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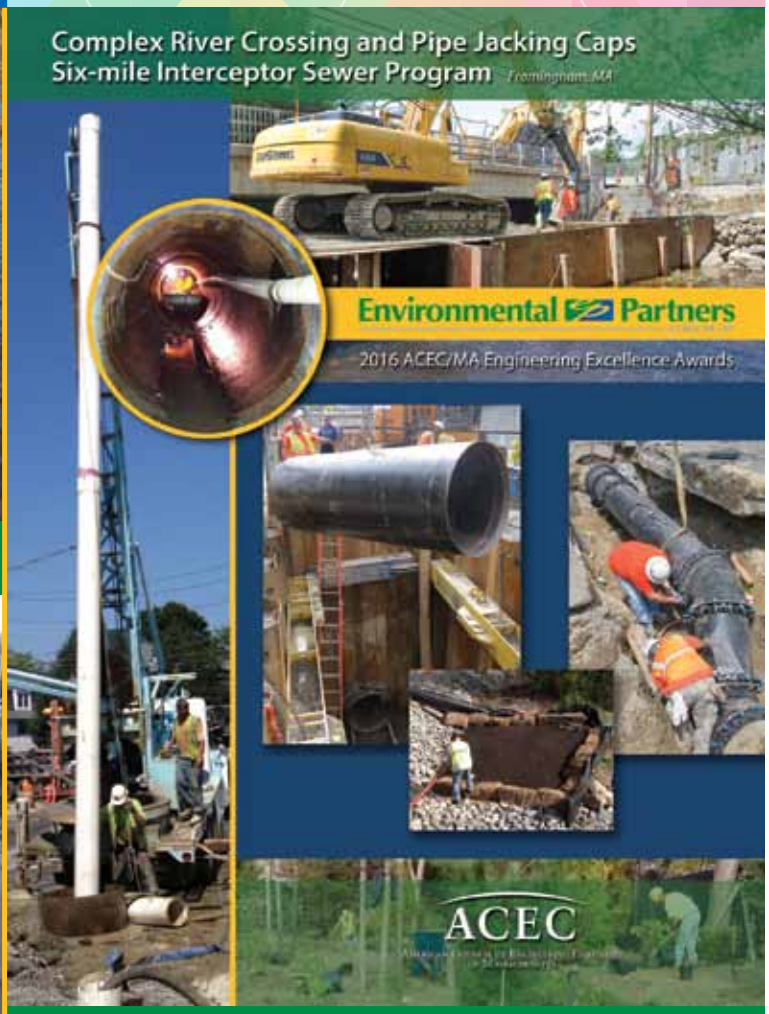
WET WEATHER ISSUES/CSO

NEWEA
WORKING FOR WATER QUALITY

Environmental Partners

Bringing Integrated and Sustainable Solutions to Life, and Upgrading Critical Infrastructure



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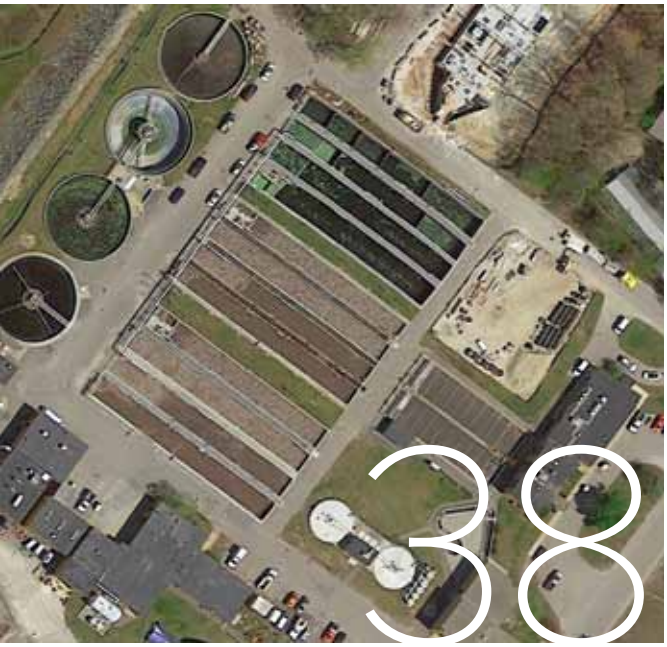

On the cover: Rain event over Boston Harbor

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NEWEA
WORKING FOR WATER QUALITY

OUR ASSOCIATION WAS ORGANIZED EIGHTY-SEVEN 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.

Academic Member—shall be an instructor or professor interested in subjects related to water quality.

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BECOME A NEWEA MEMBER TODAY

- Complete and mail the membership application form on pages 95–96
- Download a membership application from **newea.org** by clicking How Do I Join?
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Legitimate paid and/or requested distribution	Outside county paid/requested mail subscriptions	0	0
	In-county paid/ requested mail subscriptions	2,200	2,200
	Sales through dealers & carriers	8	8
	Requested copies distributed by other mail classes	0	0
Total paid and/or requested circulation		2,208	2,208
Total nonrequested distribution		0	0
Total distribution		2,208	2,208
Copies not distributed		292	292
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Raymond L. Willis III
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President's message

On behalf of the Executive Committee, thank you for being a member of NEWEA. Our association excels both regionally and nationally because our members are engaged and active in our committees. Our committees come up with the initiatives that drive the association. Our association also includes various sectors of the water-quality industry, which makes NEWEA both diverse and comprehensive. The strength of NEWEA was celebrated this past year when NEWEA was recognized by the Water Environment Federation as its Most Outstanding Member Association. I am proud to be a member of NEWEA.

NEWEA's mission is to promote education and collaboration while advancing knowledge, innovation and sound public policy for the protection of the environment and our quality of life. Every time I read the NEWEA mission statement, my first thought is how perfect this statement is for explaining, positively, to anyone our roles in society as water-quality professionals. Its message echoes the pride you hear in the voices of our members. This pride comes with being the original stewards of the environment; when they are asked about their role in the industry, they explain their job functions in protecting public health and the environment. Our industry does its job quietly and out of sight from the public, in virtual silence, much like our infrastructure, which is hidden beneath the ground, and our facilities, which are tucked away with the intention of not being seen. The work we do, day in and day out, not only protects public health and the environment but also is imperative for economic growth and sustenance.

Unfortunately, much of the exposure that the water-quality industry has received of late on television and radio and in newspapers has not been positive. While this is not how I wish the public to learn about our industry, such negative press must be viewed as an opportunity for us to promote our value to society, from both public health and economic perspectives. With any public attention, the platforms exist today to tell our story and educate people about the true state of our infrastructure, and also to ask for their support with funding the obviously much-needed improvements. NEWEA members know the great work that water-quality professionals do each day in keeping people safe and healthy, to make sure ample clean water flows from the tap, and to take the water away and responsibly return it to the environment after its use. This is why the Water for Life outreach campaign, promulgated by NEWEA's Public Awareness Committee, could not be more timely in promoting the water-quality industry and showcasing our roles as environmental stewards.

Chair Denise Breiteneicher makes a point at the Energy Committee meeting: (from left) Denise, Dede Vittori, Sharon Rivard, Jason Turgeon, Molly Lellman, Jessica Dzwonkoski

Seeing firsthand our committees' great work each year, I say if you are not a member of one of our committees, you are missing out.

Similarly, this year's Spring Meeting theme will be environmental stewardship. The event will be held jointly with the New York Water Environment Association in Mystic/Groton, Connecticut. We are excited to announce that this year's keynote speaker will be National Public Radio (NPR) science correspondent Heather Goldstone, whose reports cover all aspects of the environment. The Spring Meeting once again includes timely educational sessions and the Operations Challenge competition, which will feature teams from New England, New York and nearby eastern states competing to attend the national competition in New Orleans.

Consistent with previous years, NEWEA has a full calendar of events planned, focused on promoting collaboration and education. NEWEA will collaborate with our six New England states to educate state and local legislators about the water-quality issues and, more importantly, their effects on the people we serve; these issues include fixing our aging water-related infrastructure, addressing new stormwater compliance requirements and achieving more stringent nutrient removal at our facilities. During these legislative events we advocate for sound public policy that balances environmental compliance, addresses the need to replace crumbling infrastructure to promote economic growth and protect public health, and limits the financial impacts on residents. Following the state legislative events, NEWEA will host our annual National Congressional Briefing on April 13, 2016, in Washington, D.C. If you have not participated in this event, I strongly encourage you to attend, as this is a great opportunity to meet your congressional leaders and discuss issues affecting your state.

In addition to these upcoming events, NEWEA technical committees will hold specialty conferences throughout New England. Specialty conference topics include utility resiliency, lab practices integrity, small community challenges, collection systems accomplishments and watershed management. This year will feature the return of the Water for People Gala, which will be held on Kentucky Derby Saturday in May. Please be sure to check the NEWEA calendar for more details.

Seeing firsthand our committees' great work each year, I say if you are not a member of one of our committees, you are missing out. I know many of us lead busy lives, both at and away from work. I sense, however, that people generally misperceive that volunteering will take up too much time, and therefore they do not get involved. Having been an active volunteer in this association for years, I cannot adequately express how rewarding the experience has been for me personally and professionally, and I believe if you spoke with any committee member, present or past, he or she would say the same. Whether you provide a few minutes or several hours each month, every hand on deck helps lighten the load, reaps the benefits, shares in the fun and helps the association to continue the important work that will benefit us all.

In closing, I acknowledge Past President Matt Formica for his service to the association this past year. I look forward to working with Mr. Formica in continuing to move forward with his and other NEWEA leaders' initiatives, while also advancing promotion of the water-quality profession as the original stewardship of the environment. I also look forward to working with the Executive Committee, our technical and non-technical committees, and NEWEA staff during this year. I am honored to serve the leading water-quality association in both New England and the United States as the 2016 NEWEA president.

From the Editor

As Helen Gordon mentioned in the Winter 2015 *Journal*, she has finished her term as editor and is moving on to other important endeavors within NEWEA. Those familiar with Helen know she is an incredibly dedicated and intelligent person who has furthered the *Journal's* tradition of excellence. She will be a tough act to follow. I will do my best to maintain these high standards, with the assistance of the Journal Committee, NEWEA staff, the assistant editors and graphic designer. (Please refer to page two for a list of these hardworking people.)

In this edition, my first as the new editor, we feature an eclectic mix of articles with a combined sewer overflow (CSO)/wet weather issues theme—an appropriate topic for the spring season. In this regard, we invite you to read about the success of the Greater Augusta (Maine) Utility District's 25-year adaptive CSO program, which included a long-term control plan, several updates to that plan, and implementation of a number of collection system and wastewater treatment facility improvements that significantly reduced CSO activation and volume.

From Maine, we head south to Rhode Island, where the Warwick Sewer Authority (WSA) rehabilitated the sewer interceptor (under Route I-95!) to its wastewater treatment facility. The article describes how historic flooding in 2010 and a pipe collapse in another area in 2011 led WSA to inspect the main line to the plant, which carries millions of gallons of flow to the facility. (Imagine if that pipe collapsed!) The 50-year-old conduit was corroding and WSA solved the problem by sliplining a new pipe through the existing one without bypassing flow. We can all learn from WSA's proactive approach.

Joe Boccadoro, P.E.
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Jumping up to Boston, we have included an article on the use of scattergraphs in detecting and monitoring CSOs. In this piece the authors describe a Boston Water and Sewer Commission pilot project in which tidally influenced CSO structures are monitored using flow metering equipment. When the resultant data were plotted, fascinating trends emerged that allowed analysts to decide on the most effective way to monitor CSO events. This article describes further this intriguing use of technology.

Technology is also prominent in our last feature article, which focuses on continuous monitoring and adaptive control (CMAC) associated with stormwater management. In CMAC applications, cloud-based software can monitor and control Best Management Practices (BMPs) in real time, helping to optimize design. The authors cite successful case studies, one of which involved harvesting rainwater, that significantly reduced stormwater discharges to a combined sewer system.

I also direct readers' attention to the new Letter to the Editor section, which includes feedback on a Winter 2015 *Journal* article, "Attracting and Retaining the Next Generation of Skilled Operators." In commenting about this article, the author raises excellent points that should interest all in our industry. Everyone is encouraged to express views for possible publication in future editions of the *Journal*. In addition, check out our industry news and state director sections for the latest goings-on, and please support our young people by reading the winning entries from our student essay competition.

Lastly, we should all thank Helen Gordon for her excellent work during her time as editor. I am excited about the opportunity to be the new editor, and I am looking forward to the creative challenges over the next three years. Happy reading!

Letters

State regulatory agencies need to recognize they have a stakeholder role in developing the next generation of operators

I enjoyed Jeff Kalmes and David Garabedian's article "Attracting and retaining the next generation of skilled operators" (Winter 2015 *Journal of the New England Water Environment Association* Issue 4, Vol. 49). The authors quite capably addressed several of the staffing issues the water resource recovery industry is currently facing or will face in the near future. Attracting and retaining the best possible employees is a challenge in many occupations. In addition to the authors' findings, I offer two additional items to consider.

Focus on total compensation versus wages when recruiting a candidate. Basic wages are only one part of the compensation equation. When trying to attract new employees, it is imperative to focus on the total compensation and benefits package. From the perspective of money in the employee's pocket, call-in pay, scheduled overtime, emergency overtime, longevity pay and other cash incentives add quite substantially to the total take-home pay of many if not most employees in our industry. Speaking as a municipal employee, even though pressures to reduce benefits exist, health care, retirement, vacation and holidays and a variety of other benefits still tend to be more generous than private sector employment. When added together, the total compensation package, even for new employees, is very competitive compared to other employment opportunities for potential employees with similar skillsets and years of experience.

State regulators must recognize they have the ability and responsibility to help grow the workforce. State regulatory agencies need to recognize they have a stakeholder role in developing the next generation of operators. Certainly, certification requirements must ensure facilities are operated properly and in accordance with permits. However, when it comes to higher level certifications, the requirements must have reasonable knowledge expectations and time-in-service requirements. Regulators should investigate New England regional certification or standardize certification reciprocity with adjacent states. I am relatively new to the industry and I find it perplexing that Rhode Island, Connecticut and Massachusetts, adjacent states with common borders and similar climates, economies and other characteristics, have different certification levels and requirements. Specifically, I often wonder why Massachusetts has seven operator certification levels, but Connecticut needs only four. NEWEA as an organization can play an important role by engaging regulators on issues that cross state lines such as standardized certifications. Common certification would greatly improve the mobility of the workforce and produce a larger pool of candidates, especially for the highest level of certification where a lack of qualified candidates is most likely to exist.

Chris Lund, P.E.
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Assistant Director of Public Works
Water Pollution Control Facility

The *Journal* welcomes reader response. Please email us at Joe.Boccadoro@aecom.com. All letters are subject to editing.

Save the Date

NEWWA and
NEWEA Water For People
Committees Present

AND THEY'RE OFF!

Kentucky Derby

2016 Water for People Gala

Saturday, May 7, 2016

Join us for a Kentucky Derby themed Gala. An event full of lawn games, live streaming of the Kentucky Derby, and delicious Southern BBQ. Hats are encouraged!

Saturday, May 7, 2016
4:30 – 8:30pm
Dane Estate at Pine Manor College

For more information, please contact Anastasia.Rudenko@ghd.com.

www.waterforpeople.org

water for people
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New England
Water Works Association
a Section of the American Water Works Association

NEWEA
WORKING FOR WATER QUALITY

Industry news

One tube of exfoliating facewash can contain more than 350,000 microbeads, and 2.9 trillion microbeads are estimated to enter U.S. waterways annually

PRESIDENT OBAMA SIGNS NATIONAL MICROBEAD BAN

– WEF Stormwater Report

Plastic microbeads are designed to be washed down the drain but are too small to be reliably captured by wastewater treatment facilities. According to the Center for Biological Diversity, one tube of exfoliating facewash can contain more than 350,000 microbeads, and 2.9 trillion microbeads are estimated to enter U.S. waterways annually.

On December 28, 2015, President Obama signed into law the Microbead-Free Waters Act of 2015. The new law phases out the manufacture of personal care products containing plastic microbeads by July 1, 2017, and the sale of such beauty products by July 1, 2018. The law, introduced by representatives Frank Pallone (D-N.J.) and Fred Upton (R-Mich.), bans all plastic microbeads from beauty products. This includes microbeads made from biodegradable plastics, most of which break into smaller plastic particles within marine environments.

Both the U.S. Senate and House of Representatives unanimously approved H.R. 1321 earlier in December.

EPA PUBLISHES PROPOSED PHASE II MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT REMAND RULE IN FEDERAL REGISTER

– This Week in Washington, a weekly publication of WEF's Government Affairs Department

The proposed Phase II Municipal Separate Storm Sewer System (MS4) permit remand rule was published in the *Federal Register* on January 6, 2016. A 75-day public comment period began with that publication and concluded on March 21, 2016. The Water Environment Federation (WEF) has been working with the U.S. Environmental Protection Agency (EPA) on this rule by facilitating engagement with MS4 Phase II communities to provide EPA with input.

The proposed rule is the result of a mid-September settlement approved by the Ninth Circuit U.S. Court of Appeals with the Natural Resources Defense Council (NRDC) and the Environmental Defense Center, Inc. That settlement requires EPA to revise its MS4 Phase II permits, which affects small communities with populations below 100,000. The agency is obligated to issue a final MS4 rule by November 17, 2016 under the terms of the settlement. EPA is also required to determine by May 26, 2016 if it will regulate stormwater runoff from forest roads.

ONE WATER RESEARCH AGENDA GAINS MOMENTUM WITH THE PROPOSED MERGER OF POWERHOUSE RESEARCH FOUNDATIONS

– WERF Press Release

The Water Environment Research Foundation (WERF) and the WateReuse Research Foundation (WRRF) boards of directors have unanimously agreed to merge and integrate.

The two organizations recognize and value their history and respective missions, and believe that merging will create synergies, reduce future water research redundancy, further the evolution toward a unified voice for water and increase the value proposition to their respective subscribers by enhancing and leveraging investments.

"The water industry is currently at a critical juncture as it relates to acceptance and implementation of reuse—driven by demand, environmental needs and the creation of a local, sustaining water supply," said Doug Owen, chairman of WRRF. "The merger has the opportunity to strengthen the value of water that was historically used only once."

Both organizations currently conduct research in a clearly defined and complementary niche. WRRF focuses on water reuse and desalination, while WERF focuses on resource recovery and water-quality impacts from wastewater and stormwater.

"Our organizations share a common commitment to making the most of the water we use," said Kevin Shafer, chairman of the WERF board of directors. "Merging will strengthen that commitment as well as increase the return on investment in research for our members and the industry as a whole."

The WateReuse Association, as well as other critical partners including WEF, American Water Works Association (AWWA), National Association of Clean Water Agencies (NACWA), Association of Metropolitan Water Agencies (AMWA) and Water Research Foundation (WRF), among others, will continue to play a critical role in advancing research-based policy that turns scientific discovery into common-sense laws and regulations for water reuse and resource recovery, and in helping establish the research needs of the industry.

EPA SURVEY SHOWS $271 BILLION NEEDED FOR NATION'S WASTEWATER INFRASTRUCTURE

– EPA Headquarters News Release

The EPA released a survey showing that $271 billion is needed to maintain and improve the nation's wastewater infrastructure, including pipes that carry wastewater to treatment plants, technology that treats the water and methods for managing stormwater runoff. The survey is a collaboration among EPA, states, the District of Columbia, Puerto Rico and other U.S. territories. To be included in the survey, projects must include a description and location of a water quality-related public health problem, a site-specific solution and detailed information on project cost.

"The only way to have clean and reliable water is to have infrastructure that is up to the task," said Joel Beauvais, EPA's acting deputy assistant administrator for water. "Our nation has made tremendous progress in modernizing our treatment plants and pipes in recent decades, but this survey tells us that a great deal of work remains."

Adequate wastewater infrastructure plays a vital role in the health of streams, rivers and lakes, where discharged wastewater and stormwater runoff often end up. Wastewater infrastructure must also become more resilient to the impacts of climate change, including sea level rise, stronger and more frequent storms, flooding and drought.

Wastewater infrastructure improvements also support healthy economies. Construction projects create high-paying jobs, and where new facilities are built, workers are needed to operate and maintain them. Upgraded infrastructure results in cleaner water, which is essential for many businesses and sectors of the economy.

EPA launched the Water Infrastructure and Resiliency Finance Center in January 2015 to work with states and communities to identify innovative financing strategies for drinking water, wastewater and stormwater infrastructure. The center recently selected regional environmental finance centers to help communities across the country develop sustainable "how-to-pay" solutions to meet environmental goals. This financial expertise and technical assistance help communities make informed funding decisions for resilient infrastructure projects that best meet local needs.

In addition, EPA offers financial assistance to address the types of infrastructure needs covered in the survey. The Clean Water State Revolving Fund has provided more than $111 billion in low-interest loans since its inception in 1987, with $5.8 billion in FY 2015 alone. Grant funding is available through the Alaska Native Villages and Rural Communities program, the Clean Water Indian Set-Aside, and the U.S.-Mexico Border Water Infrastructure program.

The average American receives a much higher level of wastewater treatment today compared to when the Clean Water Act was passed in 1972. Between 1972 and 2012, the U.S. population receiving secondary treatment increased from about 75 million to 90 million, and the population receiving advanced treatment increased from 7.8 million to 127 million. Over the same period, the population receiving less-than-secondary treatment decreased from almost 60 million to 4.1 million. This has resulted in dramatic improvements in the waterways receiving discharges from these treatment plants.

The $271 billion is primarily for projects needed within five years. The survey reported the following infrastructure needs:

- Secondary wastewater treatment: $52.4 billion to meet secondary treatment standards. Secondary treatment uses biological processes to meet the minimum level of treatment required by law.
- Advanced wastewater treatment: $49.6 billion to provide upgrades so treatment plants can attain a level of treatment more protective than secondary treatment. Advanced treatment may also treat non-conventional or toxic pollutants such as nitrogen, phosphorus, ammonia or metals.
- Conveyance system repair: $51.2 billion to rehabilitate and repair conveyance systems.
- New conveyance systems: $44.5 billion to install new sewer collection systems, interceptor sewers and pumping stations.
- Combined sewer overflow correction: $48 billion to prevent periodic discharges of mixed stormwater and untreated wastewater during wet-weather events.
- Stormwater management programs: $19.2 billion to plan and implement structural and non-structural measures to control polluted runoff from storm events.
- Recycled water distribution: $6.1 billion for conveyance and further treatment of wastewater for reuse.

Visit epa.gov/cwns for more information on the report.

HOUSE VOTES TO OVERTURN OBAMA ADMINISTRATION'S WATER RULE

– This Week in Washington, a weekly publication of WEF's Government Affairs Department

On January 13, 2016, the U.S. House of Representatives voted to overturn the Obama administration's water rule that asserts federal authority over small waterways. The resolution, S. J. Res. 22, passed the Senate last year and is now headed to the President's desk where he has promised to veto it, according to The Hill.

The resolution would essentially kill EPA's new Waters of the U.S. Rule. Republicans are challenging the rule under the Congressional Review Act, which allows lawmakers to vote to block regulations in the first 60 legislative days after they are issued.

According to The Hill, the GOP says the Administration is seeking to assert federal control over puddles, ditches, areas that are occasionally wet and other large sections of private or state land in violation of the intent of the Clean Water Act. It says the rule would be disastrous to farmers, developers, landowners and other businesses that would need a federal permit for routine tasks such as digging ditches. Other agency opponents, such as farmers and homebuilders, say it is a broad overreach by EPA into vast areas that were not covered before. They say that the rule's wording is so broad that it would add new bureaucracy to, or even prevent, basic tasks such as draining small ponds and constructing basic buildings.

"The federal government shouldn't be regulating every drop of water. Just about every wet area in the country is open to

federal regulation under this rule. The rights of landowners and local governments will be trampled," said House Transportation and Infrastructure Committee Chairman Bill Shuster (R-Pa.), whose committee has authority over water policy.

Democrats are concerned that repealing the rule would result in continued confusion about which waterways should be regulated on the federal level.

"The question is what, where and how do we protect the waters of the United States?" said Rep. Peter DeFazio (D-Ore.), the top Democrat on the Transportation and Infrastructure Committee.

The White House agreed and threatened to veto the resolution when the Senate passed it in November.

"The agency's rulemaking, grounded in science and the law, is essential to ensure clean water for future generations, and is responsive to calls for rulemaking from Congress, industry and community stakeholders as well as decisions of the U.S. Supreme Court," the Administration wrote. Following with, "If enacted, S.J.Res. 22 would nullify years of work and deny businesses and communities the regulatory certainty needed to invest in projects that rely on clean water."

The Clean Water Rule is not being enforced because of a federal court ruling that blocked its implementation.

EPA says the regulation is entirely consistent with the Clean Water Act. It was necessary, the agency says, because a pair of Supreme Court rulings left significant waterways with unclear protections, including ones that sometimes lead to sources of drinking water.

ASSOCIATIONS UNITE IN SUPPORT OF WATER REUSE INVESTMENT

– WaterReuse Association Press Release

The WateReuse Association joined seven other water-sector groups last week in urging the Bureau of Reclamation to use a portion of newly received drought-response funds to invest in water reuse.

Under FY 2016 omnibus appropriations legislation approved by Congress and signed into law last month, the Bureau of Reclamation will receive an additional $100 million to address the ongoing drought in the western U.S. Citing a WRRF study that quantifies the opportunities and economic benefits of more widespread water reuse, a joint letter from eight water-sector organizations asked the Bureau of Reclamation to use a portion of the funds in support of water reuse research and infrastructure.

"On an important issue like this one where there is potential to create significant new water supply at a time when it is urgently needed, it is vital that the water community speak with one voice in requesting federal support," said WateReuse Association Executive Director Melissa Meeker.

The letter provided results from a recent survey that found that 92 agencies in 14 states across the country are developing recycled water projects that could produce more than 900,000 acre-feet (1.11 billion cubic meters) of additional water supply. The water groups also explained that funding reuse projects will have a direct, immediate and large impact on extending limited water supplies, improving reliability and enhancing economic development.

Congress had directed the Bureau of Reclamation to announce by early February how it planned to distribute the additional drought response funds.

The letter was signed by the WateReuse Association, NACWA, APWA, NAWC, WEF, AMWA, AWWA, and ACWA.

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THE 2015 LEGISLATIVE YEAR IN REVIEW

– Member Association Magazine Article from WEF Headquarters—Steve Dye, WEF Government Affairs

The final months of 2015 were busy for the WEF government affairs efforts in Congress. Several major funding priorities for water were accomplished, and several significant policy goals were enacted into law.

Final FY16 Omnibus Appropriations Bill Restores Funding. In mid-December, the U.S. Congress reached a final agreement for the fiscal year (FY) 2016 budget for the federal government, the Consolidated Appropriations Act of 2016. Funding to all federal agencies is included in the bill, and it retains or increases funding for the agencies from FY 2015. The bill holds the EPA at the FY 2015-enacted level of $8.139 billion. The Clean Water State Revolving Fund (SRF) is funded at $1.394 billion, and the Drinking Water SRF is funded at $863 million, restoring severe cuts proposed in 2015 in the draft House and Senate committee bills. The bill did not include funding for Water Infrastructure Finance and Innovation Act (WIFIA) loans and loan guarantees, but it did include language directing EPA to continue to use administrative monies to establish the program.

In 2016, WEF will be advocating before Congress and the Administration for full funding for the SRF programs, as well as funding for the WIFIA program to provide low-interest loans for infrastructure projects.

Rider that Banned CSO and Wet Weather Bypassing Excluded. The language of the FY 2016 Omnibus bill attempted to strip an unfunded mandate. The Senate version of the appropriations bill that funds EPA included a rider that would have forbidden wet weather bypassing and combined sewer overflows (CSOs) in the Great Lakes watershed. The compromise language in the final bill will require additional reporting for CSO events only, but it makes no changes to the Clean Water Act requirements or additional fines.

The Senate's FY 2016 appropriations bill contained a policy rider (Sec. 428 of S. 1645) requiring all CSOs in the Great Lakes watershed to be eliminated, including overflows discharged in compliance with a CSO Long Term Control Plan (LTCP) or consent decrees. The rider would have also required water resource recovery facilities (WRRFs) to eliminate discharges of blended effluent that otherwise meet standards established in a WRRF's National Pollution Discharge Elimination System (NPDES) permit during peak wet weather events.

A recently completed survey of Great Lakes WRRFs estimated the cost-of-compliance to the policy rider exceeded $72 billion in the region. A coalition of cities, counties and associations is aggressively lobbying Congress in opposition to this policy rider because it could be extremely costly, requiring massive infrastructure expansion, ratepayer increases and reopening of consent decrees and/or LTCPs. More than 45 letters were sent to Congress from public agencies and organizations opposed to the policy rider, including WEF; the water environment associations of Indiana, Michigan, New England, New York and Ohio; and WEF members at agencies throughout the Great Lakes region.

WIFIA Fix and Better Highway Stormwater Management. The highway reauthorization bill, known as the Fixing American Surface Transportation Act (FAST Act) that was enacted into law in December 2015, included a fix to the WIFIA that WEF helped create and a stormwater management provision that WEF helped draft. The fix removed a restriction on the use of tax-exempt financing on WIFIA-financed projects. WEF and other water associations have advocated for the provision since the program was enacted in 2014. The program required that WIFIA could finance up to only 49 percent of a total project cost and that the remaining 51 percent *could not* come from a tax-exempt source, such as tax-exempt municipal bonds or private-activity bonds. This was limited by Congress in 2014 to keep the cost of creating WIFIA budgets neutral, with the intent of fixing it later. The restriction on tax-exempt financing was removed by the provision in the FAST Act that WEF and other water associations strongly advocated.

Also included in the FAST Act was a stormwater management provision that WEF helped draft that directs metropolitan, non-metropolitan and statewide transportation planning agencies to "improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation," among the list of items to be included when agencies are planning surface transportation projects that use federal funding.

