on many water, stormwater, and wastewater fronts. We had a successful Spring Meeting and Fall Trade Show, and attendance at both annual events continues to grow.

Recent Events and GMWEA News

As mentioned before, Daniel Hecht signed on last year as our executive director. Mr. Hecht brings a wealth of professional and life experience to the table. For example, he is a *New York Times* best-selling author, professor at Champlain College, and contributor to Vermont Technical College's digester project. Mr. Hecht has been hard at work on many things. In particular, he has been working on outreach and getting GMWEA's message out there. He has retooled, updated, and changed the GMWEA webpage. GMWEA is lucky to have him, and we look forward to accomplishing many great things with him in the future.

GMWEA Executive Director Daniel Hecht

Lake Champlain International presented GMWEA with its prestigious Heritage Award at a ceremony on September 29, 2016. The annual award acknowledges GMWEA members' long service to water quality management that helps protect Vermont's precious water resources.

On November 9, 2016, GMWEA and NEWEA hosted Vermont's first-ever Poo & Brew. Thirty-eight operators, water quality industry representatives, and state and city officials from Vermont and throughout New England convened in South Burlington to learn more about two very different technology "infrastructures." The event brings together young professionals to network, learn more about each other's facilities, and have a good time. The event began with a tour of South Burlington's Class 5 water resources reclamation facility (WRRF), led by water quality supervisor and GMWEA board member Bob Fischer; participants then went to Queen City Brewery, where they sampled a range of Queen City's brews. Paul Hale, managing partner of Queen City, explained and showed off the high-tech brewing process; some participants noted that the tanks were a bit shinier than some of Bob Fischer's at the South Burlington WRRF. Thank you to GMWEA board member Chris Cox of Montpelier WRRF for organizing the event and to Charlie Tyler for the photos!

The GMWEA Fall Trade Show took place in Burlington on November 10, 2016. Nearly 500 participants attended this event, including members, guests, speakers, vendors, and the board of directors. GMWEA also exchanged operators with Massachusetts during the NEWEA Operator Exchange. GMWEA sent William Sanderson from the town of Milton to Massachusetts in September; Jeff Kalmes from the town of Billerica, Massachusetts, toured several facilities in Vermont and then attended the Poo & Brew and GMWEA Fall Trade Show.

NEWEA Annual Conference

I participated in the NEWEA Annual Conference in Boston, attending numerous meetings and technical sessions. GMWEA members received several awards:

- Ernie Kelley, State of Vermont Agency of Natural Resources – Alfred E. Peloquin Award
- Robert Baillargeon, South Burlington – Plant Operator Award
- Josie Ford, South Burlington – Vermont Stockholm Junior Water Prize
- Tim Vivian, Bethel – NEWEA Committee Service Award

Government Affairs

The GMWEA Government Affairs Committee has once again been very active. On January 19, GMWEA board and staff members, along with representatives from NEWEA, Vermont Rural Water Association, and other allies convened at the State House cafeteria to greet legislators as they arrived to start the new session. We handed out brochures, rubbed elbows and schmoozed, and provided lawmakers with a water quality acronym sheet, which was much appreciated. The annual event is intended to remind lawmakers of the important role of water quality in Vermont's way of life and to show them the faces of the real people who protect Vermont's health and natural waters. Legislators responded enthusiastically.

We were fortunate to receive a visit from Vermont's lone, hard-working representative in Washington, Peter Welch. The committee set up a GMWEA booth across from the cafeteria in the state capitol and interacted with many politicians over coffee and bagels. This first meet and greet was followed by a legislative lunch at Capital Plaza on February 24. The legislative lunch was our fifth annual legislative meal and our most successful yet.

Upcoming Events

In March, GMWEA board members will judge students' work for the Stockholm Junior Water Prize and select the Vermont finalists and winner at Norwich University during the Vermont State Science and Math Fair.

Save the Date! George Dow Memorial Golf Tournament will be held in mid-August, at Cedar Knoll Country Club in Hinesburg.

Clean Water Day and the third Visit your Water/Wastewater Facility Day will be held on May 19.

The GMWEA Spring Meeting will be held on Thursday, May 25, at Killington Resort. This includes the annual business meeting, where awards will be given out and association officers elected for the coming year.

For further information regarding GMWEA/NEWEA activities and events, contact Vermont Director Nathan Lavallee at nlavallee@town.milton.vt.us or visit our website at gmwea.org.

Bob Fischer (center, white hat) leads the tour of the South Burlington WRRF during the GMWEA Poo & Brew event

Exchange Operators: William Sanderson of Milton, Vermont, and Jeff Kalmes of Billerica, Massachusetts

Tim Vivian (right) receives the 2016 NEWEA Committee Service Award from NEWEA President Ray Willis

Maine State Director Report

by Clayton “Mac” Richardson
mrichardson@lawpca.org

Greetings from Down East! Being busy, time seems to fly by for the Maine Water Environment Association (MEWEA). After a beautiful, if dry, summer we jumped into September starting with the Portland Greenfest where our Young Professionals Committee, ably led by Michael Geuthle, engaged the crowd with discussions on the need to protect Maine’s water resources.

Annual Conference

The Greenfest was held at Monument Square on September 10. Soon after, we converged at Sugarloaf USA for our annual golf tournament and annual conference. The Sugarloaf links were, as always, challenging and spectacular.

More than 25 training sessions were held on Thursday and Friday. Thursday evening was highlighted by a popular game night on the Sugarloaf “beach” where attendees played a cornhole toss and a giant Jenga game while trying to stay warm by the outdoor fire pit. Also at the conference, 23 professionals celebrated the completion of their management candidate training program with the Joint Environmental Training and Coordinating Committee (JETCC).

North East Biosolids

In November, Maine was well represented at the North East Biosolids & Residuals Association (NEBRA)/NEWEA biosolids conference in Cromwell, Connecticut. Speaking of the Nutmeg State, we were pleased to host Rian Savage from the Storrs/UConn wastewater treatment facility as this year’s exchange operator. Rian toured a wide variety of treatment plants, from oxidation ditches to activated sludge facilities, a trickling filter, and Maine’s first membrane filtration plant.

Lobster Dip

On the first day of the New Year, Mechanic Falls Superintendent Nick Konstantoulakis was seen jumping in a very cold Atlantic Ocean to benefit Special Olympics at the annual “lobster dip.” Without questioning the wisdom of Nick’s actions, we clearly celebrate his conviction and courage. On the last Friday of January, more than 20 water professionals and family members enjoyed a bit of fun at our Young Professionals’ skate party.

NEWEA Annual Conference

Also in January, at the NEWEA Annual Conference, many Mainers were recognized for their contributions to protecting and improving our water environment. Award recipients were as follows: Paige Brown (Stockholm Junior Water Prize winner), Mark Holt (NEWEA Operator Award), Tim Levasseur (Alfred E. Peloquin Award), Vivian Matkivich—retired (Operator Safety Award and Quarter Century Operator Club membership), Rob Pontau (Young Professional Award), Clayton Richardson (Biosolids Management Award and Quarter Century Operator Club membership), Scott Firmin (E. Sherman Chase Award), James Morris (WEF Life Membership), James Galasyn (Laboratory Analyst Award), Dan Bisson (Arthur Sidney Bedell Award).

We also note that, while he may technically be a New Hampshire guy now, our Dustin Price earned an EPA Wastewater Treatment Plant Operator Excellence Award.

Stormwater Committee

Our Stormwater Committee remains active and engaged on many fronts, including tracking implementation of the newly released multi-sector general permit from the Maine Department of Environmental Protection, and working with various stakeholders on issues affecting Casco Bay and ocean acidification. One of our co-chairs, Zach Henderson, was this year’s recipient of the Golden Raindrop Award.

Annual Legislative Breakfast

February and March always contains a flurry of activity—whether or not there are snowflakes in the air. MEWEA again cooperated with the Maine Water Utilities Association (MWUA) in offering a wastewater training track at its annual conference at the Holiday Inn by the Bay in Portland (February 6–8). On March 9, we hosted our annual legislative breakfast at the Senator Inn in Augusta along with NEWEA and MWUA.

MEWEA had a strong contingent in Washington on March 21 and 22 when our president, Matt Timberlake, and our vice president, Paula Drouin, were joined by Hartland Town Manager Chris Littlefield and Livermore Falls Town Manager Kristal Flagg as well as Mr. Bisson and Mac Richardson at the National Water Policy Fly-in. Of course, we cannot fail to mention the Annual MEWEA/NHWPCA Ski Day! This year we moved over to the Granite State to help celebrate the 50th anniversary of the New Hampshire Association at Mt. Attitash. Skiers and riders scored a lift ticket, lunch, and some après ski fun for just $55.

MEWEA Spring Conference

April will see the MEWEA Spring Conference, to be held at the Lewiston Ramada Inn on April 14. There are sure to be interesting technical presentations and good times. MEWEA is again gearing up to participate in the Urban Runoff 5K and Neighborhood Festival. We have had the largest non-profit group for a couple of years running (yes, that is a little pun/fun), and we expect to keep it going this year. For those able to head upcountry, the biannual North Country Convention will be held by JETCC on April 26 and 27 in Presque Isle. This event is special in that we generally draw in some of our Canadian colleagues from across the border, making for a richer experience for all.

Speaking for Past President Scott Firmin, President Matt Timberlake, and the MEWEA Executive Committee, please join us this year at one of our association events. I can be reached at the Lewiston-Auburn Water Pollution Control Authority (LAWPCA) at 207-782-0917 or mrichardson@lawpca.org, or on my cell phone at 207-240-2701.

Nick Konstantoulakis enjoying the Lobster Dip

James Morris, WEF Life Membership

Mark Holt, NEWEA Operator Award recipient

James Galasyn, WEF Laboratory Analyst Excellence Award

More than 20 water professionals and family members participated in the Young Professionals’ skate party

New Hampshire State Director Report

by Sean Greig
sgreig@newmarketnh.gov

NEWEA and the New Hampshire Water Pollution Control Association (NHWPCA) completed another successful year working together. The NHWPCA board of directors will be led by President Kevin Maclean from Hanover. Kevin attended the NEWEA Annual Conference this January in Boston.

Kevin and I attended the NEWEA Affiliated State Association Meeting on Monday afternoon. The meeting brought representatives from the state associations and NEWEA together to discuss common issues and explore how associations could work together. Topics discussed included insurance for the associations, New England water resource recovery facility open house day, state committee structures, and promotion of water quality careers. The meeting was a great success. Mr. Maclean was impressed with NEWEA and the state association representatives. He said he is anxious to share the information and ideas from the meeting with the NHWPCA board of directors.

50th Anniversary

It is hard to believe that it is NHWPCA's 50th Anniversary. The 50th Anniversary Committee, led by Mike Theriault, has planned for a year full of events to celebrate it. The association kicked off its celebration with a Presidents' Dinner at Brown's Lobster House in Hampton. Brown's was the meeting place in 1968, one year after the association was formed. The event hosted 22 past presidents and their family members, and celebrated all of their hard work and dedication. It was great to mingle with the past presidents and listen to them talk about the days of the past and the challenges of today. The feedback for the past presidents' dinner is that it was a great event. We thank Mr. Theriault and the 50th Anniversary Committee on a successful event for the past presidents.

This year Dustin Price, chief operator for Seabrook, joined Sewer Snakes veterans, Sean Kehoe, Iron Mike Carle, and Patty Chesebrough

Sewer Snakes

The Seacoast Sewer Snakes were back in action this year with a lineup of old and new faces. Veterans Patty Chesebrough, Sean Kehoe, and Iron Mike Carle were joined this year by Dustin Price, chief operator for Seabrook. The season got off to a rough start when team captain Mr. Carle went down for back surgery in April. The team brought former Massachusetts team member Brian Farmer out of retirement for the joint NEWEA/NYWEA competition. With the help of Mr. Farmer, the Sewer Snakes slithered into a slot to go to WEFTEC in New Orleans.

The team practiced regularly cutting pipe, working on the safety and lab events, practicing the steps of the maintenance event without a pump, and studying for the process event. Once in New Orleans the Snakes were poised to compete, but, the team still wondered: Would Mr. Carle's back hold up? And how would the rookie Mr. Price do under the pressure? Coached by Pam Kehoe and supported by Margaret Price, the team ran like a finely tuned machine. It powered through several saw blades in the collections event, rescued the dummy out of the manhole for safety, hit all the meniscuses in the lab event, muddled its way through the pump maintenance event (first time running it as a team), and thoroughly processed the test. The team's hard work earned it a third-place trophy for Division II in the process control event. Congratulations to the Sewer Snakes on another great year.

Winter Meeting

The NHWPCA Winter Meeting took place at the Dover Wastewater Treatment Facility on December 9, 2016. It was a beautiful day for the 140 attendees to tour a wastewater facility. Ray Vermette showcased his beautiful facility and its upgrades. The upgrades included the conversion to the Modified Ludzack-Ettinger (MLE) process. The plant tour spotlighted the primary sedimentation tank gallery, including new pumps, actuated valves, and acoustically enclosed aeration blowers, improved septage receiving and pumping facilities, new instrumentation, fine bubble diffused aeration, anoxic zone mixing and nitrate recycle pumping, new stainless steel secondary clarifier mechanisms, new RAS and WAS pumps, an odor control biofilter, and the latest Huber dewatering screw press. The tour was followed by a lunch and a plant upgrade presentation by Tim Vadney (Wright-Pierce). The NHWPCA business meeting ushered in the new slate of board of directors. Santa Claus arrived in all his glory at the end of the meeting to raffle off prizes donated by vendors. A great time was had by all. Thanks to Mr. Vermette and the city of Dover for hosting the NHWPCA Winter Meeting.

The 2017 NHWPCA board of directors are: Kevin Maclean (President), Tim Vadney (Vice President), Andrea Martel (Past President), Dave Mercier (Secretary), Noelle Osbourne (Treasurer), Kurt Robichaud (1st Director), Ken Conaty (2nd Director), Dustin Price (3rd Director), Amy Pollock (Director at-Large), and Mike Carle (Director at-Large).

