

New York Water Environment Association, Inc.

# ClearWaters

## Susquehanna River Basin

**Also Inside:**

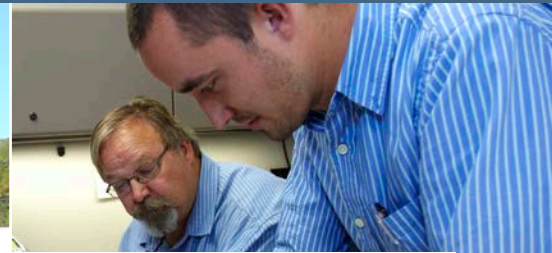
**89th Annual Meeting Highlights**





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# Clear Waters

New York Water Environment Association, Inc.

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Cover: Susquehanna River in Asylum Township, Bradford County, Pennsylvania, as seen from the Marie Antoinette Overlook along U.S. Route 6. The Overlook, approximately 500 feet above the North Branch of the Susquehanna River, was built in 1930 as a part of the Works Progress Administration. The view encompasses the French Azilum Historic Site. During the French Revolution in 1793, aristocrats fleeing persecution sought refuge in America, creating a small settlement on this parcel in Pennsylvania. A reconstructed log cabin from the period serves as a small museum with artifacts pertaining to the settlement. (Source: French Azilum Historic Site, <http://www.frenchazilum.com/index.php>) Nicholas A. Tonelli

The concepts, ideas, procedures and opinions contained in the articles in this publication are those as expressed by the various authors who submit the material for publication. The New York Water Environment Association, its board of directors, the editor, the executive director, and administrative staff hereby assume no responsibility for any errors or omissions in the articles as presented in this publication; nor are the concepts, ideas, procedures and opinions contained in these articles necessarily recommended or endorsed as valid by NYWEA, its board of directors, the editor, the executive director, or staff.

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## Celebrating the Past While Moving Forward

Spring is right around the corner, and with it comes promises of new beginnings. With that sentiment, I am honored to be writing my first message for *Clear Waters* as President of NYWEA. It is a privilege, and humbling responsibility.

Our organization is very strong and vibrant, thanks to the many volunteers that work tirelessly to make NYWEA great.

Some of the best examples of tireless volunteerism come from our past NYWEA presidents. We have had great leaders over the years and that tradition continued with our most recent presidents, now properly bestowed with the title "Water Ambassadors". Immediate Past-President and Water Ambassador Joseph Fiegl did a remarkable job with NYWEA's first ever messaging document and accompanying video that I will discuss shortly. Water Ambassador Fiegl displayed his commitment to NYWEA throughout his term as President, and is leaving me very big shoes to fill.

If you have had the opportunity to attend a recent NYWEA Spring Meeting you know Water Ambassador Michael Garland is truly a rock star. His 2015 initiative, the Year of the Operator, might be his biggest hit.

Water Ambassador Steven Fangmann continues to impress with his dedication to NYWEA. After serving with distinction through the offices leading to President, he has now taken on the position of chair of the Government Affairs Committee (GAC). With all that is going on in Albany and Washington, D.C., GAC has become one of the most active NYWEA committees. Water Ambassador Fangmann is uniquely adept at navigating these waters.

These gentlemen were the Presidents of NYWEA during my time on the Executive Committee. They each have their own style and have taught me much about leadership and guiding the wonderful organization that is NYWEA. I owe each of them much gratitude.

Of course, there are many Past-Presidents and Water Ambassadors that continue to do great things for NYWEA. It is impressive to see their ongoing involvement to help NYWEA do its work and support its mission. Please join me in thanking each and every one of NYWEA's Past Presidents and Water Ambassadors.

As mentioned previously, Water Ambassador Fiegl led NYWEA's efforts to produce a messaging document and video. Both debuted to much acclaim during the opening session of the 89th Annual Meeting in New York City. The crowd was rightfully impressed with the professionally produced handout and accompanying video. It was great to see so many passionate water professionals from across New York talk about their facilities and profession. It was also great to see many young professionals delivering compelling information in the video – future stars, I'm certain. In 2017 NYWEA will focus on getting the messaging document and video out to as many people as possible. A public awareness task force has been created by the Board to: develop a plan to get the message out; produce a shorter version of the messaging document that will provide a quickly digested message about the importance of water infrastructure; and, create shorter videos that can be more easily disseminated and shared throughout the industry.

Our industry has much to be proud of. In 2007, readers of the

*British Medical Journal* chose the introduction of clean water and sewage disposal – "the sanitary revolution" – as the most important medical milestone since the journal was first published in 1840. The members of NYWEA and other water professionals are still moving the sanitary revolution forward. We need to get this positive message out to the public. The messaging document, video and companion documents being created are great vehicles for this message.

## Planning for the Future

At its core NYWEA advances the protection of our water resources. As stated in NYWEA's Mission Statement: "NYWEA will serve the best interest of the public by promoting sustainable clean water quality management through science, education and training..." To continue to drive NYWEA's mission, and maintain focus on what you, our members, want, NYWEA conducted a strategic planning effort, the purpose of which was fourfold:

1. Continue to drive the mission of the organization into the public and political consciousness, thus producing an impact on both public policy and operational decision-making;
2. Prioritize investment of organizational resources to maintain and increase membership;
3. Review and consider ways and means to increase the value of services to membership; and
4. Align volunteer activities with the Strategic Plan goals to make the most of our invaluable NYWEA volunteers.

In the summer of 2015, many NYWEA leaders and volunteers attended a planning workshop held in Cooperstown, New York. This broad-based group identified many great ideas for NYWEA to focus on in the five-year planning horizon. Several subsequent teleconferences were held to refine the ideas and develop goals. Finally, a draft of the developed Strategic Plan was presented to the NYWEA Board. The Board voted unanimously in the fall of 2016 to approve the 2016-2021 NYWEA Strategic Plan, which set forth the following goals:

1. Training – Becoming or remaining a provider of choice to our members and others;
2. Influence – Driving the dialog related to clean water and water resources; and
3. Organizational/Financial Stability – Growing our membership and maintaining vitality.

To achieve these goals, the planning group identified a number of strategic action items to be accomplished by your Board, Executive Office, committees, and specialized task forces. The first step will be convening a Business Plan task force to identify the specific resources needed to implement the Strategic Plan. President-Elect Geoff Baldwin will lead this effort with assistance from Water Ambassador Mike Garland.

Our industry has done many great things to protect human health and the water environment, and we will meet the challenges that lay ahead. I look forward to an exciting year and hope to see many of you as we celebrate the past while moving forward.

A handwritten signature in black ink that reads "Paul J. McGarvey". The signature is written in a cursive, flowing style.

Paul J. McGarvey, PE, NYWEA President

## Executive Director's Message | Spring 2017



Sometimes, things in life just fall into place. You're at the right place at the right time ... you meet or are standing next to the right person and *Voila!* Serendipity. I'm so grateful when that happens. A case in point: Kerry Thurston, our editor, had emailed me while we were at the 89th Annual Meeting on Tuesday, in fact, just before I was walking up to the Young Professionals' Reception. She was writing to ask about the promotion of WEF's My Water Legacy program and if we could feature a couple of people in the

Spring issue of the magazine. As I arrived on the 9th Floor (literally moments after looking at her email), I met Christina Lehr. When I asked her how she got involved and she explained she was influenced by her mother who is an engineer – it was a perfect synergy! I was elated, and I think you'll enjoy reading the questions and answers Kerry posed to both of them on page 56. We'd like to continue this tradition of running My Water Legacy stories in the magazine, so please feel free to share with me your water legacy. I know of several husband/wife and family teams out there; please consider this an invitation to share your story and inspire others!

There were several other high points of the 89th Annual Meeting. For those of you who were not able attend, I want to share some of the positive experiences. The Opening Session was kicked off by President Fiegl, and his energy and enthusiasm for what was to follow set the tone for the meeting. "Protecting and Enhancing Modern Society" was the theme for the conference. NYCDEP Commissioner Vinnie Sapienza introduced Pamela Elardo, the new Bureau of Wastewater Treatment Deputy Commissioner. Pam came from King County, Oregon, where she was the Clean Water Utility Director. A seasoned professional whose passion for the industry is evident and runs deep.

**By the end of her presentation, NYWEA members were chanting "We Save Lives!"**

Her experiences serving as President of Living Earth Institute, a nonprofit organization dedicated to bringing water and sanitation to the poorest communities in Africa, punctuate the work that is carried out without fanfare and often taken for granted here in New York and across the nation. Pam's presentation was a perfect prelude to the Keynote speaker and author, Elizabeth Royte, who

shared her experiences learning about water when she wrote the book, *Bottlemania*, and then a story in the *New York Times*, titled a "Tall Cool Glass of Sewage". From the perspective of an environmental journalist, her presentation made us all understand and appreciate her passion for digging into a story to completely understand the complexities of bringing water from its source to the public and, depending on where you live, how very different each story can be.

The President and CEO of New York Environmental Facilities Corporation, Sabrina Ty, shared insight on the monies that are anticipated to be available and she encouraged municipalities to get on the Intended Use Plan for needed repairs and upgrades. Khris Dodson, NYWEA's Public Outreach chair, wrapped up the Opening Session by highlighting the important items included in the public messaging document and companion video. (Both are posted on NYWEA's website.)

There were so many great events that took place during the meeting, from the Exhibitor Reception to committee meetings; from the Student Activities to the Young Professionals' Reception. The awards luncheon on Wednesday was a wonderful way to honor those who have dedicated their time to improved water quality. There was something for everyone. Our appreciation goes out to the members of the Program Committee, the speakers and the moderators. Most importantly we want to thank the generous support of the exhibitors, sponsors and advertisers.

**With over 1,450 people in attendance, this meeting is the largest environmental conference dedicated to water quality issues in New York state.**

Attending a conference can go from good to great when you take advantage of everything that is offered. For the students and Young Professionals reading this message, I encourage you to take advantage of opportunities to learn, get involved, meet new people and push yourself outside of your comfort zone. (I tell my son, who is a college freshman, the same thing!) You will surely grow from these experiences, and be open to having some serendipitous moments of your own.

Enjoy the beauty of the Spring season and I look forward to seeing you in Rochester!

  
Patricia Cerro-Reehil  
pcr@nywea.org

### Do You Want to Be NYWEA President in 2021?

**I**f you are interested in a long-term, career-enriching opportunity, please consider applying for this important position. Being an officer is a rewarding experience, but it is also a commitment of five years (Vice President-Elect, Vice President, President-Elect, President, Immediate Past President). When reviewing applicants, the Nominating Committee will take the following items into consideration (no one is expected to have all of these items in their resumé):

- Leadership skills
- Vision and managerial skills
- Active and viable state committee chair
- Active and viable state committee involvement
- Continuous membership tenure greater than 7 years
- NYWEA award recipient
- Chapter endorsement (in writing)
- Chapter representative
- Active member of Chapter Executive Board
- Chapter officer
- Regular attendance at state meetings
- WEF Board of Directors service

**Please submit an electronic resumé with a cover letter that highlights any of the attribute areas above to:**

Patricia Cerro-Reehil, Executive Director, NYWEA,  
525 Plum Street, Suite 102, Syracuse, NY 13204 • Phone 315-422-7811 • Fax 315-422-3851 • Email pcr@nywea.org

**Nomination deadline is August 9, 2017. All members are eligible to apply!**

New York Marriott Marquis, New York, NY  
**Highlights of 89th Annual Meeting**



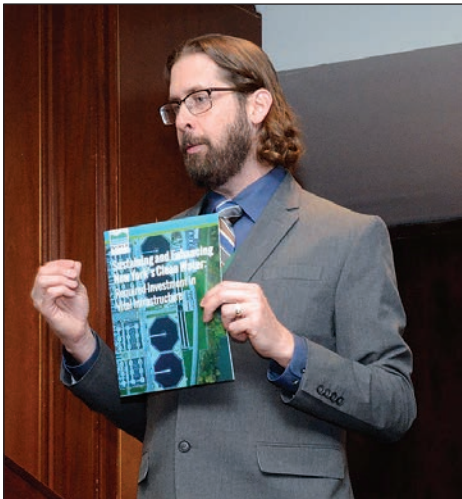
NYWEA President Joseph Fiegl addresses the members during Opening Session.



WEF President, Rick Warner, speaks about WEF programs.



Keynote Speaker is American science/nature writer, Elizabeth Royte, author of *Bottlemania* and *Garbage Land*.



Khristopher Dodson, NYWEA's Public Education Committee Chair, rolls out NYWEA's Messaging Document and video.



NYCDEP Deputy Commissioner, Pamela Elardo, has members chanting "We Save Lives!".



NYCDEP Commissioner, Vincent Sapienza introduced Deputy Commissioner Pamela Elardo.



Assemblyman Steve Englebright (left) receives NYWEA's highest honor, the Nelson A. Rockefeller Award, from President Fiegl.



The Exhibit Hall hosted lots of activity!



Above: City College students, Ingrid Florentino (left) and Berenice Oseguera, attend the Annual Meeting.



Krish Ramalingam from City College



Left: Tom Groves of NEIWPCC is recognized for his service on the Wastewater Operator Governance Council.



WEF President Rick Warner promotes a visit to Nevada!



Incoming NYWEA President, Paul McGarvey, addresses members during the Awards Luncheon.



Left: Howard Robinson is hard at work typing name badges and multi-tasking at the Registration Desk.



Above: Peter Petriccione (right) talks with Moji Amini in the Exhibit Hall.



Steve Kulcsar accepts the Gold Long Standing Exhibitor recognition award for SpectraServe Inc., who've exhibited for 20 years.

Neil Benen accepts the Gold Long Standing Exhibitor recognition award for Elliott International Equipment Corp., who've exhibited for 20 years at NYWEA's annual meeting.



Paul Brunelle accepts the Silver Long Standing Exhibitor award for Rodney Hunt, who've exhibited 18 years.



Victor Ramos (right) accepts the Gold Long Standing Exhibitor recognition award for J. Blanco Associates, Inc., the company has exhibited for 20 years.



Russell Harper (right) discusses his company's products at the Exhibition Hall.

Right: Regina Hanson accepts the Gold Long Standing Exhibitor recognition award for Varec Biogas, who've exhibited for 20 years.



continued on page 54



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### New York's Watershed Basin Programs

Through numerous watershed basin programs across the state, NYSDEC aims to improve water quality, restore and protect habitat, and enhance recreational access. Each basin program works with stakeholders to determine priority actions, guide restoration and conservation efforts, and identify project funding. These programs are:

*The Hudson River Estuary Program.* Protects and enhances the resources of the Lower

Hudson River watershed, a scenic and historic valley extending from New York Harbor to the Troy dam.

*The Mohawk River Basin Program.* This program's Action Agenda strives to conserve, preserve, and restore environmental quality, while managing the resources for sustainable economic development and farming within the 3,460-square mile watershed.

*New York City Water Supply Reservoir Program.* Located within the Hudson, Mohawk and Delaware River Basins, this program works with watershed communities to provide safe and reliable drinking water to 9.4 million downstate residents, while fostering a robust economy.

*The Great Lakes Basin Program.* Encompassing about 80 percent of the state's fresh surface water and 40 percent of its land area, this program works with local, state, federal and Canadian agencies to protect, restore, conserve, and enhance the water quality and natural resources of the watersheds of Lake Ontario, Lake Erie, and the St. Lawrence River.

*The Lake Champlain Basin Program.* Working with agencies and stakeholders in Canada and Vermont, this program's primary focus is the implementation of the Lake Champlain Phosphorus Reduction Plan, to protect the water quality of one of the largest North American lakes.

*Multi-state Agency Management Programs for the Headwaters of Three Major River Systems in New York's Southern Tier.* The Delaware River Basin Program focuses on water resource and conservation issues. The Susquehanna River Basin Program coordinates with the USEPA Chesapeake Bay Program to implement nutrient reductions. The Ohio River Valley Water Sanitation Commission (ORSANCO) encompasses a small portion of western-most New York.

*The New York/New Jersey Harbor Estuary.* This program facilitates efforts to reverse long-standing degradation of the complex marine system adjacent to one of the most densely populated metropolitan areas in the world.

*Long Island's Three Basin Programs.* Each program, working to restore and protect water resources, is a key partner in implementing NYSDEC's Long Island Nutrient Action Plan. The Long Island Sound Study (USEPA, New York and Connecticut) addresses hypoxia and other concerns in the Sound. The Peconic Estuary Program on Long Island's eastern end (NYSDEC, USEPA and Suffolk County) protects the estuary's rich aquatic communities. The South Shore Estuary Reserve (NYS Department of State) focuses on restoration and protection efforts on the south shore.

Visit the NYSDEC website and consider getting involved.

– James Tierney, Assistant Commissioner for Water Resources  
NYS Department of Environmental Conservation



### Confined Space Entry

Recently, a construction crew in Florida had a confined space life-and-death disaster. While responding to a neighbor's complaints of a foul smell, the construction crew noticed that a new section of road had settled poorly. To investigate below ground, three crew members entered a fifteen-foot-deep manhole and didn't come out. Responding to the emergency call, a volunteer firefighter entered the manhole

to attempt rescue, shedding his air pack to fit through the opening. He lost consciousness. A second rescuer, using his air pack, entered and rescued the first firefighter. The firefighter, a fourth construction crew member, and several sheriff deputies were hospitalized and survived. The first three crew members were fatally overtaken by hydrogen sulfide and methane vapors.

What does it take for these needless tragedies to stop? In this case, it could have stopped fifteen years ago, when the construction company was cited by OSHA for practically the same violations that lead to this tragedy: atmospheric testing wasn't performed; a confined space entry program wasn't implemented; confined space entry permits weren't implemented by a qualified person; a rescue plan wasn't implemented; rescue services weren't available in a timely manner; and rescue equipment wasn't available at the site.

Confined space regulations for general industry and construc-

tion have been on OSHA's books for decades. They are comprehensive and, when followed, they keep people alive. It requires effort to comply, including proper training, the right instrumentation, and – for the individuals on-site – an awareness that sometimes the best course of action is *not* to help. In a confined space situation, there is no safe way to “just jump in and out” without going through the procedures. The risk of injury or death is too high. Recent statistics showed that of about 100 fatalities a year, 20 percent were multiple fatality events. Of those fatalities, 60 percent were the would-be rescuer. This goes to the human side of all of us. We can see ourselves in the hole and, even knowing the risks, we put our clear thinking aside to help end the suffering.

What happened in Florida was a disaster on two fronts. First, it was needless. While it is not clear whether the crew had any training, they apparently didn't have the monitoring equipment or experience to properly react to the situation. Second, it was a human response. It is hard for the average person not to react; and unfortunately, this response contributed to the number of deaths. Professional rescuers train and drill to react with clear-thinking.