Rep. Donna Edwards (D-Md.), who was a member of the conference committee negotiating the final bill, included the provision. Language similar to the provision was originally developed by Sen. Ben Cardin (D-Md.) with WEF staff assistance and was introduced as the Highway Stormwater Management Act as stand-alone legislation in 2014 and 2015 (S. 518). On behalf of WEF, Dr. Dan Medina of Atkins Global (Epsom, U.K.) and Jim Gibson of Sanitation District No. 1 in Fort Wright, Kentucky, participated in a hearing in May 2014 before the Senate Water & Wildlife Subcommittee chaired by Sen. Cardin. During the hearing, the WEF members testified on the importance of better stormwater runoff management during surface transportation planning. Sen. Cardin introduced his legislation shortly after the hearing.

WEF members testified on the importance of better stormwater runoff management during surface transportation planning

The provision that Rep. Edwards included in the bill is a significant step toward better stormwater management included early in the planning of surface transportation bills. Currently, planning agencies that use federal dollars for projects are given eight criteria to consider during planning, such as increased safety, economic growth and intermodal connectivity. The Edwards provision amends U.S. Code 23, Section 134(h)(1) and 135(d)(1), and will urge planning agencies to "reduce and mitigate stormwater impacts of surface transportation." Planning agencies are not required to include these criteria in projects, but projects that meet more criteria will score more highly.

In 2016, WEF will work closely with EPA to help complete the formation of the WIFIA program and establish another federally backed source of low-interest financing. WEF will also be working with the Federal Highway Administration to incorporate stormwater management into project planning so that costs are built into the federally funded highway projects and are not left to local agencies to address after a project is completed.

Save the Date: WaterWeek 2016. WEF invites everyone to attend the National Water Policy Forum, Fly-In and Expo on April 11 to 13, 2016, in Washington, D.C. Save the date and plan on joining your colleagues from around the nation to participate in the two-and-a-half day meeting, which will feature congressional speakers, policy briefings, visits to Capitol Hill, and roundtable dialogues with key policymakers and experts on important regulatory and policy matters. The Forum, Fly-In and Expo are hosted by WEF, NACWA, WERF, and the WateReuse Association. It will take place during WaterWeek 2016 (April 10 to 15, 2016). The WEF Government Affairs Committee will also hold a full committee meeting on the morning of April 11 for committee members.

FIVE CAPE COD COMMUNITIES RECEIVING EPA TECHNICAL ASSISTANCE TO ADDRESS NITROGEN POLLUTION

– EPA Region 1 News Release

EPA is investigating innovative treatment technologies to help control the discharge of nitrogen from groundwater to Cape Cod waters.

Fieldwork began in late January in the Cape Cod communities of Barnstable, Dennis, Falmouth, Mashpee and Orleans for a project that may reduce harmful levels of nitrogen and other nutrients from flowing into Cape Cod waters. Lessons from this pilot project can be applied to other locations throughout southeastern New England to determine how to capture nutrients most effectively before they harm bays, ponds, streams or coastal estuaries.

With funding from EPA's Southeast New England Program for coastal watershed restoration (SNEP), EPA is investigating innovative treatment technologies to help control the discharge of nitrogen from groundwater to Cape Cod waters. One of these innovative technologies is a "permeable reactive barrier" (PRB), which may intercept and mitigate nitrogen reaching Cape Cod water bodies. EPA chose sites in the five Cape communities to investigate for future PRB installation.

"EPA is eager to see if this promising, low-cost technology can be applied more widely on the Cape and elsewhere to help solve the problem of nutrient pollution impacting local waters. We have experience with PRBs to remediate contaminated groundwater plumes, so we are hopeful that this technique can also help diffuse nutrient pollution," said Curt Spalding, regional administrator of EPA's New England office.

"Cape Cod is at the heart of this problem in New England," said Congressman Bill Keating, a long-time champion of SNEP funding in Congress. "I am very proud to join the EPA in announcing the release of funding from SNEP for these deserving projects on the Cape, which seek to combat contamination and purify our water bodies. These five projects are the realization of the SNEP's goals—utilizing innovative technologies to mitigate and reduce nitrogen levels in our region's groundwater."

A PRB is located below the ground surface to intercept groundwater plumes, and uses a variety of substrates, such as vegetable oil or wood chips, to intercept nitrogen as it flows towards surface water. PRBs are usually sited perpendicular to the direction that groundwater is flowing toward the water body and can be built as a trench-like design or through injection points. Each site will help EPA and its partners determine the PRB technology to propose.

Sites undergoing preliminary characterization include: Prince Cove Marina, Barnstable; Vinland Road, Kelley's Bay, Dennis; Mashpee River Road, Mashpee; Sailfish Drive, Bourne's Pond, Falmouth; Shorewood Drive, Great Pond, Falmouth; and Lonnie's Pond, Orleans. The site characterization work begun in January should be completed during the spring of 2016.

Following the initial site investigation, EPA will choose one or more of the most promising sites for more detailed characterization to determine if it can fully support a PRB design. This full-site characterization will yield additional data needed to determine the size, depth, type and placement of a potential PRB. While a PRB will not be installed through this project, a full design will be made available to the towns. The process will help Cape Cod communities decide if a PRB is suitable for future sites and how to design it effectively.

For this project, EPA is collaborating with U.S. Geologic Survey, the Cape Cod Commission (CCC) and each municipality. This collaboration also aligns with and supports the objectives of the Massachusetts Department of Environmental Protection's Total Maximum Daily Load for Cape Cod and the CCC's Clean Water Act Section 208 Plan Update. Both documents were developed to help address excess nutrient pollution, and PRBs may be both cost-effective and efficient in mitigating the discharge of nitrogen into Cape Cod waters.

For more information, visit the following websites:

- For project status updates and to learn more about SNEP: epa.gov/snecwrp
- Cape Cod 208 plan: capecodcommission.org/208
- Permeable Reactive Barriers: clu-in.org/download/Citizens/a_citizens_guide_to_permeable_reactive_barriers.pdf

The benefits of sound planning—how Augusta, Maine's 25-year adapted CSO abatement program netted positive results

STEVEN FREEDMAN, P.E., AECOM, South Portland, Maine
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ABSTRACT | The Greater Augusta Utility District (GAUD) in Augusta, Maine, provides regional wastewater conveyance and treatment services to five central Maine municipalities—Augusta, Hallowell, Manchester, Monmouth and Winthrop. GAUD also owns and operates the collection system for the core cities of Augusta and Hallowell, both of which have combined sewer systems (CSSs) with 19 permitted combined sewer overflows (CSOs) listed in the Maine Pollution Discharge Elimination System (MEPDES) permit issued by the State of Maine Department of Environmental Protection (DEP).
GAUD has been implementing an adaptive "build and measure" CSO abatement program since the late 1980s. An initial Long Term Control Plan (LTCP) was prepared in 1993 that was updated in 1999, 2006 and 2015. These plans have led to the completion of three of four abatement phases first outlined in 1993 that have reduced annual CSO discharge volume and activations by approximately 88 and 85 percent, respectively. These improvements will continue following the completion of the fourth and final phase of abatement as outlined in the 2015 LTCP update.

KEYWORDS | Combined sewer overflows (CSOs), Long Term Control Plan (LTCP), CSO abatement, wastewater collection system performance

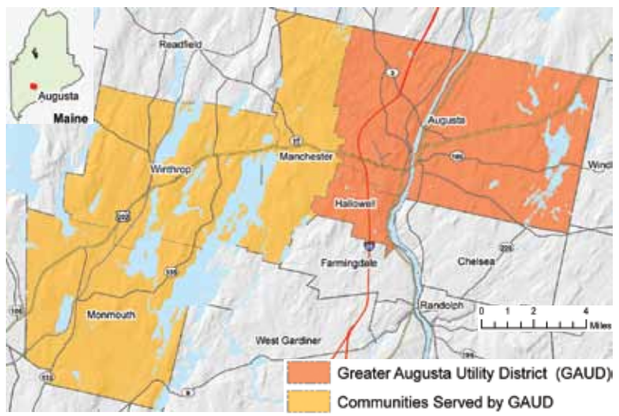

Figure 1. Location map and GAUD wastewater service area

INTRODUCTION

The Greater Augusta Utility District (GAUD) was created by a special act of the Maine legislature in 1957 as the Augusta Sewerage District, which began operations in 1960. It was later renamed the Augusta Sanitary District and then the Augusta Water and Sanitary Districts, before becoming GAUD in 2007 with the official combining of the water and sanitary districts with the wastewater portion of the Hallowell Water District.

GAUD provides regional wastewater conveyance and treatment services to the core cities of Augusta and Hallowell along the Kennebec River and the suburban towns of Manchester, Winthrop and Monmouth to the west of these cities. GAUD also provides regional water supply and distribution services to Augusta and portions of surrounding communities. The communities served by GAUD are shown on Figure 1.

GAUD owns and operates the collection systems for Augusta and Hallowell, both of which have combined sewer systems (CSSs) with 19 permitted combined sewer overflows (CSOs) listed in, and regulated by, the Maine Pollutant Discharge Elimination System (MEPDES) permit issued by the Maine Department of Environmental Protection (DEP). A schematic diagram of the CSSs and the key CSO outfalls are shown on Figure 2.

GAUD's CSOs originally discharged to the Kennebec River and five tributaries—Bond, Kennedy, Noname, Riggs and Whitney Brooks. Of the 19 remaining permitted CSOs, 18 discharge to the Kennebec River. The one remaining CSO that is on a tributary to the Kennebec River is CSO 003, which discharges into Kennedy Brook at the site of the wastewater treatment plant (WWTP).

Also regulated by the MEPDES permit is the operation of GAUD's pure-oxygen secondary WWTP. The WWTP has an average daily design flow of 8 million gallons per day (mgd) (30,300 cubic meters per day [m³/d]); actual average annual flows are around 4 mgd (15,140 m³/d), with wet weather flows peaking at 36 mgd (136,300 m³/d). During wet weather conditions, up to 12 mgd (45,400 m³/d) receives full secondary treatment and disinfection, while the excess flow—the secondary or CSO bypass—receives primary treatment followed by high-rate disinfection (HRD). Disinfection of both the secondary and CSO bypass effluents is seasonal.

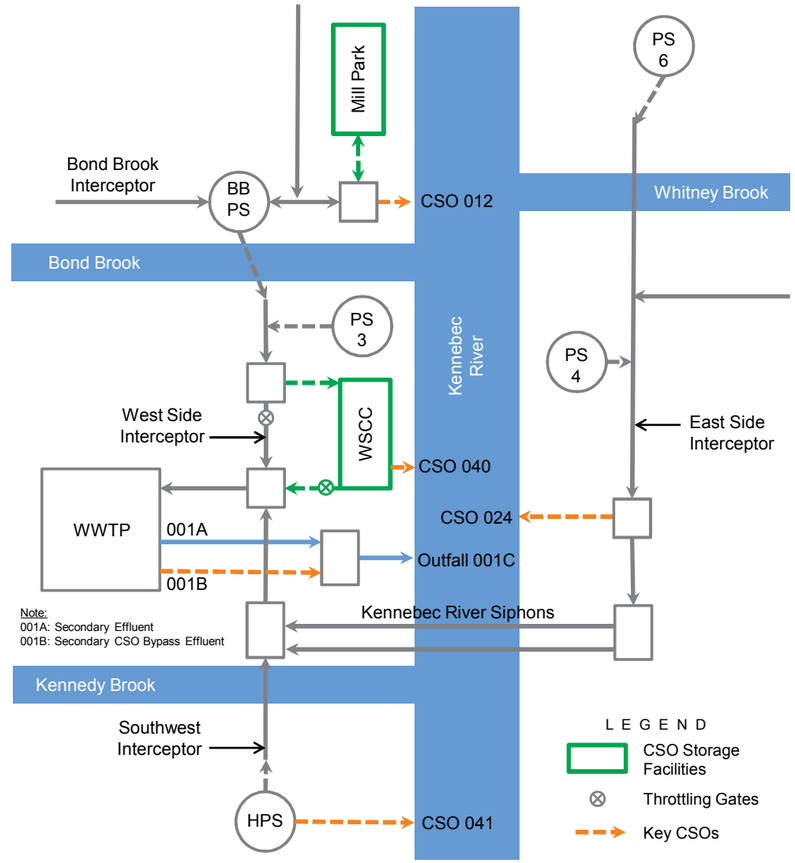

Figure 2. Key hydraulic features of GAUD's CSO system

GAUD also owns and operates the stormwater system in the urban portions of Augusta. Because of the demographics, none of the municipalities served by GAUD are designated as Municipal Separate Storm Sewer System (MS4) communities by DEP and the U.S. Environmental Protection Agency (EPA). The combined population of Augusta and Hallowell is around 22,000. The three western suburbs for which GAUD provides regional treatment services have a combined population of around 13,000. The annual operating budget for GAUD is approximately $10.7 million and includes a staff of 42.

CSO PLANNING AND ABATEMENT

GAUD's commitment to CSO abatement began well in advance of the issuance of EPA and DEP CSO policy and guidance documents that first appeared in the late 1980s, and intensified with the Federal CSO Control Policy in 1994. Like other, older New England communities, GAUD's early CSO abatement focused on separation of the CSSs but later expanded into outfall consolidation and system optimization through adjustments of overflow weirs and orifice plates in the CSO regulator structures.

Comprehensive planning for CSO abatement began for Augusta in the early 1990s, resulting in a Long Term Control Plan (LTCP) that was submitted to DEP and EPA Region 1 in 1993. The initial LTCP, termed a CSO Facilities Plan at the time, was subsequently updated in 1999, 2006 and most recently in 2015. These periodic LTCP updates represent an effective "build-and-measure" adaptive process that guided GAUD through implementation of the first three phases of its CSO abatement program,

and which continues to this day as GAUD begins to implement the final major capital phase of its program.

CSO abatement planning for the Hallowell CSS, which came under GAUD's ownership and operational jurisdiction in 2007, occurred concurrently with the ongoing planning for the Augusta CSS. The resultant 2015 Hallowell LTCP findings were incorporated into the 2015 LTCP update for the Augusta CSS.

GAUD was issued an administrative order from EPA Region 1 in the early 1990s that expired with completion of the initial phase of CSO abatement. Since then, GAUD's CSO abatement program has followed the provisions of its MEPDES permit and applicable CSO guidance documents.

The following are synopses of the GAUD LTCPs prepared to date and the abatement programs that resulted.

1993 LTCP

The 1993 LTCP established the foundation for all future plans with respect to planning boundaries, modeling, system characterization and levels of control. This initial plan:

- Established four smaller planning areas within the CSS based on the hydraulic grouping of CSOs: WWTP bypass, West Side, East Side and Bond Brook subareas
- Performed CSO and ambient monitoring and characterization of the CSS
- Developed a comprehensive hydrologic/hydraulic collection system model using the EPA Storm Water Management Model (SWMM)
- Recommended a four-phase, multi-year abatement program
- Recommended abatement (via high-flow management facilities at the WWTP) of the WWTP bypass for Phase 1

A wide range of abatement measures, categorized below, were considered in the 1993 LTCP:

- Best Management Practices
- Consolidated treatment at the WWTP
- Satellite treatment
- Satellite storage
- Select sewer separation
- Combination of the above

These abatement measures were first applied at the subarea level as options and then combined into system-wide alternatives. Through knee-of-the-curve analyses using the newly developed and calibrated SWMM, the one-year return frequency storm was established as the cost-effective control level for the Augusta CSS. The one-year, two-hour storm was selected as the design storm for flow-through facilities and conveyance, whereas long-term simulation, using 21 years of rainfall records, was used to predict corresponding one-year return frequency design volumes.

The highlight of the 1993 LTCP was the recommendation to implement the Phase I abatement program. The WWTP bypass subarea accounted for approximately 44 percent of the total annual system-wide CSO discharge volume, the highest of the four subareas. Key elements of the Phase 1 program included the following WWTP upgrades:

- New headworks to accommodate 36 mgd (136,300 m^3/d) peak flow through the preliminary and primary treatment facilities
- New flow control structure ahead of the existing primary clarifiers to improve flow distribution
- New flow control structure following primary treatment containing the CSO bypass to limit flows to the secondary treatment facilities to 12 mgd (45,400 m^3/d), their rated peak capacity
- HRD facilities, including a new, separate chlorine contact tank (CCT) for the CSO bypass flows

The HRD system included chlorination and dechlorination storage and feed equipment, and the dedicated CCT to provide a minimum of five minutes of detention time at the expected peak flows. Treated CSO bypass effluent had its own monitoring manhole prior to combining with the secondary effluent and then discharging via the existing outfall into the Kennebec River. The previous MEPDES permit contained discharge parameters and limits for the CSO bypass independent of those for the secondary effluent. However, the recently re-issued December 2015 MEPDES permit contains limits for the combined or blended effluent. The High Flow Management Facilities are shown in Figure 3.

GAUD leveraged Phase 1 work at the WWTP to complete other equipment and process upgrades, some of which dated back to the early 1960s and were past their useful design life. These included:

- New solids thickening and dewatering equipment
- Centralized odor control system
- Centralized chemical feed and storage
- Refurbished administrative building containing the laboratory, offices and operator locker rooms

The 1993 LTCP also recommended that the West Side subarea, containing the second highest annual CSO volume, be included as the Phase 2 abatement program, with the East Side and Bond Brook subareas to follow as Phases 3 and 4, respectively.

1999 LTCP update

The 1999 LTCP update focused on the West Side subarea. Building on the WWTP's ability to then safely accommodate wet weather flow up to 36 mgd (136,300 m^3/d) through both primary treatment and disinfection, the plan recommended construction of the West Side Consolidation Conduit (WSCC). The off-line storage conduit would capture and store the largest West Side subarea CSO and other smaller CSOs for eventual post-event dewatering and subsequent treatment at the WWTP.

| AUGUSTA, MAINE'S 25-YEAR ADAPTED CSO ABATEMENT PROGRAM |

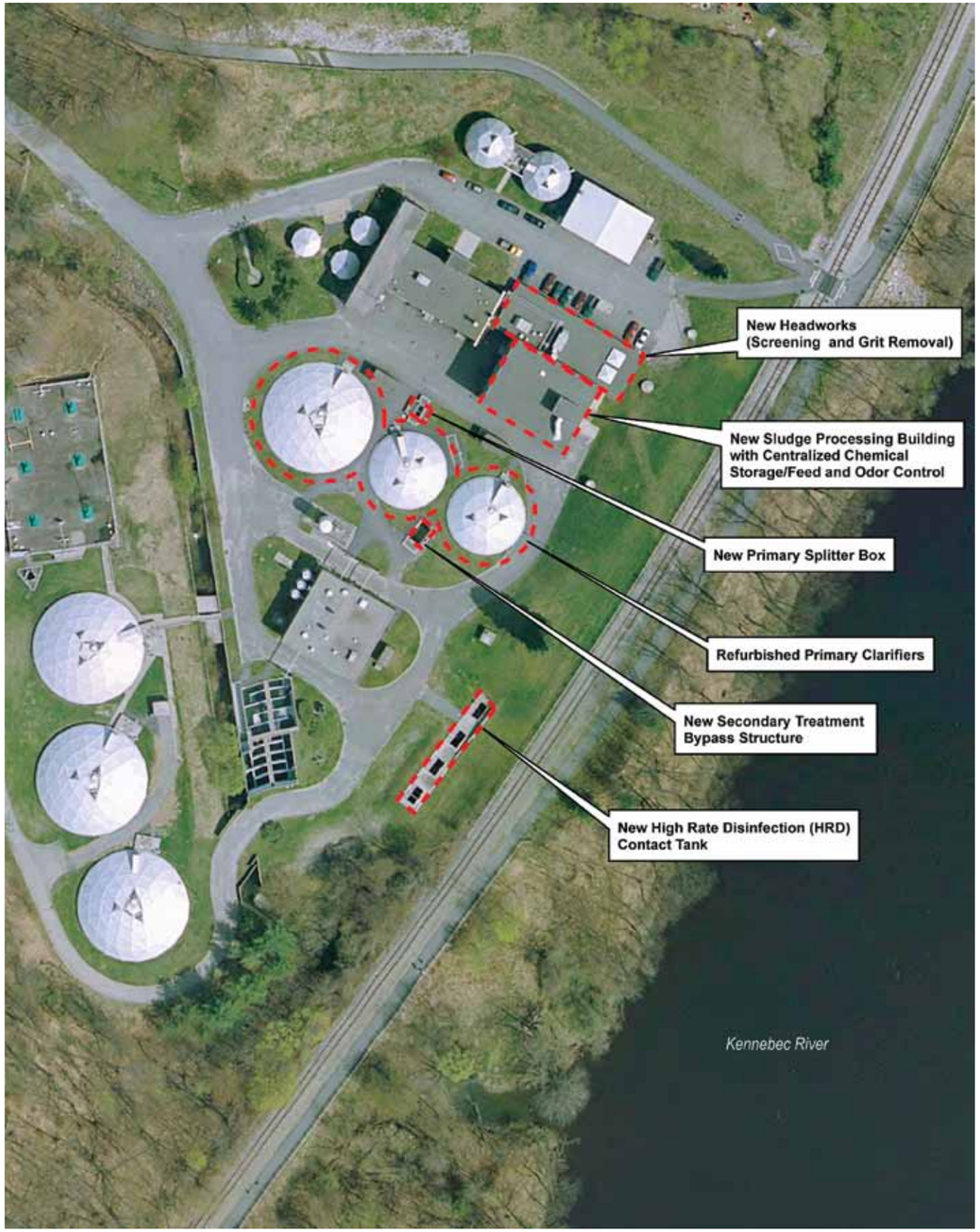

Figure 3. Phase 1 high-flow management facilities at the WWTP

The 3,655-foot (1,114-meter)-long, 10-foot (3.1-meter)-wide by 6-foot (1.8-meter)-high box-culvert conduit featured:

- 1.6 million gallons (MG) (6,060 m^3) of storage
- Gravity in/gravity out design
- Series of internal flushing gates to facilitate automated post-event cleaning
- Modulating gate on the downstream end of the conduit to regulate the rate of flow into the WWTP both during and following an event
- High-level emergency overflow (now referred to as CSO 040) with a mechanically cleaned, horizontally mounted CSO screen for flows in excess of the conduit storage capacity
- Conditions permitting, and at the discretion of WWTP operators, all or a portion of a major storm sewer which drained a highly developed portion of Augusta that could also be diverted into the WSCC

The layout and key features of the WSCC are shown on Figure 4.

An important element of the 1999 LTCP update was revision of the original SWMM using the most recent CSO monitoring and WWTP performance data. Just as the original SWMM was invaluable in planning for the 1993 LTCP, the updated SWMM remained equally valuable for the 1999 LTCP update and for two subsequent updates as well.

2006 LTCP update

This second LTCP update focused on the two remaining subareas: East Side and Bond Brook. As with the 1999 LTCP update, the 2006 LTCP update revised the SWMM using the latest CSO monitoring and performance data from the now-expanded WWTP and the newly operational WSCC from the Phases 1 and 2 abatement programs, respectively.

The 2006 LTCP update had four key recommendations:

- Off-line storage was recommended for the Bond Brook subarea due to the low-volume/high-peak nature of the CSOs.
- Flow-through treatment with HRD was recommended for the East Side subarea due to the high-volume/low peak-flow nature of the CSOs.
- Abatement of the Bond Brook subarea should precede the East Side subarea as the Phase 3 abatement program because the Bond Brook subarea had a higher annual CSO volume; thus, abatement work in that subarea would achieve a higher level of water quality benefit. The 1993 LTCP and 1999 LTCP updates both had the East Side subarea preceding Bond Brook for instituting abatement measures.
- Optimization of the earlier two abatement phases was recommended, with a focus on the WSCC and its hydraulic interface with the West Side interceptor (WSI) and WWTP.

The last recommendation resulted from an optimization analysis that concluded there was a need for more positive control to manage the filling of the WSCC and a concurrent need to limit peak flows to the WWTP to its design flow of 36 mgd (136,300 m^3/d). The LTCP also recommended a SCADA-controlled slide gate to supplement the original static overflow weir between the WSCC and the WSI. This control gate was installed as part of the Phase 3 implementation and has optimized the capture of West Side CSOs into the WSCC while protecting the downstream WWTP.

The 670-foot (204-meter)-long, 10-foot (3.1-meter)-wide by 10-foot (3.1-meter)-high double box-culvert conduit Mill Park Storage Facility features:

- 1.0-MG (3,785 m^3) storage volume
- Gravity in/gravity out design
- Drains to the new Bond Brook pump station (PS), described below
- Manually operated flusher gates

Figure 5 shows the layout and key features of the Mill Park Storage Facility.

In keeping with GAUD's earlier decision to leverage CSO abatement with the renewal of related, aging assets that began under Phase I, the Phase 3 program also included a number of needed wastewater infrastructure improvements in the Bond Brook subarea:

- New gravity interceptor sewers
- Consolidation of two flood-prone 1960s-era pump stations into the new single flood-protected Bond Brook PS

2015 LTCP update

The most recent LTCP update focused on the East Side subarea, the last of the four subareas originally established in the 1993 LTCP. As with the other LTCP updates, GAUD's SWMM was revised to reflect a number of system improvements that had occurred in the subarea since the 2006 LTCP update. Of note in the 2015 LTCP update was that it:

- Was coordinated with a parallel LTCP for the Hallowell CSS
- Re-evaluated the abatement alternatives from the 2006 LTCP for the East Side subarea
- Divided the CSOs into two groups, with the Fort Western Bridge as the dividing line:
  1. North Branch CSOs, which, collectively, had a small annual volume but many activations.
  2. South Branch CSOs, which, collectively, had a large annual volume and included the East Side Interceptor (ESI) relief, CSO 024.
- Included a system-wide performance evaluation of Phases 1, 2 and 3

The resulting evaluations revealed that off-line storage, using box culverts similar to both the WSCC from Phase 2 and the Mill Park Storage Facility from Phase 3, was preferable for the East Side subarea

| AUGUSTA, MAINE'S 25-YEAR ADAPTED CSO ABATEMENT PROGRAM |

Figure 4. Phase 2 west side consolidation conduit and interconnecting pipe network

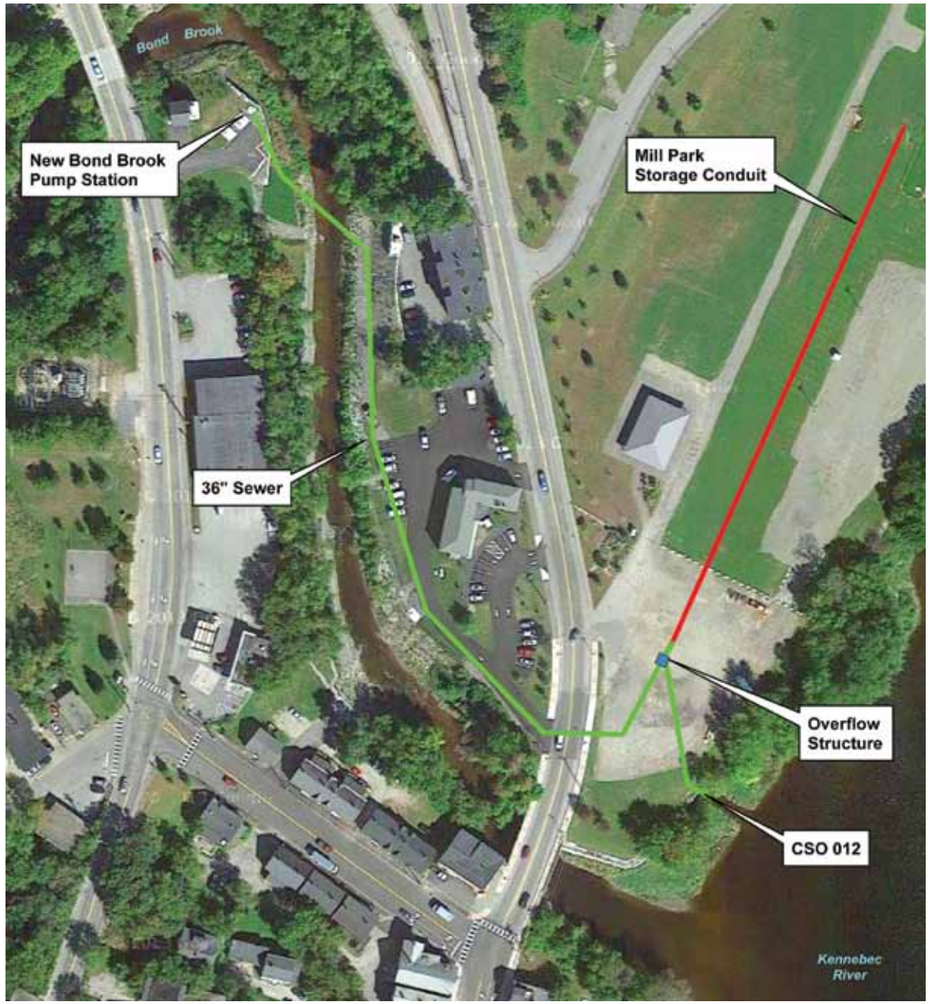

Figure 5. Phase 3 Mill Park storage facility and interconnecting pipe network

to the placeholder alternative from the 2006 LTCP update—flow-through treatment and seasonal HRD. Thus, off-line storage, referred to as the East Side Consolidation Conduit (ESCC), was recommended as the key element of the Phase 4 abatement program for the South Branch CSOs. Select sewer separation and rehabilitation were recommended for the North Branch CSOs.

The 2015 LTCP update included the following key recommendations:

- Because of the differing characteristics of the two groupings of East Side subarea CSOs, Phase 4 should be divided into two distinct phases.
- System rehabilitation/separation was recommended for the smaller but more frequent North Branch CSOs as Phase 4A.
- Off-line storage was recommended for the larger South Branch CSOs in the proposed 0.8-MG (3,028 m^3) ESCC as Phase 4B.

Figure 6 shows the proposed layout of the ESCC, while Figure 7 illustrates its interconnection to the ESI and CSO 024 outfall.

Similar to the Phase 3 abatement program, GAUD elected to include related wastewater infrastructure improvements, most notably the replacement of the last two of its 1960s-era pump stations. Thus, as part of Phases 3 and 4 CSO abatement programs, all of GAUD's original pump stations built in the early 1960s will be replaced with more efficient and reliable facilities. Figure 8 illustrates the updated schematic of the CSS with the addition of the Phase 4 ESCC.