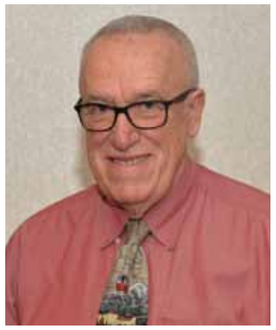
Legislative Breakfast

On Wednesday, March 8, 2017, NHWPCA held its Legislative Breakfast at the Holiday Inn in Concord. The theme was Water Is Worth It, and the guest speaker was Laura Knoy from public radio.

Upcoming 2017 NHWPCA events		
Trade Fair	April 6	Executive Court Banquet Facility, Manchester
50th Anniversary Celebration	June 23	South Beach Pavilion, Hampton

Ed Rushbrook and Victoria (Abbey) DelGreco reminisce at the 50th Anniversary Presidents' Dinner

2016 NEWEA Award recipients: Jason C. Randall, Operator; Jack Healey, Alfred E. Peloquin



2016 WEF Life Membership, Nelson Thibault

2016 EPA Region 1 Award—Dustin Price, Wastewater Treatment Plant Operator Excellence

NHWPCA Past Presidents' Dinner and 50th Anniversary

by Michael Theriault, Wright-Pierce

NHWPCA PAST PRESIDENTS' DINNER

The New Hampshire Water Pollution Control Association (NHWPCA) congratulates all past presidents for their hard work and dedication to the industry.

With low tide approaching and the nostalgic smell of the nearby salt marsh creek on a chilly Friday, October 14, 2016, NHWPCA hosted a dinner for all association past presidents at Brown's Lobster Pound in Seabrook, New Hampshire. In 1968, one year after the association was established, Brown's had served as a meeting location for the association, and it seemed most appropriate for the honoree dinner. Pins marking the 50th anniversary were unveiled and provided to each of the 22 past presidents in attendance, with plenty of opportunities to capture individual photos and group shots. The dinner celebrated the hard work of the attending past presidents, those who could not be present, and the dearly departed ones who helped pave the way for our generation. It was a vibrant social atmosphere allowing these individuals to exchange hugs, handshakes, and war stories, and reminisce about fond memories of their careers. All were treated to a delicious traditional lobster bake dinner of lobster, steamers, clam chowder, corn on the cob, French fries, and onion rings. Some brought spouses, family, or other loved ones, and all became heartily engaged in conversation. Restaurant goers who were observing the celebration were educated about the association, the history, and the difference that these individuals made to the betterment of the environment. One of Brown's picnic tables was spread with historic Collector newsletters from the past few decades, including articles featuring Bruce Kudrick (1985 past president) and celebrations of an Operations Challenge recent victory whose team included Ken Kessler (1994 past president).

Chuck Conway delivered a keynote speech on his career from college, Vietnam, the Army Corps, EPA, and the New England Interstate Water Pollution Control Commission. When Mr. Conway began his career, his first assignment involved environmental assessment and documentation of the Merrimack River, where southern portions occasionally reflected a blue, green, or purple hue from the discharge of all the industries upriver. He enlightened the crowd by explaining how the Army Corps' plan to land-apply Boston biosolids to most of Southern New Hampshire was curbed during the formation of EPA and expansion of the Clean Water Act in the early 1970s.

The celebration dinner was a great success (see photos on next page). The association thanks all the volunteers who contributed to this success, including Peter Goodwin, Kevin MacLean, Charlie Tyler, the NHWPCA board of directors, and the NHWPCA 50th Anniversary Committee.

NHWPCA 50TH ANNIVERSARY CELEBRATION

Come join NHWPCA in celebrating the 50th anniversary on Friday June 23, 2017, at the South Beach Pavilion at Hampton Beach State Park in Hampton. The event will feature a full day of activities, including slideshows and entertainment in a social atmosphere for association members and individuals in the industry.

The celebration will be highlighted by several keynote speakers reminiscing about contributions that operators, engineers, regulators, and others have made to the association and the industry in the past 50 years. Speakers will detail how regulations, the need to preserve water quality, and goals and concepts critical for the future of the

Back Row L to R: Douglas Steele (1998, 2000), Chris Hipkiss (1990), Dale Sprague (1991), Bryce Fletcher (1993), Kenneth Lowe (2001), Victoria (Abbey) DelGreco (1992), Ken Kessler (1994), John Adie (2014), Peter Goodwin (2015), Edward Rushbrook (2008), Sean Greig (2010), Mike Sullivan (2009), Gerry Curran (2011).
Front Row L to R: Fred McNeill (2003), Sarah (Goyette) White (2004), Mike Butler (1989), Bruce Kudrick (1985), Ray Vermette (2007), Kristin Noel (2013), David Lovely (2012), Rick Cantu (2002), John Grout (2005).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Presidents' dinner: 1. Victoria (Abbey) DelGreco and Ken Kessler—members of the original Synergetics Operations Challenge team 2. Bruce Kudrick, Dale Sprague, and Chris Hipkiss share memories 3. Chuck Conway and George Neill—who together have trained thousands of industry personnel 4. Holly Pottle, Mary Jane Meier, and legendary O&M trainer Don Pottle

industry have changed. Speakers may include Tom Burack, Jim Barsanti, Al Firmin, Ed Rushbrook, and Frank Underwood.

Hotel rooms have been blocked out for the 50th anniversary event at the Ashworth by the Sea on Hampton Beach. Rooms are available for approximately $260 to $280 (plus tax) for king and double queen ocean view rooms. Parking is available for $18 per car, per night. Other amenities at the hotel include a restaurant and bar. Also, the hotel is centrally located and within walking distance to surrounding attractions. For reservations and general information call Ashworth by the Sea at 603-962-6762 and ask for the block of rooms for NHWPCA. Early reservations are encouraged.

Event guests with an RV or self-contained camper have the opportunity to stay directly adjacent to the 50th anniversary event. Reserve a campsite at one of Hampton Beach State Park's 28 RV campsites for a night or the weekend. Reservations can be made by calling Reserve America at 877-647-2757, or online at ReserveAmerica.com. As for the hotel, early campsite reservations are encouraged.

NHWPCA 50TH ANNIVERSARY APPAREL AND ACCESSORIES

Visit the NHWPCA 50th Anniversary Store and place your order today: store.shirtmasters.com/nh-water-pollution-control-association.

Orders placed before Sunday March 19, 2017, can be picked up at the NHWPCA Spring Trade Fair in Manchester on April 6, 2017. If you order before Sunday June 4, 2017, you can pick your items up at the NHWPCA 50th Anniversary Celebration in Hampton Beach on June 23, 2017.

If you cannot attend the spring trade fair or the 50th anniversary celebration, you can pick up your items from the New Hampshire Department of Environmental Services office by coordinating with Ray Gordon at ray.gordon@des.nh.gov (603-271-3571) or Nancy Lesieur at Nancy.Lesieur@des.nh.gov (603-271-2985).

NHWPCA 50TH ANNIVERSARY—CALL FOR SPONSORSHIP

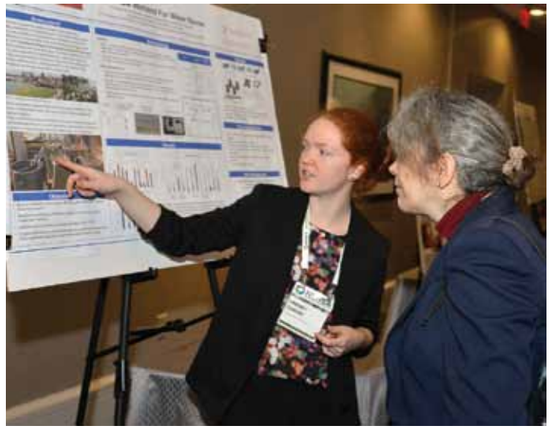
NHWPCA is celebrating its 50th anniversary in 2017. Events include a Ski Day, Spring Trade Fair, the 50th Anniversary Celebration, Golf Outing, Fall Meeting, and Winter Meeting. Your support will help us keep expenses and ticket prices reasonable for our members and friends during the celebratory year. Donations will be used to defray expenses for the 50th Anniversary Celebration, last October's dinner for past NHWPCA presidents, and for 50th anniversary promotional items. As always, we appreciate your support of our association and efforts toward clean water in New Hampshire. Help us celebrate!

We have prepared platinum, gold, silver, and bronze sponsorship levels to offer flexibility for your company to take part in these celebrations. Individuals can also contribute. Depending on the level of sponsorship, company logos and names may be included on promotional giveaways, on the NHWPCA website, in the NHWPCA Collector newsletter, or on display at events, and other recognitions will be made as appropriate.

For additional information or to sign up as a sponsor, please contact Michael Theriault mike.theriault@wright-pierce.com or any of the NHWPCA board members. The deadline to participate in this sponsorship program is May 15, 2017, to allow the association time to prepare promotional items and recognitions.

2016 NEWEA Student Poster Board Display Competition

Another successful student poster competition organized by the Student Activity Committee took place during the NEWEA Annual Conference. Seven "water-related posters" were showcased at the conference—Micah Strauss, from the University of Massachusetts Lowell, took home first place for best poster (see opposite page).

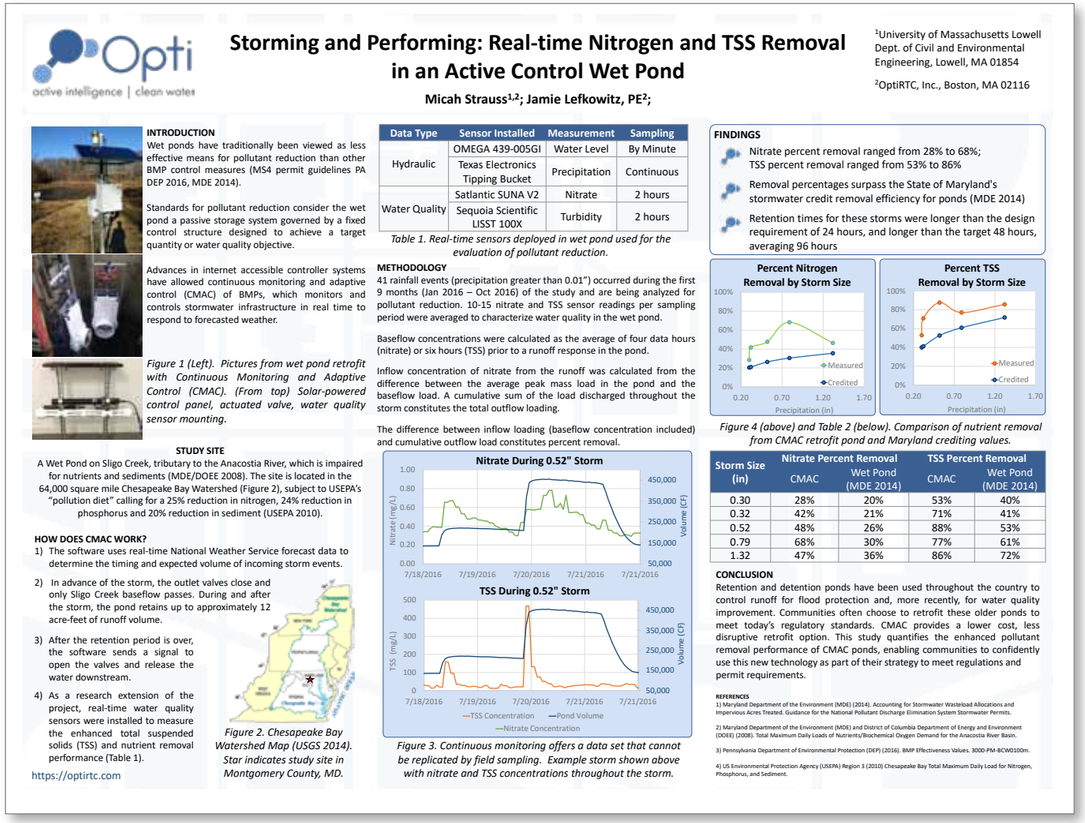


Lindsey Carver, Northeastern University
The Impacts of Living Learning Machine Configuration on Nitrogen and Phosphorous Concentrations of Wastewater for Reuse

Benjamin Aho, University of Massachusetts Lowell
The Lexington Storm Water Monitoring Project

LeighAnn D'Andrea, University of Massachusetts Amherst
The Effect of Pharmaceuticals and Personal Care Products within Urine Composting Applications

Jeffrey Lewis, University of Vermont
Phosphorus Removal Options for Wastewater Lagoon Systems



Opti
active intelligence | clean water

Storming and Performing: Real-time Nitrogen and TSS Removal in an Active Control Wet Pond

Micah Strauss[1,2]; Jamie Lefkowitz, PE[2];

[1]University of Massachusetts Lowell Dept. of Civil and Environmental Engineering, Lowell, MA 01854

[2]OptiRTC, Inc., Boston, MA 02116

INTRODUCTION

Wet ponds have traditionally been viewed as less effective means for pollutant reduction than other BMP control measures (MS4 permit guidelines PA DEP 2016, MDE 2014).

Standards for pollutant reduction consider the wet pond a passive storage system governed by a fixed control structure designed to achieve a target quantity or water quality objective.

Advances in internet accessible controller systems have allowed continuous monitoring and adaptive control (CMAC) of BMPs, which monitors and controls stormwater infrastructure in real time to respond to forecasted weather.

Figure 1 (Left). Pictures from wet pond retrofit with Continuous Monitoring and Adaptive Control (CMAC). (From top) Solar-powered control panel, actuated valve, water quality sensor mounting.

STUDY SITE

A Wet Pond on Sligo Creek, tributary to the Anacostia River, which is impaired for nutrients and sediments (MDE/DOEE 2008). The site is located in the 64,000 square mile Chesapeake Bay Watershed (Figure 2), subject to USEPA's "pollution diet" calling for a 25% reduction in nitrogen, 24% reduction in phosphorus and 20% reduction in sediment (USEPA 2010).

HOW DOES CMAC WORK?