In our industry, we have the environment for potential disasters every day. We must take every precaution to help ensure that those disasters do not happen. In the sad event that an incident occurs, we must respond with empathy, compassion, and clear-headed thinking so that we all can come home.

– Eileen M. Reynolds, Certified Safety Professional  
Owner, Coracle Safety Management

## The Susquehanna River Basin

- Drains 27,510 square miles, covering half the land area of Pennsylvania and portions of New York and Maryland.
- Includes all or portions of 66 counties.
- Comprises 43 percent of the Chesapeake Bay's drainage area.
- Is comprised of six major subbasins:
  - the Upper Susquehanna and the Chemung in New York and Pennsylvania;
  - the Middle Susquehanna, the West Branch Susquehanna, and the Juniata in Pennsylvania; and
  - the Lower Susquehanna in Pennsylvania and Maryland.
- Has more than 49,000 miles of waterways – rivers, streams, creeks, brooks, runs, etc.

*(Source: National Hydrography Dataset)*

- Is made up of 63 percent forest lands.  
*(Source: USGS/Chesapeake Bay 2006 Land Use Data)*
- Has a population of more than four million.  
*(Source: 2010 U.S. Census Bureau)*
- Is home to the native brook trout, *Salvelinus fontinalis*.
- Is one of the most flood-prone areas in the entire nation, experiencing a devastating flood on average every 14 years. On average, the Basin's annual flood damages cost \$150 million dollars.

*Source: Susquehanna River Basin Commission*

## The Susquehanna River

- Flows 444 miles from its headwaters at Otsego Lake in Cooperstown, New York, to Havre de Grace, Maryland, where the river meets the Chesapeake Bay.
- Is the largest tributary of the Chesapeake Bay, providing 50 percent of its fresh water flows.
- Is the longest, commercially non-navigable river in North America.
- Is the largest river lying entirely within the United States that drains into the Atlantic Ocean.
- Is almost one mile wide at Harrisburg, Pennsylvania.
- Flows about 20 miles per day on an average summer day.
- Has a normal flow of about 18 million gallons per minute at Havre de Grace, Maryland.

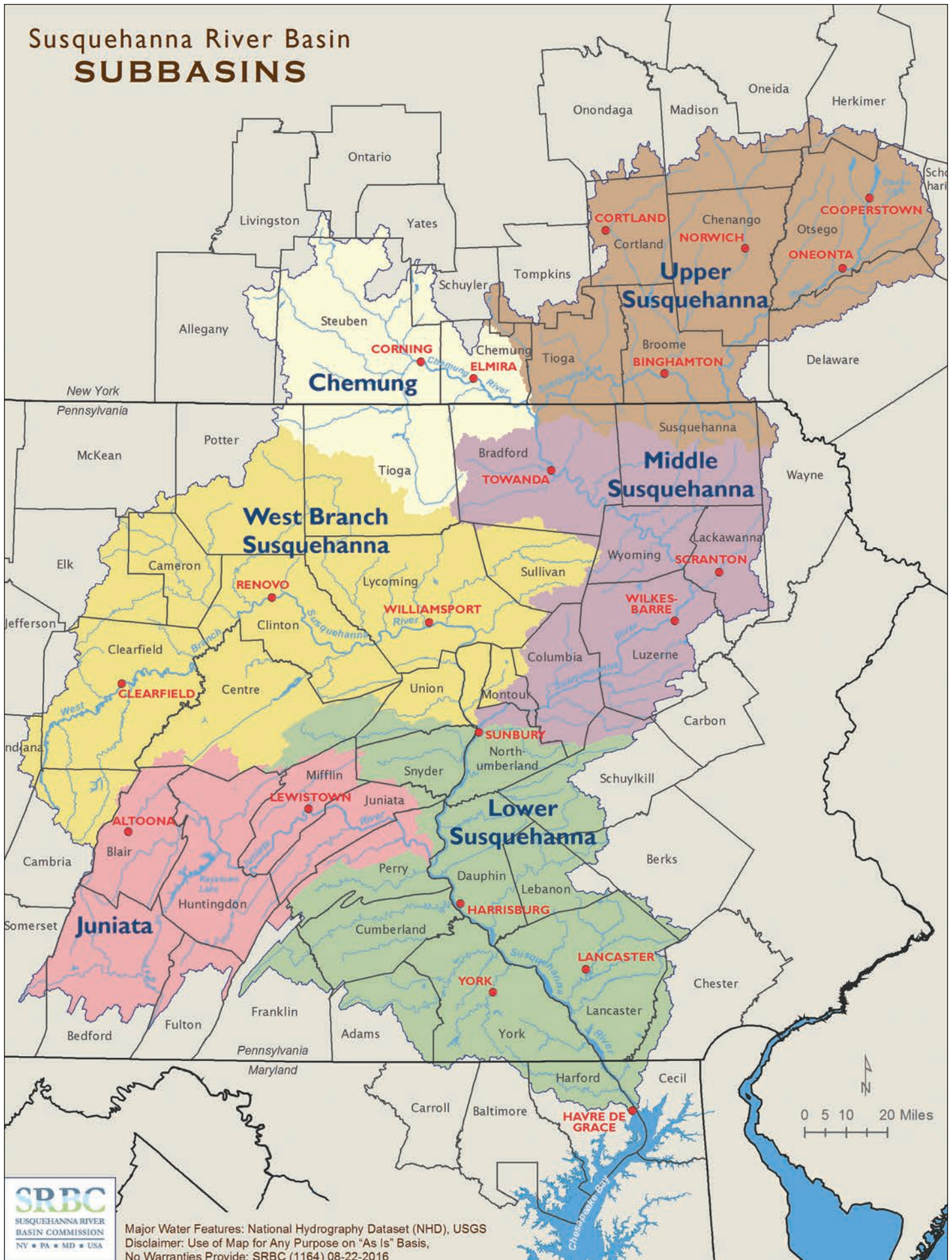
*Source: Susquehanna River Basin Commission*

The Susquehanna River Basin is  
the largest tributary of the  
Chesapeake Bay, providing 50 percent  
of its fresh water flows.



Dogwoods bloom along the Susquehanna River.

# Susquehanna River Basin SUBBASINS





Credit: benedel, istockphoto.com

# Susquehanna River Basin Commission – An Overview

by Gwyn Rowland

In the late 1960s, a broad group of concerned citizens saw the need for a federal-interstate coordinating agency to lead the conservation, development, and administration of the Susquehanna River Basin's water resources. The Susquehanna drains 27,510 square miles, an area nearly the size of South Carolina, and covers parts of the states of New York, Pennsylvania and Maryland. The Susquehanna River is classified as a non-commercially navigable waterway by the federal government; therefore, state, regional and national interests are involved.

The need to coordinate efforts of three states and the agencies of the federal government led to the drafting of the Susquehanna River Basin Compact, which was signed into law on December 24, 1970. The Compact, as adopted by the Congress of the United States, and the legislatures of New York, Pennsylvania and Maryland, provides the mechanism to guide water resource management of the Basin.

The Compact also established the Susquehanna River Basin Commission (Commission) as the agency to coordinate these efforts. Each member state/jurisdiction is represented by a commissioner who serves as the spokesperson for the government that he or she represents. In the case of the federal government, the commissioner has been identified in legislation as the Division Engineer, North Atlantic Division, U.S. Army Corps of Engineers. For the three states, the commissioners are the governors or their designees. The commissioners also typically appoint alternate commissioners.

The commissioners, or their alternates, meet quarterly to act on a variety of programmatic and administrative matters, including: applications for projects using water; adopting regulations, policies and budgets; and enacting various planning and management activities. Each of the four commissioners has a single vote.

Under the leadership of an Executive Director, technical and administrative staff support the daily operations of the Commission.

## Statement of Mission

The mission of the Commission, defined in the Compact, is to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Basin. To accomplish this, the Commission focuses on efforts to: reduce flood damage; provide for reasonable and sustained development of surface and groundwater resources for municipal,

agricultural, recreational, commercial and industrial purposes; protect and restore fisheries, wetlands and aquatic habitat; protect water quality and instream uses; and ensure future availability of flows to the Chesapeake Bay.

The Commission is uniquely qualified to carry out this mission. As a federal-interstate compact commission, its focus is defined by the natural boundaries of the Basin rather than the political boundaries of the member states. As such, the Commission serves as a forum to provide coordinated management, promote communication among the members, and resolve water resource issues and controversies within the Basin.

## Priority Management Areas

Commission staff develop and implement the programs as directed by the commissioners and as found in the Commission's Comprehensive Plan (SRBC, 2016). The six priority management areas of the Comprehensive Plan are as follows:

- *Sustainable Water Development:* To regulate and plan for water resources development in a manner that maintains economic viability, protects instream users, and ensures ecological diversity, while meeting immediate and future needs of the Basin's residents for domestic, municipal, commercial, agricultural and industrial water supply and recreational activities.
- *Water Quality:* To support the existing and designated uses of all water bodies by achieving water quality that meets or exceeds standards.
- *Flooding:* To prevent loss of life and significantly reduce future damages from floods within the Basin through an integrated system of structural and nonstructural flood damage reduction measures.
- *Ecosystems:* To achieve healthy ecosystems that provide groundwater and surface water of sufficient quality and in adequate supply to support abundant and diverse populations of aquatic, riparian, and terrestrial organisms, as well as human use.
- *Chesapeake Bay:* To manage the water resources of the Susquehanna River Basin to assist in restoring and maintaining the Chesapeake Bay so it meets or exceeds applicable water quality standards and supports healthy populations of living resources, including oysters, crabs, fish, waterfowl, shore birds and underwater grasses.
- *Coordination, Cooperation, and Public Information:* To maxi-

mize available human resources and achieve common and complementary management objectives by the Commission, its member jurisdictions and others; to promote the planning and management of the Basin's water resources in the most efficient manner possible; to inform the public on the Commission's water management responsibilities; and to enhance the public's access to Commission information and in commenting on Commission activities.

### Technical Program Overview

The Commission completes much of its work through four program areas: project review; compliance; monitoring and protection; and planning and operations.

*Project Review.* The permitting arm of the Commission's regulatory program, the Project Review team receives and reviews applications for water withdrawals and consumptive water use, makes recommendations to the commissioners for actions on those applications, and helps to develop key standards guiding how, when and where the Commission's policies and regulations are exercised.

*Compliance.* The enforcement arm of the Commission's regulatory program, the Compliance Program team works to ensure that water-related projects have the appropriate approvals and operate within the constraints of those approvals. Site inspections, quarterly reporting requirements, and an extensive project database are some of the essential tools used by staff.

*Monitoring and Protection.* To fulfill the Commission's mission, Monitoring and Protection scientists work to better understand the interactions of biological, chemical and physical traits of streams throughout the Basin. Although the Commission does not regu-

late water quality, it fulfills a critical role in monitoring conditions in a consistent, watershed-based manner across jurisdictional boundaries. Staff efforts include water quality monitoring and sampling for macroinvertebrates, fish, stormwater, nutrient and sediment loadings, and mitigating abandoned mine drainage. Other key efforts include real-time monitoring in sensitive watersheds and near drinking water supplies, establishing Total Maximum Daily Load (TMDL) criteria, and assessing risks to drinking water sources.

*Planning and Operations.* The Planning and Operations team provides technical support to the other programs and is tasked with assessing the nature and quantity of water use in the Basin. The team also leads coordination efforts to help ensure that Basin agencies and residents are prepared to withstand and react to flooding and drought conditions.

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*Gwyn Rowland is the Manager of Governmental and Public Affairs for the Susquehanna River Basin Commission and may be reached at [growland@srbc.net](mailto:growland@srbc.net).*

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Susquehanna River Basin Commission. *Comprehensive Plan for the Water Resources of the Susquehanna River Basin*. Andrew D. Dehoff, Executive Director. Harrisburg, PA. December 2013, as Amended June 2016. Available online at <http://www.srbc.net/planning/comprehensiveplan.htm>.

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# Highlights of the 2016 Susquehanna River Basin Commission Annual Report

by Gwyn Rowland

The Susquehanna River Basin Commission (Commission) releases an annual report each year to highlight some of the water resources management activities occurring in the Susquehanna River Basin (Basin). Several topics highlighted in the 2016 Annual Report include:

- the release of a report on the Cumulative Water Use and Availability Study;
- the release of a report on a five-year review of water use by the natural gas industry;
- an innovative stormwater solution for a Pennsylvania township; and
- a new TMDL-Approach for Chiques Creek.

## Cumulative Water Use and Availability Study for the Susquehanna River Basin

The purpose of the study was to develop and implement an approach to comprehensively assess consumptive water use within the Basin. This study closely examines water sustainability within the context of existing and projected water use compared to the amount of water estimated to be available during drier, low flow conditions. The scope and findings of the study include:

- comprehensive quantification of consumptive water use;
- determination of water capacity and availability;
- development of two GIS-based assessment tools; and
- consideration of protection, mitigation and enhancement measures.

Overall, the Basin is largely well-balanced in terms of sustainability, with over 82 percent of the watersheds showing adequate water availability when considering approved water use. However, certain areas of the Basin (nine percent) show potential for availability limitations based on the analysis and warrant further examination of assessed parameters such as water demand and hydrology. Lastly, the study demonstrates that current management practices have the potential for positive effects on managing water resources during a drought.

## Water Use Associated with Natural Gas Development: An Assessment of Activities Managed by the Susquehanna River Basin Commission, July 2008 to December 2013

With the initial stages of the unconventional natural gas development activities within the Basin having been completed, the Commission turned its attention to reviewing and assessing those activities from a water management perspective. Using data from July 2008 through December 2013, the primary objectives of this report were to summarize:

- the regulatory responses taken by the Commission to address this new, and previously unfamiliar, energy industry activity;
- the water use characteristics of the industry operating within the Basin;
- the various water quality monitoring activities conducted by the Commission in response to industry activity; and
- the efforts undertaken by the Commission to track the industry's compliance with its regulations.

The considerable amount of data collected and analyzed during

the report period support the following conclusions:

- Generally, the quantity of the Basin's water resources is sufficient in magnitude to accommodate the water demands of the industry concurrently with other water users currently operating within the Basin.
- Concerns related to the impacts to water sources are focused on the timing and location of the withdrawals and are adequately addressed by the low flow protection measures and other protective operating conditions.
- To date, the Commission's monitoring programs have not detected discernible impacts on the quality of the Basin's water resources resulting from natural gas development, but continued vigilance is warranted.

## Solving the Sinkhole Challenge with Innovative Stormwater Solutions: A Partnership with Hampden Township, Pennsylvania

The Commission partnered with Hampden Township and the Alliance for the Chesapeake Bay to complete an innovative stormwater treatment system within an area that is plagued by sinkholes. The project was funded by a grant through the Pennsylvania Department of Community and Economic Development. This unique project is designed to improve water quality and reduce the quantity of stormwater runoff from approximately 50 acres in a very popular and heavily used township park in the Cedar Run Watershed, located in Cumberland County, Pennsylvania.

The scope involved retrofitting an existing traditional stormwater basin at the Hampden Fire Station, and constructing a swale and an aquifer recharge system at the Hampden Township Community Swimming Pool. The swimming pool site was the location of a recurring sinkhole, formed largely due to the traditional infiltration stormwater design concepts that were used. Since the depth to karst bedrock was extensive, the Commission designed an aquifer recharge system combining two existing technologies: a filtration area (similar in form and function to a rain garden) to improve stormwater quality; and a direct connection well to inject the water to the aquifer. The use of the well allows for groundwater recharge while minimizing the potential for soil movement and the subsequent formation of sinkholes. Native plants and grasses were installed to filter pollutants and improve water quality throughout all the constructed features.

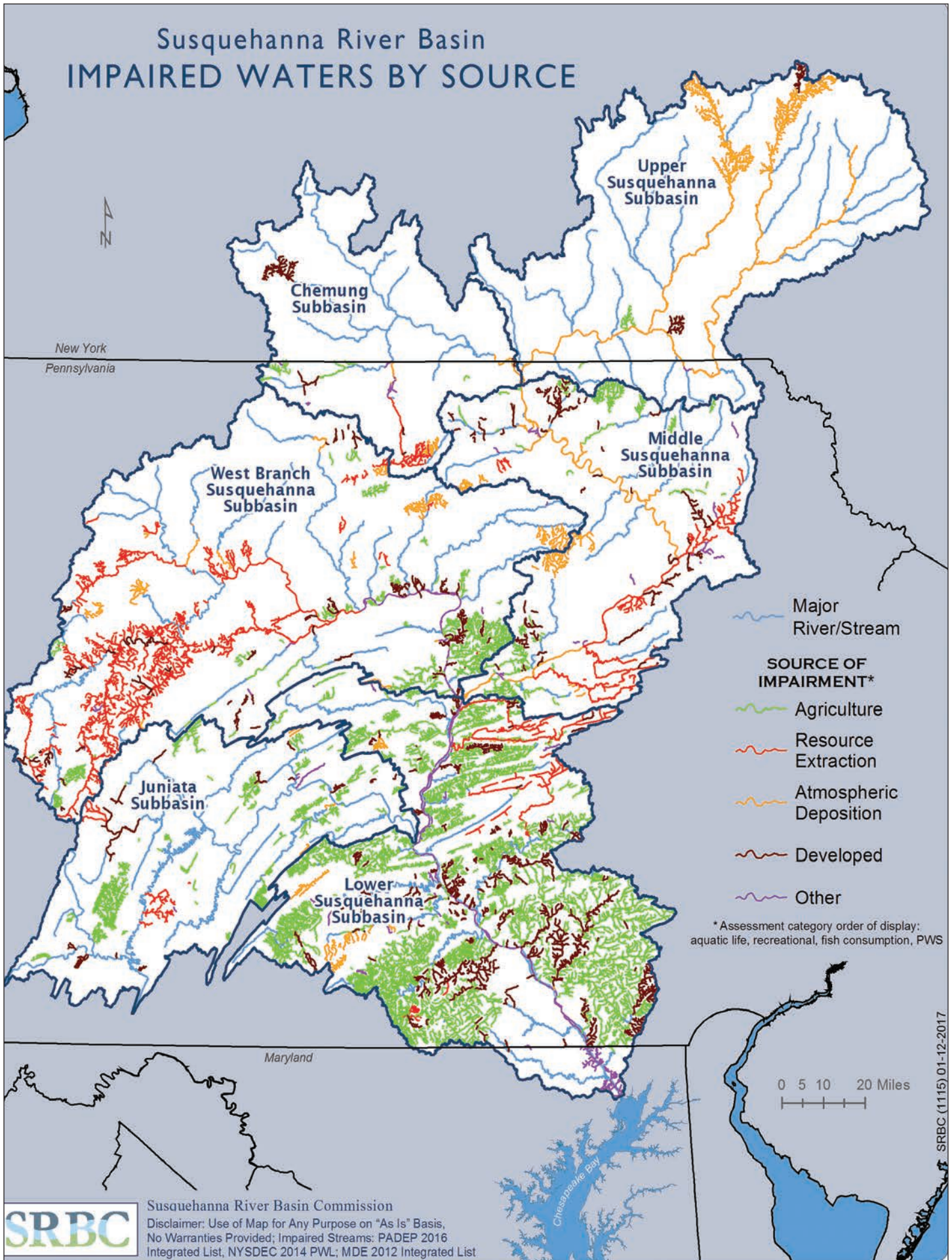
As part of the grant, on-site monitoring and sampling will be performed to evaluate the aquifer recharge system to quantify improvements.