Figure 6. Proposed east side consolidation conduit and interconnected pipe network

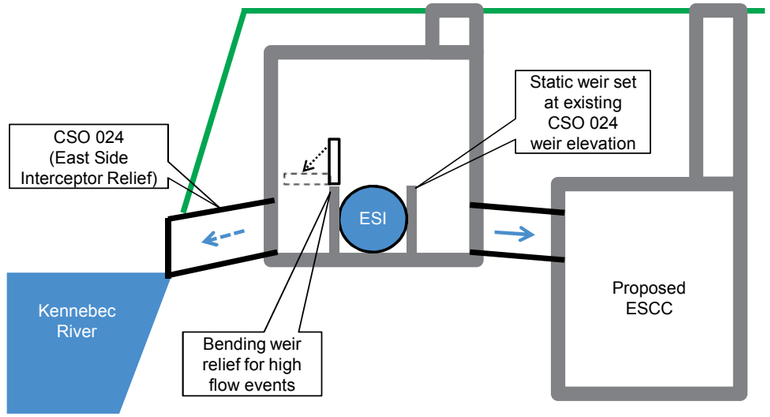

Figure 7. Proposed ESCC regulator structure at CSO 024

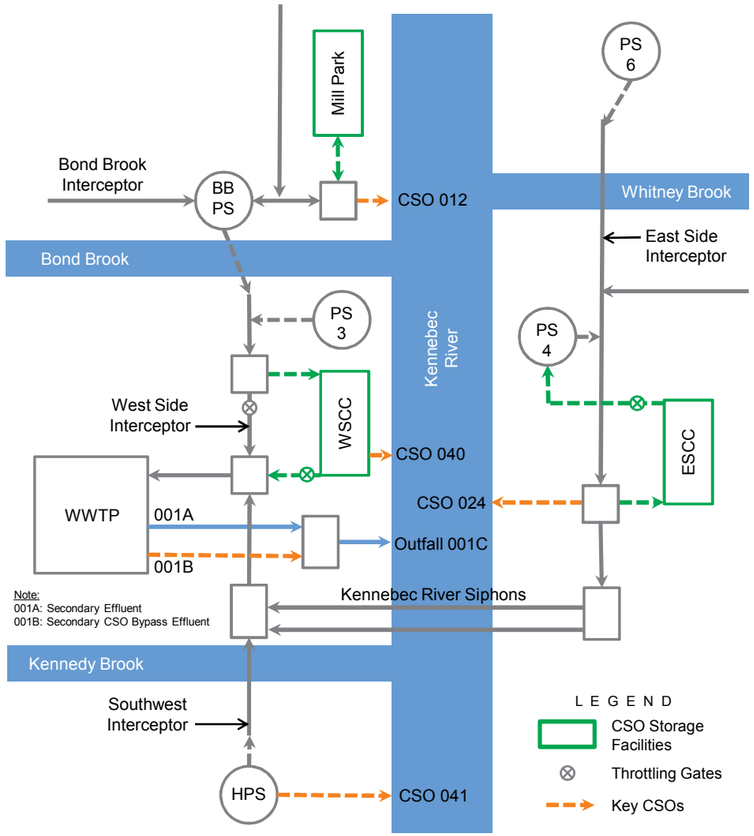

Figure 8. Key hydraulic features of GAUD's CSO system with proposed ESCC

Hallowell

Unlike the Augusta CSS, the Hallowell CSS was almost totally separated and/or replaced during construction of the interceptor sewer and Hallowell Pump Station (HPS) in the 1980s. However, because of remaining excess wet weather flows in the system, a single CSO was constructed just upstream of the HPS for flows in excess of the 1 mgd (3,785 m^3/d) limit that GAUD established for Hallowell. When GAUD took ownership of the Hallowell wastewater collection system from the Hallowell Water District in 2007, that pumping limit was subsequently increased to roughly 1.4 mgd (5,300 m^3/d) to reduce the frequency and volume of CSO discharges. Periodic but infrequent overflows, however, still persist.

As noted previously, the Hallowell CSS was studied separately from the Augusta CSS and reported in a separate LTCP prepared in 2015. The Hallowell LTCP, however, along with earlier inflow/infiltration (I/I) evaluations, failed to ascertain the causes of the continued CSO activity at the HPS. These studies suggest that the Hallowell CSS is heavily influenced by groundwater and to a lesser extent private inflow, so that CSO activity, while infrequent, is not as predictable in Hallowell's CSS as it is in more traditional CSSs containing a combination of catch basins, groundwater and private inflow sources. Notwithstanding these findings, alternatives for CSO abatement were considered in the LTCP and included off-line storage and further increased HPS pumping capacity. The recommendations, however, called for continued investigations to better determine the sources of the extraneous flows, and then following up with the necessary corrections to the CSS.

EVALUATION OF SYSTEM-WIDE CSO ABATEMENT PERFORMANCE

In addition to the primary focus on the East Side subarea, the 2015 LTCP update assessed GAUD's overall progress in CSO abatement. This assessment focused on key hydraulic points of interest throughout the CSS, emphasizing the predicted and actual performance of the abatement facilities constructed under Phases 1, 2 and 3, and overlaid with the predicted performance of Phase 4 for the East Side subarea. The performance of the Hallowell CSS, the planning for which is described below, was included in the evaluation.

A review of key hydraulic locations throughout the CSS, coupled with performance data from the completed CSO abatement facilities constructed under the Phase 1, 2 and 3 abatement programs, reveal that the original SWMM, as subsequently revised, was reasonably accurate with respect to baseline conditions and predicted overall effectiveness. In all cases, the facilities constructed under Phases 1, 2 and 3 abatement programs met or exceeded the one-year level of control as established in the 1993 LTCP. The same is predicted for the proposed ESCC to be constructed as the key element of Phase 4 abatement.

This system-wide performance evaluation revealed that CSO discharges had been significantly reduced to the Augusta-area waterways since the baseline year of 1993. Specifically:

- CSO activations per inch (2.5-centimeters) of rain were reduced by 81 percent, from 12 activations to two.
- Annual CSO discharge volume was reduced by 88 percent, from 58 million gallons per year (mgy) (219,500 m^3/yr) to 6.6 mgy (25,000 m^3/yr).
- Completion of the Phase 4 abatement program for the East Side subarea, and additional improvements to the Hallowell CSS, will further improve performance.
- Other factors that will improve performance will be realized through continued rehabilitation and/or separation of aging wastewater infrastructure and abatement of the smaller, miscellaneous CSOs in the West Side subarea.

Figures 9 and 10 illustrate the reductions in annual CSO volume and activations, respectively.

COMMITMENT TO CSO ABATEMENT AND INFRASTRUCTURE RENEWAL

GAUD is committed to the continued rehabilitation and/or separation of aging wastewater infrastructure through piggybacking on development and related street or highway projects with a long-term goal of zero CSO discharges. While the primary goal of these improvements is to provide high-quality, uninterrupted service to its ratepayers, GAUD also understands that removal of extraneous flows from the system, such as sources of I/I, will improve the level of control of the CSO abatement investments made to date. Also, less flow will need to be pumped and eventually treated at the WWTP. With these commitments and goals in mind, GAUD has invested in the latest technologies, including flow metering, CCTV equipment, hand-held personal devices for field crews and other tools to facilitate the operation and maintenance of the wastewater collection system.

Other examples of this commitment include: related WWTP improvements as part of Phase 1 abatement; gravity system and pump station improvements as part of Phase 3 abatement in the Bond Brook subarea; and similar work planned in the East Side subarea under Phase 4 abatement.

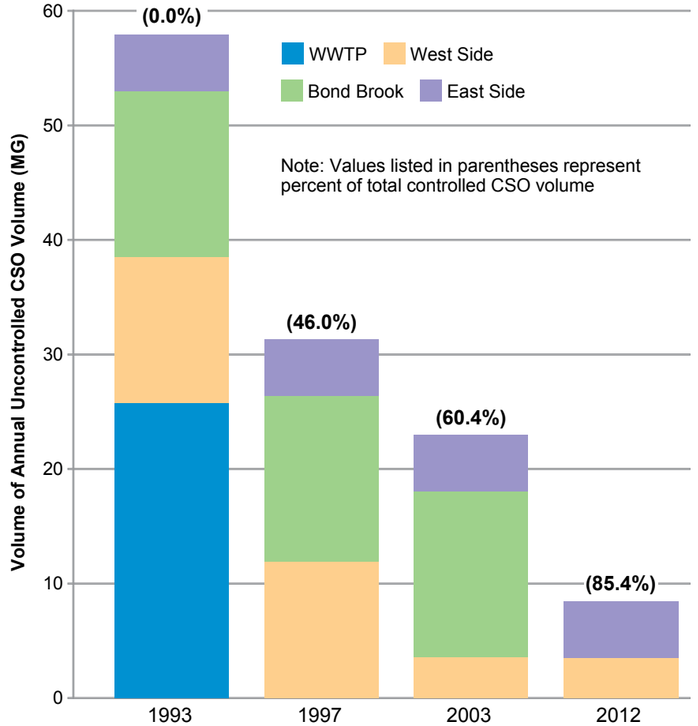

Figure 9. Trends in system-wide CSO volumetric discharges

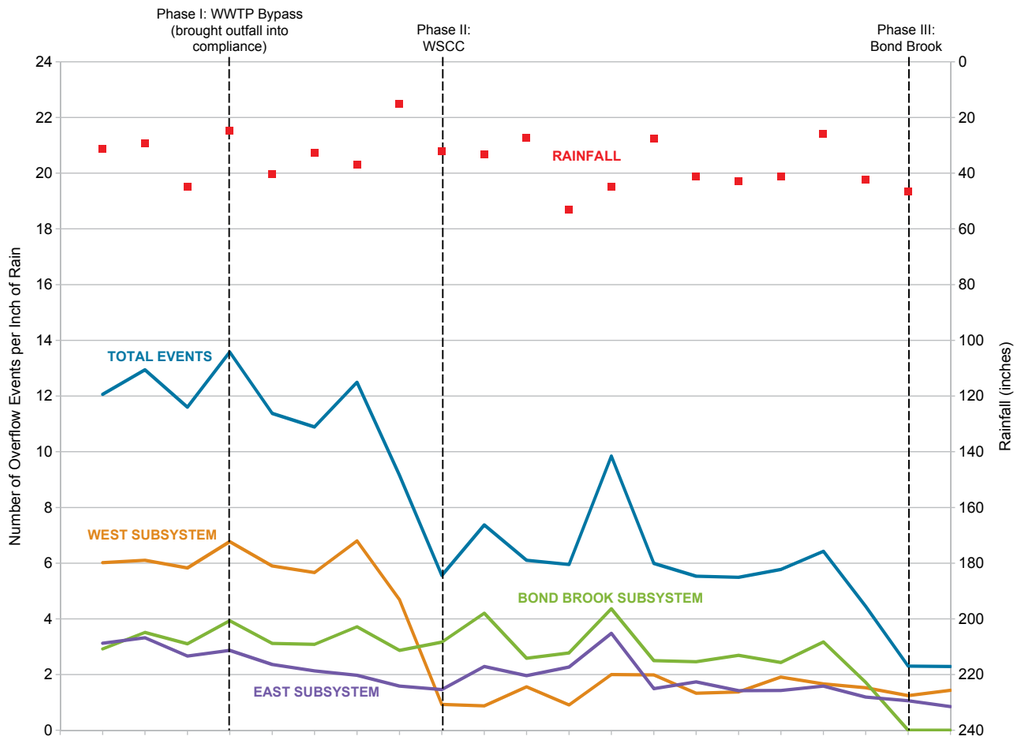

Figure 10. Trends in system-wide CSO activations

COSTS TO DATE, AND IMPLEMENTATION AND FINANCING

GAUD has spent about $43 million (2015 dollars) on CSO abatement, including the completion of three of the four phases as originally outlined in the 1993 LTCP. With the addition of Phase 4, and other future miscellaneous CSO abatement measures, this cost will rise to around $55 million. This equates to a projected unit cost of roughly $1.03 per gallon ($.27 per liter) of controlled CSO.

GAUD has worked diligently to control the impact of CSO abatement on its ratepayers and, through critical and timely adjustments to implementation scheduling, has kept the ratio of sewer charges to the Medium Household Income (MHI) at 1.27. This Residential Indicator value falls within what EPA terms the "Mid-Range" of financial impact.

Implementation

To minimize rate impact, GAUD planned the scheduling and financing of the two portions of the Phase 4 abatement program to coincide with the retiring of two 20-year bonds from the earlier Phases 1 and 2 abatement programs, shown on Figure 11. The resultant schedule for Phase 4 is as follows:

- Phase 4A for the smaller North Branch CSOs: 2015–2019
- Phase 4B for the larger South Branch CSOs: 2018–2021

This scheduling will have no impact on ratepayers for the Phase 4 abatement program and will allow GAUD to continue rehabilitating its aging collection system throughout the entire CSS and beyond.

INNOVATIVE REVENUE SOURCES

GAUD is a quasi-municipal special district that operates under an appointed board of trustees. It generates its own revenues, separate and distinct from the municipalities it serves. From its inception, GAUD has used innovative revenue streams to finance its operation and later the abatement of its CSOs. For example:

- The original rate structure from the 1960s contained catch basin charges, including both "combined" and "separate" rates depending on where they were connected.
- In the mid-1990s, GAUD communities were the first in New England to institute an impervious area-based stormwater charge to offset CSO abatement costs.

These revenue streams, in addition to the standard water consumption-based rates and service charges, have allowed GAUD to assess all categories of its ratepayers fairly and equitably.

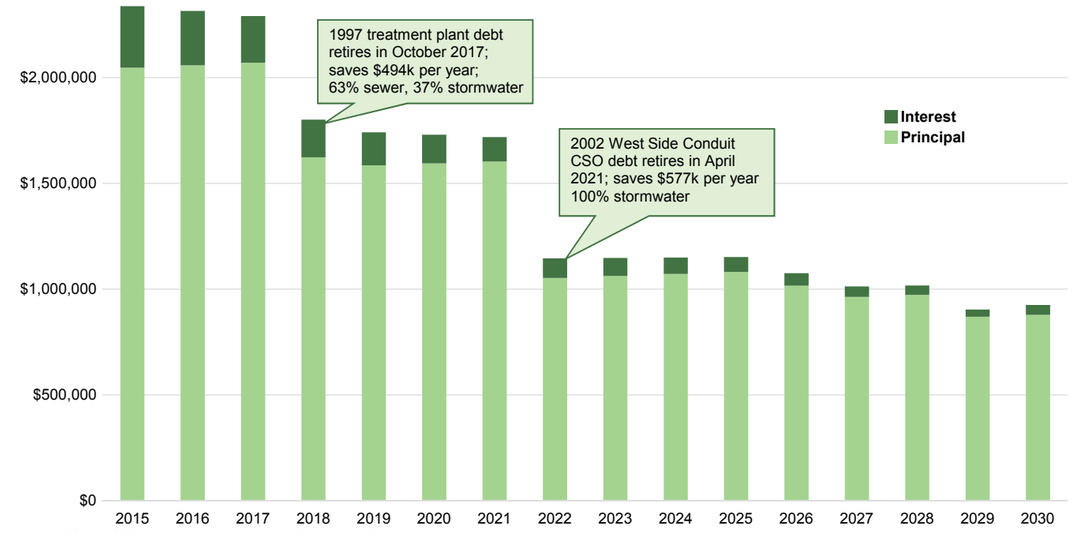

Figure 11. GAUD's wastewater bond schedule

NEXT STEPS

The most recent LTCP update was submitted to DEP on June 30, 2015, in accordance with GAUD's MEPDES permit, along with the separate Hallowell LTCP. Implementation of the Phase 4 abatement program will occur from 2015 to 2021, as noted previously. In addition to LTCP implementation, GAUD will continue to rehabilitate and/or separate its aging wastewater infrastructure through piggybacking on development and related street and highway projects with a long-term goal of zero CSO discharges. As before, future LTCP updates will be used to monitor and assess overall abatement progress in reducing CSO discharges to the area waterways.

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ABOUT THE AUTHORS

- Steven Freedman, P.E., an AECOM vice president and wet weather practice leader, is located in South Portland, Maine, and has been the technical leader for all four of GAUD's LTCPs. He was also involved with the design and construction of the first two phases of CSO abatement.
- Eric Lemont, P.E., is a project engineer in AECOM's South Portland office who specializes in mathematical modeling of collection systems and complex hydraulic structures. His role in the 2015 LTCP update for GAUD included updating the SWMM and evaluating alternatives and conceptual design of the proposed storage conduit.
- Brian Tarbuck, P.E., has been the general manager of GAUD since 2007. Prior to joining GAUD in 2002 as the assistant general manager of the Augusta Water District, he worked for the State of Maine's Drinking Water program and was facility manager of the Tolt treatment facility, a 120-mgd (455,000 m^3/day) DBO drinking water filtration plant for Seattle, Washington.

Addressing the Achilles' heel of an aging collection system

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ABSTRACT | After experiencing two back-to-back costly infrastructure catastrophes, the Warwick Sewer Authority (WSA) could not endure another. Knowing that its main influent pipe, which runs beneath Interstate Route 95 (I-95), was showing signs of age, WSA put its rehabilitation on the high-priority list. Although it took years to complete the project, WSA persevered and completed the job in 2015. This article tells the story of this project, including lessons learned, with the hope that other water utilities will choose the same proactive approach and avoid the financial and operational pains endured by WSA as a result of previous critical infrastructure failures.

KEYWORDS | Sewer rehabilitation, sliplining, trenchless technology

48-inch (120-centimeter) Interceptor Beneath I-95

INTRODUCTION

In March 2010, the city of Warwick, Rhode Island wastewater treatment facility and six pumping stations along the Pawtuxet River were rendered inoperable by catastrophic flooding following rain storms that caused the river to peak at its highest-ever flood elevation. This infrastructure disaster resulted in $14 million in damages to WSA's treatment facility and pumping stations, and took years to completely repair. In February 2011, WSA experienced a catastrophic collapse of a 48-inch (120-centimeter) reinforced concrete sewer main leading into the Cedar Swamp pumping station that handles about 50 percent of the wastewater collected in the city. The collapsed pipe was more than 20 feet (6 meters) deep and adjacent to Buckeye Brook. It took WSA months (during which time the line had to be bypassed) and cost $2 million to repair the interceptor.

Shortly after the Cedar Swamp interceptor failure, WSA contracted with a pipeline inspection company to inspect the 48-inch (120-centimeter) reinforced concrete main influent pipe that was brought on-line in 1965 and runs under I-95. (This main influent wastewater pipe went in years before I-95 was constructed over it.) This pipe delivers an average of 5 million gallons per day (mgd) (18,900 cubic meters per day [m³d]) of wastewater to the treatment facility. The current peak flow of this interceptor is 15.6 mgd (59,000 m³d), and its Facility Plan peak hourly design flow is 20.4 mgd (77,000 m³d) for 2030. The pipeline inspection company provided WSA with a video recording and detailed report of the condition of the main interceptor. It was showing signs of age, including crown corrosion and visible steel reinforcing bar, but was still in reasonable shape structurally, with no signs of immediate failure. The exposed rebar, however, was a concern to WSA staff, so they investigated the condition of this important asset further and identified options to address the deteriorating infrastructure. Because the influent sewer was the only means to convey wastewater to the treatment facility and was constructed beneath I-95, the consequence of failure was a concern due to safety and the potential environmental and economic impacts.

TIMELINE 1: **Investigation and Planning**

PROJECT INVESTIGATION AND RESULTS

In May 2014, WSA had a Conditions Assessment and Alternatives Analysis Technical Memorandum (TM) developed for the influent sewer. The TM, submitted on June 30, 2014, reviewed the CCTV inspection videos and reports and provided a Pipeline Assessment and Certification Program (PACP) rating for the sewer segment crossing I-95 and the two sewer segments leading into the wastewater treatment facility. As shown in Table 1, several defects were noted, with the most severe being structural. However, no operation and maintenance issues were identified as a result of the CCTV inspection.

In addition to the PACP rating, the TM evaluated the following rehabilitation/replacement options:

- Cured-in-place pipe (CIPP)
- Sliplining
- Epoxy lining
- Trenchless installation of a new main by jack-and-bore or other methods

An assessment of operational impacts (including conflicts with ongoing construction), concept-level costs, potential bypass pumping requirements, environmental impacts, general permitting requirements and community impacts for each technology/option were evaluated. The TM also identified possible ingress/egress access and staging areas. Table 2 presents service life, advantages and disadvantages, estimated construction duration, and costs for the various alternatives.

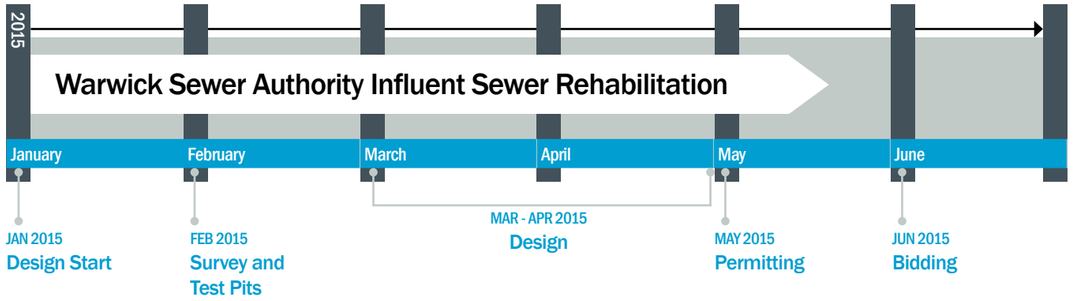
The TM recommended installing a new fiberglass reinforced polymer pipe (FRPP) sewer using sliplining in the wet. An appropriation was included in WSA's budget for engineering costs over two consecutive fiscal years. WSA contracted for engineering design and bid-phase services in November 2014.

Timeline 1 outlines major events during the planning and investigation phase of the influent sewer rehabilitation.

Table 1. influent sewer PACP rating

Sewer segment	Length (ft/m)	Diameter (in/cm)	PACP O&M grade	PACP structural	Total PACP grade
4-280-eas-b to 4-280-3 (Main Influent Sewer crossing I-95)	317/93	48/120	0000	5(63)3(63)	5(63)3(63)
4-280-3 (first manhole northwest of highway ROW) to 4-280-3A (last manhole before headworks)	189/58	48/120	0000	3(40)00	3(40)00
4-280-3A to Headworks	88/27	48/120	0000	3(40)21	3(40)21

TIMELINE 2: **Design and Bidding**



PROJECT DESIGN

The selected rehabilitation method included flexible pipeline design using FRPP, with calculations based on criteria from the American Water Works Association (AWWA) M45 manual that assume no structural reliance on the host pipe. Specifications for pipeline installation included wet construction methods, sliplining manufacturers, and contractor qualifications and experience requirements. A 300-psi (21 bar) grout was also specified to fill the annular space. Bypassing the main influent interceptor was risky and costly. However, for work on the wastewater treatment facility side of I-95 on WSA property, the contractor was given the option of bypass pumping.

Plans (90 percent design) were reviewed with WSA's board at its meeting in March 2015. Grouting options (cementitious versus cellular foam)—a large variable concerning anticipated construction cost—were discussed in depth. The engineer's estimate was $770,000, which included the cost for cellular foam grout. It had been found that lightweight cellular foam grout costs more but has a lower risk of damaging or collapsing the new pipe if installed by experienced grouting contractors.

Project permitting and other considerations

A permit from the Rhode Island Department of Transportation (RIDOT) was required for the work under I-95. WSA kept RIDOT officials informed, sharing the influent sewer TM and other pertinent reports and information. Requiring the contractor to complete all work outside the I-95 right-of-way facilitated the necessary approvals.

The Rhode Island Department of Environmental Management (RIDEM) did not require an approval since the project was considered repair/maintenance. Plans and specifications for the rehabilitation in the wet construction were forwarded to RIDEM along with calculations for the new sliplined FRPP pipe capacity. Although the diameter of the pipe was reduced, the capacity of the new pipeline far exceeded the full build-out capacity in WSA's Facility Plan.

Temporary easements had to be obtained for staging areas near the upstream sewer manhole for constructing a bulkhead and grouting the annular space between the host pipe and new FRPP pipe. One easement area comprised a gravel surface, but the other was a well-maintained lawn area that required sod for restoration.

Table 2. Comparison of alternatives for influent sewer rehabilitation/replacement

Rehabilitation/ replacement alternative	Service life (years)	Advantages	Disadvantages	Estimated construction duration (days)	Probable opinion of cost ($)[1]
CIPP Lining	50	Provides structural repair, Proven method	Bypass required	28	520,000
Sliplining	50	Lowest cost, Bypass not required, Proven method	Reduced diameter	10	350,000
Epoxy Lining	15 to 25	Provides corrosion protection	Does not restore structural integrity, Bypass required	10	605,000
Pipe Replacement	50 to 100	Provides redundancy, No bypass required	Highest cost, Significant permitting, Increased risk	35	1,020,000

[1] Probable cost for sewer segment beneath I-95 only

Contract documents were developed with the I-95 crossing as the base bid, and the two segments just upstream of headworks, on WSA property, as bid alternatives 1 and 2.

Bidding

After applying for several grants as well as funding through the State Revolving Fund (SRF), WSA identified funding in an Industrial Pretreatment Program (IPP) infrastructure fund set aside to ensure uninterrupted services for industrial and commercial customers by preventing or responding to catastrophic failure of the collection system. The money in this fund came from fines and other IPP revenues that had accrued over the years.

An amendment to the engineering contract for construction-phase services was approved at the April 2015 board meeting, pending identification of project funding that came several months later. Two bids were received, and the contract was awarded to the low bidder in the amount of $753,902 (inclusive of the two bid alternates).

Timeline 2 outlines the project's design and bidding phases.

Construction

The construction schedule was only three months, with substantial completion scheduled for November 11, 2015. Construction constraints included the limited area between a sewer manhole and the RIDOT right-of-way that required the use of 10-foot (3-meter) pipe sections. Another problem was a sewer force main discharging into the upstream manhole on the eastern side of I-95.

The contractor mobilized, completed site preparation and started constructing access pits a few days before the pipe was delivered. (Photo 1, Photo 2)

Once the main influent pipe was cut at the springline and removed, the concrete loss above the water line was visible. (Photo 3)

Prior to sliplining, a mandrel had to be pulled to proof the straightness of the line. After the two upstream segments were proofed, the contractor did not proof the line upstream of the headworks since there was confidence the sliplining pipe would fit within the sewer. (Photo 4)

Following construction of the access pits and the mandrel operation, pipe installation was accomplished by pushing/jacking using an excavator with a hydraulic system that could not exceed the manufacturer's maximum allowable force. Pipe installation and grouting took about seven days. Grouting ports for grout injection were located at bulkheads, with vent lines situated alongside these ports. (Photo 5, Photo 6)

1

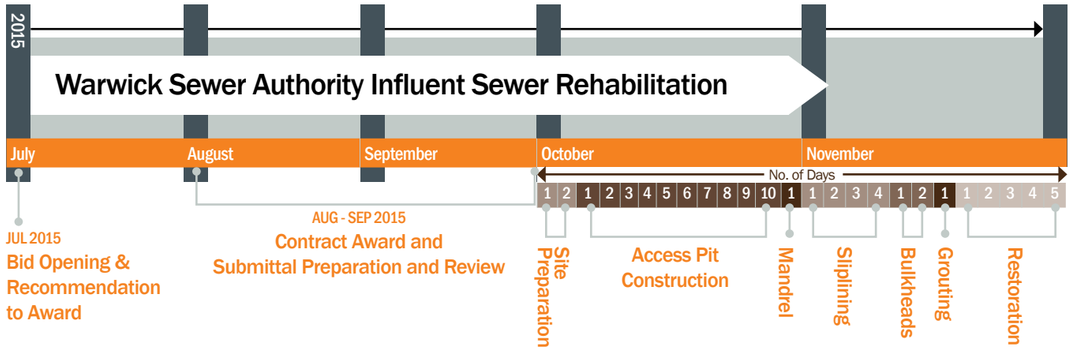

2


3


4

1. Access pit installation 2. Sliplining pipe delivery 3. Loss of 48-inch (120-cenitmeter) pipe wall 4. Mandrel installation

TIMELINE 3: **Construction**



5. Sliplining pipe installation

6. Grout installation line and vent

Construction of bulkheads in the wet was the most difficult aspect of the project. The sewer discharging into one of the upstream manholes of the main influent sewer was a 12-inch (30-centimeter) force main from a pump station that required coordination with WSA for shut down/lock out/tag out and scheduling of night-time work.

During construction, property owners were communicated with regularly. Coordination with ongoing building and levee construction at WSA's treatment facility required continuous involvement of the facility's superintendent and staff.

Timeline 3 illustrates the project schedule from the bid opening through construction completion.

PLAN ON PROBLEMS (LESSONS LEARNED)

What underground utility project would be complete without a few problems? Dealing with the inevitable problems effectively is key. The problems overcome for this project included:

A significant amount of debris (about 2 cubic yards [1.5 cubic meters]) accumulated on the bottom of the pipe, apparently dislodged by the mandrel or the new pipe as it was being pushed downstream into the headworks on a Friday afternoon (of course!). WSA's lead operator (NEWEA Operator of the Year, 2008) observed and quickly responded to a high-torque SCADA alarm on the headworks influent screen that enabled the unit to be shut down, preventing any significant damage. The screen, which was newly installed and still under warranty, sustained only minor cosmetic damage. WSA emergency response staff were immediately called in. They set up a temporary screen in a downstream channel and tried to vacuum out the debris. The pipeline contractor was contacted and sent in a crew and equipment. WSA's contractor and subcontractor for the facility upgrades also helped. Portable pumps and bypass piping were set up quickly so that the debris in the headworks could be removed, requiring a lot of manual labor—digging with shovels. Disaster was averted. There were no damages to the treatment facility, and the headworks area was cleaned up by the end of the day.