1) The software uses real-time National Weather Service forecast data to determine the timing and expected volume of incoming storm events.
2) In advance of the storm, the outlet valves close and only Sligo Creek baseflow passes. During and after the storm, the pond retains up to approximately 12 acre-feet of runoff volume.
3) After the retention period is over, the software sends a signal to open the valves and release the water downstream.
4) As a research extension of the project, real-time water quality sensors were installed to measure the enhanced total suspended solids (TSS) and nutrient removal performance (Table 1).

https://optirtc.com

Data Type	Sensor Installed	Measurement	Sampling
Hydraulic	OMEGA 439-005GI	Water Level	By Minute
	Texas Electronics Tipping Bucket	Precipitation	Continuous
Water Quality	Satlantic SUNA V2	Nitrate	2 hours
	Sequoia Scientific LISST 100X	Turbidity	2 hours

Table 1. Real-time sensors deployed in wet pond used for the evaluation of pollutant reduction.

Figure 3. Continuous monitoring offers a data set that cannot be replicated by field sampling. Example storm shown above with nitrate and TSS concentrations throughout the storm.

Figure 2. Chesapeake Bay Watershed Map (USGS 2014). Star indicates study site in Montgomery County, MD.

METHODOLOGY

41 rainfall events (precipitation greater than 0.01") occurred during the first 9 months (Jan 2016 – Oct 2016) of the study and are being analyzed for pollutant reduction. 10-15 nitrate and TSS sensor readings per sampling period were averaged to characterize water quality in the wet pond.

Baseflow concentrations were calculated as the average of four data hours (nitrate) or six hours (TSS) prior to a runoff response in the pond.

Inflow concentration of nitrate from the runoff was calculated from the difference between the average peak mass load in the pond and the baseflow load. A cumulative sum of the load discharged throughout the storm constitutes the total outflow loading.

The difference between inflow loading (baseflow concentration included) and cumulative outflow load constitutes percent removal.

FINDINGS

- Nitrate percent removal ranged from 28% to 68%; TSS percent removal ranged from 53% to 86%
- Removal percentages surpass the State of Maryland's stormwater credit removal efficiency for ponds (MDE 2014)
- Retention times for these storms were longer than the design requirement of 24 hours, and longer than the target 48 hours, averaging 96 hours

Figure 4 (above) and Table 2 (below). Comparison of nutrient removal from CMAC retrofit pond and Maryland crediting values.

Storm Size (in)	Nitrate Percent Removal		TSS Percent Removal	
	CMAC	Wet Pond (MDE 2014)	CMAC	Wet Pond (MDE 2014)
0.30	28%	20%	53%	40%
0.32	42%	21%	71%	41%
0.52	48%	26%	88%	53%
0.79	68%	30%	77%	61%
1.32	47%	36%	86%	72%

CONCLUSION

Retention and detention ponds have been used throughout the country to control runoff for flood protection and, more recently, for water quality improvement. Communities often choose to retrofit these older ponds to meet today's regulatory standards. CMAC provides a lower cost, less disruptive retrofit option. This study quantifies the enhanced pollutant removal performance of CMAC ponds, enabling communities to confidently use this new technology as part of their strategy to meet regulations and permit requirements.

REFERENCES

1) Maryland Department of the Environment (MDE) (2014). Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated. Guidance for the National Pollutant Discharge Elimination System Stormwater Permits.

2) Maryland Department of the Environment (MDE) and District of Columbia Department of Energy and Environment (DOEE) (2008). Total Maximum Daily Loads of Nutrients/Biochemical Oxygen Demand for the Anacostia River Basin.

3) Pennsylvania Department of Environmental Protection (DEP) (2016). BMP Effectiveness Values. 3000-PM-BCW0100m.

4) US Environmental Protection Agency (USEPA) Region 3 (2010) Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus, and Sediment.

Micah Strauss, University of Massachusetts Lowell (photo-right); his poster (above), *Storming and Performing: Real-time Nitrogen and TSS Removal in an Active Control Wet Pond*, took home first place

NEWEA Student Scholarship Recipients' Essays

2016 Recipients (presented at the 2017 Annual Conference in January)

Essay Question: *Stormwater management has become an integral aspect for sustainable water management in urban areas. Please discuss the recent advances in this area and the role you could play, as a researcher/engineer, to provide holistic approaches for stormwater management and guidance for planners and law makers in governmental agencies to better facilitate sustainable water management in urban environments.*

Zhiheng Xu
University of Connecticut
Graduate Student Scholarship

With the increasing population, rapid urbanization, ecological environment deterioration, and serious water pollution, the quality and quantity of fresh water become crucial to human beings. Effective utilization of stormwater, one essential part of the water cycle, becomes critical for sustainable water management in the urban environment.

Pollutants carried in stormwater runoff have raised severe concerns for the integrated water management of stormwater. This is especially the case along the coast of the United States, where polluted stormwater runoff from roads and highways is the largest source of water pollution. To provide effective precaution strategies and minimize the pollution impacts, real-time *in situ* monitoring of stormwater is an imminent topic in water quality engineering fields. During my doctorate research, I have developed a novel sensing technology milli-electrode array (MEA) capable of simultaneous monitoring of multiple water quality related parameters and thus making real-time *in situ* stormwater monitoring possible. Briefly, MEAs are fabricated by precisely printing multiple millimeter-sized electrodes on a flexible thin film using inkjet-printing technology. Compared to expensive though ineffective probes/sensors (more than $1,000 to $50,000 per sensor) that can only measure a single parameter at a single point, MEA possesses unbeatable advantages of easy fabrication, high accuracy, low cost (<$1/sensor), and easy deployment and replacement. By aligning multiple pieces of MEA sensors in a row, contaminant fate in stormwater can be profiled at a high spatial-temporal resolution, greatly enhancing the monitoring capability and unveiling the stormwater quality *in situ* for pollution control and public health. I have successfully conducted the lab-scale 1-month tests of MEA sensors in storm water, and the results clearly showed the real-time *in situ* monitoring capability of MEAs for multiple parameters (e.g., oxygen, pH, temperature, conductivity, and chloride). This frontier research has received attention nationwide and was published in a high-impact journal (*Sensors and Actuators B: Chemistry*, Impact Factor: 5.0). This breakthrough research has led to a pilot-scale water quality monitoring.

Besides stormwater quality, stormwater transfer in soil is also critical for water quality and quantity. I have developed novel millimeter-sized soil moisture sensors (MSMS) using CD-etching technology. This small, thin MSMS can be directly inserted into soil layers without disturbing soil structure which fundamentally solves the severe disturbance problem of heavy soil sensors. Furthermore, multiple pieces of MSMS inserted vertically along soil depth can obtain the soil moisture at high resolution. None of any other soil sensors have this unique feature. MSMS can monitor stormwater quality and quantity during the infiltration process, something critical to integrated water management. I have successfully conducted the lab-scale tests of MSMS *in situ*, monitoring water content in different types of soils, which is, to the best of my knowledge, the first national study of soil moisture profiling.

Overall, my pioneering research of water quality sensors greatly enhances my understanding of stormwater monitoring, treatment, and management. Stormwater becomes one valuable treasure to human beings due to its large amount. Multidisciplinary knowledge is required to achieve a sustainable water usage for a bright future for our descendants' hands in hands!

Evelyn Grainger
Worcester Polytechnic Institute
Undergraduate Scholarship

Flood maps outlining the flood zones of 10-, 50-, and 100-year storms are being updated as global climate change is believed to be increasing the frequency and intensities of these flooding events. As the population density of cities increases and urban sprawl spreads to areas that were once rural, impervious surfaces such as buildings, parking lots, and roads are intensifying the quantity of water that cannot be adsorbed by the land. These two factors, climate change and population growth, have made stormwater management critical to the safety, economic stability, and health of people living around flood boundaries.

My experience with stormwater management has focused primarily on capture and reuse methods with rainwater harvesting in rural Guatemala, where rainwater is used to sustain community members' potable water supply through the dry season. Capture and reuse systems are versatile in size and purpose. While this solution is not practical for developed urban areas of the United States, capture and reuse methods are becoming increasingly popular in urban areas. In 2015, I worked with an interdisciplinary team of engineering students to design and assist Tatnuck Elementary School with the implementation of a community garden with a rainwater harvesting system. We completed calculations to determine the storage and roof size needed for rainwater to support the garden. While these two forms of stormwater management were small scale and had little impact on the stormwater runoff, they prove the versatility of rainwater harvesting methods. Capture and reuse methods can also vary in size. At my university, a large water collection system was created for the development of new athletic fields when they found that the runoff volume caused by the modification of pervious land to impervious fields would be problematic to combined sewage overflows. This system collects water falling on the turf fields in a large cistern beneath a parking area. While the water is not reused, it is stored until it can be released to the sewer system, allowing the water to be treated without overflowing the wastewater treatment system during peak flow.

The success of stormwater management, capture, and reuse, or others such as green roofs, pervious pavement, or bioretention ponds, is not dependent on solely the innovative technologies but more importantly on the appropriate application of these technologies, and inclusion of community and policy makers in the solutions. Rainwater harvesting is far from an emerging technology, but its concept has been adapted and improved, meeting the needs of large site designs that modify peak flows, gardens, and people without access to potable water.

As this crisis intensifies, causing more detrimental impacts to health, safety, and the economy of American cities, there will be a need not only for civil engineers to work on designing stormwater management programs that consider the different technology options but also for community and policy education members to advocate for stormwater management practices. With my strong civil engineering and social science background, I understand the interconnected relationship between people and infrastructure. Through this I believe I can work to design, implement, and educate to improve local communities through improved stormwater management practices.

EVENT

2017 Annual Conference & Exhibit PROCEEDINGS

Boston Marriott Copley Place, Boston, MA • January 22–25

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1. Lieutenant Governor Karyn Polito addresses a record crowd at the Opening General Session 2. President Ray Willis cuts the official grand opening ribbon to the exhibition hall. l-r: Exhibitor Bob Jones, WEF President-elect Jenny Hartfelder, Exhibits Chair Paul P. Casey, President-elect Jim Barsanti, Mr. Willis, and Program Chair Helen Gordon 3. NEWEA staff Linda Austin tends the bustling registration counter 4. Among the crowd at the President's playoff reception were Bogdan Baudis and Amy Anderson

The 2017 NEWEA Annual Conference convened with a meeting of the full Executive Committee on Sunday, January 22, 2017. More than 2,100 people registered for the conference. The three-day event featured 205 exhibit booths and 33 technical sessions.

The Annual Business Meeting was held on Monday, January 23, 2017. Nominating Committee Chair Mike Bonomo presented the slate for officers for 2017 as follows:

- Vice President – Raymond Vermette
- Treasurer – Priscilla Bloomfield (2nd year)
- Council Director/Collections Systems and Water Resources – John Digiacomo
- WEF Delegate – Matthew Formica
- Connecticut State Director – Virgil Lloyd
- Massachusetts State Director – Justin deMello

In accordance with the provisions of Article 9.3.2 of the NEWEA Constitution & Bylaws, these Officers will advance to the following positions:

- President – James Barsanti
- President-Elect – Janine Burke-Wells
- Past President – Raymond Willis

The remaining incumbents are fulfilling unexpired terms:

- WEF Delegate – Daniel Bisson (through WEFTEC 2017)
- WEF Delegate – Susan Sullivan (through WEFTEC 2018)
- WEF Delegate – Fred McNeill (through WEFTEC 2019)
- Council Director/Outreach – Jonathan Kunay (3rd year)
- Council Director/Meeting Management – Elena Proakis Ellis (2nd year)
- Council Director/Communications – Jennifer Lachmayr (3rd year)
- Council Director/Treatment, Systems Operations, and Management. – Marylee Santoro (2nd year)
- Maine Director – Clayton "Mac" Richardson (2nd year)
- New Hampshire Director – Sean Greig (2nd year)
- Vermont Director – Nathan Lavallee (3rd year)
- Rhode Island Director – Michael Spring (3rd year)

All nominees have indicated their willingness to serve. Respectfully submitted by the NEWEA Nominating Committee: Mike Bonomo (Chair), Brad Moore, Matt Formica, Fred McNeill, Susan Sullivan.

33 Technical Sessions

SESSION 1
HOT TOPIC: Creative Responses to Water Management and Climate Change, Lessons from Scandinavia, Germany and the U.S.

Moderators:
- Maureen Neville, CDM Smith
- Jaclyn Harrison, NEIWPCC

Panel 1: Climate Change as a Catalyst for Design Change

Panel Moderator: Donna Denio, Team Dynamics Boston
- Ellen Watts, Architerra
- Kim Vermeer, Urban Habitat Initiatives, Inc.
- Isabel Kaubisch, Clarendon Hill Consulting
- Gretchen Rabinkin, BSA

Panel 2: Collaborative Governance Supporting Water Control and Reuse, Reducing Loop Holes and Red Tape

Panel Moderator: Barbara Landau, Noble Wickersham & Heart
- Julie Wormser, Boston Harbor Now
- Stephanie Kruel, VHB
- Wendi Goldsmith, Sustainability Consultant
- Steve Roy, Ramboll

SESSION 2
Watershed Management

Moderators:
- Phil Forzley, Fuss & O'Neill
- Jennifer Johnson, Nitsch Engineering, Inc.