## Chiques Creek TMDL-Alternative: A New Approach

The Commission is partnering with the Pennsylvania Department of Environmental Protection (PADEP), the Penn State Agriculture and Environment Center, Lancaster County Conservation District, local municipalities, and many other interested stakeholders to collaborate on an innovative approach for achieving water quality improvements in the Chiques Creek watershed, Lancaster and Lebanon Counties, Pennsylvania.

Based on assessment work through 2014, approximately 50 miles

*continued on page 16*



Susquehanna River Basin Commission  
Disclaimer: Use of Map for Any Purpose on "As Is" Basis,  
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Integrated List, NYSDEC 2014 PWL; MDE 2012 Integrated List



of streams within the Chiques Creek watershed do not meet water quality standards, with most of the pollution coming from a wide range of human activities adding excessive sediment and nutrients into the streams.

Total Maximum Daily Loads (TMDLs) can be thought of as a watershed budget for pollutants, representing the total amount of pollutants that can be assimilated by a stream without causing impairment or water quality standards to be exceeded. The TMDL process allocates the amount of pollutants that can be discharged into a waterway from each category of pollutant source. Once a TMDL is approved, it is often left to the local watershed groups and citizens to develop an implementation plan for achieving the TMDL with PADEP assistance.

Instead of pursuing the more prescriptive TMDL approach of assigning pollutant allocation loads and dictating restoration goals, this diverse stakeholder group will develop a restoration plan for the watershed's streams and creeks through a collaborative process established under a new TMDL-Alternative framework. This pilot process will be a comprehensive effort to understand nutrient and sediment sources; identify tools and solutions to diminish inputs; implement and/or provide technical and financial assistance to implement projects; and monitor the effectiveness of project implementation. Local stakeholder interests are heavily involved in the process and will be critical to the success of the TMDL-Alternative. Strong public interest and organized stakeholder groups were one of the driving factors for piloting the TMDL-Alternative in this watershed.

Major efforts in 2016 included establishment of five active stakeholder workgroups that include representatives from over 20

organizations as well as local and state government officials. These workgroups will provide the backbone for the efforts needed to work towards restoring the watershed. Throughout the process, checkpoints will be established to evaluate progress and adjust the approach in support of the adaptive management model. Upon completion, the TMDL-Alternative will serve as a model for achieving success in other areas of the Basin.

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*Gwyn Rowland is the Manager of Governmental and Public Affairs for the Susquehanna River Basin Commission and may be reached at [growland@srbc.net](mailto:growland@srbc.net).*

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- Susquehanna River Basin Commission. *Annual Report 2016*. Andrew D. Dehoff, Executive Director. Harrisburg, PA. Gwyn Rowland, Editor. [http://www.srbc.net/pubinfo/docs/SRBC\\_2016AnnualReport\\_Web\\_SinglePages.pdf](http://www.srbc.net/pubinfo/docs/SRBC_2016AnnualReport_Web_SinglePages.pdf).
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- “Chiques Creek Restoration Initiative: An Alternative Approach to the Traditional TMDL”. Website, *Susquehanna River Basin Commission*. <http://www.srbc.net/programs/chiques/chiques.htm>.

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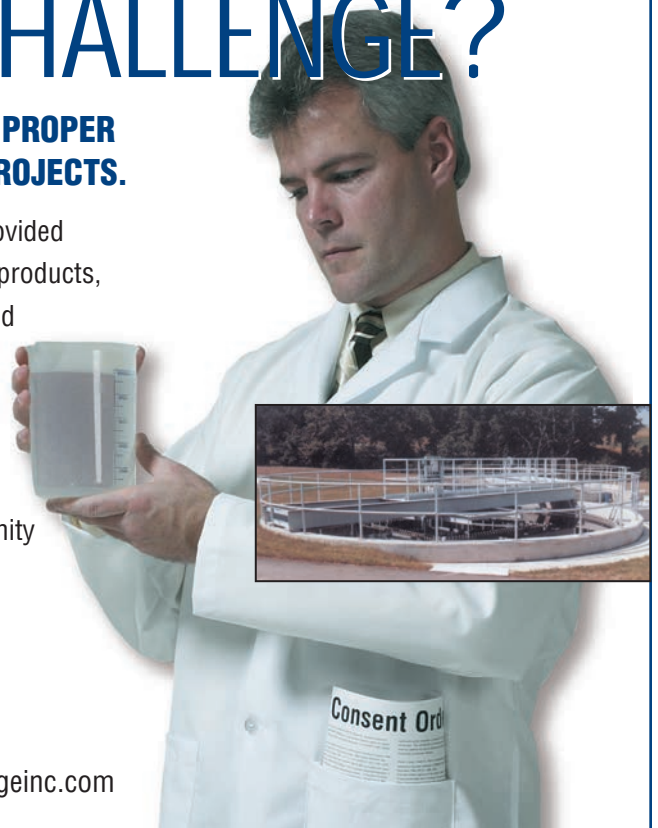
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# Building Local Capacity – The Key to Flood Resilience, Water Quality and Good Natural Resource Management

by Mike Lovegreen and Wendy Walsh

Back in the 1930s, the U.S. Department of Agriculture (USDA) recognized that to further good farmland practices there needed to be sound local understanding and buy-in. The USDA had a great idea to achieve this: each locality should have a board that represented the local landowner/manager needs; that brought local, state and federal resources to the table to address those needs; and that promoted those opportunities. These local boards became today's Soil and Water Conservation Districts, which exist in every county of the United States. Douglas Helms, former historian for what was then known as the Soil Conservation Service, wrote, "In a way the system of district and state cooperation with the federal government could produce a service that was greater than the sum of its parts." (*Helms, 1992*)

So, what happens when you combine the resources of sixteen County Soil and Water Conservation Districts in New York, and three County Conservation Districts in northern Pennsylvania, that have a common interest in the upper 7,500 square miles of the Susquehanna River Watershed? You get the Upper Susquehanna Coalition (USC), a unique and highly effective organization for sharing, empowering and building capacity at a regional level.

Each District has developed a unique set of resources in the form of people, technical resources, knowledge and equipment needed to address their local needs. Since each district has evolved to meet locally identified needs, they may not have the staff or know-how to address regional needs. Through a cooperative framework based on Memoranda of Understanding, the resources of each member

district can be shared among other member districts to achieve common goals.

The USC focuses on three primary resource concerns:

- wetlands – their preservation, management and creation;
- agriculture – providing technical, informational and financial assistance to our farming community to implement best management practices; and
- streams – providing technical, informational and financial assistance to watershed communities and individuals.

**“While laws and regulations set ground rules, the intent of those laws and regulations is to protect the resources they are addressing. Folks need to understand that intent, and reasons behind it, to truly implement sound resource management.”**

– Mike Lovegreen

**“The USC’s primary goal is to combined knowledge, skills, expertise, equipment and other resources of all its members and partners to address regional needs.”**

– Wendy Walsh

Under the USC banner, staff from one district can be detailed to assist another district in addressing natural resource issues. The USC's Stream Team is a great example of how the cooperative framework functions for stream management. Several districts that have developed top expertise in addressing stream and watershed challenges generously make those resources available to the region, thus producing a service that is greater than the sum of its parts.

The USC Stream Team, as does the entire USC, operates as a local community organization and recognizes that the only true path to managing and protecting our natural resources is in providing the landowners/managers and communities with the knowledge and tools to do the best they can. The USC Stream Team operates under guiding principles that include pragmatism; addressing the causes, not only the symptoms; local education and empowerment; science-based solutions; identifying restoration objectives; and creativity and cost effectiveness, among others.

A good example of the USC Stream Team approach is the Post-Flood Emergency Stream Intervention Program (ESI). The one-to three-day training is aimed at local officials that are the first responders after a flood has hit their community. Often, with the best of intentions, a community may impact a stream channel in a negative way while attempting to restore the drainage function of that channel, either by over-excavating, creating berms or over-widening it. The ESI program educates participants on how a stream functions and transports both water and sediment. The program also provides practical and understandable tools based on science developed by USGS, and demonstrates application of these tools. By building this understanding and providing science-based tools, the USC is building local capacity that starts the path towards restoring many of the streams of our region, one municipality

*continued on page 20*



Credit: Mike Lovegreen

2014 ESI workshop in Cortland County

**“I’ve been a town supervisor for 38 years and for all of those 38 years they [the State] have been telling me I shouldn’t be dredging the streams the way I do. I finally understand why.”**

**– An ESI Educational Session Participant**



Credit: Mike Lovegreen

**2015 NY DOT ESI workshop at a field site**

at a time. In the last two years, USC personnel have given over 40 trainings, not only in their region but statewide, to over 1,400 individuals representing federal and agency personnel and local decision makers. The USC Stream Team was awarded the New York Governor’s Award for Environmental Excellence in 2015 for their efforts in this program.

Since the USC is now recognized as representing the needs of the entire Susquehanna Region in New York, it is often successful in leveraging additional resources. An example of this has been the USC’s relationship with the National Fish and Wildlife Foundation (NFWF). Not only has the USC been fairly successful in obtaining funding from NFWF, but the USC also serves as a technical service provider for organizations and municipalities seeking NFWF assistance. Two examples of successful funding applications are the Natural Infrastructure grant and the I-4 Watershed grant, two grants the USC received from NFWF to address stream corridor issues and build local capacity.

The Natural Infrastructure grant addresses stream corridor issues. Elements of the stream corridor include the channel, stream banks, riparian areas, floodplains and upland contributions. Often, many of the funding programs focus on only one of those elements. Utilizing Natural Infrastructure funding, the USC can begin to address the multiple functions of the whole stream corridor, often matching and supplementing other existing programs. The USC can then provide any combination of assistance to its applying member in the forms of funding, inventory and analysis, design, and – with its own equipment – the building of the project.

The I-4 Watershed Program is an ambitious step towards the goal of building local capacity in seven watershed communities, not only at the watershed level but also at the local district level.

The “I-4” stands for “Information, Investigation, Implementation, and Integration”. Watersheds were selected for this program based on criteria for size and the level of local need and cooperation. Under the program, teams of volunteers are trained to do a stream corridor assessment that helps identify those problem areas that contribute to flooding and impacted water quality, such as sediment loads and threats to infrastructure.

Often, the watershed and stream studies that are conducted are not readily understood by the communities they are intended to serve. In order to address this problem, the I-4 Watershed Program focuses on compiling the stream corridor inventory and a comprehensive collection of existing watershed resources into a “background report” that tells an interpretive story of the watershed. Any “missing links” identified in the report initiate further research to address those needs. Finally, demonstration projects and educational outreach customized to the watershed communities are developed and rolled out. The result of this program will be a shelf full of identified and prioritized projects that can be applied to addressing watershed community needs. All this is accomplished through the coordination of the USC member district representing the watershed, thus building capacity at the community and district levels.

NFWF is not the only organization to recognize the unique collaborative opportunities the USC – particularly the Stream Team – offers. The U.S. Environmental Protection Agency Chesapeake Bay Program has added the USC to its Stream Health Workgroup. Both the New York State Department of Environmental Conservation and New York State Department of Agriculture and Markets (NYSDAM) has provided resources to assist the USC in building local capacity. One such example is the removal of berms that often result from stream channel dredging. While these berms may provide a sense of security, since they are made of materials initially mobilized by the stream, it is a false one. Moreover, by disconnecting the stream from its active floodplain, flooding downstream can be directly impacted. The USC, through various grants, will either remove those berms or pay to do so, thus restoring stream corridor function.

The USC is also an active responder to flooding in its region. Recognizing both the expertise of the USC Stream Team and the fact that the Susquehanna is one of the most flood-prone river systems in the nation, a flood resilience grant was awarded to the USC by the NYSDAM to develop a methodology, which is understandable for non-stream experts, of assessing the stability and potential vulnerabilities of the stream corridor. Originally designed for use by agricultural technicians, the tool has applicability for any municipal officials or others concerned with the state of their streams.

For the last 200 years we have been making stream management decisions, often with limited understanding. Those decisions, along with the land changes experienced in our watersheds, have frequently resulted in increased management challenges such as stream erosion, sedimentation and flooding. How we manage our resources is directly related to how we understand their function and mechanics. That understanding is how the USC begins and continues its mission.

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*Mike Lovegreen is the USC Stream Team Leader, and may be reached at [mike.lovegreen@u-s-c.org](mailto:mike.lovegreen@u-s-c.org). Wendy Walsh is the Manager of the Tioga Soil and Water District and Coordinator for the USC and may be reached at [walshw@co.tioga.ny.us](mailto:walshw@co.tioga.ny.us).*



Credit: Mike Lovegreen

2014 Steuben County ESI workshop, field component

## Highlighted Upper Susquehanna Coalition Programs and Projects

### USC Ag Team

The USC has developed the Basin Wide Grazing Initiative that promotes prescribed grazing techniques, cow exclusion from streams and riparian buffers. Two Grazing Specialists have been hired and they have begun coordinating several grants that will provide resources to grazing projects spread through the USC. A grazing request form was developed to track potential project sites. Interested grazers can contact Wendy Walsh for more information.

### NYS CFA Wetland Construction and Floodplain Enhancement

The USC, through the Tioga County Soil and Water Conservation District, received a New York State Consolidated Funding Application grant for the Southern Tier to construct 120 acres of wetland complexes and remove 48,000 feet of streamside berms to reconnect the streams to their floodplains. Wetlands will be constructed on NY State lands in partnership with NYSDEC foresters who are presently completing a similar project with USC biolo-

gists under another grant. The berm removal component will target counties recently impacted by Tropical Storm Lee.

### USC Stream Team

The USC Stream Team, comprised of stream professionals from several member counties, is leading the way to rehabilitate streams in the watershed. Their rigorous technical approach will ensure a high-quality restoration product. Members can suggest potential stream restoration projects using an on-line form and interested readers can contact the Team Leader, Mike Lovegreen.

### USC Wetland Program

USC staff and partners continue to develop quality wetland resources, implement off-site mitigation projects, review projects for the Susquehanna River In-Lieu Fee Program, monitor vernal pools and promote vernal pool research, and generally expand wetland awareness and protection throughout the watershed.

### USC GIS Program

Our GIS (Geographic Information Systems) Program is designed to support and enhance our natural resource projects. High quality topographic maps, aerial imagery, and site-by-site data promote our watershed modeling and tracking efforts. We are constantly expanding and improving our data resources and capabilities so please contact Chris Yearick, our GIS Specialist for more information.

### The USC Cover Crop Initiative to Bring Answers to Producers' Questions in New York

The USC was recently awarded Natural Resources Conservation Service (NRCS) Conservation Innovation Grants (CIG). The goal of this project is to stimulate the utilization of cover crops in the Chesapeake Bay Watershed to assist with basin-wide nutrient and sediment reduction goals.

Source: <http://www.u-s-c.org/html/index.htm>




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Helms, Douglas. 1992. "Conservation Districts: Getting to the Roots" in *Readings in the History of the Soil Conservation Service*,

September 1992, from a presentation at the 7th International Soil Conservation Organization Conference in Sidney, Australia, September 27-30, 1992.

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# Waverly's Approach to Chesapeake Bay Compliance

by Dave Ohman, Mike Primmer and Robert Chiappisi

## Background

On May 12, 2009 President Obama signed into law *Executive Order 13508 – Chesapeake Bay Protection and Restoration (2009)* that directed the federal government to develop a plan that would reduce pollutants and achieve water quality necessary “to support the aquatic living resources of the Bay and its tributaries and to protect human health” (*CEC 2000*). In response to that order, the U.S. Environmental Protection Agency (USEPA) established Total Maximum Daily Loads (TMDLs) to limit the quantity of phosphorus, nitrogen and sediment entering the watershed from all point and non-point sources (*USEPA 2010*).



Credit: Delaware Engineering D.P.C.

View of the Village of Waverly Water Resource Recovery Facility (WRRF)

At 64,000 square miles, the Chesapeake Bay watershed is the largest in the continental United States. Fed by 150 rivers and streams, it spans across six states and the District of Columbia (seven regional jurisdictions altogether), and is home to over 17 million people. The headwaters of the watershed are located over 500 miles north of the Bay in the upstate New York Village of Cooperstown at Otsego Lake, the source of the Susquehanna River. To comply with Executive Order 13508, the USEPA directed each of the seven regional jurisdictions to create *Watershed Implementation Plans (WIPs)* that would describe how each jurisdiction would meet the nutrient and sediment goals prescribed by the USEPA, although wide latitude was given to each jurisdiction for meeting those goals.

The Village of Waverly (the Village), located in Tioga County, is situated in the Southern Tier of New York, along the northern Pennsylvania border. It is flanked by the Chemung River to the west, and the Susquehanna River to the east, six miles north of the confluence of the two rivers. The Cayuta Creek, a tributary of the Susquehanna, flows through the western edge of the Village and receives the discharges from the Village's water resource recovery facility (WRRF).

In 2009, New York's wastewater sector was responsible for 14 percent of the total delivered nitrogen load and 20 percent of the total delivered phosphorus load entering the watershed (*NYSDEC 2013*). In their Final Phase II Watershed Implementation Plan for the New York Susquehanna and Chemung River Basins (*2013*), the New York State Department of Environmental Conservation (NYSDEC) developed waste load allocations (WLA) for the wastewater sector.

Both interim and final goals, effective 2017 and 2025 respectively, were established. The NYSDEC identified the Waverly WRRF as one of 30 “Bay significant” water resource recovery facilities in New York. These 30 identified facilities include those WRRFs and industrial dischargers with design flows greater than 0.4 million gallons per day (MGD). Final WLAs will have a target concentration of 0.5 milligrams/liter (mg/l) for phosphorus and 8 mg/l for nitrogen. Once those goals have been met, the Waverly WRRF's contribution to the watershed will account for 0.36 percent of the state's total WLA for phosphorus and 0.48 percent for nitrogen.

## Project Need

Construction on the Waverly WRRF began in 1977 and the facility was fully operational in 1980. An upgrade was completed in 1984 to add additional aeration capacity and biosolids dewatering. The plant as it exists today is unable to consistently meet the TMDL for nutrient removal from regulated point sources prescribed by the NYSDEC in the Final Phase II WIP. In addition, much of the existing equipment has reached the end of its useful life and requires repair or replacement.