It is not clear where, when or how the debris field ended up in the pipe, and it was not anticipated to be present. The lessons learned included not leaving screening equipment in service, mandreling all sewer segments and not relying on flushing/scouring velocities to confirm a clean pipe, using a temporary screen or trash rack to prevent debris from being transported downstream, and laser/sonar profiling of the sewer to confirm debris was not present during construction. (Photo 7)

The following Tuesday, the contractor had problems with leaking bulkheads during the grouting operation. WSA's lead operator noted a spike in the pH of the incoming wastewater and immediately flagged the issue. Fortunately for the Warwick treatment facility, it has excess hydraulic capacity, and flows were diverted to an off-line tank until the leaks were plugged, after which the bypassed wastewater was slowly fed back to the front of the process. This potential contingency was not anticipated, though other agencies should anticipate it in similar future projects. Information about the grouting material was readily available, but an accidental discharge into the system had not been considered. It might have been different if the grouting operation occurred 2 miles (3 kilometers) upstream in the collection system (allowing for some dilution), but for this project it occurred approximately 200 yards (180 meters) upstream from the treatment facility. (Photo 8)

CONCLUSION

The project was completed on time and on budget. The proactive approach to infrastructure rehabilitation and seeking funding over multiple fiscal years reduced costs substantially compared to a collapse and an emergency. The project received positive publicity via local news media outlets as well as positive comments from utility professionals invited to observe the construction. This rehabilitation is technically relevant and applicable to other water utilities facing the challenge of maintaining costly infrastructure.

The authors concede that the general public does not always know of or appreciate the significant efforts made by wastewater professionals to perpetually maintain collection systems and treatment facilities. We are responsible for protecting public health and the environment. As wastewater professionals, we need to lead and persevere to protect our infrastructure and ensure uninterrupted service for our customers.

While the general public may not fully recognize the critical nature of our work, we remain committed to maintaining our grounded and in-ground infrastructure to the best of our abilities.


7. Debris removed from WSA Headworks 1014


8. Grout at WSA Headworks 1006

ACKNOWLEDGEMENTS

- Owner: Warwick Sewer Authority
- Contractor: R. Zoppo Corp.
- Engineer: Brown and Caldwell
- Television Inspection of Pipeline: Inland Waters Inc.
- Source of photos: Bob Fougere, resident project representative, Brown and Caldwell

ABOUT THE AUTHORS

- Janine Burke-Wells, recently elected vice president of NEWEA, is the executive director of the Warwick Sewer Authority. She has worked in the public sector for more than 25 years. She is active in her state operators' association and water quality planning in Rhode Island, and represents the state to the New England Interstate Water Pollution Control Commission. She is also a member of NEWEA's Select Society of Sanitary Sludge Shovelers (5S).
- Charles Gore, P.E., is a senior engineer at Brown and Caldwell with more than 25 years in the engineering field. A member of NEWEA since 1989, he is a past chair of the Collection Systems Committee and received the NEWEA Golden Manhole Award. He specializes in the trenchless rehabilitation of sanitary sewers.

Continuous monitoring and adaptive control—the internet of things transforms stormwater management

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ABSTRACT | Both traditional (gray) and green stormwater management practices have almost entirely been designed as passive systems governed by a fixed control structure to achieve a target water quality and/or quantity objective (i.e., treatment volume, attenuation). Passive systems, however, rarely represent optimal solutions. Advances in low-cost, Internet-accessible controller systems and wired and wireless communications have made real-time and dynamic controls of distributed stormwater facilities now viable, cost-effective options for new construction as well as retrofits. The physical setup of continuous monitoring and adaptive control (CMAC) stormwater systems includes three primary components: a water level sensor to provide data on the facility's current state, an actuated valve to control its hydraulics (typically outflow), and an Internet connection most often provided in remote locations by cellular data. CMAC facilities have been deployed throughout the United States to enhance underperforming facilities and optimize designs for multiple objectives, such as flood protection, water quality treatment, water reuse and channel protection.

KEYWORDS | Stormwater management, adaptive control, design optimization, green infrastructure

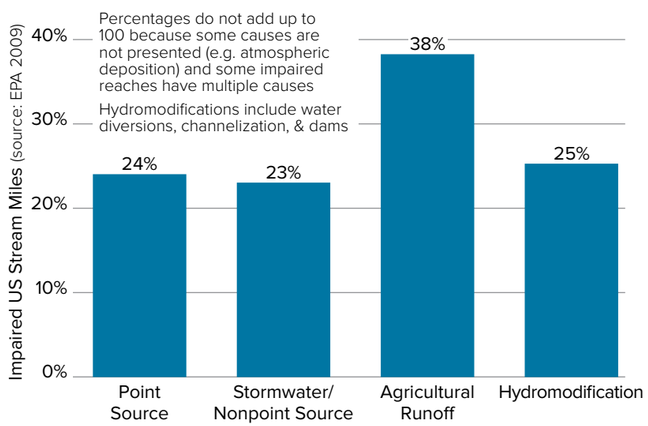


Figure 1. Nonpoint sources have surpassed point sources as the largest cause of river and stream impairments in the United States

INTRODUCTION

All infrastructure must be designed to a level of service. Stormwater management facilities are typically designed to achieve some combination of stated objectives. The most decisive objectives, for example, typically concern the lifetime of the infrastructure and its cost, a calculated design storm frequency and its regulatory or environmental function. Designing facilities to meet stated objectives certainly contributes to the successful management of stormwater, yet optimized design necessitates that the objectives are quantifiably well informed.

The reality in water infrastructure is that the level of service has become a moving target. Stormwater and flood control systems are often designed to treat up to or protect from a statistical storm event (e.g. the 1-inch [2.5-centimeter] event or the event with a 100-year recurrence interval). However, these targets assume stationarity in natural systems. Climate variability and anthropogenic changes have compromised

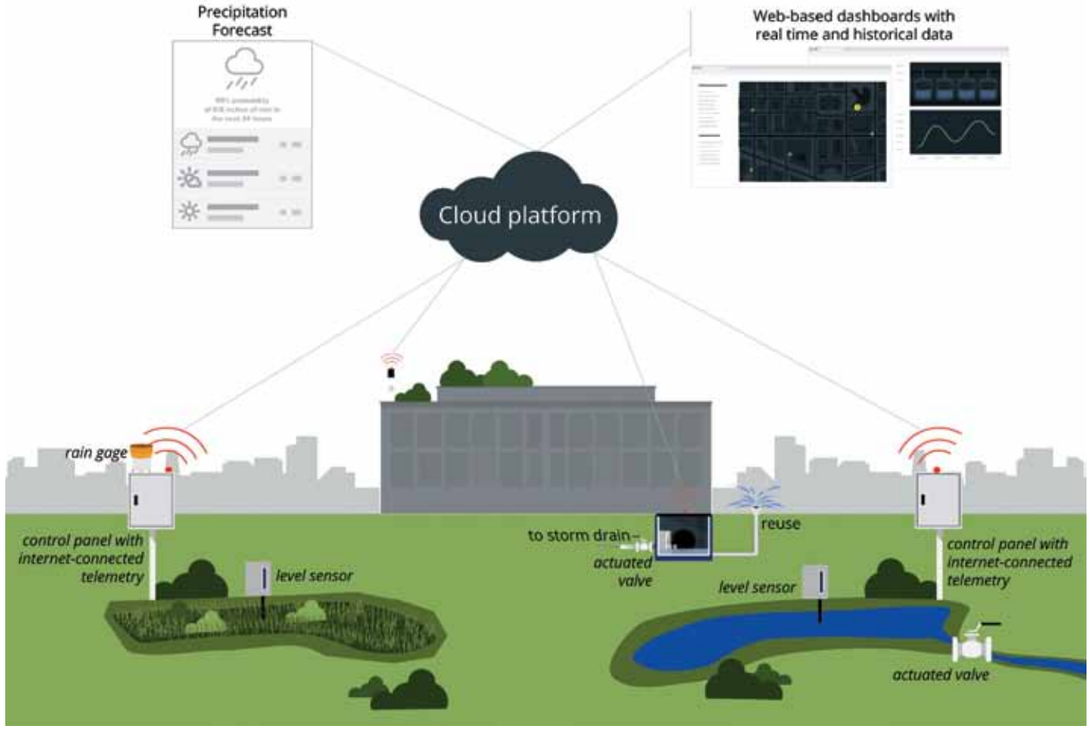


Figure 2. A schematic of CMAC for green and gray infrastructure; field-deployed sensors and Internet connectability provide the ability to verify and improve the performance of distributed stormwater infrastructure

this assumption as it relates to water resources (Milly et al. 2008). Recent studies have observed an increasing historical trend in both average precipitation and extreme events in New England. There is also consensus among researchers projecting an increase in temperature, a decrease in snowpack and an increase in precipitation volume of extreme events in the region (USACE 2015). Future water resource designs must be adaptable to the changing climate, the changing built environment and the changing response from the natural environment.

In addition to designing for an uncertain climate, stormwater managers must design systems at the expense of competing objectives and with limited information about the actual site conditions. Distributed stormwater management and treatment systems are difficult to monitor, and as a result we have limited data to inform the best possible designs. Current performance standards and designs are based on specifications and standards that are not precise on a local or individual facility level. Ideally, stormwater facilities could be designed around the local watershed with adaptive, long-lasting performance standards. Intelligent design would also empower a range of functionality to achieve what are typically considered competing objectives, such as water-quality treatment and flood protection. In the past it has been difficult and costly, if not impossible, to maximize multiple objectives with static design and limited insight.

Advances in environmental sensor and communication technology now allow us to monitor and control stormwater facility performance and to adapt static designs to meet new objectives and optimize achievement of existing ones. The technology that enables these improvements is known as the Internet of Things (IoT). IoT is the network of physical objects embedded with electronics, software, sensors and network connectivity, which enables these objects to collect and exchange data. IoT allows objects to be sensed and controlled remotely across network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems. In the context of stormwater management, IoT applies directly to the continuous monitoring and adaptive control (CMAC) of stormwater control facilities. Continuous, remote monitoring allows stormwater managers to monitor for facility-level performance data, which leads to informed maintenance and regulatory confirmation. Adaptive controls can act on the data collected by continuous monitoring and

intelligently adjust facility hydraulics to increase performance over a wider hydraulic range of conditions while optimizing for multiple objectives.

CMAC technology is not only feasible, it is used by stormwater managers across the United States. It has been successfully deployed to meet a range of stated stormwater management objectives, including: 1) reducing discharge to a combined sewer system while maximizing water available for reuse in a rainwater harvesting system; 2) increasing water-quality treatment while maintaining flood protection of a wet pond; and 3) irrigating a green roof efficiently while providing proof for green infrastructure design. In each case, CMAC consistently and predictably achieves stated objectives while simultaneously providing the data needed to inform intelligent management decisions and planning. By incorporating CMAC into the design of stormwater facilities, the industry can significantly improve asset performance.

BACKGROUND

As with other water management and treatment infrastructure, the performance of distributed stormwater management facilities depends on a variety of site-specific factors. Design assumptions and manuals can go only so far in describing the behavior of any facility. Comprehensive efforts to quantify the performance of stormwater management strategies exist, including the International BMP Database and references developed by individual states and regulatory entities. While these references are well-supported by literature, such as the New Hampshire Stormwater Manual, site-specific factors and maintenance affect the performance of all facilities. Understanding BMP removal efficiencies on a finer scale is critical for stormwater management planning, regulatory enforcement and verification.

In the decades since the Clean Water Act was passed, leading to the National Pollutant Discharge Elimination System (NPDES), regulation has greatly reduced the influence of point sources on water-quality violations in the United States. This success is largely attributed to point source dischargers meeting permit criteria and verifying facility performance through monitoring. As the pollution contribution from nonpoint sources, including urban and agricultural runoff, continues to increase relative to point sources (Figure 1, U.S. Environmental Protection Agency 2009), we must measure treatment and management strategies to verify compliance. By refocusing on verifying nonpoint source controls, the burden can shift away from under-funded POTWs that continue to face increasingly stringent discharge limits in the name of meeting ever-decreasing instream targets.

Throughout the country, to varying degrees of implementation, stormwater regulations rely on design standards and visual inspections to enforce NPDES permit requirements. Direct quantification of distributed facility performance on an individual or aggregated level has not been possible on a large scale due to the high cost of implementation. Advances in low-cost sensor and communication technology are shifting that paradigm. Furthermore, those same technologies are available to improve stormwater designs through active hydraulic control.

These new stormwater management systems are being deployed on cloud-based platforms that automatically monitor the weather forecast and calculate expected runoff volume from future storms. The remote software communicates directly with hydraulic controls and sensors at the stormwater facility, making decisions about how to prepare for incoming storms and how to manage stormwater after events. This active water management solution is particularly powerful in urban areas where space is not available for more traditional stormwater management. The flexibility of intelligent, predictive controls is also evident in its adaptive management. Managers can monitor, evaluate and adjust the logic to optimize performance over time, a cost-efficient solution in an industry often tied to costly construction projects and design modification. Introducing real-time monitoring and control of facilities—be it gray or green infrastructure—allows performance to be directly quantified as a benefit to improved design and function.

METHODOLOGY

These new stormwater management systems require integrated hardware and cloud-based software to function. The hardware needed is an actuated valve, a water-level sensor and a control panel with telemetry. Figure 2 shows how these components function together at stormwater management facilities. The components can be installed as a retrofit or in new construction to enhance the functionality of a facility. Many types of green and gray stormwater infrastructure can be enhanced with CMAC, including bioretention cells, wet ponds, dry ponds, infiltration basins, green roofs, cisterns, rainwater harvesting and site connection tanks.

These hardware components must be robust and able to function in harsh environments so that service is rarely, if ever, interrupted. As such, solenoids, slide gates and butterfly valves have shown high reliability for hydraulic control along with pressure transducers and ultrasonic sensors to measure water level. Also critical is access to the cloud-based control system through an Internet connection. Cellular data connections are often the most robust option at distributed locations.

These hardware components communicate through a cellular modem connection at the control panel with a cloud-based control system. While the logic on these systems can vary, it generally follows this sequence:

- Inspect the current 24-hour probability of precipitation (POP) and quantitative precipitation forecast (QPF) from NOAA.
- Calculate the expected runoff volume into the facility based on watershed characteristics and the qualifying parts of the forecast (usually set at 70 percent POP and 0.02 inches [0.5 mm] QPF).
- If the expected runoff volume is greater than the available volume in the facility: Open the valve to release water, until the next statement is true.
- If the expected runoff volume is less than or equal to the available volume in the facility: Close the valve.

This sequence is repeated on an interval such that the system can constantly adjust to changing forecasts and changing water levels. This enables a robust feedback loop that allows the system to self-correct as the forecast or actual rainfall, and thus water level, changes.

Also essential in these systems is the integration of fail-safes where data could be wrong or communication could be lost. The first is sensor trust; subroutines can be enabled so that alarms are sent and logic is changed if data from a sensor is implausible. The second is loss of Internet connection; local logic is always needed such that if connection to the Internet is lost the system can default to a safe state. And finally, the loss of power must be planned such that a valve will return to a safe state using a battery backup or an auto-return actuator.

The system described above provides the basics of these modern stormwater control systems. Additional logic and parameters can be configured for more sophisticated outcomes. These include maximizing retention time, modulating a valve to control release rate and preparing systems for very large events. Figure 3 shows two logic configurations targeting different primary objectives: 1) rainwater harvesting, to maximize retention time and water availability; and 2) smart detention, to minimize wet weather discharge and meet a specific retention time.

Essential in all of these applications are data on which to base control decisions, and inherent in the cloud-based systems is access to these data.

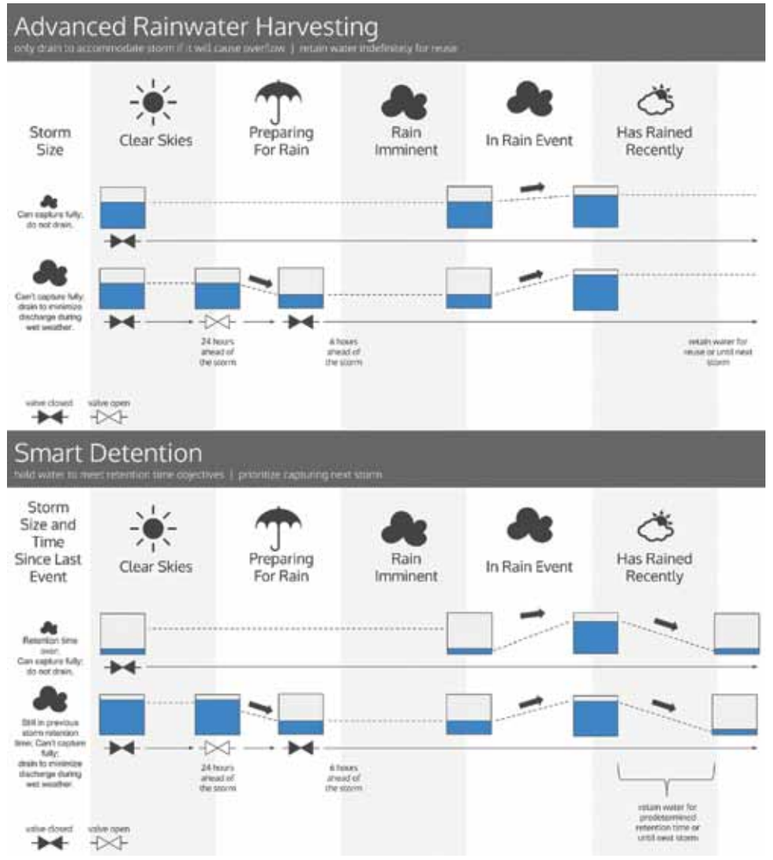


Figure 3. CMAC logic diagrams of advanced rainwater harvesting (top) and smart detention (bottom)

Data access often takes the form of a web-based dashboard that allows a user to view, explore and download data. In addition, these dashboards can deliver remote, manual control of these systems. The data presented on a web-dashboard offer the ability to continuously monitor performance. Other sensors, such as water-quality sensors (total suspended solids, nitrate, pH, temperature, dissolved oxygen, etc.), can be added to monitor water quality impacts and performance of a facility in real-time.

Security is paramount for complete vertical integration of these systems. Communication between hardware and the cloud-based platform uses hardware-driven, message-level encryption for robust security without excessive power consumption. Permissions to access data on the web-based interface are granted based on a user's role, allowing for granular control and transparency around who can view the data and execute remote control operations. Communications with the web browser are secured with modern versions of industry-standard Transport

Figure 4. Six, 1,000-gallon (3,790-liter) cisterns in the basement of EPA headquarters in Washington, D.C., collect runoff from the building roof to be used for on-site irrigation. Adaptive control of the cisterns has reduced wet weather flow to the combined sewer by 80 percent.

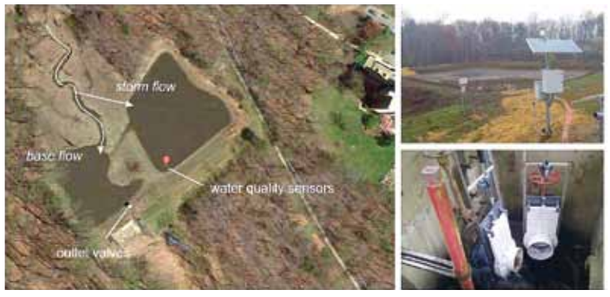


Figure 5. Aerial image of 15 acre-foot (18,500-cubic meter) retention pond with 440-acre (180-hectare) watershed on Sligo Creek in Montgomery County, Maryland (left); solar-powered control panel with cellular data connectivity (top right); and retrofitted outlet structure with actuated slide gate valves passing only baseflow (bottom right)

Layer Security (TLS). All these measures result in a secure and robust automated control system.

The components and methods described above provide a vertically integrated system for intelligently controlling distributed systems under challenging conditions.

CASE STUDIES AND RESULTS

Improve function using CMAC in design

Rainwater harvesting (RWH) systems are used worldwide as an alternative source of water. In the humid regions of the United States these systems often supplement potable water for landscape and lawn irrigation (Debusk et al. 2013). Such was the case for an RWH system installed at EPA headquarters in Washington D.C. Six 1,000-gallon (3,790-liter) water-storage tanks (cisterns) collect runoff from approximately 10,000 square feet (930 square meters) of rooftop to irrigate roughly 13,500 square feet (1,254 square meters) of landscaped area (Figure 4). The six tanks were hydraulically connected such that they function as one individual system.

In addition to being a supplemental water source, RWH systems also can provide stormwater management control by decreasing the volume and rate of stormwater leaving a site. The cistern acts as a temporary holding facility for stormwater runoff. When the stored water is used for irrigation or in other ways, part of the tank is emptied, creating storage capacity for runoff to be generated by the next rainfall event. However, if minimal water is extracted from the system, there is no storage room available inside the cistern when it rains, and the runoff leaves the site unmitigated as overflow. As with most systems installed for irrigation in humid regions, usage of the collected rainwater at the EPA site was minimal: Over the span of one year, less than 5 gallons (19 liters) of stored rainwater was extracted from the system for irrigation. Thus, before CMAC was deployed, the system provided no mitigation for stormwater leaving the site.

The CMAC system was implemented at the EPA site in April 2014 and was fully online and operational by May 1, 2014. As no water was being used for irrigation, the stormwater management benefit achieved by the RWH system relied solely on the CMAC system. Data collected between May 1, 2014, and May 1, 2015 were used to evaluate the performance of the RWH system. Of the 110 storm events that occurred during the one-year period, only 21 (19 percent) resulted in wet weather release (release during a rain event). For the 89 storms that did not result in wet weather release, the volume and peak flow reduction was inherently 100 percent. However, incorporating CMAC still significantly reduced wet weather volume releases and peak flow rates for storms that did release water during a rain event. Reductions for these storms alone averaged 82 and 86 percent for volume release and peak flow rates, respectively, bringing overall average system reductions to 97 percent for both volume and peak flow rates.

Enhance existing stormwater management

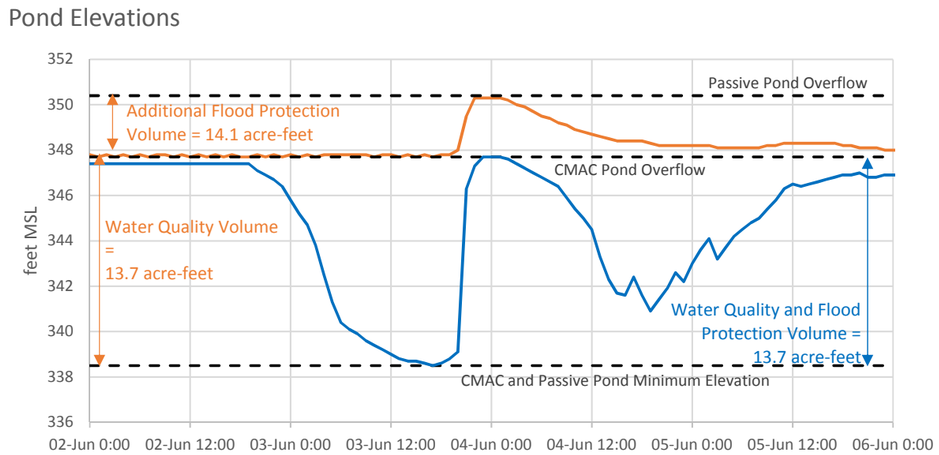
Both green and gray infrastructure systems using static methods can eventually underperform as site conditions and regulations change over time. CMAC retrofits can increase the efficiency and performance of existing systems using compact sensor and outlet control technologies. Two recently deployed CMAC systems, one at a large wet pond and another at a green roof, have effectively doubled the stormwater retention and treatment capacity of the existing BMPs.

Wet Pond, Sligo Creek headwaters, Montgomery County, Maryland

Sligo Creek is a tributary of the Anacostia River, which is impaired for nutrients, sediments, fecal bacteria, impacts to biological communities and toxics—polychlorinated biphenyls (PCBs) and heptachlor epoxide, trash/debris, and PCBs in fish tissue in tidal waters (MDE and DOEE 2008). Eventually draining to the Chesapeake Bay, this site is part of the 64,000-square-mile (166,000-square-kilometer) watershed subject to EPA's "pollution diet" calling for a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus and 20 percent reduction in sediment (EPA 2010). A 15-acre-foot (18,500-cubic-meter) wet pond (Figure 5) collects and retains stormwater draining from 440 acres (180 hectares) at the headwaters of Sligo Creek. The pond provides 24-hour retention of just 3 acre-feet (3,700 cubic meters), falling short of Maryland's requirement to treat 1 inch (2.5 centimeters) of rainfall runoff from impervious surfaces in the drainage area.

A CMAC retrofit, supported by a National Fish and Wildlife Foundation (NFWF) grant, was implemented in November 2015 that installed actuated valves at the outlet structure and a water-level sensor, and connected both remotely to cloud-based software. The software uses real-time forecast information from NOAA to determine the timing and expected volume of incoming storm events. In advance of the storm, the outlet valves are closed such that only Sligo Creek baseflow passes. During and after the storm, the pond retains up to approximately 9 acre-feet (11,000 cubic meters) of runoff volume for a predetermined length of time, currently configured to be 48 hours. After the retention period ends, the software sends a signal to open the valves to release the water downstream. If another storm event is forecasted during the retention period, the software will prepare the pond for the expected incoming volume, thereby maintaining critical flood prevention capacity when it is needed.

Figure 6 shows the results of modeling, illustrating pond behavior with and without CMAC design. The pond without CMAC technology would need



Average Stormwater Retention Time (hours)

	Passive Design	CMAC Design
Long Term	195	170
Wettest Month	80	60

Figure 6. Single-event time series graphs and summary results from a long-term model simulation showing that a passive pond would need to be twice as large as a CMAC pond to achieve similar treatment of stormwater runoff

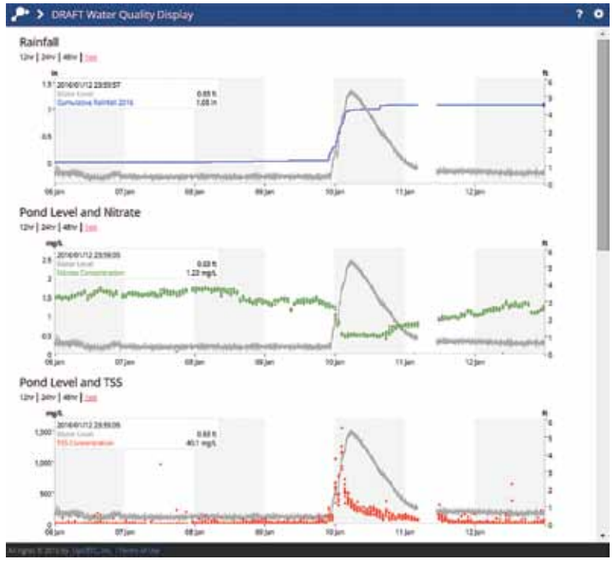


Figure 7. Example real-time and continuous water-quality data available on a web-based dashboard from CMAC systems to verify performance

Figure 8. The CMAC green roof at Villanova University (bottom); indoor cistern collecting runoff from additional, non-green roof to be used for irrigation of green roof (top left); control panel and weather station (top right)

to be twice as large to achieve similar performance over time. The project continuously monitors temperature, nitrate, total suspended solids, conductivity, pH and turbidity to evaluate the CMAC retrofit performance over one year. Figure 7 shows real-time environmental data streaming to a web-based interface, making it immediately available for viewing, download and analysis by project stakeholders.

Green roof, Villanova University, Pennsylvania

Through the Villanova Urban Stormwater Partnership, Villanova University conducts research to understand and optimize BMP performance and promotes innovative designs and technology to the industry. As part of a National Science Foundation (NSF) grant, the university installed a CMAC solution for an existing green roof site. A cistern that collects runoff from a non-green roof is dynamically connected to the green roof to use the evapotranspirative capacity of the vegetated roof year-round (Figure 8).

The green roof covers 750 square feet (70 square meters) and is used for research as well as reduction in stormwater runoff to the university's storm drain system. The 500-gallon (1,890-liter) cistern collects runoff from an additional 840 square feet (78 square meters) of non-green roof and has a water-level sensor, actuated valve and connection to the cloud-based decision software. The software maximizes runoff capture from the non-green roof and optimizes irrigation to the green roof. Between storms the intelligent irrigation logic releases water from the cistern to the green roof based on real-time soil moisture sensor readings. In advance of a storm, the software calculates the timing and expected runoff volume of the event, stops irrigation to the green roof and discharges water from the cistern to the storm drain as needed to make room for the incoming runoff. These automated steps prepare both the green and non-green roofs for maximum runoff capture while reducing potable water demand for irrigation. During an event the green roof performs as designed to capture direct rainfall, and the cistern valve is closed to capture the non-green roof runoff. The researchers can also monitor dozens of sensors on a single web-based interface, shown on Figure 9.

CONCLUSIONS

Advances in sensor technology and Internet connectivity offer an important opportunity for stormwater managers to design smarter, more cost-efficient facilities. Continuous monitoring and verification of performance on an individual facility scale is now possible. Designers and operators of distributed infrastructure can leverage the capabilities of IoT to directly control the hydraulic behavior of facilities based on real site conditions and local weather forecasts. Moving away from static design assumptions is critical to adapt to the changing climate and nonstationarity in water resources conditions.

Both green and gray stormwater infrastructure can benefit from more intelligent, adaptive design approaches. CMAC installations across the country prove that this technology is viable and cost-effective. Many more projects than could be included in this article demonstrate positive performance over time. The small subset presented here shows that:

- Adding CMAC to an underused rainwater harvesting system has eliminated 80 percent of discharges to a combined sewer during wet weather.
- An underperforming pond retrofitted with CMAC will achieve similar target water-quality treatment objectives as a passive storage facility twice its size.
- Green infrastructure designed only to capture and treat its own direct runoff, such as green roofs, can be retrofitted with CMAC storage to capture and treat uncontrolled runoff from other impervious surfaces without compromising existing performance.

CMAC offers a promising solution to the persistent stormwater issues that regulators, municipalities and private landowners continue to face: water availability, water quality, protection of property and protection of public health and safety.