Urban Watershed Renewal with Public/Private Collaboration
- Jennifer Johnson, Nitsch Engineering
- Pallavi Mande, Charles River Watershed Association

Mashpee's Unique Approach to Implementing its Wastewater Planning Effort
- J. Jefferson Gregg, GHD

Use of a Nutrient Control Plan by the City of Rochester, New Hampshire to Develop a Long-term Plan to Reduce Nutrient Loads to Receiving Waters
- Daniel Bourdeau, Geosyntec Consultants
- John Storer, City of Rochester, NH
- Bill Arcieri, VHB

Blazing a Path to Implement a "Hybrid" Approach to Reduce Excessive Nitrogen Discharges to the Town of Orleans' Ponds, Estuaries and Embayments
- Thomas Parece, AECOM
- George Meservey, Town of Orleans, MA
- Michael Domenica, Water Resources Association
- Betsy Shreve-Gibb, AECOM







1. Comparing notes between sessions 2. Plant Operations Committee Vice Chair Tom Hazlett smiles at a comment
3. Bruce Berger leads the discussion at the Young Professionals' Summit

SESSION 3
Stormwater 1: Successful Community Planning and Collaboration in Stormwater Management

Moderators:
- Virginia Roach, CDM Smith
- Vinta Varghese, CH2M

Duxbury/Kingston Bay Stormwater Mitigation— Completed after 11 Years
- Tom Pawlina, ATP Environmental
- Joe Grady, Town of Duxbury, MA
- Maureen Thomas, Town of Kingston, MA

Managing the Winnicut River Watershed Through Collaboration of Six Communities
- Renee Bourdeau, Horsley Witten Group
- Robert Hartzel, Geosyntec Consultants

A Green Possibility in Kansas City
- Courtney Eaton, Carollo Engineers
- Shawn Dent, Carollo Engineers

Collaboration and Planning for Successful Drainage Management in New England Community
- Denise Cameron, Woodard & Curran
- John Livsey, Town of Lexington, MA

SESSION 4
Collection Systems 1: Make Construction Great Again

Moderators:
- Mark Thompson, Kleinfelder
- Michael Armes, ADS Environmental Services

Management and Response Action for Catastrophic Sewer Force Main Failures in Plymouth, Massachusetts
- Ziad Kary, Environmental Partners Group, Inc.
- Jonathan Beder, Town of Plymouth, MA

Beach Community has its own "Point Break"— Hampton, NH—How a Thriving Beach Community Handled a Coastal Sewer Force Main Failure and Emergency Repair
- Michael Curry, Wright-Pierce
- Jennifer Hale, Town of Hampton, NH

Pump Station Replacement Overcomes Obstacles to Address Reservoir Contamination Potential
- Kenneth Carlson, Woodard & Curran
- Bruce Thibodeau, Town of North Andover, MA
- Jason Kreil, Woodard & Curran
- Tim Willett, Town of North Andover, MA

Warwick Sewer Authority Main Influent Sewer Rehabilitation
- Charles Gore, Brown and Caldwell
- Janine Burke-Wells, Warwick Sewer Authority

SESSION 5
Small Community: Design, Operation and Purchasing Issues for Small Communities

Moderators:
- Brandon Blanchard, Pare Corporation
- Michael Headd, Woodard & Curran

Effects of Flow Fluctuations on Cape Cod Package Plants
- Christopher Hayward, WhiteWater

Septage Receiving Upgrades: Regionally Serving Northern, NH
- Michael Theriault, Wright-Pierce
- Jason Randall, Plymouth Village Water & Sewer District

Village of Morristown NY Wastewater Treatment Plant Upgrade for Small Community
- Ashish Mehna, Premier Tech Aqua

1. Anthony Giovanone, Vicki Quiram, and Udayarka Karra unwind at the Young Professionals Summit reception 2. A discussion on the exhibit floor 3. The Water For People Committee luncheon meeting 4. Andy Fish and Phyllis Rand share a smile at the Microconstituents Committee meeting

Case Study in Engineering, Procurement and Construction Management as an Alternative Project Delivery Method
- Jeffrey McDonald, Fuss & O'Neill
- Douglas Brisee, Fuss & O'Neill

SESSION 6
Asset Management 1: Leveraging IT&A (A = Automation)

Moderators:
- James Barsanti, Town of Framingham, MA
- Geraldine Ciardelli, City of Nashua, NH

Getting Started with Asset Management on the Cheap—Three Case Studies
- Daniel Roop, Tighe & Bond
- Janet Moonan, Tighe & Bond

Securing SCADA—an Overview of Cybersecurity and Countermeasures
- Daniel Capano, Stamford, CT, WPCA
- Justin Finnigan, ARCADIS

Town Wide SCADA Upgrade Strategy
- Ashley Dunn, Town of Framingham, MA
- Blake Lukis, Town of Framingham, MA
- Jon Grant, Woodard & Curran

Asset Prioritization with GIS
- Michael Stein, Wright-Pierce
- Jeff Normandin, Wright-Pierce
- Greg Johnson, City of Burlington, VT

SESSION 7
EPA Panel Discussion: Make Your Comments Count—Examples of What Works

Moderators:
- Roger Janson, U.S. EPA Region 1 (retired)
- Sarah White, UniFirst Corp.

Make Your Comments Count—How to Comment Effectively on NPDES Permits
- Ken Moraff, U.S. EPA, Region 1

Panelists from US EPA include:
- David Webster
- Thelma Murphy
- Damien Houlihan
- Ellen Weitzler

SESSION 8
CSO/Wet Weather Issues 1: CSO Success

Moderators:
- Kate Mignone, AECOM
- Charlie Smith, AECOM

Closing of the CAM004 CSO in Cambridge
- David VanHoven, MWH/Stantec
- David Kubiak, MWRA
- Jeremy Lane, MWRA
- Christine Clancy, Kleinfelder

Turning a Negative into a "Positive"—Negotiating a Consent Decree to Develop a Reasonable Endpoint
- James Drake, CDM Smith
- Robert Ward, City of Haverhill, MA
- Paul Jessel, City of Haverhill, MA

CSO Success—Overcoming Funding & Design Challenges in Madawaska, ME
- Robert Polys, Woodard & Curran

Fitchburg's Largest Sewer Separation Project Provides Relief to the Nashua River—Conquers Urban City Challenges
- Michael Theriault, Wright-Pierce
- Anthony Maressa, City of Fitchburg, MA


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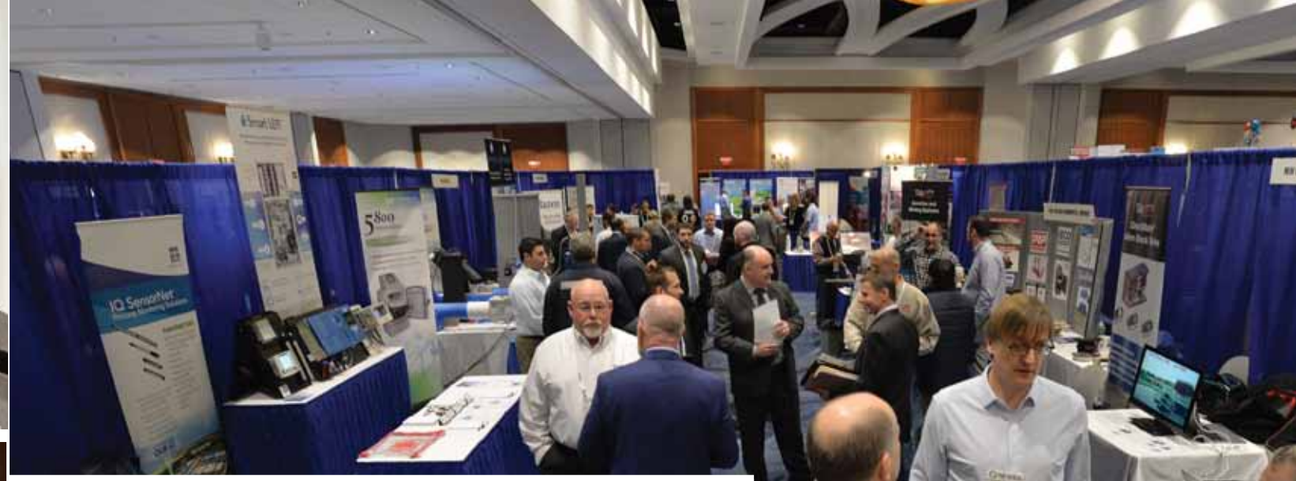


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1. Young Professional Tenzin Lama hears a sustainability presentation 2. The audience concentrates on a nitrogen removal presentation 3. Dave Polcari opens a Utility Management session 4. Concentrating on a session about climate change 5. Donna Denio moderates a panel discussion regarding climate change and design

Session 9
Plant Operations 1: Cutting Edge Nitrogen

Moderators:
- Susan Guswa, Woodard & Curran
- Mickey Nowak, SUEZ

Efficient Nutrient Removal Operating at Low Dissolved Oxygen
- Don Esping, Brown and Caldwell
- Dave Green, City of Rochester, NH

Membrane Aerated Biofilm Reactors—Oxygenated Fun with Less Carbon Cost
- Kelly Martin, Black & Veatch
- Sandeep Sathyamoorthy, Black & Veatch

Push the Limit of Enhanced Biological Phosphorus Removal Process for More Sustainable Phosphorus Removal and Recovery—A Mechanistic Investigation
- Yueyun Li, Northeastern University
- Annalisa Onnis-Hayden, Northeastern University
- April Gu, Northeastern University

A Novel Testing Approach for BNR Optimization in NYC
- Vera Gouchev, Hazen and Sawyer
- Sarah Galst, Hazen and Sawyer
- Michael Lynch, Hazen and Sawyer
- Robert Sharp, Hazen and Sawyer
- Keith Mahoney, New York City DEP

Session 10
Utility Management 1: Preparing for Millennials Management

Moderators:
- David Polcari, CDM Smith
- Fred McNeill, Cty of Manchester, NH

Succession Planning Initiatives at the South Essex Sewerage District
- Edward Leonard, Wright-Pierce
- David Michelsen, South Essex Sewerage District
- Richard Delacono, South Essex Sewerage District

Identifying and Preparing the Next Generation of Wastewater Treatment Facility Leaders—The Narragansett Bay Commission's Field's Point WWTF Experience
- Paul Nordstrom, Narragansett Bay Commission

EPA—Effective Utility Management Presentation
- James Horne, US EPA

Asset Management Lite for the Small User
- Christian Lund, Town of Groton, CT

Session 11
HOT TOPIC: All Things Green

Moderators:
- Robert Montenegro, Grundfos
- Charles Pike, Black & Veatch

Urban Stormwater Wetlands: Research into Form and Function
- Celina Balderas Guzman, MIT Center for Advanced Urbanism
- Alan Berger, MIT
- Heidi Nepf, MIT

ENVISIONing the LCA of a Wastewater Treatment Plant
- Anjana Kadava, Black & Veatch
- Sudhir Murthy, DC Water
- Andrew Shaw, Black & Veatch

Regulatory Compliance: Air Quality, Noise and Hazardous Materials Management
- Timothy Kucab, Tighe & Bond


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1. Networking at the Young Professionals Summit reception 2. A busy time in the 4th floor exhibit hall

Use of Porous Pavement Improves Water Quality and Reduces Beach Closures in Provincetown Harbor
- Sandra Tripp, GHD
- Richard Waldo, Town of Provincetown, MA
- Sara Greenberg, GHD

Session 12
Operator Ingenuity

Moderators:
- Kristen Lemasney, Wright-Pierce
- Tim Vadney, Wright-Pierce

No Cost Upgrade to Enhance Phosphorus Removal
- Leo Gaudette, Town of Merrimack, NH WTF

SCADA Upgrade for the Stamford WPCA
- Edward Abel, Stamford Water Pollution Control Authority, Stamford, CT

Biological Phosphorus Removal Chemical Reduction
- Ken Harwood, Town of Ayer, MA WWTP

Innovative Primary Effluent Sampling and Better TN Removal Through SRT Management
- Mike Carle, Town of Hampton, NH DPW

In-house Digester Emptying and Septage Receiving Concept
- Sean Greig, Town of Newmarket, NH

Session 13
Opportunities in International Development Work

Moderators:
- Anastasia Rudenko, GHD
- Sahar Kunay, Green Mountain Pipe

Operator Rainfall into Water Security—Students Partnering with a Rural Guatemalan Community to Achieve Water Security
- Evelyn Grainger, Worcester Polytechnic Institute
- Kerry Muenchow, Worcester Polytechnic Institute

Water For Health in Fonfred, Haiti
- Tim Loftus, Town of Webster, MA

Panel Discussion

Session 14
Utility Management 2: Planning for the Worst—Doomsday Planning

Moderators:
- Meg Goulet, Narragansett Bay Commission
- Donald Gallucci, Weston & Sampson

Incident Management Planning—How Does Your Utility Compare?
- Marian Long, Gradient Planning LLC

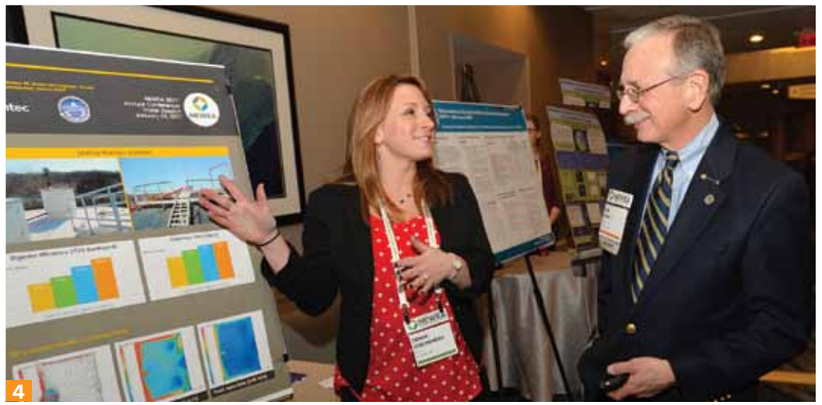
The Taanstafl Principle—Secondary Impacts of Water Conservation Efforts
- Todd Lusk, Ramboll Environ
- Russell Parkman, Ramboll Environ

Winnipesaukee River Basin Program Balanced Scorecard
- Sharon McMillin, NH Dept. of Environmental Services - Winnipesaukee River Basin Program

Planning for Framingham's Future—An Integrated Approach to Wastewater Infrastructure Planning, Operation, and Management
- John Murphy, Stantec
- James Barsanti, Town of Framingham, MA





1. Catching up in the lobby between sessions are Erin Loder, Amanda Jett, Frank Occhipinti, and Patty Chesebrough 2. An exhibitor discusses instrumentation with an interested attendee 3. Kelly Martin presents results of an innovative treatment technology concept 4. Denise Descheneau describes her poster to Bob Dunn

SESSION 15
HOT TOPIC: Global Climate Change
Moderators:
- Alan Slater, MassDEP (retired)
- Sean Osborne, OSD, LLC