Therefore, the Waverly WRRF requires upgrading to meet the current and future service needs of the community, while satisfying both the State Pollutant Discharge Elimination System (SPDES) permit and Chesapeake Bay watershed requirements.

## Project Issues

Several issues were considered during evaluation of the alternatives for the upgrade of the Waverly WRRF. These include: industrial contributions; flow capacity of the plant; effluent performance; regulatory compliance; site constraints; re-use of existing facilities; proven treatment processes; and other desired enhancements.

*Industrial Contribution* – One large industrial user contributed approximately 50 percent of the flow to the plant, as well as significant nitrogen and phosphorous loadings. Flow rates and load volumes from this industry vary, creating process challenges for the aging Waverly WRRF.

The Village's initial conceptual upgrade plan, as well as the August 2015 Engineering Report (*Delaware Engineering D.P.C. 2015, revised 2016*), included this industrial user's flow into the plant. However, in the fall of 2015 the industrial user advised the Village that they were investigating directly discharging into the Chemung River rather than continuing to be serviced by the Waverly WRRF. In February 2016, the industrial user advised the Village that they were proceeding with a direct discharge plan. Consequently, the Village's conceptual upgrade plan required revision to reflect the reduced flow and loading.

*Flow Capacity* – The Waverly WRRF's current SPDES permit specifies a 1.35 MGD monthly average flow limit. While Waverly's post-war population peaked in the 1950s at just over 6,000 residents, it has seen a steady decline since that time. The last 30 years has seen the population decrease by 14 percent. Currently, the population is holding steady at just over 4,440 residents. The population reduction, combined with the end of the industrial contribution, resulted in the Village's decision to base the upgrade capacity upon a monthly average flow of 0.8 MGD.



*Effluent Performance* – To comply with the proposed ultimate SPDES nutrient effluent limits, the upgrade design will be based upon final effluent values for total nitrogen (TN) and total phosphorous (TP) of less than 10 mg/l and less than 0.5 mg/l, respectively.

*Regulatory Compliance* – The Village is currently negotiating an Order on Consent with the NYSDEC in response to the Waverly WRRF’s non-compliance with nutrient removal requirements due to the limitations of the aging plant. The Village is working closely with the NYSDEC Region 7 to develop a reasonable compliance schedule. Also, as part of the Order on Consent, the Village will develop an Interim Operating Strategy to maximize treatment during the facility upgrade since much of the existing plant will be modified by the upgrade. Interim permit limits are included in the Order to mitigate potential SPDES violations that may occur while major treatment components are being refurbished and constructed.

*Site Constraints*

The site is bounded on the north by a railroad and on the south and east by floodplain. Therefore, upgrade activities need to be contained, as much as possible, within the existing plant footprint.

*Reuse of Existing Facilities*

Due to the site constraints and to minimize costs, the upgrade will need to reuse existing tankage and buildings to the maximum extent possible. Much of the process and electrical equipment has reached the end of its useful life and requires replacement or decommissioning.

*Proven Processes*

The wastewater treatment processes desired by the Village were

those that have a proven ability to meet conventional pollutant limits – such as for Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) – as well as enhanced nutrient removal (e.g., TN, TP).

*Desired Waverly WRRF Enhancements*

Several items are not currently included in the Waverly WRRF process train, and the Village wishes to include these items to enhance plant operations. These enhancements are equalization of influent flow and headworks for removal of screening and grit. New biosolids dewatering facilities are also needed to replace the failing belt press and to allow for improved process (e.g., mixed liquor suspended solids [MLSS]) control.

**Alternatives Considered**

Alternative process and upgrade scenarios were evaluated, accounting for project needs and issues, as well as capital, operations and management costs. Wastewater treatment processes considered included sequencing batch reactors, activated sludge with the addition of tertiary sand filtration, and activated sludge using membrane bioreactors (MBRs). Biosolids dewatering alternatives that were considered included both belt filter press and screw press.

**Upgrade Plan**

Following an extensive analysis and review with the NYSDEC, the Village agreed with an upgrade plan based on the MBR process and screw press dewatering.

The upgrade plan included the following principal components:

- Replacement/upgrade of influent pumping;

*continued on page 26*



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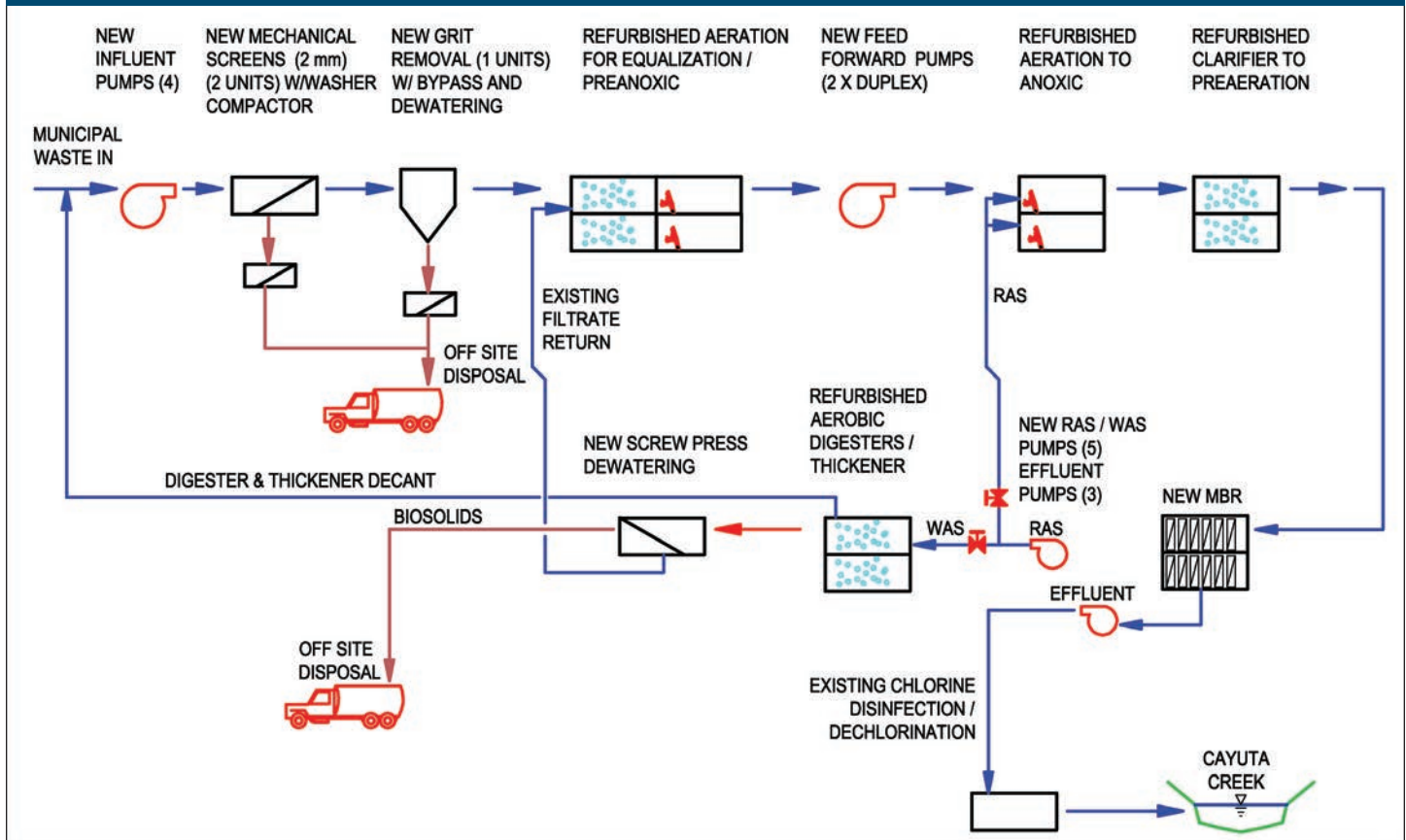
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## Village of Waverly WRRF – Upgraded Process Flow



Credit: Delaware Engineering D.P.C.

- New headworks building containing redundant fine mechanical bar screens and vortex grit removal;
- Retrofitting of the existing 1984 aeration tank to serve as an equalization tank;
- Retrofitting one clarifier to serve as a new pre-aeration tank for the MBRs;
- Retrofitting original aeration basins to serve as anoxic tanks (for nutrient removal) for the MBRs;
- New tankage containing double stack MBR flat plate submerged membrane units;
- New MBR building containing pumps, blowers, electrical motor control centers (MCCs), and supervisory controls and data acquisition (SCADA) system;
- Upgrading equipment and reuse of existing aerobic sludge tanks and gravity thickener;
- New rotary lobe positive displacement biosolids/waste sludge pumps;
- New 18-inch diameter screw press;
- New 750 kW diesel generator;
- Refurbishing of existing buildings; and
- Demolition of existing sludge drying beds containing reeds for improved delivery truck access.

### Anticipated Performance

The MBR system is an activated sludge process that uses flat plate membranes, submerged in aeration tanks with MLSS ranging from 8,000 mg/l to 10,000 mg/l. Pumps connected to the stacks of submerged membrane units (SMUs) draw water through the 0.4-micron nominal cut-off membranes, small enough to prevent bacteriological contamination of the effluent. This ensures very

low (typically less than 5 ppm) TSS levels and eliminates solids loss issues that can occur with conventional clarifiers.

Biosolids, or Return Activated Sludge (RAS), from the tanks containing the MBR SMUs are returned via pumps to anoxic tanks to facilitate denitrification. Anoxic tank effluent flows into completely mixed aerated (pre-aeration) tanks and then back into the MBR tankage.

Operating at an MLSS ranging from 8,000 mg/l to 10,000 mg/l provides a robust process which has proven effective at meeting the goals for conventional contaminants as well as enhanced nutrient



Dewatered biosolids output from the new 18-inch diameter screw press

Credit: Delaware Engineering D.P.C.

removal with no chemical addition. Process control focuses on maintaining the MLSS in this range by means of waste activated sludge (WAS) control.

The flat plate MBR system has a proven history of delivering effluent concentrations for BOD less than 10 mg/l, TSS less than 5 mg/l, TN less than 10 mg/l and TP less than 0.5 ppm. Biosolids production from the MBR system is typically 25 to 40 percent less than a conventional completely mixed activated sludge process.

The MBR process was selected for the Waverly WRRF for these reasons:

- it was cost competitive with other technologies,
- it provides a robust process capable of meeting tertiary treatment requirements,
- it has the most compact footprint that allows for reuse of most of the existing tankage, and
- it allows for setting up a process stream that is adaptable to various flow and loading conditions.

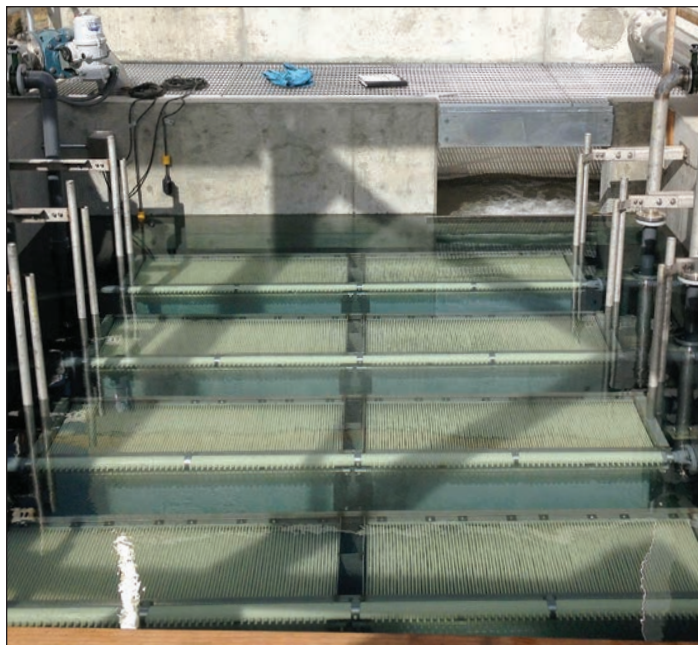
Additionally, the effluent will be reused as a non-potable water source.

## Dewatering Project

The Waverly WRRF's existing 1-meter belt filter press was no longer able to function reliably. In 2015, the Village proceeded with an upgrade that included new biosolids feed pumps and a new 18-inch diameter screw press. The screw press has been operational since September 2016 and is consistently providing 18 to 20 percent solids while operating five to six hours per day, three to four days per week.

## Project Funding

In September 2015, working closely with the NYSDEC Region 7 and the New York State Environmental Facilities Corporation (NYSEFC), the Village team prepared and submitted a New York State Water Grant Application. The upgrade project was subsequently selected in the second round for a 25 percent grant/75 percent loan. The Village team is currently moving forward with the NYSEFC to secure short term financing for project.



Credit: Delaware Engineering D.P.C.

New tankage containing double stack MBR flat plate submerged membrane units

## Implementation Plan and Schedule

The upgrade project design is nearly complete and construction is set to begin by July 2017 with anticipated completion by December 2018.

## Summary

The Village of Waverly WRRF will undergo a significant upgrade to address the long-term needs of the community while satisfying SPDES limits for conventional pollutants and ensuring compliance with the nutrient limits prescribed by the NYSDEC in their Phase II WIP.

The current plan has come to fruition through close coordination with NYSDEC Region 7 personnel and NYSEFC funding. Ultimately, the restoration of the Chesapeake Bay will require the commitment and collaboration of federal, state and local governments, private industry, and the many communities that make their home in the watershed. The Village of Waverly WRRF is just one small piece of this puzzle in the upper Susquehanna River Basin. Combined with many other small pieces working together, Chesapeake Bay restoration is an achievable goal.

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## Correction:

In the Winter 2016 issue of *Clear Waters* magazine, the credit line on three photographs in the article "Rising Expectations: Protection of Recreational Waters in New York" by Jeff Myers was erroneously cited as "New York City Department of Environmental Conservation". The correct credit for these three images is "New York State Department of Environmental Conservation." We apologize for this error.



There are many lakes and rivers in New York where people can canoe and fish.  
New York State Department of Environmental Conservation

### Rising Expectations: Protection of Recreational Waters in New York

by Jeff Myers

The concept of what constitutes a "recreational water" has changed significantly in the five decades since the New York State Pure Water Program and subsequent federal Clean Water Act were adopted. Prior to the establishment of basic wastewater treatment requirements through these and other environmental laws passed in the 1960s and 1970s, recreation - swimming, boating, fishing - in many waterways of New York state was beyond imagination. Waters like the Hudson Estuary, New York Harbor, Oneida Lake, Buffalo River and many others received millions of gallons per day of untreated or partially-treated municipal and industrial wastewater. In fact, New York state regulations at that time included water quality classifications for which the "best usage" was for "sewage or industrial waste disposal."

The first step toward the restoration of these recreational waters was the New York State Pure Water Program proposed by Governor Rockefeller in 1964. A year later New Yorkers voted by a 4 to 1 margin to support the program with a \$1 billion (\$7.5 billion in today's dollars) bond issue, launching the largest and most comprehensive water pollution control program in the world.

New York's Pure Water Program also laid the groundwork for the federal Clean Water Act. The 1972 amendments to the Federal Water Pollution Control Act declared a goal "which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water", also known as the "fishable/swimmable" goal. The 1972 amendments also established the National Pollutant Discharge Elimination System permit program (NPDES) that focused on technology-based standards for point sources, and provided additional billions of dollars in grants for sewage treatment plant construction in order to advance the

fishable/swimmable goal. Because of these actions, water quality throughout the state has rebounded remarkably over the coming years. Today it is easy to imagine water recreation in virtually any lake, river, stream or embayment in the state. Even those waters where recreation was previously thought to be out of reach are now commonly used for boating, fishing, swimming, and other contact recreational activities of growing popularity such as kayaking, paddle boarding and jet-skiing.

#### The Last Piece of the Puzzle

However, despite the tremendous water quality gains for lakes, rivers, streams and estuaries of the state, one concern remains:



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# Recent Wastewater Challenges in the Village of Greene, N.Y.

by Jason L. Bellis

The Village of Greene, New York (the Village) is in the southwest corner of Chenango County, approximately 18 miles northeast of the City of Binghamton, New York. The Village is situated on the Chenango River at the intersection of New York State Route 12 and New York State Route 206. It is centered within the Town of Greene and has a total land area of approximately 1.1 square miles with a population of approximately 1,600 persons.

## The Village Sanitary Sewer Collection System

The Village sanitary sewer collection system (Figure 1) consists of roughly 8.8 miles of gravity sewer main, a portion of which was installed in the 1920s, with the majority installed in 1968/1969 as Class 240 asbestos cement pipe. Additionally, roughly 1,000 feet of force main serves three pump stations in the Village. Presently, there are no known combined storm/sanitary sewers existing within the Village. However, prior to 1968/1969, the existing storm system was utilized as a combined sewer. The existing storm sewer, constructed around 1920, consists of 2-foot sections of vitrified clay pipe with bituminous or oakum joints.

In 1980, an evaluation of the existing sanitary collection system was performed, which included the results of physical surveys, rainfall simulation, preparatory cleaning and internal inspections. The study concluded there was “excessive” infiltration and inflow in the collection system, and a system rehabilitation program was proposed. In 2012, the Village was awarded an Engineering Planning Grant through the New York State Consolidated Funding Application to generate a Preliminary Engineering Report to further evaluate the existing sanitary collection system; develop a preliminary basis of design for rehabilitation, inclusive of estimated capital, operation and maintenance costs; and provide the foundation for the Village and project stakeholders to pursue project funding.

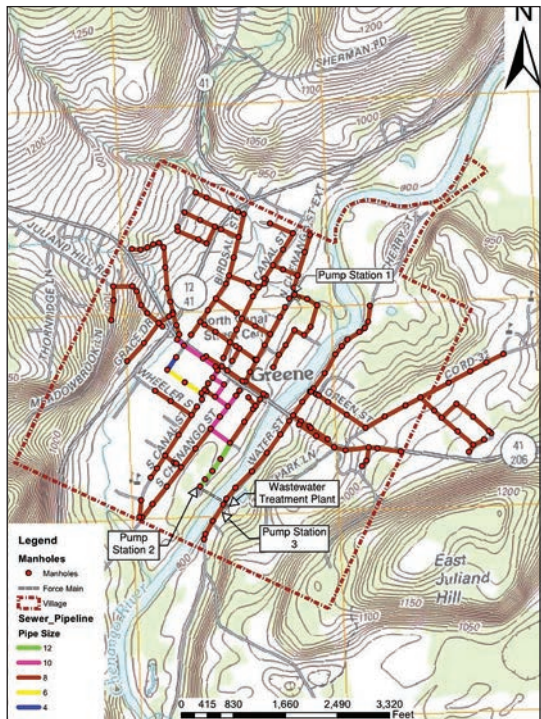


Figure 1. Map of the Village of Greene Sanitary Collection System

## The Village Water Resource Recovery Facility

In 1968, the Village of Greene Water Resource Recovery Facility (Village WRRF) was constructed and was designed to provide 80 percent Biological Oxygen Demand (BOD) and suspended solids (SS) removal at a design flow rate of 0.45 million gallons per day (MGD). The original treatment facility consisted of a fixed-film treatment process via a high-rate trickling filter, with primary and secondary settlement through clarifiers. Sludge handling consisted of an anaerobic digester, covered drying beds and land disposal. In 1986, significant improvement projects were implemented which included construction of a headworks building to enclose the influent screening, and the addition of an aerated grit chamber and flow measurement. The project also included repairs to the primary clarifier and trickling filter tanks as well as a new sludge drying building. The chlorination disinfection building was also upgraded.