Figure 9. Web-based dashboard view of green roof sensor and weather data

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- Ms. Lefkowitz is a professionally registered civil engineer with a focus on water resources. She holds a bachelor's and master's degree in engineering from Villanova University. She worked for eight years at CDM Smith on large-scale watershed management and integrated water supply planning studies in New England and around the world, providing computer modeling analysis of these water systems to support decision-making with sound science. She joined OptiRTC, Inc., in 2015 to develop a new and powerful way to manage water, by combining web-based technology with readily available field sensors.
- Ms. Sarmanian manages marketing and communications at Opti. She works to develop clear and consistent communication around critical new technologies in stormwater management. She holds a bachelor of arts in international relations from Boston University.
- Mr. Quigley is the founder and CEO of Opti. He has more than 20 years of experience in solving complex engineering problems as well as leading and managing major projects and organizations. Before founding Opti, he was a principal at Geosyntec Consultants and past member of the board of directors. Mr. Quigley holds a master of science in civil engineering from Oregon State University and a bachelor of science in environmental engineering from Notre Dame.

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Detecting overflows with a mix of old and new technologies

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ABSTRACT | In 2013, the Boston Water and Sewer Commission (Commission) initiated a pilot study of 10 combined sewer overflow (CSO) structures to determine if current technology is reliable enough to measure overflow activation, duration and volume with confidence for public notification on the Commission's web site. A hydraulic model is being used for regulatory reporting for volume, but a more immediate system is needed for public notification. This paper describes an innovative method for understanding the regulator behavior and learning how to identify overflows by looking for repeatable patterns in plots of depths and velocities. The incoming and overflow lines in all the regulators were monitored with depth and velocity sensors. Plots of these depths and velocities, or scattergraphs, revealed patterns used to identify when overflows began and ended.

KEYWORDS | Combined sewers, combined sewer overflow, CSO, flow monitoring, scattergraph, tidal influence

INTRODUCTION

The Boston Water and Sewer Commission (Commission) developed a pilot program to identify combined sewer overflows (CSOs) and to provide the public with this information. Several years ago, a plan to notify the public about CSOs was submitted to the regulatory agencies as required by the Commission's CSO National Pollutant Discharge Elimination System Permit. To complete this plan, the Commission is investigating whether current technology can be used to identify when overflows occur and whether overflow information can be posted onto a web page within a reasonable time after the overflow.

In 2013, the Commission hired a flow service provider to conduct a two-year pilot program to identify overflows and develop a web page for posting overflow information. Currently, the subcontractor collects data from 10 regulator locations (Figure 1) and stores the data on a third-party web site. In addition to storing data, this site can perform calculations and logic tests, which can identify overflow conditions. Over the past two years the pilot program has analyzed data from ten significant storms, comparing the various calculations to gain confidence in identifying the beginning and end of overflow events. At many of the regulators, confidence in identifying the overflow is high; however, data from more storms will be needed to increase the confidence at several locations.

Figure 1. Boston Water and Sewer CSO pilot location map

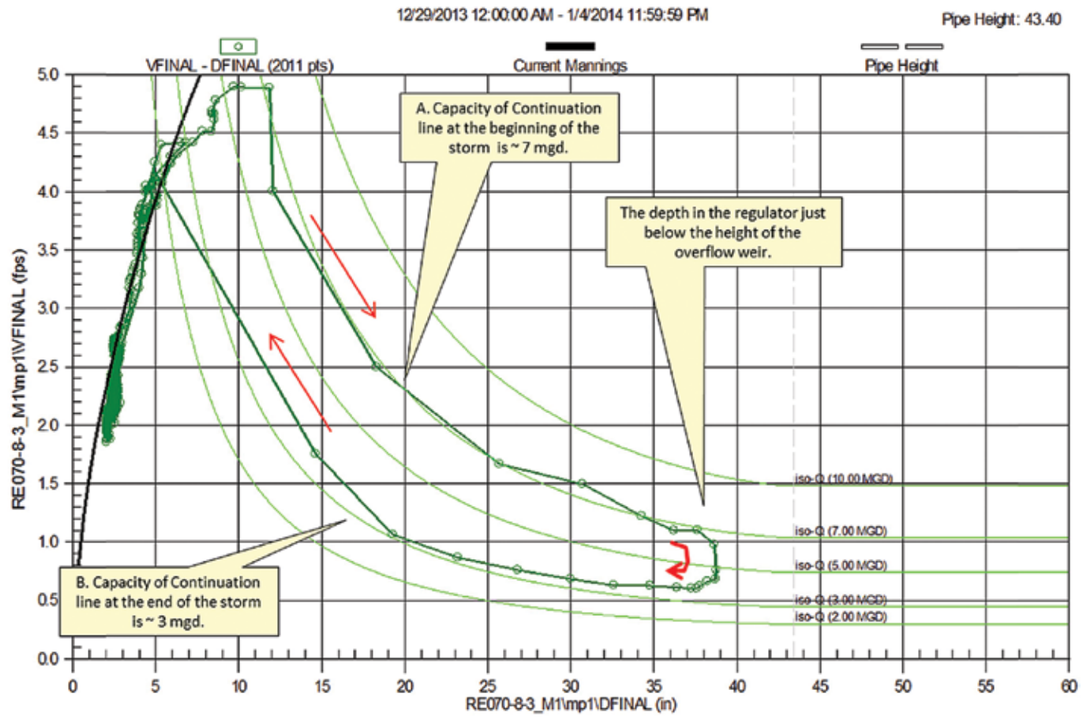

Figure 2. Scattergraph of RE070/8-3 with Iso-Q lines

BACKGROUND

Almost 20 years ago the Massachusetts Water Resources Authority (MWRA) developed a long-term control plan to reduce overflows from the combined sewer areas in Boston as well as Cambridge, Somerville and Chelsea. The goal was to eliminate overflows to receiving waters used for swimming, and reduce overflows to the remaining receiving waters such as Boston Harbor to four or fewer times a year. The regulator locations in the pilot program can discharge into Boston Harbor or Fort Point Channel, an embayment of the harbor.

Many programs in the past attempted to identify overflows by focusing on measuring depth and velocity near the overflow weirs or in the outfall pipes. If stormwater or tidal water was present in the outfall pipe downstream of the regulator, the measurements at the overflow weirs were often not useful. This program approached data collection differently; depth and velocity sensors were installed in the inlet pipes and downstream of the weirs. Data were collected in five-minute intervals so that rapidly changing conditions could be observed during an overflow. The project monitors the tidal heights in Boston Harbor, since all of the regulators are affected by the height of the tide. To compare water levels at the sensors to the water level in Boston Harbor, each location was field surveyed with elevations established for all the sensors.

Ten significant rain events from 1.5 inches (3.8 centimeters) to nearly 4 inches (10 centimeters) have occurred during the project. During many of these events stormwater or tidal water was present in the overflow pipes and affected the ability of the sensors near the overflow weirs to measure velocity with sufficient reliability, making it difficult to identify whether an overflow occurred.

Fortunately, the inlet sensors were not affected by tide or stormwater, and the full range of incoming combined sewer flows was measured. Depths and velocities from the inlet sensors were plotted onto scattergraphs to observe patterns in the data. During the initial stages of the storms, depth and velocity increased together as predicted by Manning's equation. However, as each storm progressed this relationship broke down; depth continued to increase while velocity decreased. The scatterplot presented above (Figure 2) shows depth and velocity points generally following a line of constant flow (Iso-Q lines). This line of constant value represents the capacity of the regulator to convey flows to the nearby interceptor.

Regulator capacity is specific to a location and is important in identifying an overflow. When the inlet flow exceeds the regulator capacity, the overflow begins and the excess flow discharges into the overflow pipe. After the storm ends the inlet flow recedes

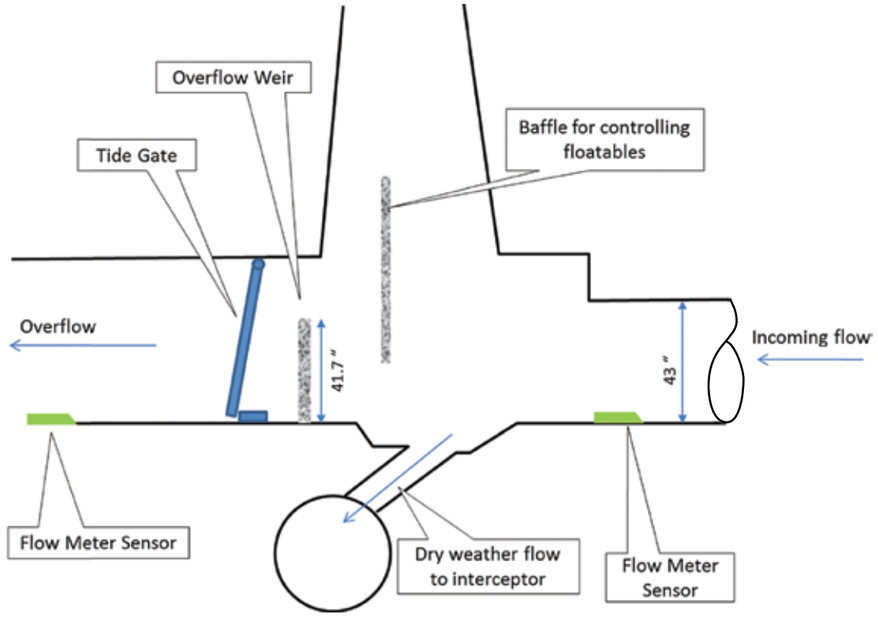

Figure 3. Simple schematic of regulator RE070/8-3

to a level that the regulator can convey to the nearby interceptor, or high tide forces the tide gate shut.

The capacity of the continuation lines for many of the program's regulators was determined with reasonable confidence. The ability of the regulator to convey flows through the continuation line to the interceptor is influenced by the conditions in the interceptor. As the interceptor fills with water during large storms, less flow is conveyed into the interceptor. The scattergraphs include Iso-Q lines used to demonstrate when the flows begin to diminish.

METHODOLOGY

The historical approach to measuring CSOs has been to install a meter in the overflow pipe to obtain an actual measurement of the overflow when it occurred. However, measuring in the overflow pipe is often affected by the conditions in the downstream portions of the overflow. In pipes with an invert below mean tide elevation, the flow meter will constantly register either positive or negative flows as the tides flood and ebb.

For this work the Commission measured all flows entering a regulator plus the overflow. Figure 3 is a simplified schematic of regulator RE070/8-3 showing that dry weather flow is diverted to an interceptor through a small connecting sewer. The incoming 43-inch (1,092-millimeter) sewer conveys both dry and wet weather flow into the regulator and wet weather flow that exceeds the capacity of the 12-inch (305-millimeter) connecting sewer.

Wet weather flows that exceed the connecting sewer capacity, the 41.7-inch (1,060-millimeter) height of the overflow weir, and the elevation of the tide outside the tide gate will cause an overflow event. Metering at all locations will provide the most information about how the regulator functions.

The study of scattergraphs is a relatively new discipline in flow metering, and many have not been exposed to it. One source for information about scattergraphs for flow metering is adsenv.com/scattergraphs.

Scattergraphs for CSO regulators are some of the most complex because the hydraulic conditions are a combination of free flow and variable backwater conditions caused by changing tide elevations. But no matter how complex the hydraulic conditions, the rules of gravity flow must be adhered to, and that behavior must be evident in scattergraphs.

RESULTS

Interesting patterns were observed in the data, and analysts attempted to understand the causes. A simple observation occurs during events in which no overflow occurs. Figure 2 shows a frequent pattern in which the flow rate in the ascending leg is higher than that in the descending leg. The key value from this graphic is the addition of Iso-Q lines. These lines are similar to the elevation contour lines on a topographic map where the same elevation is indicated at any point on a contour line. In this display any depth-velocity point along an Iso-Q line is at the same flow rate. The data shown in this example has a clockwise pattern.

The presumed cause of this clockwise pattern is that the interceptor has more capacity during the first part of the storm, and is surcharged or affected by downstream pump activity during the recovery period, allowing less flow to enter. This has not been verified by any metering data.

A second example is a scattergraph from an event that just overtopped the weir with no downstream tidal influence. There is a telltale data pattern from a meter just upstream of a weir in this condition, and it is a near-linear pattern as shown in Figure 4.

Figure 5 is a scattergraph of the incoming meter, and it shows the beginning of this linear pattern for just three data points that exceeded the weir height of approximately 41.7 inches (1,060 millimeters). The flow rate to the continuation line, as shown by the Iso-Q lines, was 7 million gallons per day (mgd) (0.31 m^3/s), and as the depth over-topped the weir, flows increased to 8.5 mgd (0.37 m^3/s). The peak overflow rate can be calculated as (8.5 mgd-7.0 mgd = 1.5 mgd) (0.066 m^3/s). The duration is approximately 15 minutes (three data points), and the overflow volume can be calculated as well.

A more complex storm revealing a counterclockwise pattern was observed during a December 9, 2014 event, shown on Figure 6. The overflow weir is around 41.7 inches (1,060 millimeters) in height, and both the ascending leg and descending leg of this scattergraph pattern show that the flow to the regional interceptor was approximately 3 mgd (0.13 m^3/s). In concept, any flow rate greater than this flow rate will be the overflow rate. The total overflow volume can be estimated by subtracting 3 mgd (0.13 m^3/s) from the flow rate and multiplying it by five minutes (the data interval).

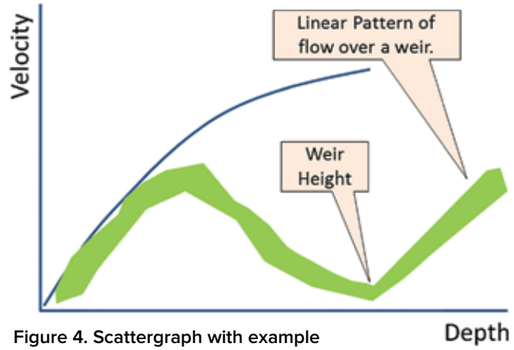

Figure 4. Scattergraph with example of flow over a weir with no restriction

To aid the reader we have placed red letters on the scattergraph, Figure 6 and the Elevations Graph (Figure 7) at key points to be a guide during the overflow for the December 9, 2014 storm event. In Figure 6, the initial storm flow (A) is following the 3 mgd (0.13 m^3/s) Iso-Q line up until (B), when the flow peaks at 5 mgd (0.22 m^3/s) and then subsides (C). An increase in the storm intensity creates a second, even higher peak (D) at more than 10 mgd (0.44 m^3/s) before receding back (E) into the interceptor after the storm. This overflow event lasted approximately

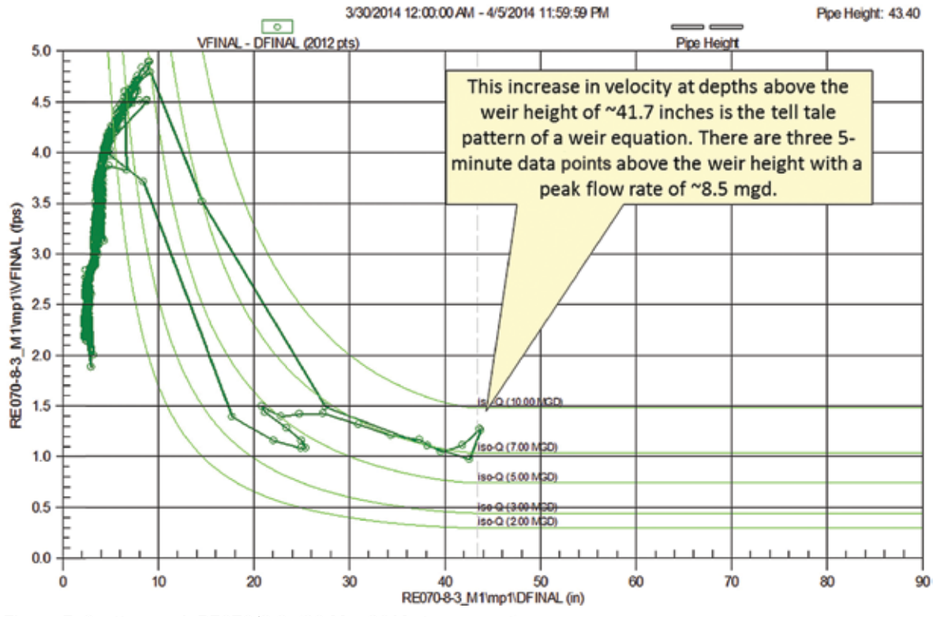

Figure 5. Scattergraph RE070/8-3 (30 Mar 2014 storm event)

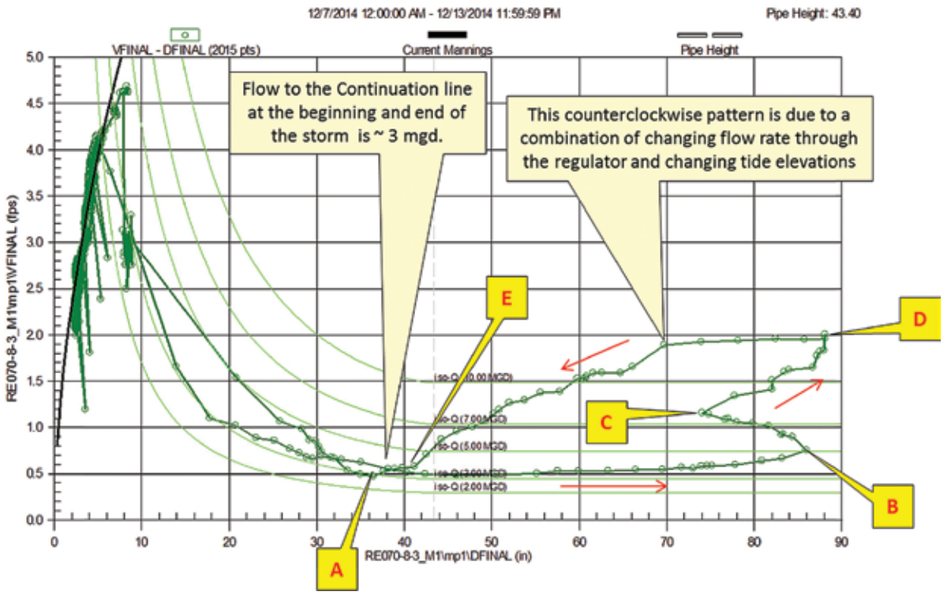

Figure 6. Scattergraph RE070/8-3 (9 Dec 2014 storm event)

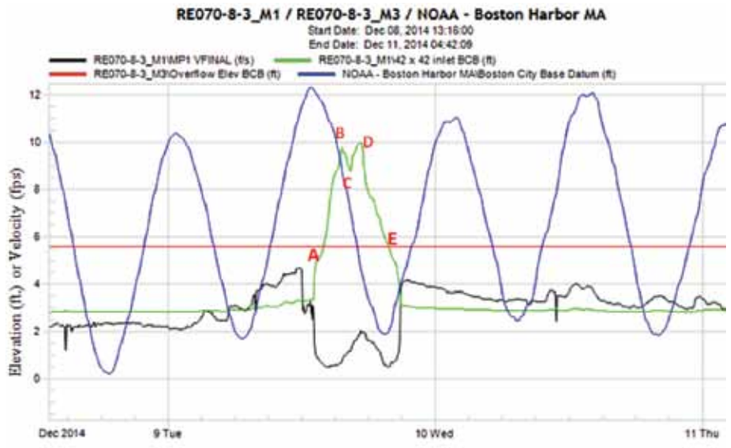

Figure 7. Elevations graph at RE070/8-3 (9 Dec 2014 storm event)

six hours, and the duration can be determined by observing all the five-minute data points greater than the weir height of 41.7 inches (1,060 millimeters). The Elevations Graph (Figure 7) for this same December 9, 2014 storm event provides a perspective many analysts are used to. The overflow begins when the water level in the regulator overtops the weir at (A) and continues until (E). The tide as measured in Boston Harbor is in blue, the overflow weir is in red, the incoming water elevation is in green, and all three levels are in the same datum.

It was noted that these scattergraph patterns were both clockwise and counterclockwise, and an attempt was made to determine if additional value or meaning could be extracted from these patterns. After review of the tide elevation and measured flow, it is surmised that the clockwise and counterclockwise patterns were due to two independent variables affecting the measurements.

In a sewer with no impact from a downstream sewer, the velocity must change when depth changes. In normal open-channel gravity flow, an increase in depth results in higher velocity, conforming to Manning's equation. If the sewer has a downstream restriction, an increase in depth will result in velocity conforming to the Iso-Q line matching the capacity of the restriction. If the downstream depth is controlled by another factor, such as tide, the rules change.

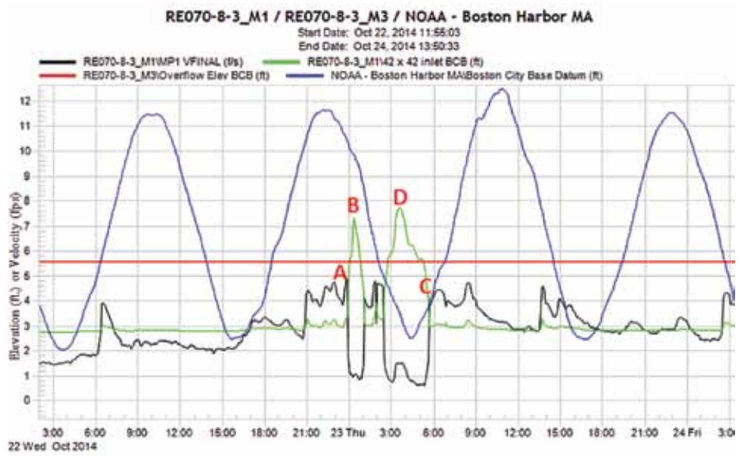

Figure 8. Elevations graph at RE070/8-3 (23 Oct 2014 storm event)

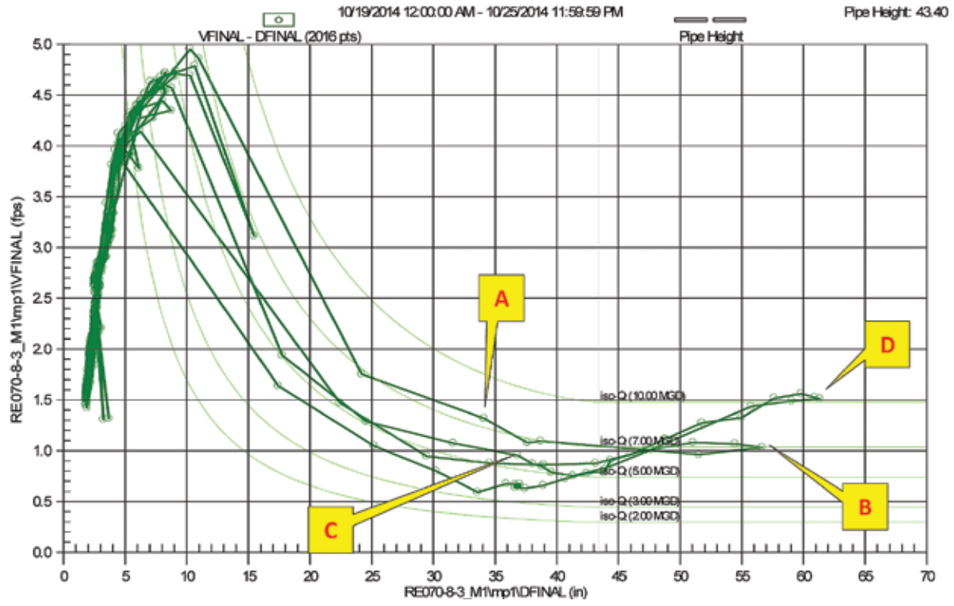

Figure 9. Scattergraph RE070/8-3 (23 Oct 2014 storm event)

The rain event on October 23, 2014, is another complex example, as it occurred in two stages. The Elevations Graph for RE 070/8-3 (Figure 8) shows four significant points during the storm labeled A, B, C and D. The corresponding scattergraph (Figure 9) is similarly labeled.

In this example, a 1:00 AM storm occurred near high tide, and the depth in the regulator could not overcome the elevation of the tide, so no overflow occurred (event B). A second storm occurred at 3:00 AM near low tide, and the depth and velocity of the incoming sewer clearly showed an overflow occurred (event D), seen from the increase in Iso-Q from 7 mgd (0.30 m^3/s) to 10 mgd (0.44 m^3/s). No clockwise or counterclockwise pattern was noticeable in either of these two events.

CONCLUSIONS

This project measured all flow entering each regulator and the overflow in a single outfall pipe. The purpose was to understand how the regulators function and also to have sufficient data to calibrate hydraulic models if desired. Going in, it was assumed data from the overflow pipe would be the primary source of CSO information, and other data collected would support or verify what was observed during the overflow. Great effort was taken to convert all depth data to a common elevation so that elevation

comparisons between tides and a given regulator could test for an overflow. Ultimately, tidal elevations could not be compared to the water elevations in the overflow pipe, because the tide gates downstream or stormwater already in the overflow pipe influenced measurements and minimized the ability to assume overflow activation from depth alone.

After examining data collected from entering and leaving the regulator, it was apparent that incoming data was much more reliable and should be the primary source of information. The data from the outfall pipe should be used to support or verify an event. This is clearly a reversal of traditional views on how to track CSO activity.

The Commission has measured flow for more than 20 years and has watched the technology improve steadily over that time. Improvements have occurred in the ability of the instruments to accurately and repeatedly measure depth and velocity, and wireless communication can create near-time access to the data. This advanced technology in the incoming sewers can now reveal both the subtle and dramatic hydraulic changes in the regulator. Scattergraphs now allow three separate flows (incoming flow, continuation flow and overflow) to be determined with one meter.

The regulator used for the examples in this paper is a simple regulator with a single line in and a continuation line to the interceptor and an overflow line. If the regulator has multiple incoming lines, this technique can predict the onset and duration of an overflow if the largest pipe is measured; however, to determine the total overflow volume the summation of flows from all incoming lines is required. This method works well only for those regulators in which the continuation line is full prior to the onset of the overflow.

The regulator's capacity to convey flows to the interceptor, or the continuation line capacity, depends on the interceptor conditions and is often difficult to establish precisely. Using continuation line capacity to calculate overflow volumes is not recommended. If the Commission plans to use continuation line capacity to identify when overflows begin, it must consider placing a meter in the interceptor as well as in the inflow line.

With the reliability of current metering technology and wireless communication, overflows can be identified in simple regulators with only a meter in the line coming into the regulator. In the simple regulators, the Commission could omit measurements in the overflow lines and rely on metering flows into the regulator.

ABOUT THE AUTHORS

- Paul Keohan, P.E., is a project manager at the Boston Water and Sewer Commission. He has worked for the Commission for more than 25 years and has been a member of NEWEA and WEF since 1989. He was also the co-chair for the 2005 WEF Collections System Specialty Conference held in Boston. He has received a WEF Collection Systems Committee Golden Manhole Award. Throughout his career, he has been involved in CSOs and collection systems modeling.
- Patrick Stevens, P.E., is the vice president of engineering for ADS Environmental Services with 45 years of experience in the environmental field. He has published several papers on collection system flow metering, and is a founding member of the American Society of Sewer Sociologists.
- Michael Armes, PMP, is a senior project manager for ADS Environmental Services with 18 years of experience in the environmental field. He manages projects in the northeastern area of North America.

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Editor's Note: This article is reprinted with permission from *WEF 2015 Collection Systems Specialty Conference.*

NEWEA
WORKING FOR WATER QUALITY

Connecticut State Director Report

by Jay Sheehan
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Proactive financial planning—the first step to utility resiliency

In 2016, Connecticut will be hosting another class of 27 students for its now famous Wastewater Manager's Leadership Training. The Connecticut Leadership trainers understand the importance of financial planning and therefore dedicate an entire day as well as other days to financial topics such as capital planning, asset management, labor issues, budgeting and

The importance of utility finance is often lost on the public

related topics. This dedication ensures that the graduating class of new wastewater managers will be prepared for the financial realities they will encounter and have the tools and skills to address them, avoiding short-term decision-making mistakes such as those at the root of the problems in Flint, Michigan.

Resiliency continues to be one of the most prominent topics in our world with blizzards, major flooding and hurricanes becoming annual events on the East Coast while drought, fire and mudslides are now routine on the West Coast. Although no utility can be fully resilient or immune from natural disasters, utility professionals can lessen the impacts of these severe events. Specifically, many items can be addressed with adequate planning and funding of infrastructure. This means that fiscal resiliency and financial sustainability become a water/wastewater utility's primary tool in combating climate change. Having an ample capital reserve and a proactive asset management program, and being aggressive around climate adaptation is the most effective means to being truly resilient.

As we know, the importance of utility finance is often lost on the public, which does not know how hard water and wastewater professionals work to continually streamline operations, leverage new technology for labor force optimization, conduct long-term planning and respond to emergencies. When fiscal sustainability is not satisfied, utilities can face incredible challenges. Consider the situation in Flint. In recent years, Flint has been facing an economic crisis that could bankrupt the city. In the 1960s and 1970s, Flint was growing with jobs supporting a thriving automotive industry. As the automotive economy changed in the 1980s and beyond, the city's population declined rapidly, driving Flint from a Top 50 most populous city in the United States to one outside the Top 300. As the economy and population tanked, Flint was taken into a form of state receivership that forced it to make decisions based on short-term savings over long-term value.

Faced with a desperate fiscal situation, the Flint City Council agreed to switch water sources from the current Detroit Metro reservoirs to the lesser-quality Flint River to save the city and utility payers about $20 per resident per year. Numbeo.com reports that basic annual utilities (electricity, heating, water, garbage) in Flint are $2,200. In return for reducing the annual utility bill by the equivalent of 2.5 percent, or by about the per capita cost annually of one average restaurant meal for three, the city will have to deal with multi-millions of dollars of insurance claims and other restitution. This shows the repercussions that can be faced by utilities that are not fiscally resilient or financially proactive. We can take away many lessons from the unfortunate situation in Flint, but a noteworthy one is that making fiscally responsible long-term decisions (such as an ample capital reserve, a proactive asset management program and assertiveness around climate adaptation) is effective in being a truly resilient utility. Thoughtful long-term technical and financial planning will serve utilities well in preventing short-term miscues.