Onwards from Climate Change Assessment to Implementation—City of Cambridge, MA
- Indrani Ghosh, Kleinfelder
- Kathy Watkins, City of Cambridge, MA

Comprehensive Watershed Planning for Climate Change in Manchester-by-the-Sea, MA
- Gabrielle Belfit, Tighe & Bond
- Janet Moonan, Tighe & Bond
- Mary Reilly, Town of Manchester-by-the Sea, MA

Integrated Hydraulic Modeling in the Alewife Brook—Developing the Right Tools for Climate Change Preparedness
- David Bedoya, Stantec
- Nicholas Stepina, Stantec

Climate Change and Flood Risks to Municipal Wastewater Infrastructure
- Nasser Brahim, Kleinfelder

SESSION 16
Plant Operations 2: New England BNR All Stars in Nitrogen Removal
Moderators:
- Ben Levesque, Tighe & Bond
- Jon Hume, Wright-Pierce

Collaborative Ingenuity and Careful Operations Brings a Unique Fixed Film Process to BNR
- Paul Dombrowski, Woodard & Curran
- Roger Ignazio, Jr., Town of Canton, CT
- Cory Knick, Woodard & Curran

Flying High at the Fairhaven, MA WWTF—The Ups and Downs of Conducting a Full-Scale Pilot Study for Nitrogen Reduction
- Meredith Zona, Stantec
- Linda Schick, Town of Fairhaven, MA
- Robert Backman, Evoqua

I Want My MLE
- William McConnell, CDM Smith

More Efficient Mechanisms of Biological Phosphorus Removal
- James Barnard, Black & Veatch
- Patrick Dunlap, Black & Veatch
- Mark Steichen, Black & Veatch

SESSION 17
Safety: Today's Safety Climate —Is Your Program Compliant?
Moderators:
- David Aucoin, Narragansett Bay Commission
- James Laliberte, NEIWPCC

What's New in Health and Safety
- David Horowitz, Tighe & Bond

The Top 10!
- David Wright, Weston & Sampson

Don't be Scared of Medium Voltage, Embrace the Revolution Enhancing Safety and Sustainability
- Jeff Miller, Schneider Electric
- Marc Buchwald, Schneider Electric

But, Did You See the Moonwalking Bear?
- David Wright, Weston & Sampson

1. Rob Gundersen comments during a lively Operator Ingenuity session 2. Influent Integrator Charlie Tyler holds forth at the 5S luncheon 3. Incoming Collection Systems chair Peter Garvey presents the Golden Manhole pin to outgoing chair John Digiacomo 4. Paula Drouin, Justin deMello, John Downey, and Scott Firmin at the Affiliated State Association meeting

SESSION 18
Plant Operations 3: Case Studies for Construction through Operations
Moderators:
- Pamela Westgate, Kleinfelder
- Stephen Sloan, Portland Water District

Nashua WWTF Headworks Upgrade—Alleviation of Flooding through Equipment Automation and Modernization
- Andy Morrill, Wright-Pierce
- Noelle Osborne, City of Nashua, NH

Wrestling with Storm Tides Again—How to Host a WWTF Mock Storm Drill
- Kathryn Roosa, Woodard & Curran
- Frank Cavaleri, Woodard & Curran

20-Year Valve Replacement at the Deer Island Treatment Plant
- Ethan Wenger, MWRA
- Brian Kubaska, MWRA
- David Duest, MWRA
- Stephen Cullen, MWRA

Phasing Approaches Yield Fast Compliance and Big Savings for Town of Middleborough for Nutrient Removal Upgrades
- Jon Hume, Wright-Pierce
- Ryan Bodnaruk, Wright-Pierce
- Todd Goldman, Town of Middleborough, MA

SESSION 19
Stormwater 2: MS4 Communities and NPDES Compliance
Moderators:
- Robert Robinson, City of Manchester, NH
- Emily Scerbo, Tighe & Bond

Integrating Sewer System Evaluation Surveys and Illicit Discharge Detection and Elimination and Helping the Community Understand Why They Matter
- Deirdre Hall, City of Quincy, MA
- Zach Henderson, Woodard & Curran

Woburn Engineering Department's Efforts to Meet MS-4 Permit Requirements
- Stephanie Collins, City of Woburn, MA
- John Corey, City of Woburn, MA

Innovative BMP Crediting
- Theresa McGovern, VHB

Assessment of New General Stormwater Permit for Small MS4 Communities
- John Hall, Hall & Associates

SESSION 20
Collection Systems 2: A Trenchless Revolution is Coming
Moderators:
- Dennis Sullivan, National Water Main Cleaning Co.
- George Pendleton, Martinez Couch & Associates

Design/Build for Trenchless Rehabilitation—Find and Fix: Lessons for Success
- Jonathan Kunay, CDM Smith
- Nicholas Rystrom, City of Revere, MA

Force Main Slip Lining—Critical Pipe Rehabilitation Under Interstate Highway
- Jeffrey Hutton, Weston & Sampson
- David Elmer, Weston & Sampson

Great Augusta Utility District (GAUD)—Trenchless Rehabilitation for the I-95 Interceptor Sewer
- Shawn Ready, Ted Berry Company, Inc.
- Brian Tarbuck, GAUD
- Andy Begin, GAUD
- Robert Lucic, Sheehan Phinney Bass & Green
- William Hall, Hall & Associates

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1. Professor Francis (Jerry) Hopcroft presents a short session on professional writing to poster contest participants **2.** A special board welcomes NEWEA attendees to a hallway lounge area **3.** Renee Bourdeau speaks regarding a successful watershed management project **4.** David Wu of MWRA speaks on Deer Island outfall effects **5.** Program sessions were often thought-provoking

Horizontal Directional Drilling a Force Main in Franklin, MA—Challenges and Pitfalls, Benefits and Success
- Amy Anderson, ARCADIS
- Laurie Ruszala, Town of Franklin MA
- Scott Haynes, ARCADIS

Session 21
Residuals 1: Optimizing Energy from Biosolids

Moderators:
- Eric Spargimino, CDM Smith
- Ned Beecher, NEBRA

Thermal Hydrolysis in Texas
- Gregory Roy, CDM Smith

Direct Electricity Generation from Biosolids using a Hybrid Fermentation-Bioelectrical System
- Caitlyn Butler, University of Massachusetts, Amherst
- Daniel Clasby, University of Massachusetts, Amherst
- Varun Srinivasan, University of Massachusetts, Amherst
- Cynthia Castro, University of Massachusetts, Amherst
- Sandeep Sathymoorthy, Black & Veatch

Construction and Commissioning of a Merchant Food-Waste Digester in Southington CT
- Brian Paganini, Quantum Biopower
- Michael Curtis, Quantum Biopower

Bench Marking Digestion for Process Capacity Assessment and Improved Performance
- Christopher Muller, Brown and Caldwell

Session 22
HOT TOPIC: Planning for a Sustainable Future

Moderators:
- Katelyn Biedron, CDM Smith
- Scott Lander, Retain-It

A Utility Business Reference Model for Sustainability
- Michael Barnett, SmartCloud, Inc.

Integrated Planning and the Triple Bottom Line
- Nancy Kelley Beaton, CDM Smith
- Terrance Sullivan, City of Fall River, MA

Utilizing Food Waste in its Path Towards Net Zero Energy Performance—Ithaca WWTP Case Study
- Anastasia Rudenko, GHD
- Sara Greenberg, GHD
- Dan Ramer, Town of Ithaca, NY

Infrastructure for a Livable Future
- Julie Wood, Charles River Watershed Association
- Bruce Douglas, Natural Systems Utilities
- Nigel Pickering, Horsley Witten Group
- Robert Black, Industrial Economics

Session 23
Plant Operations 4: Operational Challenges and Solutions from Influent to Effluent

Moderators:
- Tom Hazlett, Woodard & Curran
- Ed Rushbrook, Process Analysts

Manchester Retools its Aeration System for the Next Generation
- Fred McNeill, City of Manchester, NH – EPD
- Bryanna Denis, Wright-Pierce

Being a Good Neighbor!—Reducing Offsite Odors by Optimizing Odor Removal at Mattabassett WPCF
- Prashanth Emmanuel, Wright-Pierce


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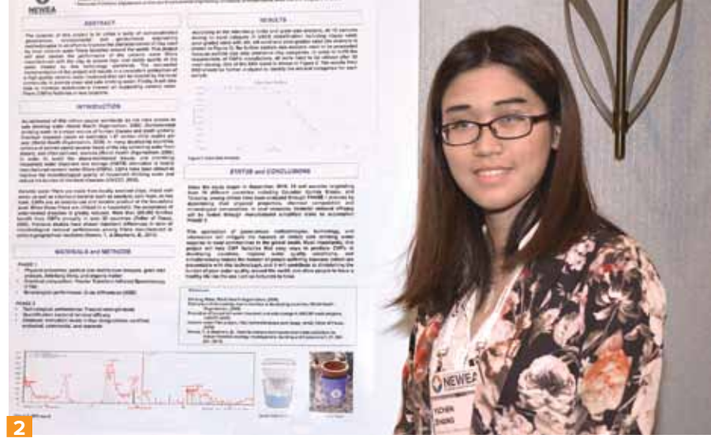
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1. Rick Merson of NE APWA speaks as NEWEA's Priscilla Bloomfield looks on during an association cooperative leadership meeting **2.** University of Rhode Island graduate student Yichen Zhang **3.** Public Awareness Committee meeting: Stevi Hunt-Cottrell (WEF), Teri Demers, Elena Proakis-Ellis, Meg Tabacsko **4.** Ray Willis hands the NEWEA gavel off to 2017 President Jim Barsanti

Disinfection and Dilution Prevent Influence of Deer Island Treatment Plant Effluent on Indicator Bacteria Levels in Massachusetts Bay Outfall Receiving Waters
- David Wu, MWRA
- Daniel L. Codiga, MWRA

Using Constant SRT as a Process Control Strategy
- Mickey Nowak, SUEZ
- Eric Wahlberg, Wastewater Technology Trainers
- Kevin Carney, SUEZ
- Ashley Warren, SUEZ

Session 24
Asset Management 2: Focus on Assets

Moderators:
- Christian Lund, Town of Groton, CT
- Daniel Capano, Diversified Technical Services

Taking it to the Next Level: Predictive Models Based on Over 500 Miles of Force Main Condition Assessment
- David Smith, Pure Technologies U.S. Inc.
- Jeff Zdrojewski, Pure Technologies U.S. Inc.

An Uncomplicated, Effective Approach to the Implementation of Asset Management in the Creation of a 20-year Capital Improvement Plan for 36 Pump Stations
- Kevin Olson, Wright-Pierce
- Marc Moccio, Wright-Pierce
- Robert Ward, City of Haverhill, MA
- Paul Jessel, City of Haverhill, MA

Applying the NACCS Framework in New Jersey—A Case Study
- Lauren Klonsky, CDM Smith
- Frances Bui, CDM Smith
- Donald Cresitello, USACE
- JB Smith, USACE

Asset Management for MS4 Compliance
- Lauren Caputo, VHB
- Annie Bastoni, MassDOT
- Theresa McGovern, VHB

Session 25
Walking the Tightrope for Metals and Phosphorus Removal

Moderators:
- Nicholas Tooker, Northeastern University
- David Press, Tighe & Bond

Breathing New Life into Existing Assets: Full-Scale Performance Results for Cloth Media Filters to Meet 0.1 mg/L TP
- Alexandra Doody, CDM Smith
- Maureen Neville, CDM Smith
- Elizabeth Taglieri, Charles River Pollution Control District
- Kristen Mucciarone, Charles River Pollution Control District

Cheshire's Spin for Achieving Effluent TP of Less Than 0.1 mg/L with Disc Filtration
- Matt Formica, AECOM
- Dennis Dievert, Town of Cheshire, CT
- Jon Pearson, AECOM
- Walt Gancarz, Town of Cheshire, CT

Selecting the Optimal Coagulant to Achieve Both Low-Level Phosphorus and Metal Limits at the Upper Blackstone
- Alexandra Bowen, CDM Smith
- Erik Grotton, Blueleaf, Inc.
- Karla Sangrey, Upper Blackstone Water Pollution Abatement District

Removing Metals from Wastewater: Lessons Learned from Recent Case Studies
- Austin Weidner, Tighe & Bond
- Fred Mueller, Tighe & Bond
- Ian Catlow, Tighe & Bond

SESSION 26
Residuals 2: Biosolids Optimization Technologies

Moderators:
- Natalie Sierra, Brown and Caldwell
- Elaine Sistare, CDM Smith

Biosolids Stabilization in Concord, New Hampshire—So Where Do We Go From Here?
- Chris Dwinal, Wright-Pierce
- Daniel Driscoll, City of Concord, NH

Recycling/Solid Waste Impact of Orthophosphate Concentrations on the Dewatering Process—A Summary from Phosphorus Recovery Tests
- Gerhard Forstner, CNP Technology Water and Biosolids
- Hiroko Yoshida, Centrisys Corporation
- Zhongtian Li, CNP Technology Water and Biosolids

Innovative Water Treatment Technology Reduces Struvite and Lowers Polymer Use
- Douglas Miller, Douglas L. Miller Consulting, LLC
- James Morris, James W. Morris & Associates, Inc.

Studying and Pilot Testing Biosolids Thickening Alternatives at NYC's Largest WWTP
- Bryan Atieh, Hazen and Sawyer
- Paul Saurer, Hazen and Sawyer
- James Mueller, New York City DEP

SESSION 27
Corrosion: Lessons in Solving Corrosion Issues

Moderators:
- George Pendleton, Martinez Couch & Associates
- Charles Labbe, Warwick Sewer Authority

Corrosion Basics for Concrete and Metals in Wastewater Applications
- Randy Nixon, Corrosion Probe, Inc.
- David Crowe, Corrosion Probe, Inc.

Key Principals for Success When Lining Concrete Headspaces to Prevent Biogenic Sulfide Corrosion
- Larry Mitkus, Righter Group, Inc.
- David Pope, Righter Group, Inc.