## The Village WRRF and the Chesapeake Bay Nutrient Removal Initiative

The Chesapeake Bay currently receives an excess loading of nitrogen, phosphorous and sediment from its surrounding watershed, resulting in a depleted oxygen level in the Bay’s waters. This oxygen depletion adversely impacts aquatic life, including fish, crab and oyster populations, which subsequently impacts the economy of local communities. The United States Environmental Protection Agency (USEPA) created goals for watershed jurisdictions to achieve a 60 percent reduction of nutrients, based upon nutrient loading observed in 2009 received by Chesapeake Bay (USEPA 2010). Included in this objective is a deadline of 2017 to set controls in place to meet the reduction goals, and a deadline of 2025 to achieve the nutrient and sediment allocations required. The New York State Department of Environmental Conservation (NYSDEC) has proposed a modification to the current SPDES permit serving the Village WRRF to meet these goals.



Existing facility shown here contains the control building, aerobic digester and clarifier.

**Table 1. Summary of Waste Loading, Average from July 2010 to January 2014**

	INFLUENT	EFFLUENT	PERMITTED UP TO 2017	PERMITTED 2017-2025	PERMITTED AFTER 2025
Average Daily Sewage Flow	0.32 MGD	0.32 MGD	0.45 MGD		
Average BOD <sub>5</sub> Loading	176.8 mg/l	22.6 mg/l	40 mg/l		
30-Day Average	436.4 lbs/day	55.1 lbs/day	150 lbs/day		
Suspended Solids Loading, 30-Day Average	167.8 mg/l	16.6 mg/l	40 mg/l		
	388.1 lbs/day	40.5 lbs/day	150 lbs/day		
Percent Removal, BOD <sub>5</sub> and SS	—	BOD <sub>5</sub>	85% Removal of BOD <sub>5</sub> and SS		
		SS			
		86%			
		89%			
Settleable Solids Loading, Daily Max	—	<0.1 ml/l	0.3 ml/l		
Total Phosphorous Loading	6.57 mg/l P 16.7 lbs/day	2,754 lbs/year	Monitor	1,020 lbs/year	761 lbs/year
Total Nitrogen Loading	37.8 mg/l N 98.2 lbs/day N	16,986 lbs/year	19,000 lbs/year		
<b>Notes:</b> BOD <sub>5</sub> = Five-day Biological Oxygen Demand mg/l = milligrams per liter; ml/l = milliliters per liter MGD = million gallons per day lbs/day = pounds per day; lbs/year = pounds per year					

**Table 1** summarizes the Village’s annual average sewage flow to the Village WRRF from June 2010 to January 2014, as documented in the Village’s monthly Wastewater Facility Operation Reports. The plant, after 46 years of service, is still operating above its designed pollutant removal parameters for BOD and SS. However, the plant was designed during an era where nutrient loading was not identified as a significant issue, thus nutrient removal was not included in the plant design. Based on current nutrient loading, the Village WRRF will not meet phosphorous levels required by 2017, nor the more stringent levels required by 2025. While the average nitrogen loading over the timeframe observed (from June 2010 to January 2014) is below the nutrient loading limit, 32 percent of the months are at or above 95 percent of the effluent limit, and 13 percent of the months are out of compliance, based on the 31 months in which sufficient data is available to calculate the 12-month rolling average.

From 2011 to 2015, the Village of Greene began the process of evaluating upgrades to their existing WRRF in response to the Chesapeake Bay Nutrient Removal Initiative, and sought funding for the necessary improvements to meet the federal and state mandates. On April 9, 2015, the Village was notified by the New York State Environmental Facilities Corporation (NYSEFC) that the Village was eligible for up to \$6.6 million in Clean Water State Revolving Fund (CWSRF) interest-free financing for a term of up to 30 years. The Village’s projected cost was \$6.7 million, but the financing package they presented included previous funding assistance: \$44,960 through the CWSRF Planning Grant; and the NYSDEC Water Quality Improvements Project Grant of \$80,000. On December 17, 2015, NYSEFC further awarded the Village up to \$1.6 million in grant monies through the New York State Water Grants program.

**Available Alternatives for WRRF Upgrades**

Several alternatives were considered for the upgrades to the Village WRRF, for both short-term and long-term solutions to address two concerns: (1) the pressing nutrient loading requirements of their SPDES permit, modified per NYSDEC’s Phase II Watershed Implementation Plan; and (2) structural issues with the existing WRRF. The Village’s existing WRRF is permitted for 0.45

MGD, with an average of about 0.33 MGD observed at the plant, and a peak flow of 1.87 MGD, based upon the capacity of the pump stations that feed the treatment plant facility.

The following alternatives were evaluated:

- 1) Keep the existing system;
- 2) Retrofit the existing WRRF with chemical addition;
- 3) Retrofit the existing WRRF with chemical addition and structural rehabilitation; and
- 4) Build a new sequencing batch reactor (SBR) facility.

After evaluating the alternatives described above, as well as assessing the existing facility’s capacity for nutrient removal and its current condition, it was recommended that the Village of Greene implement a new SBR WRRF along with the necessary collection system improvements. This alternative would provide the Village with a long-term, cost effective solution for their existing insufficient and aged WRRF. With an estimated budget of \$6.7 million for the necessary improvements, the project is currently under construction with an estimated completion date of November, 2017.

*Jason L. Bellis, PE, is the Office Leader and Project Manager for Larson Design Group. He may be reached at [jbellis@larsondesigngroup.com](mailto:jbellis@larsondesigngroup.com).*

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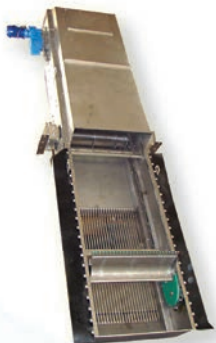




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# Adaptability, Flexibility and Patience Keep the Binghamton Johnson City Joint Sewage Treatment Plant Going

by Catherine P. Young

The City of Binghamton, the Village of Johnson City, the Joint Board and the employees of the Binghamton Johnson City Joint Sewage Treatment Plant take their mission very seriously. They are responsible for around the clock environmental protection of one of the community's most valuable resources – the Susquehanna River. This mission has been especially challenging in the last decade, as the Plant went through major upgrades and construction, and suffered from catastrophic flooding in 2005, 2006 and 2011. In addition, a massive concrete wall failure substantially impacted the secondary and tertiary treatment abilities of the Plant. Operating and reconstructing a plant with these challenges has proven that adaptability, flexibility and patience are key components to making things work.

## About the Facility

The Binghamton Johnson City Joint Sewage Treatment Plant (the Plant) is situated on 11 acres on the banks of the Susquehanna River in Vestal, New York. The Plant was originally built to accommodate combined storm and sewer flows from the City of Binghamton, and was expanded a few years later to accommodate the Village of Johnson City. As the area's population increased, the Plant was again expanded and currently provides wastewater treatment for a substantial portion of western Broome County. The service area includes Binghamton University and eight other municipalities, serving an estimated population of about 90,000.

## Facility Upgrades – Late 1990s to early 2000s

The Plant had originally been designed as an activated sludge plant, but due to combined flows and frequent Combined Storm Overflows, upgrades were started in the late 1990s and continued into the 2000s. The upgrade design centered around a treatment capacity for:

- average daily flows of 26 million gallons per day (MGD),
- maximum monthly flows of 35 MGD, and
- peak flows of 60 MGD.

Due to a limited facility footprint, with little room for expansion, the design included the removal of the activated sludge process and the addition of Biological Aerated Filters (BAF). The project was finally put on line in 2007, despite major delays due to several flood events, the most significant at the time being the June 2006 flood.

## Responding to the Flood of 2011

Staff managed to operate the Plant through start up and significant process challenges for a very short few years before flooding and construction issues in 2011 necessitated reconstruction. In May 2011, a 100-foot section of the BAF treatment tank wall experienced a catastrophic failure. As a result, the Plant operated at reduced treatment levels until repairs could be made. A few months later, in September 2011, a record-breaking flood event occurred. Over a 48-hour period, Tropical Storm Lee dropped from six to 12 inches of rain over the region (*Figure 1*). Record floodwater crests were reported on many rivers and streams (*National Weather Service*). The Susquehanna River at Binghamton crested quickly (*Figure 2*), rising over 20 feet in a span of 24 hours.

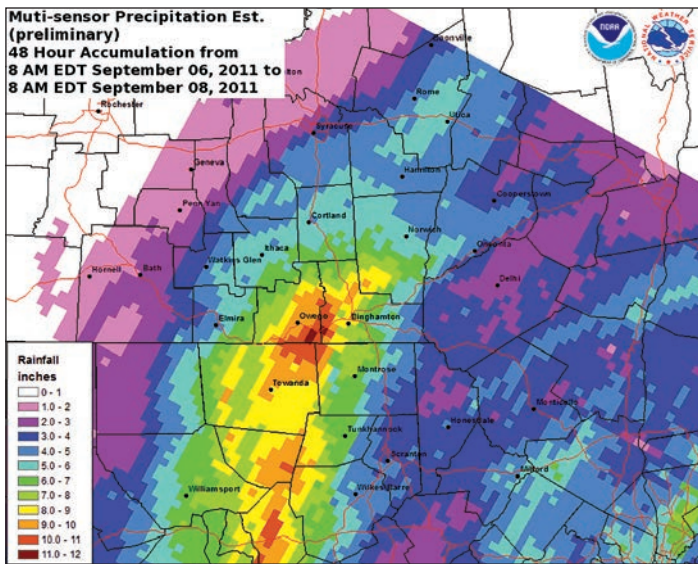
Once again, staff were required to adapt and be flexible to the seemingly ever changing configurations of the Plant processes. As the flood waters rose, employees began to relocate motors, drives, samplers, and movable equipment beyond the water's reach. They also began the search for high capacity pumps so that the lower levels of the plant could be pumped out quickly, cleaned up and put back into service as soon as possible. Every one of the ten settling basins needed to be hosed out and cleaned, with chains, flygts and drive motors repaired and replaced. Each lower level pump room also needed to be hosed and cleaned. Mud caked and coated everything. Debris was strewn throughout the facility, caught in fences and against walls once the waters receded. The digester covers also collapsed.

In 2006, in what had been the Flood of Record, the Plant did not lose power. Unfortunately, in 2011, power was lost to the main Plant as well as to the Johnson City Pump Station. This resulted in a loss of pumping and treatment at the facility for over 24 hours. A search for large generators was put into motion.



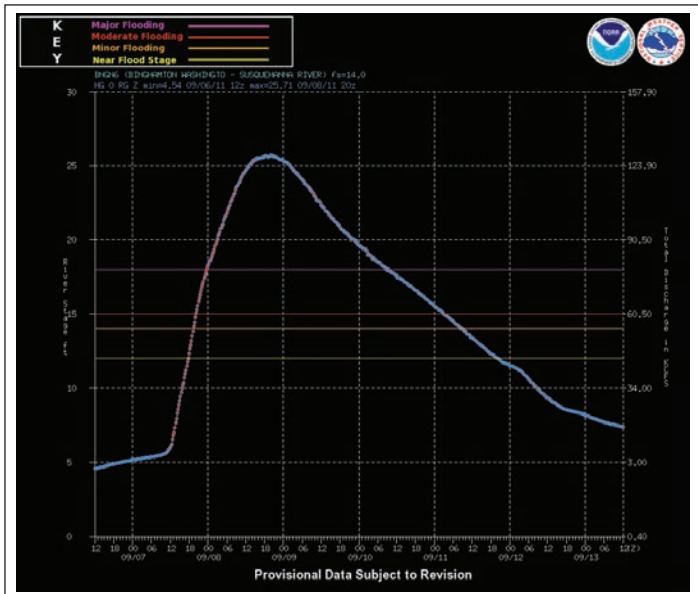
The BAF wall at the Plant experienced a catastrophic failure in May 2011.

Credit: Binghamton Johnson City Joint Sewage Treatment Plant



Source: National Weather Service

Figure 1. Rainfall (in inches) reported for the Southern Tier of New York and northern Pennsylvania, including the Susquehanna River watershed, over the 48-hour period from September 6 to September 8, 2011.



Source: National Weather Service

Figure 2. The storm hydrograph (in feet) of the Susquehanna River at Binghamton, for the period from noon on September 6 to noon on September 13, 2011.

As staff monitored the situation at the plant, they also began to reach out to other employees to check whether their homes were threatened by flood waters. Some employees suffered severe damages to their homes and needed to attend to their families. Their coworkers pitched in to help where and when they could.

Storm clean up and recovery became the focus following the 2011 flood. The cleanup and emergency repair work lasted well into 2012. Structural evaluations were necessary for the recently constructed BAF. After a full survey of the damage was completed, the Plant's owners (the City of Binghamton and the Village of Johnson City), the plant staff of the Joint Sewage Board, and the New York State Department of Environmental Conservation (NYSDEC) developed a plan to restore treatment operations to the Plant. This plan focused predominantly on rebuilding the BAFs. The goals were to complete a floodwall and reconstruct the Plant into full operation by April of 2017.

Due to the serious damage of the secondary treatment portion of the facility, and the timeline needed for design and reconstruction, Chemically Enhanced Primary Treatment (CEPT) with the addition of ferric chloride and polymer was determined to be the best initial course of action. The CEPT was constructed in 2012.

### Review of the Reconstruction Plan

In January of 2014, when the initial design was completed, the reconstruction plan was reviewed and modified in consultation with a team of experts, including GHD Design Services, J.L. Richards Architects and Engineers, Dr. Paul Carr from Cornell University, and Dr. Cliff Randall from Virginia Tech University. Not only was a much more comprehensive reconstruction project determined to be necessary, but a change to the BAF process was needed as well. Pilot testing was completed by Kruger, Inc. to verify that its system could indeed treat our wastewater to design limits (including carbonaceous biochemical oxygen demand [CBOD], total suspended solids [TSS], and total Nitrogen) at or near 9 degrees Celsius (°C). Other tests included evaluation of media treatment capacity, hydraulic stress testing, and toxicity testing of the effluent.

Integral to the upgrade was a complete redesign of the headworks, electrical systems, backwash treatment process, and disinfection processes. All parts of the facility were designed for efficiency and operator flexibility, and to provide adequate capacity for all operating conditions. Designs were updated, demolition expanded, and construction began in earnest in 2016. A Consent Order agreed to with the NYSDEC requires restoration of secondary treatment for 35 MGD by August 1, 2018. In addition, the Plant must be fully operational and capable of treating up to 60 MGD by May 1, 2019.

### Major Components of the Upgrade:

- a new floodwall, to protect the plant to an elevation 1.5 feet above the 2011 flood level;
- new coarse and fine screens and grit removal with the addition of aeration;
- a new primary distribution box, new mechanical equipment for the primary settling tanks, with reconfigured flow to half of the settling tanks;
- new CEPT equipment;
- new secondary influent pumps and an expanded pump station for the BAF system;
- new CN-BAF and DN-BAF treatment tanks;
- new methanol system for denitrification;
- new ultra violet disinfection;
- new sludge thickening equipment;
- additional high rate ballasted settling (HRBS) for the BAF backwash treatment;
- a new administration building and supervisory control/data acquisition (SCADA) system;
- new odor control equipment;
- two new 2-megawatt electric generators, solar panels, and micro turbines;
- a new plant outfall; and
- renovated digesters, and completely new solids handling facilities.

*continued on page 37*

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## Upgrade Construction Underway

In preparation of work to be completed, an underground utilities survey was conducted. Throughout the life span of the Plant, with many upgrades and repairs over the years, there was not a comprehensive understanding of what existed underground throughout the site. Though the survey was helpful, it ultimately did not locate every pipe. Therefore, extreme caution will be needed throughout construction, with recurrent test pot-holing necessary to identify potential conflicts. In addition to the underground survey, the structures slated to remain intact were given thorough condition assessments.

Impressive in size, the new construction will also include a 96-foot wide by 192-foot long by 30-foot deep secant pile-supported excavation to allow the construction of the new backwash tank. The secant piles will function as the temporary excavation support system and as the foundation and exterior walls of the backwash tank. The secant piles are 5 feet in diameter and extend to depths of 36 feet to 45 feet below grade. During construction, the internal bracing of the secant pile wall consists of reinforced concrete wale beams and struts that are supported on caissons installed within the excavation footprint. The internal bracing and caissons will remain and become part of the permanent support element.

## During Construction, Operations Continue

Now that the construction is in full swing, the Plant is being kept in service using some of the existing infrastructure while other parts are being replaced and still others are being converted to new uses. Keeping the Plant in service while the existing infrastructure is rebuilt is a monumental challenge that requires

good communication and teamwork from all the parties involved, including the design engineer, the construction management team headed up by Jacobs Engineers, Inc. and contractors, as well as the plant operations staff. There is no area of the Plant that will remain untouched. Even the disinfection process with sodium hypochlorite will need to be relocated while the building is retrofitted for ultraviolet disinfection.

Since the plant staff need to access much of the Plant, and because they are the ones most acutely aware of how the processes are interconnected, an important communication tool was designed to assist all involved. This tool is a tracking request form completed by the contractor for each task, describing in detail the work involved and method used. The contractor, construction manager, and operations manager must all sign off on the tracking request form before work can move forward. This tool has proved to be invaluable in maintaining operations during construction.

Currently, the primary operational treatment process online is the CEPT. It is incumbent on operators to optimize this process. The Plant typically has ten primary clarifiers, however, half of these functioned “backwards” with the effluent and sludge removal both occurring at the same end of the tank. Those settling tanks have been taken out of service to be reconstructed to process flow appropriately. To accommodate the decrease in settling tank capacity, maximum flows to the Plant have been limited to 35 MGD. Grit removal and screening have also been temporarily taken off-line for reconstruction. Rerouting of flow to the settling tanks is being achieved through a temporary header system that brings flow directly to the influent end of the primary settling

*continued on page 38*



*Credit: Binghamton, Johnson City Joint Sewage Treatment Plant*

Aerial image of the Plant, taken during construction after the flood of September 2011

continued from page 37

tanks. Immediate challenges include keeping solids moving constantly from the settling tanks so as not to plug lines with grit, as well as reviewing the dosing points and reactions of the ferric and polymer in the new flow configuration to optimize floc formation for BOD and suspended solids removal. Jar testing and full scale product testing with blended products will be ongoing as seasons change and the flow directions get reconfigured. The Plant has a pounds-per-day iron limit for its effluent into the river, therefore the operations staff also needs to keep a close eye on the concentrations of ferric used.