2016 Connecticut wastewater events

Event	Date (2016)	Location
CWPAA Annual Tradeshow	April 28	New Life Church, Wallingford
CAWPCA Spring Forum & Annual Meeting	May 6	Aquaturf, Southington
Connecticut Wastewater Appreciation Day	May 20	Various locations
Plant Tour	Late-May	Manchester WPCF
CWPAA Sewer Open	June 17	Skunkamaug Country Club, Coventry
CWPAA Scholarship Awards	June/July	TBD, Connecticut
Plant Tour	mid-Sept	TBD WPCF, Connecticut
20th Annual Source to Sea Cleanup	Sept 23 & 24	Various locations on the Connecticut River
Operator Exchange (with Maine)	Oct/Nov	Various WWTFs throughout Connecticut
CWPAA/NEIWPCC Fall Manager's Forum	Oct/Nov	MDC Training Facility, Hartford

The 2016 schedule in Connecticut is busy! For more information, please contact:

- Mike Bisi (Mike.Bisi@glastonbury-ct.gov) about Connecticut Water Pollution Abatement Association (CWPAA) events
- Tom Sgroi (tsgroi@gnhwpca.com) about Connecticut Association of Water Pollution Control Authorities (CAWPCA) events


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NEWEA 2015 award recipients: 1. (from left) Robert Scott, Sean Hetherington and Lawrence Woznicki (all from Woodard & Curran) accept the Asset Management Award—on behalf of Woodard & Curran/University of Connecticut 2. Michael Bisi of CWPAA accepts the Founder's Award on behalf of his association 3. Mary Lee Santoro, Public Educator Award 4. Shane McCannon, Operator Award 5. Thomas Arnone, James J. Courchaine Collection Systems Award

New Hampshire State Director Report

by Sean Greig
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The New Hampshire Water Pollution Control Association (NHWPCA) completed another successful year. The new board of directors will be led by President Andrea Martel in 2016. Ms. Martel's goal is to promote the industry and to get more operators involved with the association.

Recent events

NHWPCA had its Fall Meeting at the Hanover water reclamation facility on October 8, 2015. The facility serves the town of Hanover and a portion of the city of Lebanon. Improvements to the facility over recent years include the addition of anaerobic selectors, conversion of the disinfection system from UV to chlorination/dechlorination, construction of a new effluent outfall pipe, construction of a third secondary clarifier, upgrade of the blowers to turbo style blowers, fine screen and "washpactor," installation of new primary sludge pumps and grinders as well as new RAS/WAS/TWAS pumps and dewatering equipment, and rehabilitation of the anaerobic sludge digestion system. Attendees toured the facility and proceeded to the Courtyard Marriott in Lebanon, New Hampshire, for lunch and an engineering planning, design, and construction presentation.

Operations challenge

The 2015 New Hampshire Operations Challenge team competed at WEFTEC in Chicago with 46 teams from the United States, Canada and Germany. The New Hampshire team captain Mike "Iron Man" Carle led his team (Mike Baker, Patty Chesebrough and Tim Deguglielmo, under the coaching of Paula Anania) into battle. The team did well, earning a Division II second place in Process Control and finishing 11th overall out of 36 teams in its division.

US EPA Region 1 Industrial Pretreatment Program Excellence Award recipient City of Manchester, represented by Christopher Crowley, industrial pretreatment coordinator

Seacoast Sewer Snakes: Patty Chesebrough, Paula Anania (coach), Mike Baker, and Mike "Iron Man" Carle

Winter meeting

The NHWPCA Winter Meeting took place at the Merrimack wastewater treatment facility on December 10, 2015. Merrimack showcased the dewatering system upgrade and a major overhaul to the wastewater treatment and composting facilities. Included in the dewatering upgrade was a screw press, new sludge pumps and SCADA controls. The plant also received new aeration blowers, D.O. probes, a SCADA upgrade, a new plant water system, replacement primary clarifier mechanisms, new primary effluent pumps with VFDs and a new bisulfite system. Attendees toured the Merrimack facility and then gathered at the Crowne Plaza in Nashua for a presentation and business meeting. Jolly old Santa "George Claus Neill" made a rare appearance and was in great form.

At the winter meeting the association elected the 2016 New Hampshire board of directors:

- President Andrea Martel
- Past President Peter Goodwin
- Vice President Kevin Maclean
- Secretary Dave Mercier
- 1st Director Tim Vadney
- Treasurer Noelle Osbourne
- 2nd Director Kurt Robichaud
- Director-at-Large Dustin Price
- 3rd Director Ken Conaty
- Director-at-Large Paul Patrick Casey

Future events

On March 23, 2016, NHWPCA will hosted its Annual Legislative Breakfast at the Holiday Inn in Concord. Keynote speakers for the Water's Worth It! event were: Haley Lapoint, meteorologist WMUR Channel 9; Peter Rice, director, Portsmouth Department of Public Works; and Thomas Burack, New Hampshire Department of Environmental Services commissioner.

On March 25, 2016, the New Hampshire and Maine associations hosted a joint ski day at Sunday River.

On April 8, 2016, NHWPCA will host its Trade Fair and Spring Meeting at the Executive Court Banquet Facility in Manchester. The event will consist of vendors, two technical sessions and a lunch.

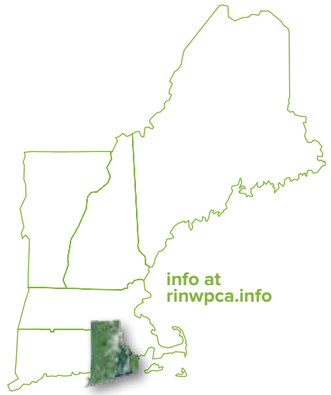
The NHWPCA summer outing will be on June 17, 2016. The Activities Committee plans to hold this year's event at Pawtuckaway State Park in Nottingham.

Past NHWPCA President Peter Goodwin hands the gavel to current President Andrea Martel

NEWEA 2015 award recipients: 1. Rob Lauricella, Operator Award 2. John Adie, WEF-MA William D. Hatfield Award 3. US EPA Region 1 Wastewater Treatment Plant O&M Excellence Award recipient Dover, New Hampshire Wastewater Treatment Facility, represented by (right) facility supervisor Raymond Vermette; with Mark Spinale, EPA

Rhode Island State Director Report

by Michael Spring
mspring@narrabay.com



Rhode Island had a successful 2015, and we look forward to another successful year in 2016. Our goals are to continue assisting the Rhode Island state operators and wastewater treatment facility staff to become the state's best generation of wastewater treatment operators ever. How will we succeed, you may ask? We will continue to provide cost-effective training as well as fun and exciting networking opportunities for our members.

2015 event roundup

In June, Narragansett Water Pollution Control Authority (NWPCA) held its annual Golf Classic at Potowomut Country Club. We had a sellout crowd of 144 golfers and gave out more than 50 prizes as well as a grand prize of a $500 gift certificate and foursome golf day at the club. We look forward to repeating the event this year, as it is always a huge hit!

July was our Hot Dog roast at the Smithfield, Rhode Island plant. It was hosted by Veolia Water and Karen Goffe, Smithfield plant superintendent. Attendees had a guided tour of the facility.

The NWPCA website has opened a new page, A Bug's Life, at rinwpca.info/the-lab-committee/a-bugs-life. This page is maintained by the lab committee, and it is all about the bugs. The page offers clear photos and brief descriptions of many different types of microorganisms.

In August, NWPCA held two events. The first was the 2nd Annual Chowder cook-off/general business meeting, hosted by the town of Narragansett and Peter Eldridge, plant superintendent. The second event was our family BBQ night at the Pawtucket Red Sox. Both events have been added to our calendar for 2016 as well.

September brought the annual NWPCA Tradeshow/Clambake, an event that always enables great interaction among members of our profession. The Rhode Island Operations Challenge team demonstrated its skills in a pipe-cutting event, and it opened competition to all attendees. The individual that cut the pipe the fastest won a $50 Home Depot gift certificate. NWPCA raffled off more than 50 prizes and awarded scholarships totaling $3,000 to six students.

The Annual Holiday Party with Food Drive and Election of Officers was held in December. Four hundred forty-seven pounds of canned goods were collected for the Rhode Island Food Bank. Several new board members were also elected: president, Scott Goodinson; vice president, Peter Eldridge; treasurer, Peter Connell; secretary, Nora Lough; NEWEA state director, Michael Spring; executive board members Bernard Bishop, Dennis Colberg, Edward Davies, Michael Bedard; directors of vendor/consultant coordination, Bob Mack and Steve Buckley; and operator certification board representative, Paul Desrosiers.

NEWEA's 2016 Annual Conference

At NEWEA's 2016 Annual Conference & Exhibit in Boston, NWPCA members received several awards: Operator of the Year, Patrick Doyle; Alfred E. Peloquin, Nora Lough; Laboratory Analyst Excellence, Betty Anne Rogers; EPA – Region 1 New England O&M Program Excellence, Smithfield water treatment plant represented by Karen Goffe; and Quarter Century Operators' Club trophy and pin, Scott Goodinson.

Rhode Island award recipients and supporters at the NEWEA Annual Conference: (from left) Patrick Doyle, Nora Lough, Janine Burke-Wells, Melissa Mooradian, Betty Anne Rodgers, Karen Goffe, Scott Goodinson

Upcoming 2016 NWPCA events

Event	Date	Location/Time
Annual Awards Banquet	April 28	Potowomut Golf Club/7:00 PM
Board of Directors Meeting	May 10	Quonset Development Corporation/Noon
Annual Golf Classic	June 27	Potowomut Golf Club
Hot Dog Roast/ General Business Meeting	July 12	Smithfield WWTP/5:00 PM
Chowder Cook-off/ General Business Meeting	August 9	Narragansett WWTF/5:00 PM
Annual Clambake and Exhibition	Sept 9	Twelve Acres, Smithfield
General Business Meeting	Oct 11	7:00 PM
General Business Meeting & Nomination of Officers	Nov 8	7:00 PM
Annual Holiday Party, Food Drive, & Election of Officers	Dec 6	Santa Maria DiPrata/7:00 PM

Monthly board meetings will be held at the offices of the Warwick Sewer Authority, unless otherwise indicated. Please check rinwpca.org and our Facebook page for association news, events and features.

US EPA Region 1 Wastewater Treatment Plant O&M Excellence Award recipient Burrillville, Rhode Island Wastewater Treatment Plant represented by (right) Superintendent John E. Martin, III; with with Mark Spinale, EPA

Massachusetts State Director Report

by Mike Moreau
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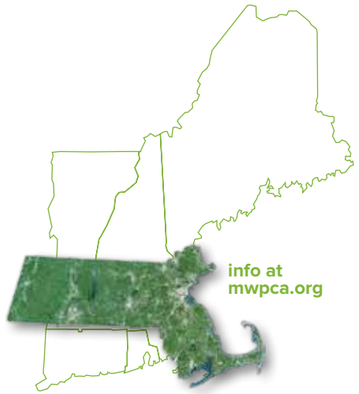


Since the last director's report in the fall issue, the Massachusetts Water Pollution Control Association (MWPCA) has continued to provide, promote and participate in events that advance the water-quality industry. In this report, I will review these activities and describe other developments related to the association and its membership.

Recent events and MWPCA news

Ray Willis, past president and current board member of MWPCA, has ascended to the role of NEWEA president. Mr. Willis has been a guiding light for MWPCA for years, and those of us who have worked closely with him as part of MWPCA leadership know that he will bring a full agenda and strong work ethic to his new role at the helm of NEWEA. In receiving the gavel recently, he delivered a speech that exhibited the ambition and drive that we appreciate at MWPCA. He was also this year's Massachusetts recipient of the Alfred E. Peloquin Award.

Bob McRae, the 1985–1986 MWPCA president, cuts the association's 50th anniversary cake

The MWPCA annual trade show was on September 23, 2015, at the Wachusett Mountain resort in Princeton. A record number of vendors and individuals attended. The one-day event featured more than 50 vendors, an outdoor demonstration area, raffle and door prizes, and opportunities to earn TCHs. As part of its 50th anniversary celebration, MWPCA invited all past presidents to attend the event, and Michael Burke, a past president, read remarks by founding president Jim Dostal about the history and development of the association, and how it has evolved to continue to serve our operators. His message included a tribute to the many people instrumental in forging and developing this association into the responsive organization that we know today.

Mr. Dostal (the first president of MWPCA) passed away in late October but right up until the end he had been, with his characteristic energy, spearheading an effort to institute mandatory house sanitary drain condition inspections at the time of property transfer, to ensure the integrity and tightness of each house connection. This inspection would function much like the current Title 5 mandatory inspections on septic systems, to ensure that any problems were remedied before transfer of ownership. In Mr. Dostal's honor, MWPCA, led by Past President Henry Albro, is supporting action in the state legislature to make Mr. Dostal's goal a reality.

MWPCA continues its search for the right candidate to replace Tom Azevedo, who has been MWPCA's meeting management coordinator for longer than most of us can remember. Mr. Azevedo, who announced to the board last year that he would like to hand off this responsibility, has graciously agreed to continue in his position until the right candidate is identified. Please contact Mr. Azevedo, or apply to Executive Director Lynn Foisy, if you are interested in assuming this role.

The Massachusetts Department of Environmental Protection (MassDEP) has announced the hiring of John Murphy, formerly of the New England Interstate Water Pollution Control Commission (NEIWPCC), to fill the office vacated by the retirement of Tom Bienkiewicz. This office oversees the state's wastewater treatment plant operator certification and training programs. MWPCA looks forward to working with Mr. Murphy to continue the professional excellence of this program.

NEWEA Annual Conference

With the near-threat of a repeat of last year's extraordinary weather during the Annual Conference, the pre-conference snow storm instead had its greatest impact south of Boston. Many who live south of Boston (including the keynote speaker) had challenges to get to the conference, but once there the spring-like weather was a delight compared with the piles of snow we contended with last year.

As in past years, most MWPCA members who attended the conference came on Tuesday, Operators Day, and some stayed for the award ceremony on Wednesday in part to support Ray Willis as he assumed the NEWEA presidency. In addition to Mr. Willis's accomplishments, several Massachusetts professionals earned awards this year. MWPCA is proud to recognize the following deserving award winners:

NEWEA Awards: Jeffery Kalmes, Operator Award; Ray Willis, Alfred E. Peloquin Award; Jody St. George, Operator Safety Award; Elizabeth Taglieri, Young Professionals Award; Patricia Chesebrough, Committee Service Award; Virginia Roach, E. Sherman Chase Award; Peter Sellers, Elizabeth Cutone Executive Leadership Award; Helen Gordon, Clair N. Sawyer Award; Deborah Smith, Paul Keough Award.

NEWEA Recognition: Nihar Sheth and Harshal Sheth, Stockholm Junior Water Prize.

WEF Awards: Erin Mosley, WEF Service Delegate Award; Gerald Potamis, WEF Life Membership; Glen Haas, WEF Life Membership; Michael Wilson, Arthur Sidney Bedell Service Award.

EPA Awards: Dan Freitas, Wastewater Treatment Plant Operator Excellence Award; Massachusetts Maritime Academy Wastewater Treatment Plant, WWTP O&M Excellence Award.

MWPCA training

The Hoisting License Preparation and Renewal Class will be on May 5, 2016, at the Mike Ackerman training room in the Richard Alden training center in Millbury.

Certificate training for the NASSCO Pipeline Assessment and Certification Program (PACP), Manhole Assessment and Certification Program (MACP), and Lateral Assessment and Certification Program (LACP), an all-inclusive three-day course, will be offered at the Richard Alden training center on June 23, 24, and 27.

If you have any questions regarding MWPCA or NEWEA or have issues or ideas you wish to share, please contact me at 508-989-2744 or at mikem@wwtsinc.com. Thank you for reading the Massachusetts report.

2015 NEWEA award recipients: 1. Elizabeth Taglieri, Young Professionals **2.** Jeffery Kalmes, Operator **3.** Jody St. George, Operator Safety **4.** Deborah Smith, Paul Keough Award

Upcoming events:

The next MWPCA Quarterly Meeting will be in mid-June at the Log Cabin in Northampton, Massachusetts.

MWPCA hosted its sixth Annual Legislative Event at the Omni Parker House in Boston on March 3, 2016. This year's event featured speakers from throughout the commonwealth, including officials from the town of Westford and the city of Lawrence. MWPCA was again joined in support by a number of water-quality professional organizations, including NEWEA, NEIWPCC, the Massachusetts Association of Onsite Wastewater Professionals (MAOWP) and, for the first time, the Massachusetts Water Works Association (MWWA). Jen Pederson, executive director of MWWA, accepted an invitation to speak that day.

The MWPCA Annual Golf Tournament will be at Shaker Hills Country Club in Harvard again this year following unwavering, unanimous support of this venue after another successful tournament last June. The partnership with Shaker Hills continues to develop, and our membership is excited to continue with the successful event format. Anyone interested in helping with the event or joining the Golf Tournament Committee, please contact any MWPCA board member for more information.

Upcoming 2016 MWPCA events		
Quarterly Meeting	June 15	Log Cabin, Holyoke
Annual Golf Tournament	June 21	Shaker Hills Country Club, Harvard
Annual Trade Show	Sept.	Wachusett Mountain

Please mark your calendar with these events and look for future events on mwpca.org or facebook/mwpca, or Twitter, @MWPCA.

Vermont State Director Report

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

Many exciting things happened at Green Mountain Water Environment Association (GMWEA) in 2015 and so far in 2016. 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

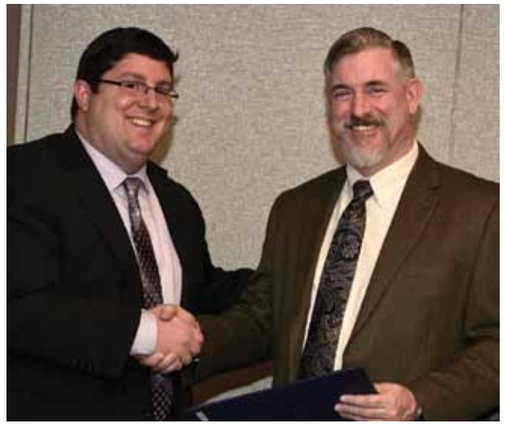
The Wastewater Management Training Course is in full swing, at full capacity and going well.

GMWEA is proud to announce that Daniel Hecht has signed on to be our executive director. Daniel brings a wealth of professional and life experience. He is a *New York Times* best-selling author and a professor at Champlain College, and he assisted Vermont Technical College with its digester project. GMWEA is lucky to have him, and we look forward to accomplishing many great things with him at the helm.

With recent incentive programs, there have been several retirements at Vermont Department of Environmental Conservation (DEC), Randy Bean and Andy Fish were among the most prominent in our fields of work.

GMWEA Fall Meeting

The GMWEA Fall Trade Show took place in Burlington on November 5, 2015. Almost 400 people participated at this event, including members, guests, speakers, vendors and the board of directors. GMWEA also exchanged operators with Connecticut during the NEWEA Operator Exchange. Shane McCannon from the Suffield, Connecticut Water Pollution Control Authority toured seven Vermont facilities and attended the GMWEA Fall Trade Show.



Michael Smith (right) of Waterbury, Vermont, receiving the Golden Manhole Society Award from Collections Systems Chair John Digiacomo at the NEWEA Collection Systems Committee meeting in January

Paul Olander delivers a presentation on nutrient removal at the GMWEA fall trade show and conference

NEWEA Annual Conference

I participated in the NEWEA Annual Conference in Boston, attending numerous meetings and technical sessions. GMWEA members received several awards: Andy Fish (retired), U.S. EPA Region 1 Lifetime Achievement Award; Thomas DiPietro, City of South Burlington, Alfred E. Peloquin Award; Christopher Cox, City of Montpelier, Plant Operator Award; Nick Knudson, Burlington Vermont, Stockholm Junior Water Prize.

Government affairs

The GMWEA Government Affairs Committee has once again been very active. On January 29 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 the Capital Plaza on February 24. The legislative lunch was our fifth annual legislative meal and our most successful yet.

Vermont DEC released its fiscal year 2016 fee schedule. There were significant fee increases across the board as well as new fees, most of which will fund the state's Clean Water Initiative, including restoration of Lake Champlain.

Last but not least, the TMDL has been the subject of much debate. There are no significant updates. It seems we are in a holding pattern, and GMWEA is still waiting to see what happens.

Upcoming events

On March 19 at Norwich University during the Vermont State Science and Math Fair, GMWEA board members judged the work of students, and selected Vermont finalists and the state winner of the Stockholm Junior Water Prize.

Clean Water Day and the second Visit your Water/Wastewater Facility Day will be held in May.

The GMWEA Spring Meeting will be on May 26 at Killington Resort. This event includes the annual business meeting, where annual awards will be given out and association officers will be elected for the coming year.

Save the Date! The George Dow Memorial Golf Tournament will be on August 19 at the Cedar Knoll Country Club in Hinesburg.

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

GMWEA members receive awards at the NEWEA Annual Conference
1. Christopher Cox, City of Montpelier, Plant Operator Award
2. Thomas DiPietro, City of South Burlington, Alfred E. Peloquin Award
3. Andy Fish (retired), US EPA Region 1 Lifetime Achievement Award with Jay Pimpare, EPA

Upcoming 2016 GMWEA Events		
GMWEA Spring Meeting	May 26	Killington Resort
George Dow Golf Tournament	August 19	Cedar Knoll Country Club

Maine State Director Report

by Clayton “Mac” Richardson
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I am excited to be stepping into the Maine director position for NEWEA, although I admit it is intimidating to follow Peter Goodwin in this role. For those of you who do not know me, I have been the superintendent of the Lewiston-Auburn Water Pollution Control Authority for longer than I care to admit, and I also contract operate a tiny (25,000 gpd) treatment plant serving the school complex in my home town of Windham, Maine.

MEWEA events

As always, plenty has kept the Maine Water Environment Association (MEWEA) busy over the autumn and early winter. Our annual convention and golf tournament was held in the beautiful Mahoosuc Mountains at Sunday River Resort from September 16 to 18. Eighty-four people enjoyed the fine weather for a round of golf on the stunningly scenic Sunday River links. One hundred eighty-four attendees were greeted with 28 technical sessions and an opportunity to visit with 82 vendors.

Operator exchange

We were pleased to host Glenn Peterson from the Narragansett Bay water pollution control facility under NEWEA’s operator exchange program. Mr. Peterson toured the York Sewer District wastewater treatment facility (WWTF) and pump stations, the Saco Water resource recovery facility, Portland Water District’s East End WWTF, the Lewiston-Auburn WWTF (with Maine’s first municipal anaerobic digester) and the Mechanic Falls Sewer District WWTF, before joining us for the convention at Sunday River. Special thanks to the staff at all these facilities for sharing their experiences and facilities.

Government affairs

The Government Affairs Committee continues to track legislative developments relating to odor control standards, ocean acidification and non-dispersibles as well as many other issues that keep this committee busy. The committee hosted a State House Symposium with coffee and treats in the historic Hall of Flags on January 12, 2016. The dozen volunteers representing Maine Water Utilities Association (MWUA) as well as MEWEA had productive discussions with legislators and staff as the capitol’s morning business went on. Our legislative breakfast followed up on March 3 at the Senator Inn in Augusta.

MEWEA President Scott Firmin makes a point at the state association meeting at the NEWEA conference

US EPA Region 1 Industrial Pretreatment Program Excellence Award recipient City of Portland, Maine, represented by Benjamin Pearson and Mike Moore, industrial pretreatment coordinators

50th anniversary

Incoming MEWEA President Scott Firmin from the Portland Water District accepted the gavel from Tom Connolly at the January Executive Committee meeting. MEWEA is excited to celebrate its 50th anniversary this year. Numerous events will celebrate our history and explore the next 50 years. One new initiative this year is our association’s offering of advertising in our quarterly newsletter. Another initiative is MEWEA’s underwriting Maine Public Broadcasting with three tag-line messages that will be heard through June during the extended afternoon/evening drive time. Doing so is just one way the MEWEA Executive Committee hopes to reach out and engage the public. The three brief messages are:

1. MEWEA, hands-on professionals celebrating 50 years of protecting Maine Waters
2. MEWEA, whose members maintain and operate your local municipal and industrial wastewater collection and treatment systems
3. MEWEA, working to keep waterways clean and healthy for all Maine people

NEWEA Annual Conference

Maine was well represented again this year at the NEWEA annual conference awards luncheon with awards presented to Paige Brown (Stockholm Junior Water Prize), Ross Elliott (Safety Logo Contest), Nick Konstantoulakis (2015 Operator of the Year), Tim Haskell (Alfred E. Peloquin Award), Saco Water Resource Recovery Facility (Energy Management Achievement), Brad Moore (NEWEA Past President plaque), Force Maine (WEF Operations Challenge—third place process control), Eric Teittinen and Doug Miller (WEF Life members), Brewer Water Pollution Control Facility (EPA Region 1 O&M Excellence Award), Aubrey Strause (EPA Region 1 Wastewater Trainer Excellence), and the city of Portland together with the Portland Water District (EPA Region 1 Industrial Pretreatment Excellence). We are thankful that these folks are acknowledged as we realize the many hours of dedicated effort Maine water professionals put into our water environment every day without recognition.

York Beach Sewer District was well represented at NEWEA Annual Conference (from left): Walter Kyllonen, Alfred E. Peloquin Award recipient Tim Haskell, and Wayne Mcintire

EPA’s Mark Spinale presents the O&M Program Excellence Award to Ken Locke and Lou Colburn of the Brewer, Maine facility

Safety Logo Contest winner Ross Elliott

EPA Region 1 Wastewater Trainer Excellence Award recipient Aubrey Strause

Essays by the 2016 NEWEA Student Scholarship Recipients

Maya Swope
Macalester College,
Non-Environmental Student Scholarship

Essay Question: *Wipes, plastics, and pharmaceuticals/personal care products are examples of modern industrial challenges to wastewater treatment and water quality. What can people in your field of study do in the future to ease the burden of these products on the environment?*

Modern environmental problem solving requires the successful convergence of scientific knowledge, politics, and culture. The disciplines of Geography and Environmental Studies provide a framework to do just that. People in this field study the way that people and societies interact with their environment from the perspective of a spatial, geographical analysis. One component of studying geography that is especially useful in this instance is Geographic Information Systems (GIS), which can be used to map out the distribution of where pollution from wipes, plastics, and pharmaceuticals originates and where it ends up. GIS allows us to create a map layer of measured instances and locations of water pollution by these materials. Then, adding information about the flow of rivers or the density of populations in given locations allows us to both analyze potential sources of pollution and predict consequences and complications as the pollution moves further downstream. We can also overlay that with a map layer indicating the cultural or socioeconomic class of residents in a given location, for example. This is important from an environmental justice perspective because all too often it is the poorest members of our communities who experience a greater burden of pollution in their neighborhoods. Maps created through this GIS process can also serve as an educational tool for industries, community members, and policymakers. They can accurately communicate large amounts of data in a quick and intuitive manner.

Geography and environmental studies both also emphasize the importance of systematic thinking approaches to problem solving. In the context of the aforementioned consumer products that are creating problems for water treatment and water quality, my studies of consumerism and of the psychology of sustainable behavior are especially applicable. Geographers and environmentalists alike aim to better understand what drives the consumption and subsequent disposal of these products. The GIS programs that I use for analysis and predictions are driven largely by quantitative data, so it is integral that these other aspects of the discipline are included in my evaluation of this particular water pollution problem.

It is the very nature and interdisciplinarity of geography and environmental studies that make them both great problem-solving areas of study and aptly suited to this particular problem of wipes, plastics, and pharmaceuticals/personal care products in our waterways. As I continue my education and begin my career, the concrete knowledge and the frameworks that I have learned for asking and answering relevant questions will allow me and others to better understand and devise solutions to this problem and similar environmental issues.

Yan Li
University of Connecticut,
Graduate Student Scholarship

Essay Question: *Water, energy and food systems are tightly interconnected. Increasing human population and urbanization, water pollution, and increasing energy demand pose fresh challenges to scientists, engineers, and law makers. Please discuss the relationship between food, water, and energy, and discuss what role you could play, as an engineer, to help foster secure and efficient use of water resources.*

As the critical factors for human activities, water, energy, and food are tightly interconnected with the aid of bacteria. Water and energy are the indispensable consumption in food processing, while food wastes rich in organic compounds and bacteria can be converted to clean energy in biochemical processes such as microbial fuel cells (MFC) and anaerobic digesters (AD). Environmental engineers should understand environmental challenges, apply novel biotechnology, turn wastes into beneficial products, and integrate food, energy, and water.

As a PhD student of environmental engineering, I have conducted frontier research on energy-positive wastewater treatment using bioelectrochemical systems (BESs). One major achievement is to identify new applications of MFCs for heavy metal and nutrient removal in wastewater. The MFC concept has drawn global attention in the past decade due to the distinct advantage of converting wastewater to electricity by intrinsic anaerobic electrogenic bacteria in wastewater. But the typically low power generation of MFCs has hindered real-world usage. I have discovered a novel feature of MFCs through harvesting electrical energy produced from spontaneous reactions (e.g., Cr^{6+} reduction) to power non-spontaneous reactions (e.g., Ni^{2+} reduction), so that self-sustaining wastewater treatment can be achieved. Lab-scale tests have demonstrated well the simultaneous removal of multiple heavy metals in MFCs without external power supply, which reveals an alternative low-cost treatment technology. Moreover, I have developed short-cut nitrification/autotrophic denitrification (SNAD-MFC) to overcome the critical problems of high aeration costs, high carbon requirements, and long retention times in traditional biological nutrient removal (BNR) processes. By utilizing an aerobic cathode for short-cut nitrification and an anoxic cathode for autotrophic denitrification, the SNAD-MFC system accelerates the nitrogen removal rate without extra energy/chemical requirements, and achieves energy-positive BNR, which can be used for diverse food wastewater treatment. My MFC research has drawn attention in the environmental field, and has been published in top engineering journals (e.g., Applied Energy, Bioresource Technology and Journal of Power Sources).

Another focus of my research is the optimization of AD systems for biomass energy and nutrient recovery from food wastes. Conventional AD systems only target biogas production from organic wastes. In fact, biogas production is closely correlated with fermentation liquid components (e.g., fatty acids, ethanol) and biomass solids (e.g., microbial population, nutrients). If harvested properly, fermentation liquid and biomass solids are high quality energy sources and fertilizers, which have enormous economic value and environmental benefit. My goal is to renovate the engineering and scientific understanding of AD systems and enhance sustained, economically attractive AD performance with food waste as the starting point. The breakthrough of my study is to integrate the gas/liquid/solid phases as a whole bioenergy/nutrient recovery system, and to optimize AD systems through novel monitoring technology. Optimizing AD systems will have a great impact on bioenergy production, water reclamation, and food availability.