Monitoring and Upgrading Cathodic Protection Systems for CAN Type Pump Stations
- Arthur Enderle, Town of East Windsor, CT
- Edward Alibozek, Town of East Windsor, CT
- Randy Nixon, Corrosion Probe, Inc.

Failure Analysis Fundamentals for Fiberglass Reinforced Plastic (FRP) Materials in Wastewater Service
- Gary Arthur, Fiberglass Institute
- Kevin Krawiec, Corrosion Probe, Inc.

SESSION 28
CSO/Wet Weather Issues 2: Wet Weather Technology

Moderators:
- Jeff Cantwell, Flow Assessment Services
- Chuck Wilson, Hazen and Sawyer

Next Generation Hydraulic Modeling—Forecasting and Real Time Decision Making
- Nicholas Anderson, MWH Global

Utilizing Two Trenchless Rehabilitation Technologies to Reduce Wet Weather Flows in the Bear Brook Watershed—Saco Maine Case Study
- Matt Timberlake, Ted Berry Company, Inc.
- Shawn Ready, Ted Berry Company, Inc.
- Howard Carter, City of Saco, ME

If You Can't Go Green, Go Lean!
- Kristel Zaman, Xylem
- Jim Fischer, Xylem

Solutions to Pipeline Construction Challenges
- Robert Robinson, City of Manchester, NH – EPD
- Robert McCoy, Kleinfelder

SESSION 29
Collection Systems 3: I'm With Innovation

Moderators:
- Peter Garvey, Dewberry
- Ashley Dunn, Town of Framingham, MA

Detect Growing Blockages, Monitor CSOs and Conduct Micro-metering with an Innovative Parabolic Depth Sensor
- Patrick Stevens, ADS Environmental Services
- Michael Armes, ADS Environmental Services

Educational Outreach—Kitchen BMP at Local High Schools and Testing of a Novel Protein-based Degreaser
- Patrick Antle, Tufts University
- Albert Robbat, Tufts University

The Main Interceptor Project—An Engineered Approach to Innovative Pipeline Rehabilitation
- Jonnas Jacques, Kleinfelder
- Jason Lavoie, Kleinfelder
- Eric Morse, MWH/Stantec

The Design and Constructability Aspect of Private Inflow Removal—Creating and Executing a Private Inflow Removal Contract in a Coastal Community
- Sean McFee, CDM Smith
- Marina Fernandes, CDM Smith

SESSION 30
Utility Management 3: Utility Projects Management—What Works

Moderators:
- Gary Zrelak, Greater New Haven WPCA
- Richard Rodgers, Town of Danvers, MA

The Role and Value of the Owner's Project Manager on Treatment Plant and Utility Projects
- Paul Millett, Environmental Partners Group. Inc.

Step One of Integrated Planning: What Can You Afford?—A Case Study from Upper Blackstone
- David VanHoven, MWH/Stantec
- Karla Sangrey, Upper Blackstone Water Pollution Abatement District
- Matt Labovites, City of Worcester, MA

Harvesting Operational Inefficiency: Strategies for Performance Contracting
- Peter Thomson, Black & Veatch
- Mike Hanna, Black & Veatch
- Roland Jezek, Black & Veatch

Sanford Sewerage District—10 Years Later
- Lindsey Shields, Wright-Pierce
- Andre Brousseau, Sanford Sewerage District
- Ed Leonard, Wright-Pierce

SESSION 31
Stormwater 3: Stormwater Management Innovative Projects and Ideas

Moderators:
- Vonnie Reis, Town of Framingham, MA
- Glenn Haas, Brown and Caldwell

Continuous Monitoring and Adaptive Control (CMAC) Retrofits—Maximize the Value of Your Stormwater Infrastructure Assets
- Dave Wheeler, City of South Burlington, VT
- Tom DiPietro, City of South Burlington, VT
- Viktor Hlas, OptiRTC, Inc.

Decatur WAY Green Alley
- Michael Dodson, CDM Smith
- Mike Stuer, Lowell Regional Wastewater Utility
- Mark Young, Lowell Regional Wastewater Utility
- Daniel Bisson, CDM Smith

Assessing the Impacts of a Biofiltration Best Management Practice (BMP) and Associated Groundwater Flow on Water Quality
- Paul Mathisen, Worcester Polytechnic Institute
- Jacquelyn Tupper, Worcester Polytechnic Institute

Innovative Stormwater Treatment for Tavares, Florida
- Brad Hayes, City of Tavares, FL
- Scott Shannon, ARCADIS

SESSION 32
Water Reuse: Growing Sustainable and Resilient Businesses and Communities with Water Reuse

Moderators:
- Meredith Zona, Stantec
- Ed Whatley, VHB

From Wine to Vine—Water Reuse at Ridge Vineyards
- Pete Annunziato, bioprocessH2O, LLC
- Emily Massed, bioprocessH2O, LLC

Achieving Sustainability and Resiliency in Arid Inland Communities Through Water Reuse
- Vijay Sundaram, Stantec

Evaluating Emerging Contaminants Biodegradation—Are Nitrifiers Doing the Work?
- Amy Hunter, Tufts University
- Sandeep Sathyamoorthy, Black & Veatch
- C. Andrew Ramsburg, Tufts University
- Catherine Hoar, Columbia University
- Kartik Chandran, Columbia University

Disruptive Tech—Beyond Net Zero Energy Onsite Water Reuse
- Zachary Gallagher, Natural Systems Utilities LLC
- Bruce Douglas, Natural Systems Utilities LLC

SESSION 33
Energy: Energy Saving Pumps and More

Moderators:
- Sharon Rivard, NH DES
- Tom Schwartz, Woodard & Curran

Perfecting Your Pumps—Pump System Optimization Through Interior Coatings
- Jessica Dzwonkoski, JKMuir, LLC
- Jen Muir, JKMuir, LLC
- Carina Hart, JKMuir, LLC

Variable Frequency Motor Control—30 Years of Lessons Learned
- Marc Buchwald, Schneider Electric
- Jeff Miller, Schneider Electric

Co-Gen Without Gas Scrubbing
- Matt Williams, WesTech Engineering Inc.
- Brian Mitchell, WesTech Engineering Inc.
- Rachelle Tippets, WesTech Engineering Inc.

Green Energy and Efficiency Improvements at a Wastewater Treatment Plant in Western MA
- Pamela Westgate, Kleinfelder
- Alan Wells, Kleinfelder
- Carl Shaw, City of Pittsfield, MA

POSTER BOARD DISPLAYS

Development of a Novel Digester—Co-Generation Approach for a Food Waste Digester
- Michael Curtis, Quantum Biopower

Success—New England's First Linear Motion Sludge Mixer
- Denise Descheneau, Stantec

Ocean Outfall Design to Mitigate Nutrient Loading Of Stressed Watersheds
- Marc Drainville, GHD

Less Mixing Yields Big Savings in BNR Selector Basins
- Jim Fischer, Xylem

Development of Nutrient-Rich Crystals from Wastewater for the Fortification of Compost
- Aliza Furneaux, Lafayette College

Evaluating Non-Traditional Nitrogen Control Measures
- Mike Giggey, Wright-Pierce

Variations in Hydrogen Sulfide Concentrations in a Wastewater Pumping Station with an Odor Control System
- Mohamed Hamoda, Consultant

Septic Tank Replacement Using a Low-Pressure Sewer System
- Clark Henry, Environment One Corporation

To Locate or Not to Locate is a Question of Mapping
- Nick Holly, PelicanCorp

CMAR Delivery Process
- Mike Leonard, PC Construction Company

Improving Nutrient Removal of Existing Wastewater Facilities Using Cyclical Aeration & Chemical Addition
- Rachel Schnabel, Fuss & O'Neill
- Stephanie Baldino, Town of Plainfield, CT

Pre-Installation Detection and Correction of New VFD Motor Resonance Issues on Water Treatment Pumps at City of Cambridge, MA
- Eric Olson, Mechanical Solutions, Inc.

Taking Inventory of Municipal Facilities for Stormwater Management: SWPPPs—MS4 vs. MSGP
- Rosalie Starvish, GZA

Bowling Green Municipal Utilities Sludge Dewatering Process Control Improvements
- Amy Pollack, HACH

Life Cycle Costs of Wastewater Pumping Systems
- Ian Belczyk, Xylem, Inc.

UNDERGRADUATE STUDENT POSTER BOARD COMPETITION

The Lexington Storm Water Monitoring Project
- Benjamin Aho, University of Massachusetts/Lowell

The Impacts of Living Learning Machine Configuration on Nitrogen and Phosphorous Concentrations of Wastewater for Reuse
- Lindsey Carver, Northeastern University

Phosphorus Removal Options for Wastewater Lagoon Systems
- Jeffrey Lewis, University of Vermont

The Effect of Pharmaceuticals and Personal Care Products Within Urine Composting Applications
- Christa Spedding, University of Massachusetts/Amherst

Storming and Performing: Real-time Nitrogen and TSS Removal in an Active Control Wet Pond
- Micah Strauss, University of Massachusetts/Lowell

GRADUATE POSTER BOARD DISPLAYS

Development and Standardization of Ceramic Water Filter Clays Selection Criteria
- Yichen Zhang, University of Rhode Island

MWRA employees accepting the EPA Region 1 Industrial Pretreatment Program Excellence Award from Mark Spinale and Jay Pimpare from EPA (third and fourth from left, respectively)

2016 Awards & Recognitions

U.S. EPA REGION I NEW ENGLAND AWARDS

Wastewater Treatment Plant O&M Excellence Award
- Seabrook, New Hampshire Wastewater Treatment Facility
- Belchertown, Massachusetts Wastewater Treatment Facility
- South Kingstown, Rhode Island Regional Wastewater Treatment Plant
- Quonset Development Corporation North Kingstown, Rhode Island
- Athol, Massachusetts Wastewater Treatment Plant
- Great Barrington, Massachusetts Wastewater Treatment Facility

Wastewater Treatment Plant Operator Excellence Award
- Dustin Price, Seabrook, New Hampshire Wastewater Treatment Facility
- Joseph Nowak, Upper Blackstone Water Pollution Abatement District, Milbury, Massachusetts

Industrial Pretreatment Program Excellence Award
- City of New Bedford, Massachusetts
- Massachusetts Water Resources Authority Toxic Reduction and Control Division, Boston, Massachusetts

Lifetime Achievement Award
- Charlie Tyler (retired), Massachusetts Water Resources Authority

NEWEA RECOGNITIONS

Scholarship Recipients 2016

Undergraduate Student
- Evelyn Grainger, Worcester Polytechnic Institute

Graduate Student
- Zhiheng Xu, University of Connecticut

Student Design Competition
- Meghan Bruckman, Greg Coyle, Andrew Gillen, Alston Potts, Mitch Quine—Northeastern University, Boston, MA

Stockholm Junior Water Prize
- Courtney Litts, Shelton, CT
- Lauren Pawlowski, Shelton, CT
- Paige Brown, Bangor, ME
- Lillian Cain, Worcester, MA
- Mary Zhu, Nashua, NH
- Nicolas Berg, North Kingston, RI
- Josie Ford, South Burlington, VT

NEWEA AWARDS

NEWEA Operator Award

Connecticut
- Rian Savage, Storrs, CT

Maine
- Mark Holt, Jay, ME

Massachusetts
- Michael Hughes, Winthrop, MA

New Hampshire
- Jason C. Randall, Plymouth, NH

Rhode Island
- John Mackenzie, Wakefield, RI

Vermont
- Robert Baillargeon, South Burlington, VT

Alfred E. Peloquin Award

Connecticut
- Thomas Sgroi, New Haven, CT

Maine
- Timothy J. Levasseur, Waterville, ME

Massachusetts
- Evangelos Manoloulis, Winthrop, MA

New Hampshire
- Jack Healey, Tewksbury, MA

Rhode Island
- Adel Banoub, Woonsocket, RI

Vermont
- Ernie Kelley, Montpelier, VT

NEWEA AWARDS

Asset Management Award
- Town of Canton DPW, Canton, MA

Biosolids Management Award
- Clayton Richardson, Lewiston, ME

Clair N. Sawyer Award
- Joseph Boccadoro. Chelmsford, MA

Committee Service Award
- Tim Vivian, Bethel, VT

E. Sherman Chase Award
- Scott Firmin, Portland, ME

Elizabeth A. Cutone Executive Leadership Award
- Raymond J. Marshall, Providence, RI

Energy Management Achievement Award
- City of Keene WWTP. Keene, NH

Founders Award
- Charles W. Tyler, Sherborn, MA

James J. Courchaine Collection Systems Award
- Jonathan Beder, Plymouth, MA

Operator Safety Award
- Vivian Matkivich, Auburn, ME

Past President's Plaque and Pin
- Matthew Formica, Chelmsford, MA

Paul Keough Award
- Heather H.M. Goldstone. Woods Hole, MA

Public Educator Award
- Leonard Young, Winthrop, MA

Wastewater Utility Award
- City of Ellsworth WWTF, Ellsworth, ME

Young Professional Award
- Robert A. Pontau, Jr.. Brunswick, ME

NEWEA Award Recipients: 1. Scott Firmin, E. Sherman Chase 2. Vivian Matkivich (retired), Operator Safety and Quarter Century Operator Club membership 3. Leonard Young, Public Educator 4. Raymond J. Marshall, Elizabeth A. Cutone Leadership

WEF – MA AWARDS & RECOGNITIONS

Operations Challenge Division II - Process Control, 3rd Place*
- NH Seacoast Sewer Snakes: Mike Carle (Coach), Brian Farmer, Sean Kehoe, Patty Chesebrough, Dustin Price

George W. Burke, Jr. Award
- Woodard & Curran—Pinehills PSTF Plymouth, MA

Laboratory Analyst Excellence Award
- James Galasyn, Portland, ME

WEF Service/Delegate Award
- Michael Wilson, Boston, MA

William D. Hatfield Award
- Roger Ignazio, Jr., Collinsville, CT

Arthur Sidney Bedell Award
- Daniel Bisson, North Yarmouth, ME

Quarter Century Operators' Club
- Joseph Alosso, Plainville, CT
- Peter Eldridge, West Warwick, RI
- Vivian Matkivich, Auburn, ME
- Clayton Richardson, Lewiston, ME