Throughout the project, professional photographic documentation is being performed. This form of documentation would have been very useful in prior projects at the Plant, and may have enabled us to avoid destructive testing of various areas. The photographic documentation will assist engineers as well as plant staff to identify issues, track progress and verify completion of specific tasks. The final photographic documentation will give “visual

as-built” records of construction from the beginning to the end of the project.

Financing for the project is being provided through a variety of sources, including the New York State Environmental Facilities Corporation, the Federal Emergency Management Agency, and the NYSDEC Water Quality Improvement Project program through the New York State Regional Economic Development Council.

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*Catherine P. Young is the Superintendent at the Binghamton Johnson City Joint Treatment Plant. She can be reached at [caingworth@stny.rr.com](mailto:caingworth@stny.rr.com).*

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## A Record Flood Event on the Susquehanna River Inundated the Binghamton Johnson City Joint Sewage Treatment Plant in September 2011.

*All photos are credited to the Binghamton Johnson City Joint Sewage Treatment Plant*



The Terminal Pump Station that services Johnson City and portions of the Towns of Union and Vestal were under record flood waters.



The settling tanks at the Plant were significantly damaged by the flood in September 2011.



Flooding of the sampling manhole for influent flows



The Plant, looking north over the primary settling tanks, shows them under several feet of water























































The digesters at the Plant were inundated with floodwaters, before the membrane covers deflated.




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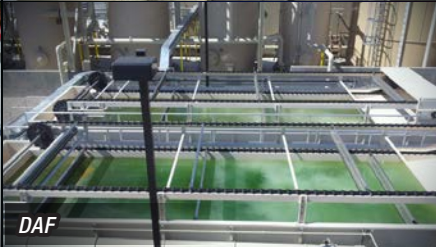
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# Chemung County Water Quality Strategy Committee – A Partnership Focusing on Nonpoint Sources

by Mark Watts

Chemung County, established in 1836, has an area of 412 square miles. The county has one city, eleven towns, and five villages. The city of Elmira is designated as a Metropolitan Statistical Area (MSA) by the U.S. Census Bureau, a geographic designation for municipalities containing a core urban area of 50,000 or more population. Eight percent of the county is classified as urbanized. The remainder of the county is largely rural, consisting of farmland, forested hills and surface water bodies.

Chemung County has three major watersheds. Much of the county is covered by the Chemung River Watershed. The Susquehanna River Watershed covers the eastern portion. Both the Chemung and Susquehanna watersheds are headwaters of the Chesapeake Bay water system. The Oswego River/Finger Lakes Watershed covers parts of three towns in the northern portion of the county.

## Mission and Goals of the Water Quality Strategy Committee

In 1993, Chemung County realized a need to formulate a strategy to protect and improve water quality. The Chemung County Water Quality Strategy Committee (WQS Committee) was organized to address various water quality impairments. A strategy was written in 1992 to assist in the implementation of measures to improve and maintain the quality of water in Chemung County. In order to remain current, the Strategy was updated in 1996 and again in 2007.

The goals of the WQS Committee are:

- Maintain an updated listing of countywide groundwater and watershed-specific water quality concerns;



C. reddit: Christopher Yearick, Upper Susquehanna Coalition

Hellbenders are a species of salamander found in the Susquehanna watershed. These amphibians are sensitive to water quality conditions, and are the proverbial “canary in the coal mine”. Restoration efforts are underway in the Susquehanna Basin to enhance hellbender populations in their historically occupied waters. The water quality monitoring efforts of the WQS Committee play an important role in the future survival of this species.

- Collect, tabulate and consolidate available water quality information;
- Establish a network between agencies;
- Promote and introduce specific programs that assist in preventing or alleviating water quality impairments;
- Educate the public on water quality issues; and
- Evaluate the program and make amendments as needed.

The success of the program is evaluated concurrently with meetings and during project reviews by the WQS Committee. This is an ongoing process to ensure good water quality in Chemung County.

## Water Quality Stream Sampling: What Does It Tell Us?

Every two months, members of the WQS Committee go out to monitor surface waters across Chemung County. This has been ongoing since 1998, which has given the WQS Committee a great historical record. Currently there are 13 monitoring sites. This monitoring provides a snapshot of water quality at each site, to assess consistency – or lack thereof – for the quality of water at each sampling location. General information is gathered at each location, including the date, time and weather conditions. A sensor placed in the creek measures parameters such as specific conductance, dissolved oxygen, depth and temperature. Visual observations are noted for the presence of aquatic life, clarity of water, presence of litter or debris in the water and flow. A sample of the water is collected and taken to the Elmira Water Board where analysis generates data for turbidity, alkalinity, hardness, chloride and pH.

The water quality monitoring is used to obtain baseline data and track changes at each site. There are a number of environmental impacts that can affect the data, such as time of year, snow melt, rainfall and drought, which have to be taken into account each time the site is sampled.

Currently, the water quality results are very consistent. If a change from the baseline is apparent – such as something different in the visual observations, or a spike or drop in the numbers – actions are taken depending on the nature of the change. There are many partner members in the WQS Committee who might get involved. For example, if it is trash or litter that is identified as a change, the Friends of the Chemung River Watershed would be contacted to set up stream bank clean-up. Other “go-to” members are Chemung County Soil & Water Conservation District, Stormwater Coalition or the County Department of Health. These partners would also be utilized to follow up and address the changes observed in water quality.

## Assistance to Municipalities

The WQS Committee is available to municipalities to assist in improving water quality. Upon request, the Committee will review projects, meet with officials and make recommendations. This service is offered to all agencies in Chemung County.

Among the accomplishments of the WQS Committee are projects and efforts including:

- Storm drain stenciling;
- Flood plain management workshops;

- Assisting municipalities with site plan applications;
- Hosting meetings for code enforcement officers;
- Nutrient management grant;
- Road bank erosion inventory;
- Homeowners packet of information available through code enforcement officers; and
- Flood attenuation projects.

- o Village of Elmira Heights
- o Village of Horseheads
- o Town of Horseheads
- o Town of Veteran
- o Town of Southport
- o Village of Millport
- o Village of Wellsburg

### Partnerships in Water Quality

In Chemung County, there are multiple partners working with the WQS Committee. These include:

- New York State Department of Environmental Conservation (NYSDEC)
- NYSDEC Spill Response Hotline
- Chemung County Soil & Water Conservation District
- Chemung County Health Department, Environmental Health Services
- Cornell Extension of Chemung County
- Chemung County Legislature
- Upper Susquehanna Coalition
- Southern Tier Central Regional Planning & Development Board (STCRPDB)
- Chemung County Federation of Sportsmen's Clubs
- Municipality Representatives
- Stormwater Coalition:
  - o Town of Ashland
  - o Town of Big Flats
  - o Town of Elmira
  - o City of Elmira

The WQS Committee is a great step forward for Chemung County. The uniting of these organizations and meeting on a regular basis increases agency efficiency. The duplication of services is reduced, and in the long run complements all agency programs. The vast quantity of diverse agencies involved allows for expertise and invaluable resources in a broad range of areas, working together towards a common goal: the protection and enhancement of the water quality in Chemung County.

*Mark Watts is the District Manager for the Chemung County Soil & Water Conservation District. He may be reached at [markwatts@stny.rr.com](mailto:markwatts@stny.rr.com).*

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## 2016 Legislative Year in Review

### Great Accomplishments with More Changes in 2017

by *Steve Dye*

The Water Environment Federation (WEF; Alexandria, Va.) Government Affairs Department spent a very busy 2016 advancing the WEF agenda before Congress and building a robust grassroots program for the future. Thank you to all WEF members who contributed to our fruitful efforts in 2016. We look forward to your continued participation in 2017.

Here are highlights of the many critical events and policy changes from the past year.

#### **New President, New Direction**

The year ended with one of the most monumental (and unexpected) political events in the history of the U.S. with the election of Donald J. Trump as President. While what the future of a Trump presidency will mean for our nation is unclear, there are some early, clear indications of how his agenda may affect the water sector.

Mr. Trump spoke on the campaign trail about a massive infrastructure investment package, reforms to the tax code, and curtailing the reach of federal agencies on matters of regulation and oversight. In early December 2016, WEF wrote a letter to the then-President-Elect detailing WEF's priorities and recommendations for our nation's water policies. The key points in the letter were

- advancing smart regulations and policies by using sound science and technical merit,
- accelerating and expanding water infrastructure investment,
- bolstering research and development to find solutions to pressing challenges in water,
- developing high-skill construction and water sector jobs, and
- ensuring local water systems are affordable and robust.

WEF also pledged to provide reliable and expert input to the next administration to help solve the nation's water challenges. The full letter is available at <http://bit.ly/wef-letter-to-trump>.

#### **WEF Testifies before Congress on Infrastructure Funding Bill**

Despite admirable bipartisan efforts by some key members of Congress, for the last decade Congress has struggled to advance major legislation to expand funding resources for water infrastructure investments. While no far-reaching legislation was passed last year, several significant policies advanced deep into the legislative process, only to be cut from final bills. This set the table for 2017, which is expected to see a sizable infrastructure package. WEF contributed to these efforts on several levels.

In April 2016, WEF testified at a Senate Environment and Public Works (EPW) Committee hearing. Rudolph Chow, Baltimore Public Works Director and the new WEF Government Affairs Committee Chair, testified on behalf of WEF (an archived hearing webcast and a transcript of Chow's testimony can be accessed at <http://bit.ly/chow-testifies-to-senate>). The Senate Committee heard the results of an analysis that the committee had requested WEF and the WateReuse Association (Alexandria, Va.) conduct. The results show the full economic benefits to the economy, job cre-

ation, and federal tax revenues from funding the Clean Water and Drinking Water State Revolving Fund (SRF) programs.

The data show that:

- every dollar of SRF spending results in \$0.93 of federal tax revenue;
- each million dollars in SRF spending produces 16.5 jobs with an average salary of \$60,000/year; and
- every million dollars of SRF spending results in \$2.95 million dollars in output for the U.S. economy.

Following the hearing, the Senate EPW Committee introduced its version of the 2016 Water Resources Development Act (WRDA), which cited the WEF/WateReuse report and called on Congress to increase SRF funding significantly. The final WRDA bill included a version of the Senate provision (*further detailed below*).

#### **2016 Fly-in a Success, Setting the Stage for 2017**

WEF's annual Washington, D.C., fly-in event in April 2016 drew nearly 200 water professionals from across the nation to carry the message to Capitol Hill about the need for increased funding and support for water infrastructure. In addition to meeting with Congressional offices, attendees participated in regulatory briefings and roundtables with program directors from the U.S. Environmental Protection Agency (EPA) and other agencies. The 2017 National Water Policy Fly-In and Expo on March 21 and 22 brought hundreds of other water professionals to advocate before Congress for more funding and sound policies for water and water infrastructure. Details are available at [www.waterweek.us/nwbf](http://www.waterweek.us/nwbf).

#### **Congress Finishes 2016 with New Funding for Water Infrastructure**

As the 2016 calendar year drew to a close, Congress took several actions benefitting water infrastructure investments. A Continuing Resolution that will fund the federal government through late April includes \$20 million to start the Water Infrastructure Financing and Innovation Act (WIFIA). WIFIA is a new loan and loan guarantee program that WEF helped create. EPA estimates that the \$20 million may provide more than \$1 billion in credit assistance and may potentially finance more than \$2 billion in new water infrastructure investments.

Organizations interested in applying for low-interest loans and loan guarantees have until April 10, 2017, to submit a Letter of Interest (LOI) to EPA, which issued a Notice of Funding Availability (NOFA) in the *Federal Register* on Jan. 10, 2017. Further details about WIFIA and the NOFA are available at [www.epa.gov/wifia](http://www.epa.gov/wifia).

In addition, Congress passed and President Obama signed into law the Water Infrastructure Improvements Act for the Nation (WIIN) Act, which includes the Water Resources Development Act (WRDA). The bill authorizes port, waterway, flood protection projects, and drinking water and wastewater provisions.

While the WRDA authorizes mostly U.S. Army Corps of Engineers projects and programs, the WIIN Act also features

WEF-supported provisions, including a Sense of Congress urging robust funding for the Clean Water and Drinking Water State Revolving Fund (SRF) programs. This provision is a result of the Senate version of the WRDA bill previously mentioned.

The WIIN Act contains provisions to assist the city of Flint, Michigan, including authorization to allocate \$170 million through the Drinking Water SRF program and grants to reduce lead in drinking water. The bill also includes a Sense of Congress to provide \$20 million to Flint through the WIFIA program.

Sixty million dollars per year also are provided until FY 2021 to help small and disadvantaged communities reduce lead in drinking water at a cost share of 45 percent. In addition, the bill permits WIFIA loan applicants to finance fees for the loan application process. The bill also changes the WIFIA program to allow applicants to receive credit for any costs and in-kind contributions they incur prior to the loan award.

### EPA Advances CSO Public Notification in Great Lakes

In late December, EPA Administrator Gina McCarthy signed a notice of proposed rulemaking (NPRM) implementing Section 425 of the Consolidated Appropriations Act of 2016. This section requires EPA to work with the Great Lakes to establish public notification requirements for combined sewer overflow (CSO) discharges.

“This NPRM addresses signage, notification of local public health departments and other potentially affected public entities, notification to the public entities, notification to the public, and annual notice provisions for National Pollutant Discharge Elimination System (NPDES) permittees authorized to discharge

from a CSO to the Great Lakes Basin,” EPA states on its website.

The rule affects NPDES permits within the Great Lakes watershed that include a CSO. The public comment period was open until March 14 ([www.regulations.gov](http://www.regulations.gov) at Docket ID No. EPA-HQ-OW-2016-0376).

### Water Advocates Gain a New Home

WEF launched a new online grassroots advocacy website last year to support the Water Advocates program. WEF members and water sector professionals can access the website at <http://cqrcengage.com/wef/home> for important legislative and regulatory matters and calls-to-action on issues affecting the water sector.

A number of grassroots tools on the site help WEF members engage with their elected officials. It’s easier than ever to become a WEF Water Advocate and receive notifications about legislative and regulatory issues and calls-to-action – visit <http://cqrcengage.com/wef/wateradvocates>.

A recent successful Water Advocates campaign led to nearly 200 emails and letters sent to Congress during final negotiations over the WRDA bill and Continuing Resolution.

With a newly elected President and the start of the 115th Congress, 2017 is shaping up to be a monumental year for the water sector. WEF will continue to push policies, regulations, and support that reflect the interests of its members. Your input and involvement is greatly appreciated as we work to advance the interests of water professionals before policymakers and the public.

---

*Steve Dye is the legislative director at the Water Environment Federation (Alexandria, Va.).*



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# Why Science Matters

by Gina A. McCarthy

*Reprinted from the blog EPA Connect – The Official Blog of the EPA Leadership, published January 10, 2017 11:30am EDT.*

As someone who has utilized and appreciated science for the better part of my life, I want to take a minute to reflect on the importance of science at the Environmental Protection Agency.

Most people recognize EPA as a regulatory agency, but they may not be aware of the tremendous role EPA plays in protecting public health and its worldwide leadership in science. Without question, EPA is one of the premier public health agencies in the world, and our work helps all Americans have a clean and healthy environment to live, work and play.

And the very foundation of everything we do comes down to one principle: using science in a factual and nonpartisan way to inform our actions to protect the American people and our environment.

As John Adams said, *“Facts are stubborn things; and whatever may be our wishes, our inclinations, or the dictates of our passions, they cannot alter the state of facts and evidence.”* This remains as true today as it was when said centuries ago. As we enter a different time in American history with a new Administration and new Congress, one thing must be clear – those chosen to lead this country cannot dictate science or make changes to the way in which science is conducted simply to meet a political or policy outcome. Nor should they minimize the impacts of EPA’s science that has been and will continue to be critical to progress in keeping our kids and communities safe and healthy.

We know full well that as a regulatory agency, we often face a high degree of scrutiny from stakeholders influenced by EPA regulations and policies. That’s to be expected and welcomed. EPA is a world leader in science in critical areas like public health, toxicology, epidemiology, ecology, engineering, risk assessment, and more.

While it is understandable that there will be difference of opinions about policy and even strong opposition to some of the agency’s work, denying the science and facts as determined by a majority of scientists benefits no one. It undermines our global scientific leadership and cedes future opportunities to other nations.

And it is this use of science that fuels our vitally important work that affects every single American. Whether we are working to clean up waste sites, improve air quality, ensure safe drinking water, or advance chemical safety, science guides everything we do. For example, EPA scientists are learning more each day about how air quality impacts human health, with recent research showing that air pollution can affect cardiovascular health and even trigger heart attacks and strokes. That’s important information for all Americans, not just the millions of Americans who have heart disease and for the doctors and nurses whose job it is to keep people healthy. The more we understand the problem, the better we can be at addressing it and protecting the health and environment of our citizens.

We also use our science to keep the nation’s waters clean. For example, we recently partnered with other federal agencies to use satellite data to monitor harmful algal blooms in our rivers, lakes, and streams. These increasing algae blooms can contaminate drinking water sources, make water toxic to people and animals, cause beach closures, and raise drinking water treatment costs. EPA scientists and colleagues developed an early warning system

and guidance to help alert and prepare public health officials as toxic algal blooms arise so communities can better manage the environmental, health, and economic impacts.

EPA science is also essential to states and their efforts to protect local communities. EPA’s scientists are often called upon to assist states during emergencies such as the recent chemical spill into the drinking water in Corpus Christi, Texas. EPA worked in close partnership with the city and state to bring its technical experts to the table to help inform decisions about drinking water restrictions. Yes, we’ve made tremendous progress over the years – we have clearer air, cleaner waterways, and we are doing all we can to protect our fellow citizens by controlling pollution. Just look at a picture of Los Angeles from a few decades ago to see the progress that we have made together. But the challenges we face today are increasingly complex and sometimes even more dangerous than those in the past. Legacy pollutants like lead and new contaminants continue to demand the best science we can offer if we hope to ensure the long-term preservation and protection of our water resources.

Climate change and discovering new sources of pollution due to improved technologies – these are the very issues that need to be informed by the best science and the dedicated scientists at the EPA.

Through science, we can gain understanding, discover solutions, and show that a healthy environment and a healthy economy go hand in hand. Since the EPA was founded, we have cut pollution by 70 percent while our GDP has tripled.