My vision of self-sustaining, new generation wastewater treatment technology has been considerably broadened throughout my PhD research. I have clearly recognized the correlation of food, energy, and water, and learned effective strategies to tackle environmental contamination, convert wastes to clean energy/nutrient sources, and bring the most benefit to the environment.

The relationships among food, water, and energy, especially when considered in the context of our 21st century world, can be complex. However, understanding their nexus is critical for maintaining healthy communities, both built and natural. In built environments, examples of water-energy-food interrelatedness play out through: water and energy inputs required for food production; energy inputs for water acquisition, treatment and delivery; and water inputs required for energy extraction, refining, and cooling needs. This interplay illustrates the cyclical manner in which water, energy, and food resources are interdependent for obtaining desired outcomes. When considered alongside the challenges of population growth, urbanization trends, water pollution, and increasing energy demand, this interdependence reveals the need for diverse stakeholder collaboration to achieve creatively integrated solutions for community health and sustainability.

Many studies argue that human populations have exceeded or will soon exceed the sustainable resource capabilities of our biosphere. This excess results in water pollution, as well as food and energy insecurity. In order to sustain increasing populations, our water-energy-food systems will need to become more efficient. Human populations are also becoming more urbanized; in some ways, this produces more efficient outcomes across water-energy-food systems, but usually with new sets of challenges. Ever-growing human populations intensify these challenges, resulting in dramatic increases in energy demand and water pollution, potentially negating efficiency and efficacy gains achieved in recent decades. Another driver and passenger alike in this trio, food production serves up a confounding link. Considering the magnitude of this link (an estimated 15.7-percent of national energy use in 2007* and 80-percent of national freshwater use in 2015† were expended in food-related processes), it becomes clear that addressing any one of these constraints will require solutions across the water-energy-food nexus.

As a scientist, my role in fostering secure and efficient use of water resources will depend on effective implementation of research and best practices through collaboration with diverse stakeholders involved across the water-energy-food nexus. As a researcher both at the University of New Haven and with the Environmental Protection Agency, I have begun seeking these collaborations, most notably in the field of green infrastructure. Green infrastructure is a valuable component of plans to address water-energy-food conundrums. One reason for this value is green infrastructure's versatility in meeting multiple goals over a range of scales, often simultaneously addressing triple-bottom-line constraints. These qualities produce both cost-benefit optimization and strategically critical buy-in from varied stakeholders. In addition to promoting green infrastructure, I have also partnered with others on waste reduction initiatives. Increasing system efficiency, when coupled with minimizing wasteful use of system outputs, realizes truly improved outcomes. As a young scientist, I look forward to furthering my knowledge of green infrastructure, waste minimization, and other capabilities, as well as working with a variety of stakeholders to explore and implement these synergistic solutions. Such solutions will help ensure current and future generations have access to the food, energy, and water resources essential to their health and quality of life.

* U.S. Department of Agriculture's Economic Research Report 94 (2010).
† U.S. Department of Agriculture's Economic Research Service Irrigation and Water Use Reporting (2015).

Jessica Zielinski Meffert
University of New Haven,
Undergraduate Scholarship

EVENT

2016 Annual Conference & Exhibit PROCEEDINGS

Boston Marriott Copley Place, Boston, MA • January 24–27

1. Fourth floor exhibit hall ribbon-cutting: (from left) Amy Anderson, Paul Bowen, Matt Formica, Jim Barsanti, and Helen Gordon
2. & 3. Attendees unwind at exhibit hall receptions 4. Jack Troidl, Rob Musci, and Janine Burke-Wells at a website committee lunch meeting 5. The NEWEA Safety Committee at their luncheon meeting

The 2016 NEWEA Annual Conference convened with a meeting of the full Executive Committee on Sunday, January 24, 2016. More than 2,030 people registered for the conference. The three-day event featured 202 exhibit booths and 30 technical sessions.

The Annual Business Meeting was held on Monday, January 25, 2016. Nominating Committee Chair Daniel Bisson presented the slate for officers for 2016 as follows:

- Vice President – Janine Burke-Wells
- Treasurer – Priscilla Bloomfield (1st year)
- Council Director/Meeting Management – Elena Proakis Ellis (1st year)
- Council Director/Communications – Jennifer Lachmayr (2nd year)
- Council Director/Treatment, Systems Operations, and Management – Mary Lee Santoro (1st year)
- WEF Delegate – Fred McNeill (WEFTEC 2016 – 2019)
- Maine Director – Clayton "Mac" Richardson (1st year)
- New Hampshire Director – Sean Greig (1st year)
- Secretary – Gerald Potamis (3rd year)

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

- President – Raymond Willis
- President-Elect – James Barsanti
- Past President – Matthew Formica

The remaining incumbents are fulfilling unexpired terms:

- Council Director/Collection Systems & Water Resources – Virgil Lloyd (3rd year)
- Council Director/Outreach – Jonathan Kunay (2nd year)
- WEF Delegate – Michael Wilson (through WEFTEC 2016)
- WEF Delegate – Daniel Bisson (through WEFTEC 2017)
- WEF Delegate – Susan Sullivan (through WEFTEC 2018)
- Connecticut Director – Jay Sheehan (3rd year)
- Massachusetts Director – Michael Moreau (3rd year)
- Rhode Island Director – Michael Spring (2nd year)
- Vermont Director – Nathan Lavallee (2nd year)

All nominees have indicated their willingness to serve. Respectfully submitted by the NEWEA Nominating Committee: Daniel Bisson (Chair), Mike Bonomo, Brad Moore, Mike Wilson, and Jennifer Lachmayr.

30 Technical Sessions

SESSION 1
Hot Topic: Innovative Treatment Technologies
Moderators:
- Chuck Pike, Black & Veatch
- Vinta Varghese, CH2M

Novel Deammonification Process for Separate Centrate and Main Plant Nitrogen Removal
- Robert Sharp, Manhattan College
- Allen Deur, New York City DEP
- Wendell Khunjar, Hazen and Sawyer
- Kathleen O'Connor, New York State Energy Research and Development Authority

Sustainably Stabilizing EBPR Performance at Meriden, CT with a Side-Stream Biological Sludge Reactor
- Nick Tooker, Northeastern University
- Paul Dombrowski, Woodard & Curran
- April Gu, Northeastern University
- Frank Russo, City of Meriden, CT

Proven and Emerging Alternatives for Stringent Phosphorus Limits
- Jim Fitzpatrick, Black & Veatch
- Mark Steichen, Black & Veatch
- Anjana Kadava, Black & Veatch
- Kelly Martin, Black & Veatch

Lessons Learned from a Nitritation/ Anammox Sequencing Batch Reactor
- Eric Staunton, CDM Smith
- Michael Aitken, University of North Carolina-Chapel Hill

SESSION 2
Residuals Management—Comprehensive Residuals Management
Moderators:
- Eric Spargimino, CDM Smith
- Natalie Sierra, Brown and Caldwell

New Phosphorus Removal Requirement Tips the Scales—Lessons Learned on Biosolids Management and Odor Control at the Southington CT Treatment Plant
- Frederick Mueller, Tighe & Bond
- John DeGioia, Town of Southington, CT

Integrated Resource Management for Wastewater, Solid Waste, and Energy in New Bedford
- Jason Turgeon, US EPA Region 1
- Chris Beling, US EPA

Composting of Mixtures of Sewage Biosolids and Municipal Solid Wastes in a Wastewater Treatment Plant
- Mohamed Hamoda, Kuwait University

Challenges in Selecting New Biosolids Treatment & Disposal Equipment for the Mattabassett WPCF, Cromwell, CT
- Prashanth Emmanuel, Wright-Pierce

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1. Keynote speaker George Hawkins of DC Water held the audience spellbound **2.** Ten past NEWEA presidents were on hand for lunch with current president Matt Formica and WEF President Paul Bowen **3.** Standing-room-only crowds packed the popular technical sessions **4.** The Brewer, Maine contingent (Lou Colburn and Ken Locke) decides the day's course of action

SESSION 3
Watershed Management—Approaches to integrated Watershed Management

Moderators:
- Becky Weig, CH2M
- David Bowen, Wright-Pierce

The Cape Cod 208 Plan Update
- Thomas Cambareri, Cape Cod Commission
- Scott Michaud, Cape Cod Commission

An Integrated Watershed Approach to Nutrient Management
- Matthew Davis, Brown and Caldwell
- Jeffrey Herr, Brown and Caldwell

Optimizing Performance of Existing Stormwater Infrastructure through Real time Control Retrofits— A Minnesota Pilot Study
- David Roman, Geosyntec Consultants
- Scott Landers, OptiRTC
- David Richardson, Geosyntec Consultants

Managing Phosphorus Loads to Pearly Pond
- Rebecca Balke, Comprehensive Environmental, Inc.
- Ben Lundsted, Comprehensive Environmental, Inc.

SESSION 4
CSO I—Repurposing and Renewal to Extend Existing Wet Weather Assets

Moderators:
- James Drake, CDM Smith
- Jeff Cantwell, Flow Assessment Services

Removing Gully Brook from the CSO System and Restoring it to the MS4 System
- Cynthia Baumann, CDM Smith
- Joseph Laliberte, CDM Smith
- Jason Waterbury, The MDC

Walking the Plank—Lessons Learned Inside a 140-Year-Old Combined Sewer
- Michael Sullivan, MWH Global
- David VanHoven, MWH Global

The Final Link in MWRA's Long-term CSO Control Plan for Alewife Brook
- Deborah Duhamel, Stantec
- Jeremy Hall, MWRA
- Michael Carroll, Stantec

The Benefits of Sound Planning—How Augusta Maine's 25-year Adapted CSO Abatement Program Netted Positive Results
- Steven Freedman, AECOM
- Brian Tarbuck, Greater Augusta Utility District

SESSION 5
Utility Management/Managing—Improvements, Assessments and Apps

Moderators:
- Fred McNeill, City of Manchester, NH
- Jamie Lefkowitz, OptiRTC

Making Real Progress in Organizational Improvement: Moving from Study to Results
- Seth Garrison, Woodard & Curran
- Mark Lowenstine, Polk County Utility District

Managing the Public Outreach, Regulatory, Funding, and Staffing Challenges of Framingham's Capital Improvements Program
- James Barsanti, Town of Framingham, MA
- Blake Lukis, Town of Framingham, MA
- Peter Sellers, Town of Framingham, MA

The J100 Standard: A Catalyst for an All-Hazards Vulnerability Assessment in our Dynamic World
- Marian Long, Gradient Planning

There Is an App for That! SSO mobile Application Achieves Better Reporting
- Greg Pellerin, Woodard & Curran
- Erik Osborn, Woodard & Curran
- Rachel Osborn, Woodard & Curran

1. Long-time exhibitor Bob Mack demonstrates using a cutaway model pump **2.** Student Display Board Competition judge Tom Groves appraises a presentation by Northeastern student Greg Coyle **3.** Anastasia Rudenko, Dave VanHoven, and Jonathan Kunay at the Water For People Committee meeting **4.** Exhibitor Eric Saitta with Eric Staunton, Alexandra Bowen, and Bill Hotz the younger

SESSION 6
Hot Topic: On-Site Power Generation

Moderators:
- Lauren Hertel, Stantec
- Matt Dickson, MGD Process Technology

It's All About Energy—MDC's On-Site Power Generation & Energy Conservation Efforts at the Hartford, CT WPCF
- Thomas Tyler, The MDC
- Jeff Bowers, The MDC
- Rick Peebles, The MDC
- Mike Zabilansky, The MDC

Keeping Your Cool on a Combined Heat and Power Project
- Jonathan Keaney, Brown and Caldwell
- Jim Schettler, Brown and Caldwell
- Nancy Andrews, Brown and Caldwell
- James McCaughey, Narragansett Bay Commission

Emergency Generator Compliance at Your Facility
- Timothy Kucab, Tighe & Bond

The Road to Net Zero at Wastewater Treatment Plants
- Paul Hughes, Electra Therm

SESSION 7
Specialty—NEWIN—Local innovation and Piloting for Global Impact

Moderators:
- Marcus Gay, Nobus Technical Services
- Robert Scherpf, AECOM

New England Water Innovation Network Primer
- Karen Golmer, NEWIN

Prevention of Fat, Oil, and Grease Buildup in Collection Systems, Lift Stations, and Grease Interceptors through Use of a Novel Protein-Based Chemical Formulation
- Patrick Antle, Protein Matrix LLC
- Peter Rehage, Protein Matrix LLC
- Christian Zeigler, Protein Matrix LLC
- Albert Robbat, Tufts University

The Green Keeps Getting Greener—Advanced Biological Nutrient Recovery (ABNR)
- Rick Johnson, Clearas Water Recovery

The Nutrient Roadmap
- Jane Madden, CDM Smith

SESSION 8
Small Communities/ Water for People—Wastewater Around the World

Moderators:
- Robert Robinson, City of Manchester, NH
- David Bedoya, MWH Global

Successfully Navigating a Pre-Procurement and Evaluated Bid Process for the First Municipal Wastewater MBR System in the State of Maine
- Robert Polys, Woodard & Curran

Chatham WPCF—Challenges Faced by a Small Community Removing Nitrogen to the Limit of Technology
- Marc Drainville, GHD
- Richard Peter, Weston & Sampson

Small Scale Irrigation Project at Abba Samuel River Watershed in Ethiopia
- Kelsey Reeves and Fiona O'Donnell, Student Chapter of Engineers Without Borders – University of Connecticut

1. Robert Bowker speaks on odor and corrosion control **2.** Jay Sheehan makes a point to Scott Firmin at the Utility Management Committee meeting **3.** The Residuals and Biosolids Committee at their luncheon meeting. **4.** Dan Roop promotes his committee during the conference Committee Fair

What Difference Have We Made? Evaluating the Sustainability and Impact of Engineers without Borders Projects in Nicaragua
- Claire Barker, Boston Professional Chapter, Engineers Without Borders

SESSION 9
Collection Systems I—Episode I: The Piping Menace

Moderators:
- John Murphy, Stantec
- Kevin Garvey, CDM Smith

Challenges in Planning, Design and Construction of Coastal and Island Infrastructures to Adapt to New Flood Elevations and Climate Changes
- Karen Wong, GHD Inc.
- Marc Drainville, GHD Inc.

Finding Infiltration Using Chemical Flow Dilution
- Daniel Iannicelli, Fuss & O'Neill
- Matthew Jermine, Fuss & O'Neill

A Revolutionary City's Multi-Faceted Emergency Repair Under the Governor's Avenue
- Nicholas Rystrom, City of Revere, MA
- Jonathan Kunay, CDM Smith

Failed Sewer Main Under Salem Harbor Spurs Action
- Scott Williamson, Parsons Brinckerhoff
- Rachel Burckardt, Parsons Brinckerhoff
- Eric Barber, South Essex Sewerage District
- David Michelsen, South Essex Sewerage District

SESSION 10
Plant Operations I—BNR—From Concept to Implementation, Part 1

Moderators:
- Ben Levesque, Tighe & Bond
- Ed Rushbrook, Process Analysts

Real, Affordable Nutrient Removal in Secondary Treatment Plants
- Paul LaVigne, Montana DEQ
- Grant Weaver, The Water Planet Company

Nutrient Removal at the Manchester, CT WPCF
- Christopher Pierce, Wright-Pierce
- Michael Emond, Town of Manchester, CT
- Ray Weaver, Town of Manchester, CT
- W. Doug Hankins, Wright-Pierce

BNR in a Small Footprint
- William McConnell, CDM Smith

How Low Can We Go? Full Scale Pilot Testing of Total Nitrogen Removal Processes
- Dan Peterson, Town of Durham, NH
- Tim Vadney, Wright-Pierce

1. The crowded registration lobby during a break in technical sessions **2.** Program Committee chair Helen Gordon reacts during her induction roast at the Select Society of Sanitary Sludge Shovelers luncheon **3.** Past President Phyllis Arnold Rand took time while at the conference to visit with her daughter Linda Beth

SESSION 11
Industrial Wastewater—From Regulation to Innovation

Moderators:
- Lisa Andrews, Barr Engineering
- Sarah White, UniFirst Corp.

Development of Water-effects Ratios (WERs) and Site-Specific Water Quality Criteria (SSC) for Aluminum, Cadmium, and Copper for the Androscoggin River
- Patrick Gwinn, Integral Consulting, Inc.
- John Samuelian, Integral Consulting, Inc.
- Elizabeth Rand, Integral Consulting, Inc.

Biosolids Dewatering Modernization at an Industrial Plant—Plate & Frame Press to Centrifuge
- Carl Wilcox, Woodard & Curran

Water Reuse for a Commercial Greenhouse
- Elizabeth Troop, Fuss & O'Neill

Water ReUse System for an Industrial Discharger
- Timothy St. Germain, Fuss & O'Neill

SESSION 12
Hot Topic: innovative Solutions to Equipment and Operational Challenges

Moderators:
- Mary White, MWRA
- Andy Morrill, Wright-Pierce

Multiparty Collaboration—A Cost-Effective Culvert Replacement
- Kathryn Edwards, ARCADIS
- Robert Cantoreggi, Town of Franklin, MA

Leveraging Technology to Increase Catch Basin Maintenance Efficiency
- Matt Bianchi, Utility Cloud
- John Lopes, Boston Water and Sewer Commission

Adventures in Phosphorus Removal
- Daniel Sullivan, Town of Wallingford, CT;
- Brian Hickey, CDM Smith

Bay Park STP Flood Mitigation Upgrade Program
- Eric Mills, Hazen and Sawyer

SESSION 13
MassDEP I/I—Implementing Your MassDEP 314 CMR 12.00 I/I Program…by 2017!

Moderators:
- Mike Bonomo, ADS Environmental Services
- Robert Dunn, Stantec

Overview of the MassDEP I/I Program
- Kevin Brander, MassDEP

Case Study—Framingham, MA Experience with I/I Reduction Program
- James Barsanti, Town of Framingham, MA

Important Considerations of an I/I Investigation or "Getting Bang for Your Buck"
- Patrick Stevens, ADS Environmental Services

Panel discussion:
- James Barsanti, Town of Framingham, MA
- Kevin Brander, MassDEP
- Patrick Stevens, ADS Environmental Services

1. Officers and committee chairs at the Annual Conference Executive Committee Meeting. 2. Pooya Paydary presents at the Graduate Student Session 3. Northeastern U. graduate students Sahar Shirani and Marissa Dreyer listen intently at the Graduate Student Technical Session 4. Fred Mueller discusses biosolids management issues

SESSION 14
Water Reuse—Economics and Sustainability Drive Innovation in Wastewater
Moderators:
- Vanessa Borkowski, Stantec
- Austin Weidner, Tighe & Bond

Use of Tertiary UF for Water Reuse Reduces Costs and Provides a Reliable Source for Industry
- Melanie Blake, Koch Membrane Systems, Inc.
- Henia Yacubowicz, Koch Membrane Systems, Inc.

Phosphorus-Recovery from Waste Activated Sludge (WAS) in Enhanced Biological Phosphorus Removal (EBPR) Process
- Yuqi Wang, Northeastern University
- April Gu, Northeastern University
- Annalisa Onnis-Hayden, Northeastern University

Water Conservation Technology for Recirculating Cooling Systems
- Karen Golmer, NEWIN

Utilizing Stormwater for Cooling Tower Reuse at a University CoGen Facility
- Jay Sheehan, Woodard & Curran

SESSION 15
Stormwater I—Putting the Horse Before the Cart—Planning Carefully to get the Most Benefit from a Stormwater Program
Moderators:
- Angela Blanchette, Town of Scarborough, ME
- Iulia Barbu, AECOM

Portland Maine's Design Standards and O&M Plan for Municipal Green Infrastructure
- David Senus, Woodard & Curran
- Zach Henderson, Woodard & Curran

Step-by-Step, Improving the Environment through a Comprehensive Illicit Discharge Detection and Elimination Program while Facing a Consent Decree
- Teri Demers, Woodard & Curran
- Garrett Bergey, Stacey DePasquale Engineering

Trying to Keep a Step Ahead—How Framingham is Preparing for the New MS4 Requirements
- Kerry Reed, Town of Framingham, MA
- Eric Johnson, Town of Framingham, MA

Proactive Preparation—A Small Community's Approach towards MS4 Compliance
- Jon Gregory, Tata & Howard

SESSION 16
Plant Operations II — BNR—From Concept to Implementation, Part 2
Moderators:
- Jon Hume, Wright-Pierce
- Steve Sloan, Portland Water District

Upgrading WRRFs for Biological Nutrient Removal
- Don Esping, Brown and Caldwell

Emerging Nutrient Limits? Let's Pilot BNR!
- Lindsey Shields, Wright-Pierce
- Kristen Lemasney, Wright-Pierce
- Raymond Vermette, City of Dover, NH

Mystic Completes Year One Operating the Biomag Process
- Megan Moody, CDM Smith
- William McConnell, CDM Smith

Prove It! Demonstrating Performance of a Combined Carbon and Ammonia Removal BAF
- Erik Meserve, AECOM
- Paula Anania, City of Portsmouth, NH
- Terry Desmarais, City of Portsmouth, NH;
- Erik Grotton, Blueleaf Incorporated

1. Paul Dombrowski emphasizes a point in the Innovative Treatment Technologies session 2. Megan Moody relates the Mystic experience with the Biomag process

SESSION 17
Hot Topic: Regulatory Challenges
Moderators:
- Dave Polcari, CDM Smith
- Joe Kietner, City of Chicopee, MA

Overview of NPDES Issues Impacting New England Permittees and Strategy for Ensuring Reasonable Requirements
- John Hall, Hall & Associates

Working Through the Maze of the New SSI Rules—Lessons from the Mattabassett District
- Melissa Hamkins, Wright-Pierce

TMDLs: One Size DOES NOT Fit All
- Paul Hogan, Woodard and Curran

Integrated Planning for Nitrogen Controls in the Exeter/Squamscott Watershed—New Flexibility Brings New Opportunities
- Robert Roseen, Horsley Witten Group
- Renee Bourdeau, Geosyntec Consultants
- Paul Stacey, Great Bay NERRS
- Alison Watts, University of New Hampshire

SESSION 18
Operator Ingenuity
Moderators:
- Tim Vadney, Wright-Pierce
- Sandra Tripp, GHD Inc.

Instruments and Methods used for Process Monitoring and Control of the North Attleborough, MA WWTF
- Kaela Wiklund, Town of North Attleborough, MA
- Daniel Roop, Tighe and Bond

Low Cost Technology for Operational Efficiency
- Brad Hayes, City of Tavares, FL

Do-it-Yourself Permanganate Dosing System for Odor Control
- Mike Carle, Town of Hampton, NH

Do-it-Yourself Sludge Dewatering Screw Press Installation
- Ray Vermette, City of Dover, NH

Do-it-Yourself Improved Septage Receiving Facilities
- Sean Greig, Town of Newmarket, NH

Innovative Pump Rag Removal Tool and Low Chlorine Early Warning System
- Paula Anania, City of Portsmouth, NH
- Mike Baker, City of Portsmouth, NH

Drive Chain Removal Assistive Device and Simple Fix for Railing Removal and Access
- Joe Crosby, Narragansett Bay Commission

SESSION 19
Information Technology & Automation—Continuous Improvement in the Instrumentation, IT and Automation Sectors
Moderators:
- John Trofatter, Duperon Corporation
- John Sykora, Weston & Sampson

Integrating Wireless Technology into Wastewater Treatment Process Monitoring
- Daniel Capano, Diversified Technical Services, Inc.

Optimization of Supplemental Carbon Feed through Automation
- Anthony Giovannone, Environmental Operating Solutions, Inc.

1. Mrs. and Mr. Fish (Deb and Jeff Sandler) perform a program about sea life before a group of... 2. Enthralled elementary students 3. Council Director Mary Lee Santoro takes notes as Microconstituents Committee chair Justin Irving leads a discussion

- Boyd Gregg, Environmental Operating Solutions, Inc.

How Public Utilities Increase Productivity for Annual FOG Inspections
- Ricky Langley, Utililty Cloud

NO2—20 Years of Tracking an Elusive Quarry with Online Spectrometry
- Bruce Stevens, ASA Analytics
- Bernard Beemster, ASA Analytics
- Scott Kahle, ASA Analytics
- Roy McKnight, ASA Analytics

SESSION 20
Collection Systems II—Episode II: Attack of the Odors and Fog

Moderators:
- Kevin Olson, Wright-Pierce
- Ashley Dunn, Town of Framingham, MA

Rooftop Biofilter to Solve Odor Concerns in Downtown Rockport, MA
- Lauren Hertel, Stantec;
- Joe Allen, Stantec

Ensuring Your Collection System for the Future: Recovering from H2S Attack
- Gerald Furrier, CDM Smith
- Caitlin Carbonello, CDM Smith
- Kristie Wagner, CDM Smith
- Richard Feminella, Town of Greenwich, CT

A Proactive Approach to Assessing and Managing the Wastewater Collection System, and a UV Cured CIPP Rehabilitation
- Joseph Hausmann, Wright-Pierce

Take It Off! Odor Stripping Solves Odor Issues in Red Deer's Collection System
- Michael Headd, Stantec
- Joel Sawatzky, Stantec

SESSION 21
Asset Management I—Asset Management Trends

Moderators:
- George Pendleton, Martinez, Couch & Associates
- Lori Carriero, Tighe & Bond

Practicing Environmental Stewardship—and Saving Money—Utilizing Trenchless Technology
- Shawn Ready, Ted Berry Company Inc.

3D Laser Scanning & Modeling for Condition Assessment and Asset Management/Planning
- Christopher Lorrain, LandTech Consultants

Enhanced Asset Management through Vulnerability Assessment
- Linda Warren, Launch! Consulting, LLC
- Sanjay Puranik, Hazen and Sawyer
- George Brown, Hazen and Sawyer
- Vincent Morello, Broward County Water and Wastewater Services

ISO55000 & Asset Management
- Aditya Ramamurthy, Hazen and Sawyer
- Ryan Nagel, Hazen and Sawyer

1. WEF President Paul Bowen addresses the crowd at the conference Opening Session 2. Members of the Journal Committee: Dan Coughlin, Gail Lollis, Meredith Zona, and Joe Boccadoro 3. Exhibitor Monty Hart (center) interacts with interested industry representatives. 4. 2015 President Matt Formica turns the NEWEA gavel over to 2016 President Ray Willis.

SESSION 22
Energy—Something Tried and Something new—Energy reduction and Production Projects

Moderators:
- David VanHoven, MWH Global
- David Michelson, South Essex Sewerage District

Down the Drain: Trimming Energy Waste from a Wastewater Facility without Breaking the Bank
- Frederick Mueller, Tighe & Bond
- Ruth Gay, Environmental Systems Corporation;
- Anthony Piazza, Town of Simsbury, CT

Worth the Trouble? Raw Wastewater Energy Recovery Case Study
- Anastasia Rudenko, GHD Inc.
- Andrew Boule, Town of Barnstable, MA
- Marc Drainville, GHD Inc.

Energy and Organics: Regulatory and Contracting Issues
- Steven Torres, Pannone Lopes Devereaux and West LLC
- Teno West, Pannone Lopes Devereaux and West LLC

A Transition to Resource Recovery Facility through the Installation of Enhanced Primary Treatment
- Alex Wright, ClearCove

SESSION 23
Hot Topic: Watershed Nitrogen Tracking and Accounting

Moderators:
- Patricia Chesebrough, Weston & Sampson
- Cynthia Baumann, CDM Smith

How New Methods of Nitrogen Treatment for Stormwater are Designed to Help Cape and Other Coastal Municipalities Meet Nitrogen TMDLs
- Matt Lundsted, Comprehensive Environmental, Inc.
- Nick Cristofori, Comprehensive Environmental, Inc.
- Ray Cody, US EPA

A Multi-Faceted Approach to Addressing Nitrogen Sources in Exeter, NH
- Ed Leonard, Wright-Pierce
- Andrew Morrill, Wright-Pierce

Combining Sewering with Non-traditional Technologies to Meet Nitrogen TMDLs in Dennis, Massachusetts
- Kara Johnston, CDM Smith
- David Young, CDM Smith

Eastham's Integrated Approach to Nutrient Management—Initial Implementation and Next Steps
- Jessica Janney, GHD Inc.
- Jane Crowley, Town of Eastham, MA
- Anastasia Rudenko, GHD Inc.