WEF Life Membership
- John Batorski, Durham, CT
- Arnold Bevins, Vernon Rockville, CT
- Robert Chervincky, Manchester, NH
- James Colantonio, Norwell, MA
- Robert Dunn, Jr, Lexington, MA
- James Geremia, Providence, RI
- William Hebard, Norton, MA
- William Howard, Providence, RI
- James Morris, Standish, ME
- David Press, Medfield, MA
- Lorraine Sander, Merrimack, NH
- Nelson Thibault, Nottingham, NH
- Grant Weaver, New London, CT
- Christopher Woodcock, Northborough, MA

*Presented at WEFTEC 2015

The following retiring NEWEA officers and committee chairs were acknowledged

OFFICER	OFFICE
Matthew Formica	Past President (Management Review)
Gerald Potamis	Secretary
Michael Wilson	WEF Delegate (10/13)
Jay Sheehan	Director—Connecticut
Michael Moreau	Director—Massachusetts
Virgil Lloyd	CS/Water Resource Council

CHAIR	COMMITTEE
Charles Applebee	Awards Committee
John Digiacomo	Collection Systems Committee
Daniel Roop	Committee Member Appreciation Committee
Peter Grose	Government Affairs Committee
Michael Bonomo	Nominating Committee
Michael Burke	Operations Challenge Committee
Raymond Vermette	Plant Operations Committee
Elaine Sistare	Residuals Management Committee
Philip Forzley	Watershed Management Committee
Justin Skelly	Young Professionals Committee

EXHIBITORS

A.W. Chesterton
Abba Pump Parts & Service
ADS Environmental Services
Advanced Drainage Systems, Inc.
AERO-Mod
Aesc Utility Cloud
AirSep Corp. - A Chart Industries Company
Airvac-Aqseptence Group
Allied Powers LLC
ANUA International
AP/M CentriPipe
Applied Dynamics Corp
Aqua Solutions, Inc.
Aquaturbo Systems, Inc.
Aquionics UV
Aries Industries, Inc.
ASA Analytics
Asahi/America, Inc.
Associated Electro Mechanics Inc.
Atlantic Fluid Technology Inc.
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Boyson And Associates, Inc.
C.N. Wood Co.
Cabot Norit Americas Inc.
Carl Lueders & Company, Inc.
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Carter Pump Company
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Clean Waters Inc
Continental Carbon Group
Coyne Chemical Environmental Services
Cretex Specialty Products
CSI Controls
CUES
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DeZURIK, Inc.
DN Tanks
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Environmental Operating Solutions, Inc
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Flo Pro Products
Flomotion Systems
Flood Control International Inc.
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Flow Tech, Inc.
Flowworks
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Fournier Ind.
Franklin Miller, Inc.
Gabriel Novac & Associates Ltd.
GEA - Westfalia
Grande Water Management Systems
Green Mountain Pipeline Services
Groth Corp.
Grundfos Water Utility, Inc.
Hach Company
Hach Flow
Hannah Equipment
Hayes Pump, Inc.
Hazen And Sawyer
High Tide Technologies
Hiller Separation & Process
Hobas Pipe Usa
Holland Company
Honle UV America
Hydro Gate
Hydro Logic
Hydromatic Pump / Pentair
In-Situ Inc.
IPEX USA LLC
Ishigaki USA Ltd.
ITpipes
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J&R Sales And Service, Inc.
JDV Process Equipment Co.
JWB Company
Kemira Water Solutions, Inc.
Kruger Inc.
Kusters Water, a division of Kusters Zima Corporation
Lakeside Equipment Corporation
LandTech Consultants, Inc.
Lane Enterprises
Layne Water
LobePro Rotary Pumps
Lystek International Inc.
Maltz Sales Company
Manning Environmental Wastewater Samplers
Mechanical Solutions, Inc. (CT)
Mechanical Solutions, Inc. (NJ)
Methuen Construction Co., Inc./Summit Metal Fabricator
MGD Process Technology Inc.
Momentum Press
National Filter Media
National Water Main Cleaning Co.
Netzsch
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NewTerra
Nexom
Oakson, Inc.
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Opti Float/Cox Research
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The Wise Company, Inc.
Thermal Process System, Inc.
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Travelers Insurance Company & FCB Insurance Services LLC.
Trelleborg Pipe Seals Milford, Inc.
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Truax Corporation
Trumbull Industries, Inc.
United Concrete Products
USABlueBook
Valmet Inc.
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Vogelsang
Vortex Infrastructure
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Walker Wellington, LLC
Wastecorp Pumps, LLC
Water & Waste Equipment, Inc.
Water Resource Technologies
Watson-Marlow, Inc.
Weir Specialty Pumps (WEMCO)
Wescor Associates, Inc.
WesTech Engineering, Inc.
Whipps, Inc.
WILO USA
Winters Instruments
Xylem Dewatering Solutions
Zerion

The following companies received award of recognition of continuously exhibiting at the NEWEA Annual Conference:

25-Year Award
- Duke's Root Control, Inc.
- Synagro Northeast, LLC.
- Water & Waste Equipment, Inc.

10-Year Award
- Cabot Norit Americas, Inc.
- EST Associates, Inc.
- Oakson, Inc.
- USABlueBook
- Hanna Instruments, Inc.

Town of Framingham staff surrounding their colleague, NEWEA President Jim Barsanti

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WSP/Parsons Brinckerhoff

NEWEA
WORKING FOR WATER QUALITY

Upcoming Meetings & Events

Join us at the NEWEA 2017 Spring Meeting & Exhibit

June 4 – 7, 2017 | Sea Crest Beach Hotel
North Falmouth, Massachusetts

NEWEA OPS CHALLENGE TRAINING DAY & TOUR
April 7, 2017
Holyoke WWTP, Holyoke, MA

COLLECTION SYSTEMS AND SUSTAINABILITY CONFERENCE
May 1, 2017
DoubleTree Hotel, Westborough, MA

WATER FOR PEOPLE: DEER ISLAND DASH ROAD RACE
May 13, 2017
Deer Island, Winthrop, MA

EXECUTIVE COMMITTEE MEETING WITH ALL CHAIRS
June 4, 2017
Sea Crest Beach Hotel, Falmouth, MA

NEWEA SPRING MEETING
June 4 – 7, 2017
Sea Crest Beach Hotel, Falmouth, MA

JOINT NEWEA WATERSHED COMMITTEE, NEWWA, NEAPWA CLIMATE CHANGE CONFERENCE
July 12, 2017
UMass Lowell, Lowell, MA

WEFTEC
September 30 – October 4, 2017
McCormick Place, Chicago, IL

JOINT STORMWATER CONFERENCE— MEWEA AND NE STORMWATER COLLABORATIVE
October 23 – 24, 2017
Holiday Inn, Portland, ME

This is a partial list.
Please visit the state association websites and NEWEA.org for complete and current listings.

AFFILIATED STATE ASSOCIATIONS AND OTHER EVENTS

MEWEA SPRING MEETING
April 14, 2017
Ramada Inn, Lewiston, ME

CWPAA SPRING TRADE SHOW
April 27, 2017
New Life Church, Wallingford, CT

CAWPCA SPRING WORKSHOP AND AWARDS
May 6, 2017
Aqua Turf, Plantsville, CT

WATER QUALITY DAY
May 19, 2017

MWPCA LEGISLATIVE EVENT
May 23, 2017
MA State House

RI NWPCA AWARDS BANQUET
May 25, 2017
Potowomut Country Club, Warwick, RI

GMWEA ANNUAL MEETING
May 25, 2017
Killington Grand Resort, Killington, VT

MWPCA ANNUAL GOLF TOURNAMENT
June 20, 2017
Harvard, MA

NHWPCA ANNIVERSARY CELEBRATION
June 23, 2017
Hampton South Beach, Hampton, NH

RI NWPCA TRADE SHOW & CLAMBAKE
September 8, 2017
Twelve Acres Banquet Facilty, Smithfield, RI

MWPCA TRADE SHOW
September 13, 2017,
Wachusett Mountain, Princeton, MA

NHWPCA FALL MEETING
September 15, 2017
Manchester WWTF, Manchester, NH

NEWWA ANNUAL CONFERENCE
September 17 – 20, 2017
Ocean Edge Resort, Brewster, MA

MEWEA FALL CONFERENCE - 50TH
September 21 – 22, 2017
Sunday River, Newry, ME

New Members

December 2016 – February 2017

Christopher C. Hodgson
DN Tanks
Wakefield, MA (COR)

Lindsay D'Anna
Waste Management
Milford, NH (EXEC)

Eric Kelley
Environmental Partners Group Inc.
Woburn, MA (PRO)

Erika McDowell
Surpass Chemical
Menands, NY (PRO)

Kevin L Sutherland
City of Saco
Saco, ME (PRO)

Scott Kelley
Brentwood, NH (PRO)

Jason Randall
Plymouth Village Water & Sewer District
Plymouth, NH (PRO)

Megan Ambrose
UCONN WPCF
Storrs, CT (PRO)

Aaron Costa
City of Keene
Keene, NH (PRO)

Robert Backman
Wayland, MA (PRO)

Jessica Richard
Woodard & Curran
Andover, MA (PRO)

Mark Shea
Arlington, MA (PRO)

Dick Johnson
Sandwich, MA (PRO)

Vito Ciaramitaro
Weston & Sampson Services
Peabody, MA (PRO)

Timothy Smith
Massachusetts Water Resources Authority
Boston, MA (PRO)

Barry Smith
Medway, MA (PRO)

Nancy Kelley Beaton
CDM Smith Inc.
Providence, RI (PRO)

Judy Bruenjes
Dept. of Environmental Protection
Augusta, ME (PRO)

Rustam Spaulding
Isle LA Motte, VT (PRO)

Jonathan Beder
Town of Plymouth Sewer Division
Plymouth, MA (PRO)

Nancy Hammett
Watertown, MA (PRO)

Ernie Kelley
Vermont Watershed Management Division
Montpelier, VT (PWO)

John Mackenzie
Narragansett, RI (PWO)

Daniel Sullivan
Beacon Falls, CT (PWO)

Robert J Gabry
Warner Brothers Incorporated
Turners Falls, MA (PWO)

Adel Banoub
Woonsocket Regional Wastewater Commission
Woonsocket, RI (PWO)

Nate Melanson
Lewiston Auburn Water Poll
Lewiston, ME (PWO)

Rene Robillard
Town of Fairhaven
Fairhaven, MA (PWO)

Michael P Higgins
Crane & Co Inc.
Dalton, MA (PWO)

Earl Bond
Warwick Sewer Authority
Warwick, RI (PWO)

Derek Beckwith
City of Haverhill
Haverhill, MA (PWO)

Zebulan Day
City of Haverhill
Haverhill, MA (PWO)

Michael Hughes
Massachusetts Water Resources Authority
Winthrop, MA (PWO)

Evangelos Manoloulis
Norfolk, MA (PWO)

Samuel Marinez
City of Haverhill
Haverhill, MA (PWO)

Thomas Perry
Borden & Remington Corp
Fall River, MA (PWO)

Peter Pommersheim
South Essex Sewerage Dist.
Salem, MA (PWO)

Pedro Rosario
City of Haverhill
Haverhill, MA (PWO)

David Shaw
City of Haverhill
Haverhill, MA (PWO)

Theodore Van Gerven
Edgartown Wastewater Plant
Edgartown, MA (PWO)

Yichen Zhang
Narragansett, RI (STU)

Jason Chin
Yonkers, NY (STU)

Calvin Dwuye
Taunton, MA (STU)

Allison Heil
Wakefield, MA (STU)

Anna Mallonee
Seattle, WA (STU)

Zachary Pierce
Wells, ME (STU)

Erin Remillard
Cambridge, MA (STU)

Daniella Roitman
Boston, MA (STU)

Joanna Sullivan
Sterling, MA (STU)

Isaiah Williams
Stratford, CT (STU)

Elizabeth Manning
Arlington, VA (STU)

Joseph Adiletta
Seymour, CT (STU)

William Violette
Brown University
Providence, RI (STU)

Joseph Gitau
Belchertown, MA (STU)

Edris Taher
Environmental Operating Solutions, Inc.
New Bedford, MA (YP)

Allison Fisher
City of Portland ME
Portland, ME (YP)

Lindsay Gaskill
Charles River WPCD
Medway, MA (YP)

Amanda Jett
Weston & Sampson Engineers Inc.
Peabody, MA (YP)

Nicole Mangano
Charles River WPCD
Medway, MA (YP)

David Wheeler
City of South Burlington
South Burlington, VT (YP)

Ben Sweeney
Portsmouth, NH (YP)

Carrie Prescott
Haverhill WWTP
Bradford, MA (YP)

Emily Patrice Dudley
CDM Smith Inc.
Boston, MA (YP)

Zachary Aaronson
Providence, RI (YP)

Shannon Beaton
Stantec
Burlington, MA (YP)

Elizabeth Garvey
Weston & Sampson Engineers Inc.
Peabody, MA (YP)

Academic (ACAD)
Affiliate (AFF)
Complimentary (COMP)
Corporate (COR)
Dual (DUAL)
Executive (EXEC)
Honorary (HON)
Life (LIFE)
Professional (PRO)
Professional WW/OPS (PWO)
Student (STU)
Young Professional (YP)

Thank you

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Build relationships with water industry leaders *and* make a positive impact on the water environment

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NEWEA offers companies the opportunity to promote their products and services throughout the year by participating in multiple sponsorship activities. Annual Sponsorships include:

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- Recognition as an environmental leader among peers and customers

For more information contact Mary Barry
Email: mbarry@newea.org
Call: 781-939-0908

Advertiser Index

Journal Themes—coming in 2017

Summer—**Wastewater Treatment and Collection Systems Operations**
Fall—**Municipal/Agency Topics**
Winter—**National Issues of Regional Interest**

NEWEA/WEF* Membership Application 2017

Water Environment Federation® the water quality people®

NEWEA WORKING FOR WATER QUALITY

Personal Information

Last name | M.I. | First Name | (jr. sr. etc)

Business Name (if applicable)

Street or P.O. Box (☐ Business Address ☐ Home Address)

City, State, Zip, Country

Home Phone Number | Mobile Phone Number | Business Phone number

Email Address | Date of birth (month/day/year)

☐ Please send me information on special offers, discounts, training, and educational events, and new product information to enhance my career ☐ by e-mail ☐ by fax

☐ Check here if renewing, please provide current member I.D.