The American people demand clean air and water, food free of harmful pesticides, products free of harmful toxics, and their communities resilient to climate change. They also demand that we use the best science and research to define challenges and come up with solutions. And while there will always be political changes in Washington, the use of science at the EPA and its core mission will continue. That is the timeless goal at the EPA – to protect public health and the environment – and with clear science as the very bedrock of those goals, EPA’s mission will continue to endure for years and years to come.

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*Gina A. McCarthy served as the administrator of the Environmental Protection Agency from July 2013 through February 2017.*



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**September 12, 2017**

Chlorine Disinfection Soup to Nuts  
Faculty: Gary Lohse, PE,  
De Nora Water Technologies

**November 16, 2017**

Nitrogen Removal  
Faculty: Phil Smith, PE, M.S.,  
Phil Smith Consulting, LLC

### **CENTRAL CHAPTER**

**September 21, 2017**

Dewatering and Thickening Technologies  
and Polymer Optimization  
Faculty: Ron Drake, Alfa Laval; Ron Bowman,  
Velo Dyne

**October 19, 2017**

Mathematics for Water and Wastewater Operators  
Faculty: Charles Defazio, PE

**November 9, 2017**

Innovative Treatments for Meeting  
Low Level Nutrient Limits  
Faculty: Manuel de los Santos, Aqua Aerobics;  
Mark Hughes, PE, Aqua Aerobics

### **GENESEE CHAPTER**

**July 21, 2017**

Chlorine Disinfection Soup to Nuts  
Faculty: Gary Lohse, PE,  
De Nora Water Technologies

**November 3, 2017**

Innovative Treatments for Meeting  
Low Level Nutrient Limits  
Faculty: Manuel de los Santos, Aqua Aerobics;  
Mark Hughes, PE, Aqua Aerobics

### **LONG ISLAND CHAPTER**

**April 6, 2017**

Mathematics for Water and Wastewater Operators  
Faculty: Charles Defazio, PE

**October 19, 2017**

Innovative Treatments for Meeting  
Low Level Nutrient Limits  
Faculty: Manuel de los Santos, Aqua Aerobics;  
Mark Hughes, PE, Aqua Aerobics

### **LOWER HUDSON CHAPTER**

**April 6, 2017**

Fundamentals of Wastewater Asset Management  
Faculty: Timothy Taber, PE, BCEE

**June 14, 2017**

Solids Handling and Dewatering  
Faculty: Dan Fronhauser, PE, BDP;  
Peter Radosta, PE, Koester Associates

**October 25, 2017**

Nitrogen Removal  
Faculty: Phil Smith, PE, M.S.,  
Phil Smith Consulting, LLC

**November 8, 2017**

Mathematics for Water and Wastewater Operators  
Faculty: Charles Defazio, PE

### **WESTERN CHAPTER**

**July 13, 2017**

Dewatering and Thickening Technologies  
and Polymer Optimization  
Faculty: Ron Drake, Alfa Laval; Ron Bowman,  
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**November 16, 2017**

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Faculty: Timothy Taber, PE, BCEE

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# New Technique IDs Micropollutants in New York Waterways

by Blaine Friedlander

Reprinted with permission from the Cornell Chronicle, January 23, 2017.

Cornell engineers hope that clean water runs deep. They have developed a new technique to test for a wide range of micropollutants in lakes, rivers and other potable water sources that vastly outperforms conventional methods.

“Water quality monitoring is conventionally done by narrowly investigating one or a few contaminants at a time. We aimed to develop an analytical method that would be as broad as possible,” said Damian Helbling, assistant professor of civil and environmental engineering. Helbling and Amy Pochodylo, M.S. '14, published their research as the cover story in the journal *Environmental Science: Water Research & Technology*.

“We demonstrate that our approach can more than double the amount of information that would otherwise be obtained from more conventional methods,” Helbling said. “This has important implications for risk characterization and exposure assessment.”

The new technique – using high-resolution mass spectrometry – assessed 18 water samples collected from New York state waterways. A total of 112 so-called micropollutants were found in at least one of the samples – chemicals including pharmaceuticals, pesticides and personal care products. Helbling said that eight of the chemicals were found in every sample and dozens more were found in most samples.

Helbling and Pochodylo refer to their approach as “suspect screening.” The spectrometer analyzed the chemical composition of the water samples and the researchers compared the resulting data with a large list of 1,100 “suspect chemicals” by employing a nimble data-mining algorithm.

The unmasked contaminants read like a soup recipe concocted in a pharmacist’s nightmare, as they found anticonvulsants (levetiracetam), antihistamines (fexofenadine) and muscle relaxants (carisoprodol, metaxalone and methocarbamol) – all chemicals that have rarely been reported as water contaminants and some of

which are being reported for the first time.

Prominent chemicals found in New York’s waterways include triclosan, an anti-bacterial agent found in liquid hand soaps and toothpaste; the anesthetic and heart medicine, lidocaine; diethyl-phthalate, a component of plastics; and the herbicide atrazine.

In all of the 18 waterways, researchers detected atenolol acid (a high-blood-pressure medication component); 5-methyl-1H-benzotriazole (a corrosion inhibitor found in dishwasher detergent); caffeine; the insect repellent DEET; gabapentin (an epilepsy medication); metformin (a medication that controls blood sugar); saccharin and sucralose (Splenda).

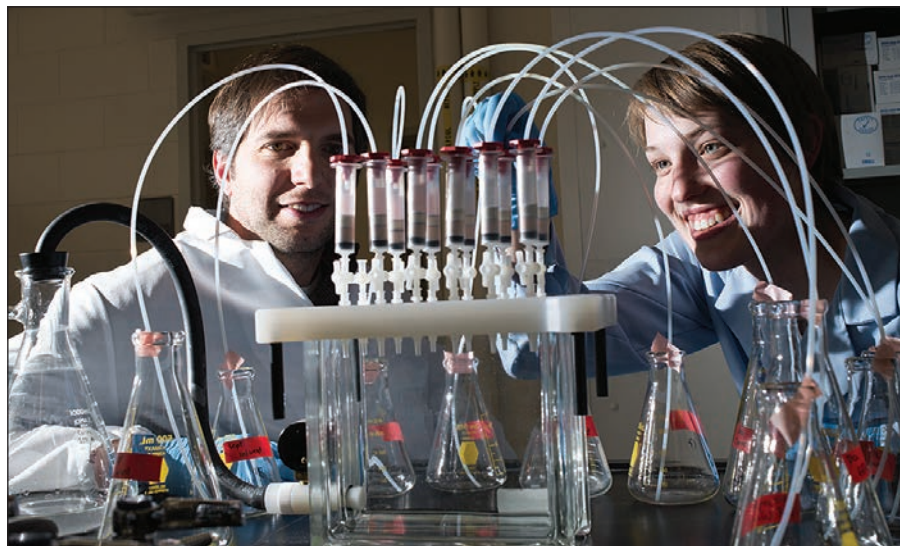
Citing how this new technique represents a

broad range of chemical structures unlikely to be found using conventional means, Helbling said, “These results are not only interesting from a novelty perspective, but demonstrate the breadth of chemical coverage that our suspect screening affords.”

Helbling hopes that local and regional stakeholders – responsible for ensuring that waterways are monitored effectively – adopt their approach.

“It is no secret that the chemicals we use in our daily lives often find their way into our air and water. This work contributes to our understanding of the specific types of chemicals that influence our water resources,” he said, noting that he believes this broad method will one day become routine in monitoring. “This is probably several years down the line.”

The National Science Foundation funded this work.



Damian Helbling, left, and Amy Pochodylo, M.S. '14, examine samples of New York waterways in a search for previously undetected micropollutants.

Photo provided by Robyn Wishna

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*Blaine Friedlander is a science writer for the Cornell Chronicle and may be reached at [bpf2@cornell.edu](mailto:bpf2@cornell.edu). Media Contact Melissa Osgood may be reached at [mms59@cornell.edu](mailto:mms59@cornell.edu). The original article may be viewed on-line at <http://www.news.cornell.edu/stories/2017/01/new-technique-ids-micropollutants-new-york-waterways>.*



# Algae: From Resource Depletion to Resource Recovery

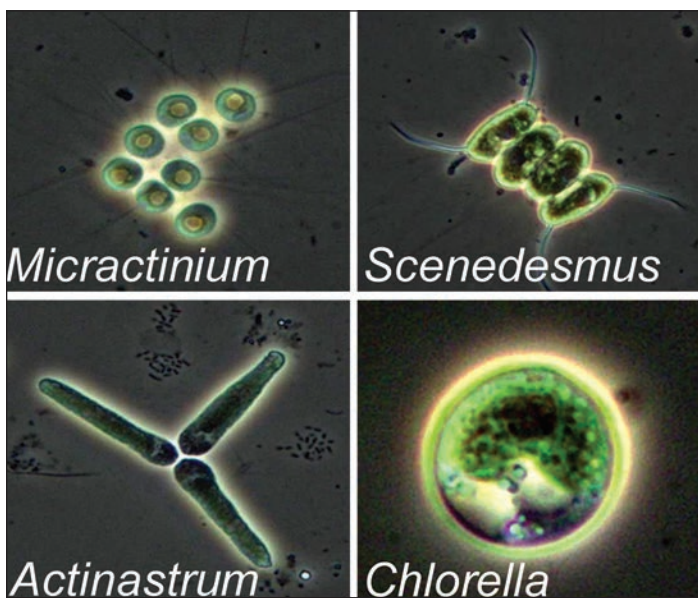
by Barry Liner and Noah Mundt

Generally, when we think of algae in a water quality context, we think of how nutrients in agricultural runoff, municipal wastewater effluent, and urban stormwater provide the conditions for algal blooms in water bodies. These algal blooms lead to eutrophication and dead zones, causing water quality and negative economic effects.

The same biological processes that lead to water quality problems from nutrient pollution can be harnessed to treat, and recover, nitrogen and phosphorus through production of algal biomass for wastewater bioremediation. Algae can be cultivated and harvested to create biomass that can be transformed into biofuels and bioproducts.

As the wastewater sector seeks to manage high energy costs while recovering resources to meet tighter nutrient limits, the algae bioproducts and biofuels industry is searching for productive feedstock. The potential is being recognized, as demonstrated by awarding of the 2016 Paul L. Busch Award to Jeremy S. Guest, assistant professor in the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. This \$100,000 award recognizes Guest's work with algae treatment and resource recovery.

In October 2016, the Water Environment Federation (WEF; Alexandria, Va.) and the Algae Biomass Organization (ABO; Preston, Minn.) hosted the forum Algae in Wastewater Treatment at the Algae Biomass Summit. The forum brought together algae technology developers, leading design and engineering firms, municipalities, regulators, and other stakeholders to review the state of algae-based tertiary wastewater treatment systems. Forum participants also discussed opportunities and challenges in deploying such systems in the context of an evolving economic, environmental and regulatory landscape.



Credit: Lundquist et al (2016)

Figure 1. Green algae typically found in wastewater pond polycultures

## Types of Algae

Algae tolerate a wide range of environments with respect to temperature, salinity, and water quality. The communities of algae found in treatment and harvesting operations typically are mixed culture, combining both photosynthetic and heterotrophic types, as occurs in nature. Photosynthetic algae use nutrients from nitrogen and phosphorus in wastewater, capture carbon as carbon dioxide, use energy from sunlight, and produce oxygen as a waste product. Heterotrophic algae use organic chemicals for carbon and energy.

Blue-green algae are photosynthetic, but actually are bacteria (cyanobacteria) that contain phyocyanin, which gives the blue-green color. Blue-green algae also produce microcystins, which are toxins that cause many of the negative effects of algal blooms in lakes. Other algae are eukaryotes, as opposed to bacteria, and are generally green, brown and red. Common green algae strains are shown in *Figure 1*.

## Algae Treatment

The use of algae as wastewater treatment is common, as the biological processes take place in ponds and lagoons naturally. About half of the 16,000 regulated water resource recovery facilities (WRRFs) have ponds/lagoons. These features are prevalent especially at smaller WRRFs (*Bastian 2016*). The efforts now are focusing on how to use microalgae for wastewater treatment within conventional WRRFs.

Similar to other biological wastewater treatment techniques, algae treatment can utilize suspended- or attached-grown methods. Suspended-growth ponds use paddles to keep microalgae suspended for sunlight, coupled with a shallow depth for light penetration. The layout of these ponds gives rise to the name “raceways”, as shown in *Figure 2*.

Attached growth techniques utilize a substratum that rotates alternatively through wastewater (to provide nutrients) and atmosphere (to provide sunlight and carbon dioxide). Two common types of attached growth algae treatment technologies are biofilm rotating algae biofilm reactor (RABR) and revolving algal biofilm (RAB).

In pilot tests in Chicago, an RAB system has demonstrated the potential for recovering nutrients from wastewater. The RAB system is capable of producing concentrated algae biomass (10 percent to 25 percent solids), which has value and can be used to produce a variety of products (*Kumar 2016*).

Several types of wastewater are applicable for algae treatment including municipal wastewater, produced water from oil and gas extraction, dairy farms and swine wastewater. During treatment, nitrates and phosphates are combined with water and carbon dioxide to grow the algae. Microalgae often is represented by the chemical formula  $C_{106}H_{263}O_{110}N_{16}P_1$ . It is important to note the phosphorus to nitrogen ratio of 1 to 16 when evaluating the design, as well as looking to add carbon dioxide to balance the



Figure 2. Raceway algae high rate pond

carbon:nitrogen:phosphorus ratio and achieve completed nutrient assimilation, according to Ron Sims, who gave the presentation, Microalgae-based Approaches to Algae-based Tertiary Wastewater Treatment, at the forum.

Most of our existing laws and regulations that deal with wastewater were designed with conventional treatment systems in mind. How does algae fit in the regulatory environment? 40 CFR Part 503 includes definitions for Class A and Class B biosolids. Algae from municipal wastewater (as part of the treatment system) are subject to Part 503. Algae solids from municipal treatment could meet Class A or Class A/EQ in a number of ways. Metals are unlikely to be problematic and consistent low metals and pathogens may provide basis for reduced monitoring, said Robert Bastian in his presentation, Algae Biotechnology for Wastewater Treatment: Regulatory Issues, at the forum.

### Bioproducts and Bioenergy

A number of bioproducts can be produced from algae biomass. Fertilizers from algae solids generally have about eight percent to ten percent nitrogen content and one percent to two percent phosphorus content, Bastian said. The biomass also can be used as feed for aquaculture and agriculture. Products from phycocyanin include pigments and antioxidants, Sims also reported.

The first techno-economic analysis (TEA) for algae biofuels integrated with wastewater treatment was performed in 1960, according to Algae Biotechnology for Wastewater Treatment: An Introduction presented by John Benneman. Using anaerobic digestion, the biomass can produce biogas, especially when mixed with food wastes and municipal wastewater biosolids to generate more methane for combined heat and power (CHP). Additional processing, such as hydrothermal liquefaction (“pressure cooking”) can convert algae to biocrude oil. Other processes can produce biodiesel, bioplastics, acetone, butanol and ethanol, Sims said.

When evaluating any energy resource recovery opportunity, it is important to calculate the energy return on investment (EROI): Does the system provide more usable energy than it consumes?

According to recent work in Europe, algae biofuels have an EROI of 1.9, substantially higher than corn ethanol’s and biodiesel’s value of 1.3. In addition, biomethane from algae enables greenhouse gas savings of more than 50 percent compared to diesel. Furthermore, algae biofuel production per hectare is 10,000 kg CH<sub>4</sub>/ha/yr, enough to fuel 10 vehicles, double sugar bioethanol and palm oil diesel, reported Frank Rogalla in his presentation,

Wastewater Treatment and Energy Recovery with Cultivation of Microalgae.

### Conclusions

State regulators, municipalities and other industrialized jurisdictions increasingly are moving toward tertiary wastewater treatment as a means to mitigate the environmental effects of nitrogen, phosphorus, heavy metals and other components of traditional wastewater treatment systems. But traditional systems can be an expensive and energy intensive proposition.

Algae-based systems, which make up just a small fraction of tertiary systems in use today, offer a potential solution, providing a low input-energy platform for nutrient recovery with a variety of opportunities for production of value-added coproducts.

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*Barry Liner, PhD, PE, is director of the Water Science & Engineering Center at WEF. Noah Mundt, senior program manager at Siemens, was a moderator of the forum and is a member of both WEF and ABO ([www.algaebiomass.org](http://www.algaebiomass.org)).*

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# People in the News

## NYWEA's Water Hero for 2016, Jeff Parker



Jeff Parker

Jeff Parker has always had a deep interest and appreciation for the environment. As an avid hunter and fisherman, he attended Morrisville College and received his degree in Natural Resources Conservation. He began his water resource career in 1984, working at the Cortland water resource recovery facility. He earned his first license in 1990 after training under the tutelage of Jim Cunningham and John Yaw, doing contract operations. His other certifications include Grade 4A Wastewater Operator since 1997, and New York State Department of Health certified as a Water Operator Grade II-B since 2002.

Jeff has been with the Town of Owego for 18 years, and held the position of Chief Wastewater Operator for 15 years. Currently, Jeff is the Director of Utilities for two Town of Owego plants: Apalachian – Activated Sludge; and Owego – Sequencing Batch Reactor. These two utilities serve a consolidated community of approximately 9,000 people. He is proud to have served in the wastewater field for a total of 31 years, in both the public and private sectors.

The Town of Owego was established in 1800 in Tioga County, in the Southern Tier of New York. Owego is the largest town in the county, and is bisected by the Susquehanna River. Like many municipalities in the Chesapeake Bay Basin, the Town of Owego recognizes the need to spend time and construction money to meet the tighter federal regulations for nitrogen and phosphorus.

When Jeff first heard about these new requirements a decade ago, he thought about what he might be able to accomplish with the two Town of Owego plants without spending a lot of money. He reached out to other operators and to the New York State Department of Environmental Conservation (NYSDEC) staff for ideas. He implemented minor in-house modifications and process changes to help both plants move towards the tighter nitrogen and phosphorus limits. Some of the modifications and changes worked and some didn't, but he learned and made further refinements. He also kept others informed on his progress, both within his plants and throughout the region, to share what was working and what needed changes. Many Chief Operators would have delegated plant staff to work on making the modifications, but Jeff was "in the tanks" and involved every step of the way. Jeff's time and efforts provided a decade's worth of better effluent quality for the receiving waters, all without grant money and well before the 2025 deadline.

When asked what he found most rewarding about his career, Jeff stated, "I'm lucky to have learned how to be creative in this field. I try to hire the best people and do a good job in everything I do. Passing on that same work ethic and respect for having a job like this is what I do daily, because we owe it to the people who rely on our services, we owe it to the profession, and we owe our good work to the environment."