SESSION 24
Sustainability—Sustainable and Resilient Infrastructure

Moderators:
- Meredith Zona, Stantec
- David Peterson, Kleinfelder

Vulnerability of Water to Climate Uncertainty and How to Adapt Effectively
- Frances Bui, CDM Smith
- Lauren Klonsky, CDM Smith
- Kirk Westphal, CDM Smith
- Shayne Wood, CDM Smith

Putting Envision to Work in Planning Sustainable Projects
- Courtney Eaton, Carollo Engineers
- Tracy Clinton, Carollo Engineers
- Brian Clow, Carollo Engineers

Urban Smart Sewering: Water and Energy Solutions for the Coming Century
- Julie Wood, Charles River Watershed Association
- Bruce Douglas, Natural Systems Utilities
- Nigel Pickering, Charles River Watershed Association

Maximizing Long term Reliability through Commissioning
- Jen Muir, JKMuir

SESSION 25
Safety—Safety Updates for Today's Plant Challenges
Moderators:
- Dave Aucoin, Narragansett Bay Commission
- James Laliberte, NEIWPCC

Letterman's... OSHA's Top Ten Safety Violations
- David Horowitz, Tighe & Bond

Confined Space—Check Your Knowledge
- David Wright, Weston & Sampson

Hazard Communication—What's the BIG Deal?
- David Wright, Weston & Sampson

Daily Work Hazards Due to Facility Construction
- Adam Conley, Woodard & Curran

SESSION 26
CSO II—Wet Weather Conveyance Improvements and Impact Mitigation
Moderators:
- Steven Freedman, AECOM
- Virginia Roach, CDM Smith

Construction Challenges of the Seekonk Combined Sewer Overflow (CSO) Interceptor
- Roger Norton, CDM Smith
- William Cotter, , CDM Smith
- Mohammad Reza Jafari, CDM Smith
- Robert Otoski, CDM Smith

A CSO Tunnel for a Century: Challenges of Planning and Design of the DC Clean Rivers Project
- Rosa Castro-Krawiec, McMillen Jacobs Associates;
- Rafael Castro. McMillen, Jacobs Associates
- Joel Kantola, McMillen, Jacobs Associates

Nashua Reduces CSOs with Green Infrastructure and Trenchless Technology
- Nicholas Ellis, Hazen & Sawyer
- Joseph Mendola, City of Nashua, NH

Capacity Assessment and Management Strategies to Control an Urban Stream in Lewiston, Maine
- Jeff Beaule, City of Lewiston, ME
- Daniel Bisson, CDM Smith
- Robert Musci, CDM Smith

SESSION 27
Asset management II—Case Studies
Moderators:
- Keith McHale, Consultant
- Shelby Beauchemin, Woodard & Curran

Getting Started with Stormwater Asset Management in Westford, MA
- Emily Scerbo, Tighe & Bond
- Jeremy Downs, Town of Westford, MA

Groton, CT Pump Station Evaluation
- Jen Zoppo, CH2M
- Chris Lund, Town of Groton, CT
- Eric Muir, CH2M

Master Facility Plan for the Bowery Bay WWTP
- Benjamin Levin, Hazen and Sawyer
- Anni Luck, Hazen and Sawyer
- Paul Saurer, Hazen and Sawyer
- James Mueller, New York City DEP

Pulling it Together: Canton's Five-Year IWRMP Asset Management Implementation
- Michael Trotta, Town of Canton, MA
- Rod Lovely, Kleinfelder
- Kirsten Ryan, Kleinfelder

SESSION 28
Stormwater II—Earn Your Keep: Making Your BMPs Work Better
Moderators:
- Aubrey Strause, Fuss & O'Neill
- Russell Parkman, Ramboll Environ

Selecting the Most Cost Effective BMPs for the Removal of Specific Nonpoint Source Pollutants
- Jeffrey Herr, Brown and Caldwell

Optimization of Filter Media and System Configurations of Green Stormwater Infrastructure Technologies
- Iulia Barbu, AECOM
- Kevin Beuttell, Stantec
- Thomas Ballestero, UNH Stormwater Center

Tools for Climate Change Adaptation—Intelligent Control of Green Infrastructure
- Andrea Braga, Geosyntec Consultants
- Kelly Havens, Geosyntec Consultants

The Development of Flow Simulation Tools for Permeable Pavement Systems
- Iulia Barbu, AECOM
- Thomas Ballestero, UNH Stormwater Center

SESSION 29
Plant Operations III—Operational Challenges and Solutions: Grit, Odor, Instrumentation and Primary
Moderators:
- Tom Hazlett, Woodard & Curran
- Pam Westgate, Kleinfelder

Get the Grit Out! Manchester, NH's WWTP Grit System Upgrade Project
- Fred McNeill, City of Manchester, NH
- Stephen Calabro, Stantec

Case Study: Odor Control Evaluation and Corrective Action at the Stamford, CT WPCF
- Jeffrey Pinnette, Wright-Pierce
- Daniel Capano, City of Stamford, CT/ Diversified Technical Services, Inc.

Foam Accumulation and Mitigation in BNR Systems
- Sarah Galst, Hazen and Sawyer
- Michael Lynch, Hazen and Sawyer
- Paul Pitt, Hazen and Sawyer
- Keith Mahoney, NYC DEP

Optimizing Clarifier Performance—Are We Designing the Clarifiers Right?
- Jim Fitzpatrick, Black & Veatch
- James Barnard, Black & Veatch
- Bikram Sabherwal, Black & Veatch
- Mark Steichen, Black & Veatch

SESSION 30
Collection Systems III—Episode IV: A New Tech
Moderators:
- Peter Garvey, Dewberry
- Thomas Loto, Kleinfelder

Innovative Odor and Corrosion Control Strategies for the Woodbridge Interceptor Sewer
- Robert Bowker, Bowker & Associates
- David Skibicki, Alaimo Group
- Scott Thompson, Township of Woodbridge, NJ

Prioritizing Efforts Using SL-RAT to Reduce SSOs
- Lindsey Donbavand, CDM Smith
- Dan Murphy, CDM Smith

Welcome PACP Version 7.0: Introducing the New Standard for Pipe Asset Management
- Laurie Perkins, Wright-Pierce

Cambridge Street Rehabilitation—Challenges of Trenchless Rehabilitation in Large Interceptors
- Kara Keleher, Weston & Sampson
- Frank Occhipinti, Weston & Sampson

GRADUATE STUDENT TECHNICAL SESSION

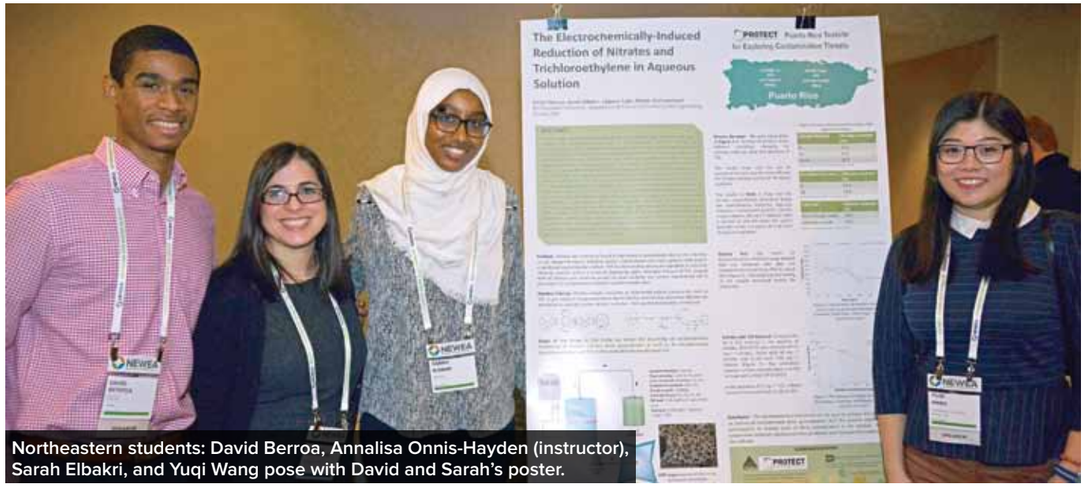
Fighting the Rising Tide: Diminished Septic System Performance Due to Climate Change
- Jen Cooper, University of Rhode Island

Technology Limit of Enhanced Biological Phosphorus Removal Process for Sustainable Phosphorus Removal and Recovery
- Yueyun Li, Northeastern University

Rapid Quantification of Dissolved and Nanoparticulate Metals with SEC-ICP-MS
- Pooya Paydary, Northeastern University

Diversity Of Cyanobacteria in Lake Systems: Explaining Biogeographic Patterns Using a Neutral Agent-Based Model
- Sahar Shirani, Northeastern University

Effects of Outer Membrane Vesicles on the Gram-Negative Bacteria Population
- Masoud Mahdi Soltani, Northeastern University



Northeastern students: David Berroa, Annalisa Onnis-Hayden (instructor), Sarah Elbakri, and Yuqi Wang pose with David and Sarah's poster.

POSTER BOARD DISPLAYS

Combined Odor Control and Enhanced Dewatering
- Alan Burke, Chemours, ADOX® Water Technologies

Phase 2 Upgrade to the Merrimack, NH WWTF—
Advancing Nutrient Removal
- Matthew Burns, Wright-Pierce

Church Street Pump Station—Vital Infrastructure for Thriving Beach Community
- Michael Curry, Wright-Pierce

Glycerin Augmented BNR in an A2/O Process with Online Process Monitoring and Automation
- Anthony Giovannone, Environmental Operating Solutions, Inc.

Application of the Biotic Ligand Model to Derive Acute and Chronic Site-Specific Water Quality Criteria for Copper in the Little Androscoggin River
- Patrick Gwinn, Integral Consulting, Inc.

Low Tech/High Performance Nitrogen Removal
- Brooks Newbry, Aero-Mod, Inc.

Trenchless Technology Microtunneling and HDD Methods Bring Added Value to Wastewater Collection and Water Supply Systems
- Maurice Ponti, Jr., Stantec

Novel Hydrolysis Process Produces Additional Biogas, Class A Biofertilizer, and a Carbon Source for BNR
- Ajay Singh, Lystek International, Inc.

What is my General Duty to Prevent Releases?
- Alan Stratton, Tighe & Bond

Challenges & Opportunities in variable Speed Wastewater Pumping
- Kristel Zaman, Xylem, Inc.

Urban Resilience Planning - How Ready Are You?
- Kristel Zaman, Xylem, Inc.

STUDENT DISPLAY BOARD COMPETITION

Wastewater Treatment System Design Improvements at the American Farm School in Thessaloniki, Greece
- Nikos Kalaitzidis, Worcester Polytechnic Institute

The Electrochemically-Induced Reduction of Nitrates and Trichloroethylene in Aqueous Solution
- David Berroa, Northeastern University

Use of Ozone to Remove Soluble Organic Nitrogen from Wastewater
- Lindsey Carver, Northeastern University

Recharging the City: Improving Stormwater Management and Groundwater Recharge for Redevelopment of the William E. Carter Field
- Greg Coyle, Northeastern University

Lexington "Stream Team"
- Karen Chan, University of Massachusetts/Lowell

Woburn MS4 Stormwater Management Program
- Stephanie Collins, University of Massachusetts/Lowell

UMass Lowell students, Karen Chan and Joseph Czerwinski with their presentation poster

The Annual Awards and Recognitions Ceremony was held on Wednesday, January 28, 2015. This ceremony recognizes the 2015 award recipients of EPA regional awards, various Water Environment Federation awards, and annual NEWEA awards. 1

2

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4

5

NEWEA Award Recipients: 1. A large contingent of City of Framingham Public Works employees posed at the awards luncheon to honor their Executive Director Peter Sellers, recipient of the Elizabeth Cutone Executive Leadership Award. 2. Betty Anne Rogers, Laboratory Analyst Excellence 3. Ned Beecher, Biosolids Management 4. Nora Lough, Alfred E. Peloquin (RI) 5. Peter Sellers, Elizabeth A. Cutone Executive Leadership

2016 Awards & Recognitions

U.S. EPA REGION I NEW ENGLAND AWARDS

Wastewater Treatment Plant O&M Excellence Award
- Dover, New Hampshire Wastewater Treatment Facility, *Represented by Raymond Vermette, Facility Supervisor*
- Massachusetts Maritime Academy Wastewater Treatment Plant, *Represented by Daniel Freitas, Chief Operator*
- Burrillville, Rhode Island Wastewater Treatment Plant, *Represented by John E. Martin, III, Superintendent*
- Smithfield, Rhode Island Wastewater Treatment Plant, *Represented by Karen Goffe, Superintendent*
- Brewer, Maine Water Pollution Control Facility, *Represented by Ken Locke, Superintendent*

Wastewater Trainer Excellence Award
- Aubrey Strause, Verdant Water

Wastewater Treatment Plant Operator Excellence Award
- Daniel Freitas, Chief Operator Massachusetts Maritime Academy Wastewater Treatment Plant
- Justin Frazier, Superintendent, Town of Troy, New Hampshire Wastewater Treatment Plant

Industrial Pretreatment Program Excellence Award
- City of Manchester, New Hampshire *Represented by Christopher Crowley, Industrial Pretreatment Coordinator*
- Portland Water District Portland, Maine *Represented by Rebekah Sirois and Abram Patenaude, Industrial Pretreatment Coordinators*
- City of Portland, Maine *Represented by Benjamin Pearson and Mike Moore, Industrial Pretreatment Coordinators*

Lifetime Achievement Award
- Andy Fish (Retired), Vermont Department of Environmental Conservation

NEWEA RECOGNITIONS

Scholarship Recipients 2015

Undergraduate Student
- Jessica Zielinski Meffert, University of New Haven

Graduate Student
- Yan Li, University of Connecticut

Non-environmental Student
- Maya Swope, Macalester College

Stockholm Junior Water Prize
- Julia Ennis, Fairfield, CT
- Paige Brown, Bangor, ME
- Nihar Sheth, Westford, MA
- Harshal Sheth, Westford, MA
- Erica Doucet, Allenstown, NH
- Morgan Kane, Bristol, RI
- Nick Knudsen, Burlington, VT

NEWEA AWARDS

NEWEA Operator Award

Connecticut
- Shane McCannon, Suffield, CT

Maine
- Nicholas Konstantoulakis, Mechanics Falls, ME

Massachusetts
- Jeffrey Kalmes, Billerica, MA

New Hampshire
- Rob Lauricella, Claremont, NH

Rhode Island
- Patrick Doyle, Warwick, RI

Vermont
- Christopher Cox, Montpelier, VT

Alfred E. Peloquin Award

Connecticut
- Vincent Susco, Jr., Haddam Neck, CT

Maine
- Timothy Haskell, York Beach, ME

Massachusetts
- Raymond Willis, Franklin, MA

New Hampshire
- Dana Clement, Allenstown, NH

Rhode Island
- Nora Lough, Providence, RI

Vermont
- Thomas DiPietro, South Burlington, VT

NEWEA AWARDS

Operator Safety Award
- Jody St. George, Southbridge, MA

James J. Courchaine Collection Systems Award
- Thomas Arnone, Windsor Locks, CT

Paul Keough Award
- Deborah Smith, Malden, MA

Young Professional Award
- Elizabeth Taglieri, Medway, MA

Public Educator Award
- Mary Lee Santoro, Stamford, CT

Biosolids Management Award
- Ned Beecher, Tamworth, NH

Asset Management Award
- University of Connecticut, Storrs, CT

Energy Management Achievement Award
- Saco Water Resource Recovery Department, Saco, ME

Wastewater Utility Award
- Raymond Vermette, Jr., Dover, NH

Committee Service Award
- Patricia Chesebrough, Peabody, MA

E. Sherman Chase Award
- Virginia Roach, Boston, MA

Clair N. Sawyer Award
- Helen Gordon, Dedham, MA

Founders Award
- Connecticut Water Pollution Abatement Association

Elizabeth A. Cutone Executive Leadership Award
- Peter Sellers, Framingham, MA

Past President's Plaque and Pin
- Bradley Moore, Frankfort ME

WEF – MA AWARDS & RECOGNITIONS

Operations Challenge Division II - Process Control, 2nd Place*
- NH Seacoast Sewer Snakes

Operations Challenge Division II - Process Control, 3rd Place*
- Force Maine

Outstanding Member Association Award*
- New England Water Environment Association

WEF Service/Delegate Award
- Erin Mosley, Boston MA*
- Howard Carter, Saco ME

Quarter Century Operators' Club
- Edward Alibozek, East Windsor, CT
- Scott Goodinson, Warwick, RI
- Robert Scott, Colchester, CT

WEF Life Membership
- David Gates, Manchester, NH
- Douglas Lee Miller, Cape Elizabeth, ME
- Glenn Haas, Taunton, MA
- Gerald Potamis, Falmouth, MA
- John De Gioia, Jr., Plantsville, CT

George W. Burke, Jr. Safety Award
- Narragansett Bay Commission, Providence, RI

Laboratory Analyst Excellence Award
- Betty Anne Rogers, Warwick, RI

William D. Hatfield Award
- John Adie, Nashua, NH

Arthur Sidney Bedell Award
- Michael Wilson, Boston, MA

*Presented at WEFTEC 2015

The following retiring NEWEA officers and committee chairs were acknowledged

OFFICER	OFFICE
Bradley Moore	Past President
James Barsanti	Vice President
Frank Occhipinti	Treasurer
Meg Tabacsko	Meeting Management Director
Peter Goodwin	Director—Maine
Frederick McNeill	Director—New Hampshire
Priscilla Bloomfield	Council Director—Treatment Systems, Operations & Management

CHAIR	COMMITTEE
Deborah Mahoney	Assessment & Development
John Jackman	Asset Management
James Drake	CSO/Wet Weather Issues
Thomas Schwartz	Energy
Amy Anderson	Exhibits
Lisa Andrews	Industrial Wastewater
John Trofatter	Information Technology & Automation
Helen Gordon	Journal
Mary Lee Santoro	Laboratory Practices
Brian Braginton-Smith	Microconstituents
Geraldine Ciardelli	Newsletter
Daniel Bisson	Nominating
Jessica Cajigas	Program
Clary Coutu	Public Awareness
Elena Proakis Ellis	Public Education
Katelyn Biedron	Registration
Nicholas Schwartz	Scholarships
Glenn Haas	Sponsor
Aubrey Strause	Stormwater
Edward Whatley	Water Reuse

EXHIBITORS

ABBA Pump Parts & Service
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ADS Environmental Services
Advanced Drainage Systems, Inc.
AESC Utility Cloud
Allied Powers LLC
AllMax Software Inc.
AP/M CentriPipe
Apollo Safety Inc.
Aqua Solutions, Inc.
AquaGen Infrastructure Systems, Inc.
Aries Industries, Inc.
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Atlantic Fluid Technologies
BAU Hopkins Inc.
Bilfinger Airvac Water Technologies
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BMC Corporation
Burt Process Equipment
C.N. Wood Co., Inc.
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Carl Lueders & Company
Carlsen Systems
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Casella Organics
Coyne Chemical Environmental Services
Cretex Specialty Products
CSI Controls (PRIMEX)
CUES
David F. Sullivan & Assoc.
DN Tanks
Duke's Root Control Inc.
Eastern Pipe Service, Inc.
ECOInsight Instruments Ltd.
Environmental Operating Solutions, Inc.
eRPortal Software, Inc
EST Associates, Inc.
F R Mahony & Assoc.
F.W. WEBB Co. - Process Controls Dlv.
Flow Assessment Services LLC
FlowWorks, Inc.
Flygt Products - A Xylem Brand
Grease Guardian
Green Mountain Pipeline Services
Ground Penetrating Carbon, Inc.
Hach Company
Hampshire Pump & Equipment LLC
Hanna Instruments, Inc.
Hayes Pump, Inc.
Hazen and Sawyer
Hobas Pipe USA
Holland Company, Inc.
Hydro Logic
Innovyze, Inc.
ITpipes
J&R Sales and Service, Inc.
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Lystek International, Inc.
Martinez Couch & Associates LLC
McGill Hose & Coupling, Inc.
Mechanical Solutions Inc.
Methuen Construction Co. Inc.
Milliken Infrastructure Solutions
National Filter Media
National Water Main Cleaning Co.
New England Environmental Equipment
Oakson
OptiRTC
Performance Chemicals, LLC
Perma-Liner Industries, LLC
PMC Engineering
POND Technical Sales
Precision Trenchless LLC
Protein Matrix LLC
Pump Systems, Inc.
Pure Technologies
R.H. White Construction Co., Inc.
R.I. Analytical Laboratories Inc.
Rain for Rent
RITEC Environmental
Rockwell Automation
Russell Resources
Safety, Inc.
Spartan Tool
Sprayroq, Inc.
Stacey DePasquale Engineering, Inc. (SDE)
Stantec
Statewide Aquastore, Inc.
Suez
Synagro Northeast
TcTech/Boyson New England
Technology Sales Associates, Inc.
Ted Berry Company, Inc.
The MAHER Corporation
The WISE Co., Inc. - Rotork Controls
Thompson Pipe Group - Flowtite
Trelleborg Pipe Seals
Truax Corporation
Trumbull Industries
United Concrete Products
USABlueBook
Victaulic
Vogelsang
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Walker Wellington LLC
Water & Waste Equipment, Inc.
Water Analytics, Inc.
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Xylem Dewatering Solutions – dba Godwin Pumps of America
Zoeller Engineered Products

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Green Mountain Pipeline Services
Hayes Pump
Hazen and Sawyer
Hoyle, Tanner & Associates
Kleinfelder
NEFCO
Stantec
SUEZ
Synagro Northeast
Tata & Howard
The MAHER Corporation
Tighe & Bond
Weston & Sampson
Woodard & Curran
Wright-Pierce
WSP/Parsons Brinckerhoff

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

25-Year Award
- ADS Environmental Services
- J&R Sales and Service

10-Year Award
- AP/M Permaform
- Environmental Operating Solutions
- Flow Assessment Services LLC

Upcoming meetings & events

NEWEA CONGRESSIONAL BRIEFING

April 12 – 13, 2016 • Rayburn House Office Building, Washington, DC

The NEWEA Congressional Briefing is the annual hallmark for the Association and its government affairs program. Mark your calendar to join us on April 12 – 13, 2016.

This is a great opportunity for our membership and elected officials to join together to discuss water, wastewater and stormwater infrastructure issues facing communities of the Northeast. We look forward to meeting with you and providing you with the latest information affecting our industry. Your involvement is critical—come to D.C. and be heard.

Attending the Briefing will allow:

- Opportunities to meet with senators, representatives and legislative staff
- Substantive discussion of federal clean water legislative initiatives and opportunity to provide feedback related to the impact that these initiatives have on our communities and the water quality industry
- A forum for presentation and discussion of the NEWEA Position statements
- Opportunities to learn about key federal regulatory initiatives
- A forum to provide comments directly to regulatory leaders from EPA's Washington, D.C. Headquarters

In addition to the Briefing Breakfast, an important part of this day is holding individual meetings with senators and representatives on the Hill. If you plan to attend the briefing, the government affairs committee will work with you to schedule these individual appointments.

EXECUTIVE COMMITTEE MEETING
March 30, 2016
Hilton Garden Inn, Worcester, MA

NEWEA CONGRESSIONAL BRIEFING AND NATIONAL WATER WEEK
April 12-13 2016
Rayburn House Office Building, Washington, DC

UTILITY MANAGEMENT— RESILIENCY/ EMERGENCY PREPAREDNESS CONFERENCE
Apr 26, 2016 • Best Western Royal Plaza

OPERATIONS CHALLENGE TRAINING DAY
April 29, 2016 • Holyoke WWTP • Holyoke, MA

LAB PRACTICES INFORMATION MANAGEMENT SYSTEM CONFERENCE
May 3, 2016
Narragansett Bay Commission, Providence, RI

WATER FOR PEOPLE—KENTUCKY DERBY GALA PARTY
May 7, 2016 • Dane Estates, Chestnut Hill, MA

NEWEA & NYWEA JOINT SPRING MEETING
June 5-8, 2016 • Mystic Marriott, Groton, CT

EXECUTIVE COMMITTEE MEETING
June 5, 2015 • Mystic Marriott, Groton, CT

INTERNATIONAL LOW IMPACT DEVELOPMENT CONFERENCE
Co-sponsored by ASCE
Aug 29-31, 2016
Holiday Inn By The Bay, Portland, ME

COLLECTION SYSTEMS CONFERENCE
September 12, 2016
Holiday Inn, Boxborough, MA

AFFILIATED STATE ASSOCIATIONS AND OTHER EVENTS

NEWWA SPRING CONFERENCE
March 30-31, 2016
DCU Center, Worcester, MA

NHWPCA TRADE FAIR
April 8, 2016
Executive Court Manchester, NH

MEWEA SPRING MEETING
April 15, 2016
Hilton Garden Inn, Bangor, ME

CWPAA TRADE SHOW
April 28, 2016
New Life Church, Wallingford, CT

CAWPCA SPRING WORKSHOP
May 6, 2016
Aquaturf, Plantsville, CT

RI NWPCA AWARDS BANQUET
May 24, 2016
Potowomut Country Club, Warwick, RI

GMWEA SPRING MEETING
May 26, 2016
Killington Grand Hotel, Killington, VT

NHWPCA SUMMER OUTING
June 17, 2016
Ellacoya State Park, Gilford, NH

CWPAA GOLF TOURNAMENT
June 17, 2016
Skungamaug River Golf Club, Coventry CT

MWPCA ANNUAL GOLF TOURNAMENT
June 21, 2016 •
Shaker Hills Country Club
Harvard, MA

RI NWPCA GOLF TOURNAMENT
June 27, 2016
Potowomut Country Club, Warwick, RI

RI NWPCA HOT DOG ROAST/GENERAL BUSINESS MEETING
July 12 • Smithfield WWTP

RI NWPCA CHOWDER COOK-OFF
August 9 • Narragansett WWTF

GMWEA GOLF TOURNAMENT
August 19, 2016
Cedar Knoll Country Club
Clambake and Exhibition

MWPCA ANNUAL TRADE SHOW
September, 2016
Wachusett Mountain Resort
Princeton, MA

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

Thank you

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- **Gold**
  - Aqua Solutions
  - AquaGen
  - CDM Smith
  - EST Associates
  - Flow Assessment Services
  - Green Mountain Pipeline Services
  - The MAHER Corporation
  - Weston & Sampson
- **Silver**
  - ADS Environmental Services
  - Brown and Caldwell
  - CH2M
  - Environmental Partners Group
  - Fuss & O'Neill
  - Hazen and Sawyer
  - NEFCO
  - SUEZ
  - Synagro Northeast
  - Tata & Howard
  - Tighe & Bond
  - Woodard & Curran
  - Wright-Pierce
  - WSP/Parsons Brinckerhoff
- **Bronze**
  - Carlin Contracting Co., Inc.
  - David F. Sullivan & Associates
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  - Stantec

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

Join NEWEA's 2017 Annual Sponsor Program

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

- NEWEA Annual Conference
- NEWEA Spring Meeting & Golf Tournament
- The Operations Challenge Golf Tournament
- A web presence on NEWEA.org's sponsorship program page
- The option to customize sponsorship levels by selecting to participate in up to eight additional unique NEWEA events plus additional activities

Sponsorship Benefits:

- Increased corporate visibility and marketing opportunities within a wide audience of water industry professionals
- Relationship-building access to key influencers involved in advancing water industry services, technology, and policy
- Recognition as an environmental leader among peers and customers

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

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New members

November 2015 – February 2016

Alana Burton Spaetzel
Boston College
Brighton, MA (STU)

Emily Derrig
Northeastern University
Littleton, MA (STU)

Joseph P. Donohue
EOS
Bourne, MA (YP)

Maria Franko
Northeastern University
Boston, MA (STU)

Kimberly Groff
MASS DEP
Worcester, MA (PRO)

Kestral Johnston
Northeastern University
Steamboat Springs, CO (STU)

Nicholas Konstantoulakis
Mechanic Falls Sanitary District
Mechanic Falls, ME (PWO)

Nancy C. Mohn
Simsbury, CT (PRO)

Isabelle Pelve
Mississauga, ON (STU)

Meghan Rauber
Brighton, MA (STU)

Mary Lou Rychling
Norwich Public Utilities
Norwich, CT (PWO)

Matthew Vareika
Evoqua Water Technologies
Lakeville, MA (PRO)

Derek Berg
Scarborough, ME (PRO)

Stephanie Cappelli
WPI Dept. of Civil & Environmental Eng.
Worcester, MA (STU)

Earle Chesley
City of Concord WWTF
Concord, NH (PRO)

Gordon Clark
Amherst, MA (STU)

Riley Cobb
Gorham, ME (STU)

Stephanie Collins
Woburn, MA (STU)

Richard Corsetti
BMC Corp.
Pinehurst, MA (COR)

Kevin Coulon
Triumvirate Environmental
Somerville, MA (PRO)

Carl Dahlman
Wallingford, CT (PWO)

Nathan Edwards
Jefferson, MD (STU)

Rebecca Gonsalves-Lamontagne
Woburn, MA (STU)

Sara Greenberg
GHD
Hyannis, MA (YP)

Kerem Gungor
Lewiston, ME (PRO)

Monty Hart
McGill Hose & Coupling, Inc.
East Longmeadow, MA (PRO)

Kevin Hoyt
Kevin Hoyt Construction LLC
Block Island, RI (PRO)

Yan Li
Willington, CT (STU)

Jason L. Mammone
Town of Dedham
Dedham, MA (PRO)

Bryan Manter
City of Somerville DPW Engineering
Somerville, MA (PRO)

Adam McNair
Northampton, MA (STU)

Xiaodi Pan
Worcester, MA (STU)

Pooya Paydary
Malden, MA (STU)

Stephanie Phillips
South Windsor, CT (STU)

Kevin Raftery
MWH Americas Inc.
Boston, MA (PRO)

Nathan Ratcliffe
Scituate, MA (PWO)

Sarah Vitale
UCONN
Storrs, CT (STU)

Michael Votruba
Worcester, MA (YP)

Andrea Weber
Cambridge, MA (STU)

Katherine Weber
New Haven, CT (STU)

David Wright
Weston & Sampson Engineers
Woburn, MA (PRO)

Xinzhu Xiong
University of Connecticut - Storrs
Mansfield, CT (STU)

Zhiheng Xu
Willimantic, CT (STU)

Jessica Zielinski Meffert
Branford, CT (STU)

Jeremy Bouvier
Manchester, NH (PRO)

Gwinlin Cox
Warwick Sewer Authority
Warwick, RI (PWO)

David Garabedian
North Billerica, MA (PWO)

Adrian Gutierrez
Bourne, MA (YP)

Peter Sullivan
Warwick Sewer Authority
Warwick, RI (PWO)

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)

Advertiser index

NEWEA/WEF* Membership Application 2016

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*	$174
☐ **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*	$67
☐ **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*	$105
☐ **Academic Package**	Instructors/Professors interested in subjects related to water quality.	■ *WE&T* (including *Operations Forum*) ■ *WEF Highlights Online* ■ *Water Environment Research* (Online)	$174
☐ **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*) ■ *World Water* ■ *Water Environment Research* (Online) ■ *Water Environment Regulation Watch* ■ *WEF Highlights Online*	$338
☐ **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*	$393

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 Fax 781.939.0907 NEWEA.org	**Charge** ☐ Visa ☐ American Express ☐ Master Card ☐ Discover	Card #	Security/CVC
		Signature	Exp. Date
		Daytime Phone	
Billing Address (☐ check here if same as above)	Street/PO Box	City, State, Zip	

Depending upon your membership level, $10 of your dues is allocated towards a subscription to the NEWEA Journal.

NEWEA/WEF* Membership Application 2016

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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