***NEWEA is a member association of WEF (Water Environment Federation). By joining NEWEA, you also become a member of WEF.**

Employment Information (see back page for codes)

1. ORG Code: | Other (please specify): | 2. JOB Code: | Other (please specify):

3. Focus Area Codes: | Other (please specify:

Signature (required for all new memberships) | *Date*

Sponsorship Information

WEF Sponsor name (optional) | Sponsor I.D. Number | ACQ. Code for WEF use only | WEF 15

Membership Categories (select one only)

		Member Benefit Subscription	Dues
☐ **Professional Package**	Individuals involved in or interested in water quality	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online*	$185
☐ **Young Professional Package**	New members or formerly student members with 5 or less years of experience in the industry and less than 35 years of age. This package is available for 3 years.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online*	$69
☐ **Professional Wastewater Operations (PWO) Package**	Individuals in the day-to-day operation of wastewater collection, treatment or laboratory facility, or for facilities with a daily flow of < 1 mgd or 40 L/sec.	■ WE&T (including *Operations Forum*) ■ *WEF Highlights Online*	$109
☐ **Academic Package**	Instructors/Professors interested in subjects related to water quality.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *Water Environment Research* (Online)	$181
☐ **Student Package**	Students enrolled for a minimum of six credit hours in an accredited college or university. Must provide written documentation on school letterhead verifying status, signed by an advisor or faculty member.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *Water Environment Research* (Online)	$10
☐ **Executive Package**	Upper level managers interested in an expanded suite of WEF products/services.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *World Water* ■ *Water Environment Research* (Online) ■ *Water Environment Regulation Watch*	$353
☐ **Dual**	If you are already a member of WEF and wish to join NEWEA		$40
☐ **Corporate Membership** (member benefits for one person)	Companies engaged in the design, construction, operation or management of water quality systems. Designate one membership contact.	■ *WE&T* (including *Operations Forum*) ■ *Water Environment Research* (Print) ■ *Water Environment Regulation Watch* ■ *WEF Highlights Online*	$411
☐ **New England Regulatory Membership**	This membership category is a NEWEA only membership reserved for New England Environmental Regulatory Agencies, including: USEPA Region 1, CT Department of Energy and Environmental Protection, ME Department of Environmental Protection, MA Department of Environmental Protection, NH Department of Environmental Services, VT Department of Environmental Conservation, and RI Department of Environmental Management		$50

WEF Utility Partnership Program (UPP): NEWEA participates in the WEF Utility Partnership Program (UPP) that supports utilities to join WEF and NEWEA while creating a comprehensive membership package for designated employees. As a UPP Utilities can consolidate all members within their organization onto one account and have the flexibility to tailor the appropriate value packages based on the designated employees' needs. Contact WEF for questions & enrollment (703-684-2400 x7213).

Payment

☐ **Check or money order enclosed**
Made payable to NEWEA
10 Tower Office Park, Suite 601
Woburn, MA 01801
For more information: 781.939.0908
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Depending upon your membership level, $10 of your dues is allocated towards a subscription to the NEWEA Journal.

NEWEA/WEF* Membership Application 2017

Water Environment Federation® the water quality people®

NEWEA WORKING FOR WATER QUALITY

To help us serve you better, please complete the following:

(choose the one that most closely describes your organization and job function)

***NEWEA is a member association of WEF (Water Environment Federation). By joining NEWEA, you also become a member of WEF.**

What is the nature of your ORGANIZATION?

(circle one only) (ORG)

1
Municipal/district Water and Wastewater Plants and/or Systems

2
Municipal/district Wastewater Only Systems and/or Plants

3
Municipal/district Water Only Systems and/or Plants

4
Industrial Systems/Plants (Manufacturing, Processing, Extraction)

5
Consulting or Contracting Firm (e.g., Engineering, Contracting Environmental, Landscape Architecture)

6
Government Agency (e.g., U.S. EPA, State Agency, etc.)

7
Research or Analytical Laboratories

8
Educational Institution (Colleges and Universities, libraries, and other related organizations)

9
Manufacturer of Water/Wastewater Equipment or Products

10
Water/Wastewater Product Distributor or Manufacturer's Rep.

11
Stormwater (MS4) Program Only

12
Public Financing, Investment Banking

13
Non-profits (e.g., Trade, Association, NGO, Advocacy, etc.)

99
Other _____
(please specify)

What is your Primary JOB FUNCTION?

(circle one only) (JOB)

1
1. Upper or Senior Management (e.g., President, Vice President, Owner, Director, Executive Director, General Manager, etc.)

2
Engineering, Laboratory and Operations Management (e.g., Superintendent, Manager, Section Head, Department Head, Chief Engineer, Division Head, Landscape Architect etc.,)

3
Engineering and Design Staff (e.g., Consulting Engineer, Civil Engineer, Mechanical Engineer, Chemical Engineer, Planning Engineer, Landscape Architect, Environmental/ Wetland Scientist etc.)

4
Scientific and Research Staff (e.g., Chemist, Biologist, Analyst, Lab Technician, Environmental/Wetland Scientist etc.)

5
Operations/Inspection & Maintenance (e.g., Shift Supervisor, Foreman, Plant Operator, Service Representative, Collection Systems Operator, BMP Inspector, Maintenance, etc.)

6
Purchasing/Marketing/Sales (e.g., Purchasing, Sales Person, Market Representative, Market Analyst, etc.)

7
Educator (e.g., Professor, Teacher, etc.)

8
Student

9
Elected or Appointed Public Official (Mayor, Commissioner, Board or Council Member)

10
Other _____

What are your KEY FOCUS AREAS?

(circle all that apply) (FOC)

1
Collection Systems

2
Drinking Water

3
Industrial Water/Wastewater/ Process Water

4
Groundwater

5
Odor/Air Emissions

6
Land and Soil Systems

7
Legislation (Policy, Legislation, Regulation)

8
Public Education/Information

9
Residuals/Sludge/Biosolids/Solid Waste

10
Stormwater Management/ Floodplain Management/Wet Weather

11
Toxic and Hazardous Material

12
Utility Management and Environmental

13
Wastewater

14
Water Reuse and/or Recycle

15
Watershed/Surface Water Systems

16
Water/Wastewater Analysis and Health/ Safety Water Systems

17
Other _____

Optional Items (OPT)

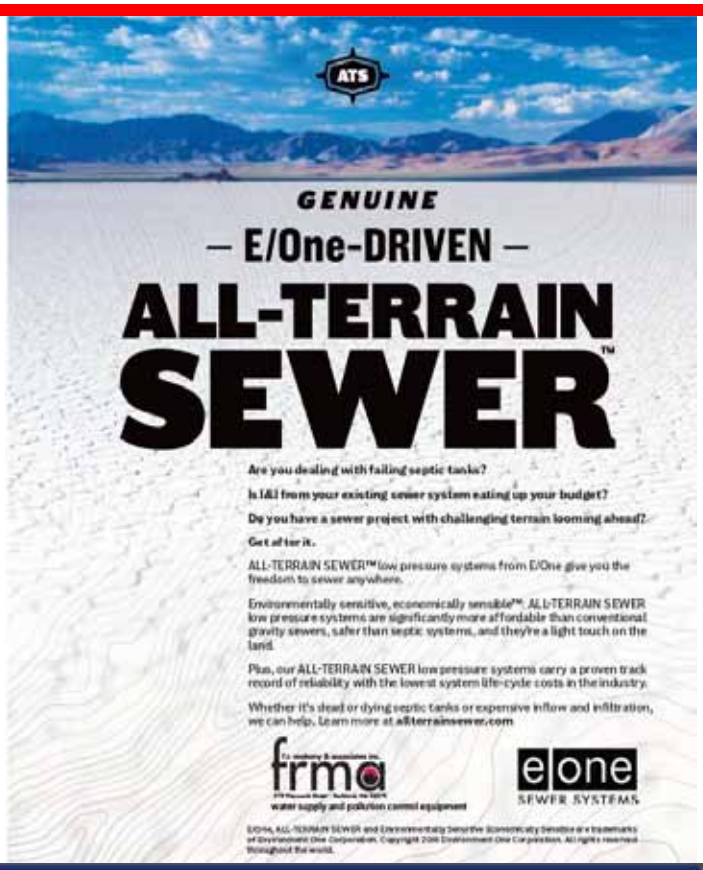
Years of industry employment? _____
1 (1 to 5) **2** (6 to 10) **3** (11 to 20)
4 (21 to 30) **5** (>30 years)

Gender? _____
1 Female **2** Male

Education level? (ED) _____
1 High School **2** Technical School
3 Some College **4** Associates Degree
5 Bachelors Degree
6 Masters Degree **7** JD **8** PhD

Education/Concentration Area(s) (CON) _____
1 Physical Sciences (Chemistry, Physics, etc.)
2 Biological Sciences **3** Engineering Sciences
4 Liberal Arts **5** Law **6** Business

Water quality professionals, with fewer than 5 years working experience and under the age of 35, are eligible to join WEF as an Active Member, while participating in the NEWEA/WEF Young Professionals Program. This program allows up to 50% off of the Active Member dues, valid for the first three years of membership. This program is available for new member applicants and Student Members.



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Celebrating 50 years ~ 1964 - 2014

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- KRUGER INC. – Veolia Water Technologies
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- LIGHTNIN MIXERS – A Unit of SPX Process Equipment
- MGD PROCESS TECHNOLOGY
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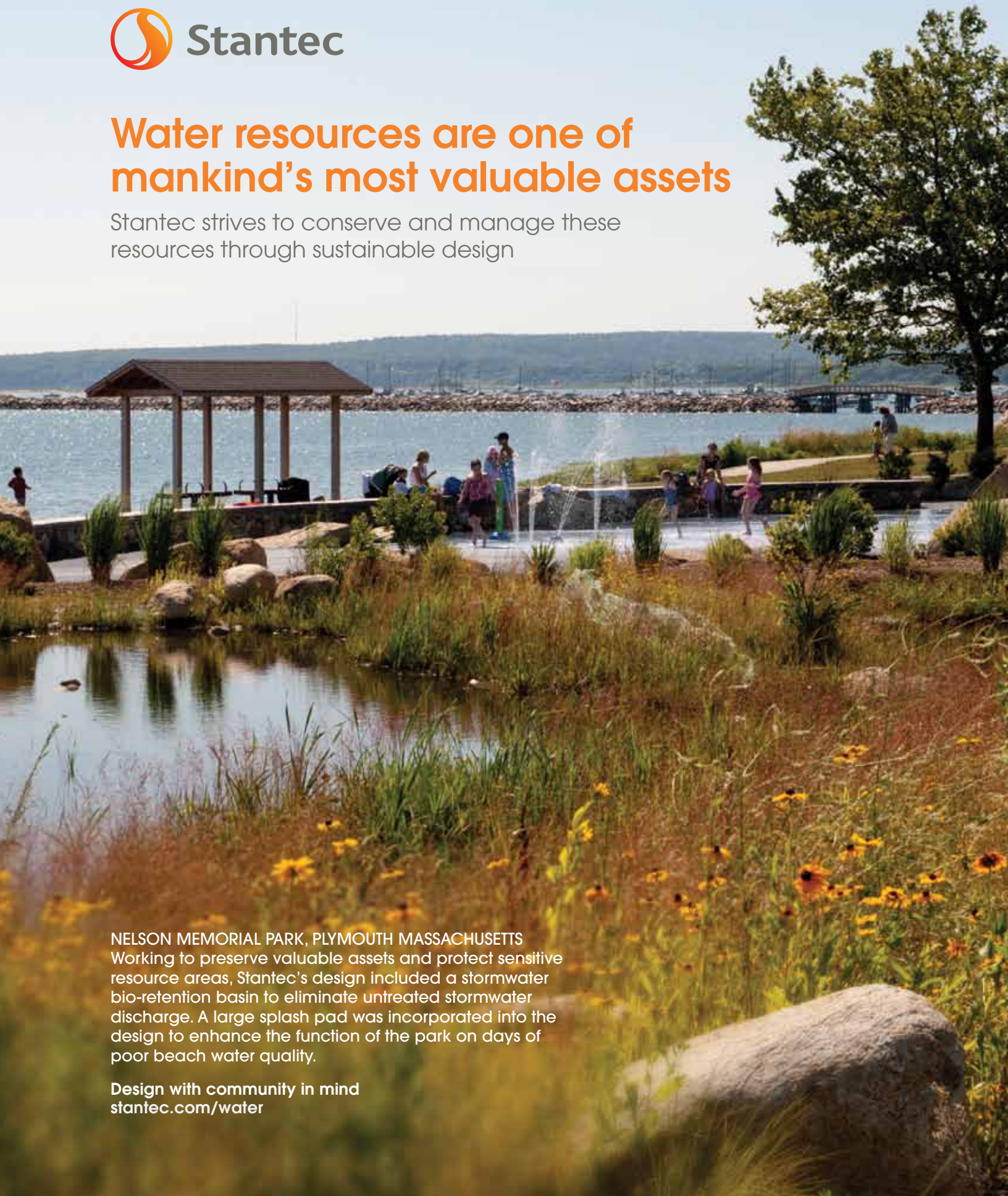
Call or email for more information.

Stantec

Water resources are one of mankind's most valuable assets

Stantec strives to conserve and manage these resources through sustainable design



NELSON MEMORIAL PARK, PLYMOUTH MASSACHUSETTS
Working to preserve valuable assets and protect sensitive resource areas, Stantec's design included a stormwater bio-retention basin to eliminate untreated stormwater discharge. A large splash pad was incorporated into the design to enhance the function of the park on days of poor beach water quality.

Design with community in mind
stantec.com/water