*See Water Hero Award presentation photo on page 55.*

## NYWEA Represented on the Capitol Pressroom

by Kerry A. Thurston



Joseph Fiegl

Immediate Past President and Deputy Commissioner of the Erie County Division of Sewerage Management, Joseph Fiegl, was a featured interview on the March 10, 2017 edition of the "Capitol Pressroom" on WCNY public radio.

Host Susan Arbetter opened the program with a discussion about Rebuild New York Now, a coalition focused on raising public awareness about the need to invest in environmental infrastructure. Mike Elmendorf (President and CEO of the Associated General Contractors of New York State) and Bill Cooke (Director of Government Relations with the Citizens Campaign for the Environment) explained the need for funding to address the problems with old infrastructure systems for water and sewer. They discussed the different proposals for investment put forward by Governor Cuomo and by the Senate.

In the second portion of the program, Ms. Arbetter stated "What is occasionally lost in all this conversation of sewer upgrades and fixing our pipes is that without water infrastructure, we go back to the 19th century when water-borne diseases like typhoid and cholera were common, and the infant mortality rate was sky-high. That mortality rate has now been cut by 75 percent, thanks in large part to sanitation." She introduced Joseph Fiegl and asked him to explain why these systems are so critically important. Joseph highlighted the public health impacts that sewer infrastructure has had over the course of time. The overall mortality rate from the adoption of clean water technologies decreased by 50 percent, from about 40 years of life expectancy before the advent of sanitation to over 60 years of life expectancy. He went on to describe the impact that these clean water systems have had on the environment and on the economy. In the 1960s, for example, Lake Erie was declared dead by *Time Magazine*. In fact, in Dr. Seuss's "The Lorax" from 1971, "Lake Erie" is rhymed with "weary" and "smeary". But just last month, the *Buffalo News* printed an article about how lake sturgeon have made a comeback in Lake Erie. And 14 years after "The Lorax" was first released, Dr. Seuss updated the book because of so many of the upgrades to systems to protect water quality.

In the remainder of the interview, Joseph discusses the need to re-invest in these clean water systems. This unseen infrastructure, buried underground, is often taken for granted, and the dialog between the utilities and ratepayers needs to raise the level of understanding of the benefits of the services of the water and sewer industry to public health, the environment and the economy.

To hear the full interview, visit the website at <http://www.wcny.org/march-10-2017-new-yorks-water-and-sewer-needs/>.

*Kerry A. Thurston is the Editor for Clear Waters magazine, and the owner of InFocus Environmental Consulting, and may be reached at [clearwaters@nywea.org](mailto:clearwaters@nywea.org).*

... and the Awards Kept Coming!



Lawrence Vulis (right) is presented the Association Student Chapter Service Award by President Fiegl.



Kristina Macro from SUNY-ESF receives the Association Student Chapter Service Award.



Anthony Bacchus was presented with the Young Professionals Award.



Scholarship winner Cecelia Martin is recognized by President Fiegl.



Natalie Morse is presented with the N.G. Kaul Memorial Scholarship Award.



2016 Major Scholarship winner, Larissa Gaul, from Elma, NY, is recognized by President Fiegl at the Opening Session. She is attending the University of Delaware.



Krish Ramalingam (left) and President Fiegl present the student paper award to Thomas Bolen (right).



Professor John Jeris (left) from Manhattan College and Professor Stefan Grimberg from Clarkson University at the Student Luncheon

KUDOS!



John Fortin, left, receives WEF's Arthur Sidney Bedell Award from WEF President Rick Warner.



Lisa Derrigan receives the John Chester Brigham Award.



Lauren Livermore is recognized for her leadership on the Program Committee.



John Ruggiero is inducted into the NYWEA Hall of Fame.



Jeffrey Parker receives the Water Hero Award from President Fiegl.



Mike Manning is recognized for his leadership on the Board of Directors as a Committee Representative.



President Fiegl presents Joseph Emminger, Supervisor of the Town of Tonawanda, with the Frank E. Van Lare Award.



Mark Wagner receives the John Chester Brigham Award.



Above: Members are recognized. Left to right are Pradeep Jangbari, Steve Carroll, Paul Sawyko, Gail Finkelstein and Dan Menelly.



Angela Horton receives the Collection Systems Operator Award from President Fiegl.



Left: Walter Dobkowski is presented the Ernest R. Carroll Award by President Fiegl.

Nice Job!

# My Water Legacy – NYWEA Connects with the Lehr Family

Edited by Kerry A. Thurston

In the spirit of the Water Environment Federation's (WEF's) social media campaign, #MyWaterLegacy, we wondered whether any NYWEA members had family connections in the water resources field. We found Christina Lehr, E.I.T., C.F.M. and her mother Victoria (Vicki) H. Lehr, P.E., both water resources engineers. Christina is a Staff Engineer in Water Resources with Dewberry Engineers in New York City, and is a NYWEA member. Vicki is a Senior Principal Engineer and Client Relations Manager for Nova Consulting in Washington, D.C.

We asked both women to talk about their experiences in the field, from their own perspectives.

*Describe what you do presently in your current situation as an engineer. What kinds of activities are typically a part of your work?*

**Vicki:** I work for Nova Consulting, a small woman-owned business that specializes in civil, environmental and water resources engineering, and program and construction management. I manage Nova's Washington, D.C. office where my focus is winning new work and growing the company's business. I am involved in business development and strategy, the technical and administrative management of projects, the negotiation of contracts, maintaining client relationships and satisfaction, and mentoring younger staff.

**Christina:** I have been working in engineering in New York City since graduating college in 2012 and most of my experience has been a part of the Consent Order initially entered in 2005 to reduce combined sewer overflows to the surrounding waterbodies. In my previous position, I conducted extensive field work at various New York City water resource recovery facilities and in many of New York City's waterbodies – including the Gowanus Canal, Flushing Bay and Newtown Creek – analyzing the effect of the combined sewer system on water quality.

In my current position, I spend time between the field and the office conducting design and desktop analysis for multiple water resources projects, mainly as part of the green infrastructure program under New York City Department of Environmental Protection, to reduce the amount of stormwater entering the sewer system and in turn, minimizing the amount of combined sewer overflows. We have also recently begun a major modeling project providing a comprehensive study and flood mitigation for the Town of Oyster Bay and Village of Massapequa to identify areas of flooding and offer alternatives.

*Why did you choose engineering? What were the major factors in your decision? Was the decision an easy one? Why or why not?*

**Vicki:** As early as elementary school I had a passion for math and science and for figuring out how things worked. That interest continued through high school and was reflected in a near perfect math SAT score and winning the physics award as a senior. So, when I went to college (University of Florida – Go Gators!), engineering seemed like a natural choice of profession. I selected mechanical engineering as a major, again related back to my interest in figuring out how things worked, particularly from a mechanical perspective.

**Christina:** To be frank, engineering was not my first choice and that made it a difficult decision. Growing up, I was involved in arts as a cellist from elementary school through high school. Near the end of high school, I started becoming more interested in my science classes, particularly chemistry and physics, for both of which I had fantastic teachers that were great role models. I was drawn to the idea that everything we were learning could be applied to everyday situations,

and I decided just before attending college to enroll in engineering classes.

*In your experience, what are the benefits of working in engineering? Were any of these benefits unexpected?*

**Vicki:** The benefit is being able to really make a positive change in your community and the environment. My first job out of school was as an analytical engineer for a major defense contractor, developing engines that would be used for the next generation of fighter jets. My work there was on the leading edge of technology. We were developing new materials and determining how to design parts from those materials, including analyzing and manufacturing those parts for use in extremely harsh environments. There were several failures along the way, but information was gained from each failure and the work continued until a successful engine run was achieved. It was extremely satisfying knowing the work I was doing would be used to create new jet fighters which would keep our pilots and country safe.

After ten years in the defense aerospace industry, I was laid off (the Cold War was over and defense spending was slashed) and found myself searching for a new job. A neighbor who worked at



Mother and daughter engineers: Victoria H. Lehr, PE (left) and Christina Lehr, EIT, CFM

Credit: Conor O'Rourke



the South Florida Water Management District (SFWMD) told me they were looking for an engineer and I should apply. I had lived in south Florida nearly my entire life and had seen their signs on the canals and structures in the area, but I was unaware of their mission. I did some research, went on the interview and was hired. I worked for them for the next 11 years and it was there that I developed my passion for water resources. I was fortunate to start working there as the Everglades Restoration Program was beginning and was the project manager for the first two large flood control pump stations constructed as part of that program. These stations pump treated water from Stormwater Treatment Areas (manmade wetlands) which cover more than 13,000 acres and treat local runoff by removing nutrients from the water prior to the water being released south to the Everglades.

After 11 years with SFWMD, I decided to move to private consulting as I had always wanted to learn the business side of engineering and the SFWMD was outsourcing most of the engineering work associated with the Everglades program to private consultants. I joined Parsons where I was the project executive for the Picayune Strand project, an Everglades project which involved the restoration of natural water flow across 85 square miles in western Collier County. This area was drained in the early 1960s in anticipation of extensive residential development. This subsequent development dramatically altered the natural landscape, changing a healthy wetland ecosystem into a distressed environment. The restoration of the wetlands in Picayune Strand and in adjacent public lands reduced over-drainage, while restoring a natural and beneficial sheetflow of water to the Ten Thousand Islands National Wildlife Refuge. The refined project includes 83 miles of canal plugs, 227 miles of road removal, and the addition of three pump stations and spreader swales to aid in rehydration of the wetlands. What was remarkable with these restoration projects was how quickly the benefits could be seen in the ecosystem, even before the projects were totally completed. It is very satisfying as an engineer to be able to have such a positive impact on the environment that will benefit generations to come.

I have now moved onto Nova Consulting, a small woman-owned business, to gain yet another perspective of the engineering profession and apply what I have learned in my career to help them grow.

**Christina:** The benefits of working specifically in civil engineering is the opportunity to familiarize yourself with the area you and your friends and family live. When I first moved to New York, I had only visited a few times previously and instantly being immersed in field work around all the boroughs gave me the opportunity to not only become familiar with the layout of the city (something that seemed all but impossible initially) but also familiarize myself with the infrastructure and environment that many people who have been residents for years have yet to experience.

*What challenges have you met and conquered in your pursuit of an engineering career? What were some of the unexpected hurdles you encountered?*

**Vicki:** One thing they do not teach you in engineering school is how much politics plays a role in the engineering decisions that are made. Many times, it is not the best engineering solution which is selected for a project, but it is the best engineering solution that matches the political priorities which are impacting a particular project. As an engineer, it is always important to be aware of all the factors which are driving a project and to be able to develop

solutions which take all those factors into consideration

**Christina:** One challenge that I met – and will seemingly always be conquering as long as I am living here – was moving to New York City at the start of my career. Aside from the obvious difference between New York and Florida being the weather, the infrastructure in the city was unlike anything I had worked with previously. Familiarizing myself with the system that my colleagues had been working on for years was a challenge that I believe I have and will continue to conquer. One hurdle that I've encountered that proves to be a benefit is that there is always something to learn. While in school, there is a set curriculum that is required to move to the next chapter in starting a career. I found out very quickly that not everyone had experienced the same curriculum that I had, but offered their own knowledge that I've been able to apply throughout my subsequent work.

*How would you characterize the benefits or hurdles specifically to being a woman in the engineering field?*

**Vicki:** In my graduating class, there were just three females who graduated with a degree in mechanical engineering out of a class of about 80. I started my career nearly 35 years ago in the aerospace field designing jet engines, and I was one of two female engineers out of a group of about 100 engineers working in my department. There were a few other female engineers on site, but out of about 8,000 employees, less than five percent of them were female engineers. There were many times when I was mistaken

*continued on page 58*

## #MyWaterLegacy Campaign Celebrates Tradition of Working with Water

The Water Environment Federation (WEF; Alexandria, Va.) encourages water quality professionals to take pride in the work they do ensuring a continued supply of clean water and adequate sanitation for future generations. At WEFTEC® 2016, Paul Bowen, immediate past president of WEF, launched the #MyWaterLegacy social media campaign.

The campaign, unveiled alongside a video titled “What Legacy Are You Creating?” promotes mentorship of young professionals and celebrates the contributions of WEF members working in the water sector. During the near century of WEF’s history, many water professionals have passed on their expertise and passion for the field to their children and other relatives, creating families of WEF members and employees committed to the protection of our water resources. The ongoing *WEF Highlights* “My Water Legacy” series profiles some of these families and their important work. So far, the articles include “My Water Legacy: Canhams Forged a Strong Bond, Inside and Outside of WEF” and “Hamlett Family’s WEF Service Spans Three Generations and Five Decades.”

“Every action, decision, and innovation we make as water professionals is really a building block for the future,” Bowen said at the WEFTEC 2016 Opening General Session. “WEF hopes this campaign will be a fun and engaging way to capture and celebrate that spirit and the passion our members and our colleagues around the world have for water and for the communities that they serve.”

For more information or to submit a story idea, contact *WEF Highlights* Editor Jennifer Fulcher at [jfulcher@wef.org](mailto:jfulcher@wef.org).

Source: <http://news.wef.org/mywaterlegacy-campaign-celebrates-tradition-of-working-with-water/>

for a non-technical person and I did encounter some uninformed attitudes when taking maternity leave for the birth of my children. I was also told during one review that I 'make a nice second income for my family'. While these odds and attitudes can prove daunting, I did find if you focused on the technical aspects of the job and performed well, your gender was not a factor in determining assignments or advancement opportunities. I hope for my daughter's generation, there is more awareness and she is not subjected to this type of stereotyping.

My experiences working in the public sector, where there was more of a balance between males and females, were very positive and I felt on a much more even playing field.

**Christina:** Being a woman in the engineering field provides me an opportunity to meet and create relationships with incredibly inspiring women not only in engineering but in all STEM fields. One hurdle I've seen in my short career is the slight look of surprise when people meet me under a hard hat and having to confirm that I am an engineer assigned to the project and focused on working together with other team members to complete the task at hand. Near the start of my career there were a few instances where I was assumed to be a non-technical person out at the facilities, but I have been fortunate throughout the latter portion of my career to be treated as a peer and on select projects a team leader when on site or at facilities.

*Do you have any role models you look up to, either within or outside of the engineering field?*

**Vicki:** I have several female engineers whom I consider role models, especially those who have successfully established their own firms, those who I consider to have broken through the glass ceiling. This includes the owner of my current company, Maria Molina. She had found herself limited professionally in the consulting firm she was working for at the time and decided to strike out on her own. That was more than 20 years ago, and she has never looked back. There were also several math and science teachers I had in elementary and high school who encouraged me and challenged me to learn as much as I could about the subjects.

I also consider my daughters to be role models. Christina for being fearless and moving to New York to start her career when she knew no one there, and my daughter Andrea for staying true to herself and having a clear sense of what is important to her. Both of them remind me daily of what is really important in life and make me want to put forth the effort to improve and create things that will make a difference.

**Christina:** I have been extremely fortunate that through my short engineering career, each of my immediate supervisors and managers have been incredible, strong women. Not all are engineers but they have all shown me how to be professional, efficient and effective in my work and I intend to keep those relationships throughout my career. And I consider each member of my family a role model. My father for shaping my strong work ethic and sense of drive, my older sister for always allowing me to be myself, and my mother for showing me that being a woman and having a voice are not mutually exclusive, it's okay to have both.

*What is the most important piece of advice you would give to a woman thinking of starting a career in engineering?*

**Vicki:** Network, network, network. Participating in professional organizations and connecting with engineers in other companies and organizations is very important. The relationships you build

through those activities are extremely valuable in obtaining advice, learning about new opportunities and providing assistance, whether that be making an introduction to someone or serving on a panel for a conference you are organizing.

It is also important for all women to have good mentors, both male and female. This will allow you to benefit from their experiences and have the perspective of both sexes.

I would also advise any engineer to get experience working both as a client and as a consultant. This allows you to understand and appreciate the drivers both organizations have so you can develop solutions acceptable to both sides. It has been my experience that the best engineers have sat on both sides of the table.

**Christina:** Join local organizations and attend any events! This for me is one of the best parts about engineering, being able to meet new people to share ideas with and build relationships that are invaluable when pursuing other work and opportunities.

*In your opinion, why is it important for women to go into the field of engineering?*

**Vicki:** Women bring a different voice and a different way of looking at a problem that is beneficial to finding the best solution. The more diversity in a team, the better the solutions. It is important for female engineers to mentor other female engineers and to work with their local schools to foster young girls' interest in math and science.

**Christina:** In my experience it's beneficial to have women in engineering because we provide a different perspective. We all get to the same endpoint, but offering a new path allows for creativity and in some instances breakthroughs that can be applied to a more effective solution.

*As a mother and daughter who have both become engineers, what are the three key points that you would want to get across in this article about engineering and your Water Legacy?*

**Vicki:**

1. Engineering can be a very rewarding field – working on projects that have a direct impact on your community and environment is very satisfying.
2. Follow your passion, wherever that leads you.
3. Don't be afraid to fail – it is through the failures that you learn the most.

**Christina:**

1. My parents were extremely supportive of every activity I was involved in growing up, which became engineering and sciences halfway through high school. Nothing was forced on me and there was no pressure to choose one activity and it helped me to find engineering later on. Expose young women to as much as possible to allow them to find their passion.
2. If you're the smartest person in the room, you're in the wrong room.
3. It's very rewarding to work on projects that will affect your community for years to come. Remember the positive impact that your work will have on everyone around you.

*What haven't we asked you that we should have? Is there anything else you'd like to add?*

**Vicki:** Have women cracked the glass ceiling in the field of engineering and do you feel they are making inroads into key positions?

I would answer with an enthusiastic yes! Several of the top consulting engineering firms have female executives and many of the clients and governmental agencies have female engineers in top positions. This doesn't mean there is not a lot of work to do until we are on an equal footing with our male counterparts, but it is a good start. It will also take the mentoring and encouragement of young females in primary and secondary schools, creating a supportive environment whereby they will pursue engineering as a career.

**Christina:** One thing we found interesting about our responses after discussing them was that my mom mentioned how rare female engineers were when starting her career, but I mention that all of my managers and immediate supervisors thus far in my career have been women. It's clear we have made great progress but there is always more to do.

**Vicki:** What are the biggest challenges facing engineers in the field of water resource engineering today?

One of the biggest challenges is coming up with an integrated water resources management approach that takes into account the social, economic and ecologic aspects of water systems. There are many entities competing for a finite water supply, including utilities, agriculture and healthy ecosystems. It is imperative a holistic approach be used to evaluate the most beneficial use of that water and in determining a resilient solution. Sea level rise and climate change will also need to be factors in that decision-making process.

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*Kerry A. Thurston is the Editor for Clear Waters magazine, and the owner of InFocus Environmental Consulting, and may be reached at [clearwaters@nywea.org](mailto:clearwaters@nywea.org).*

## Women in Architecture & Engineering Occupations in 2016

In 2016, 44.3 percent of full-time wage and salary workers were women. Among STEM occupations – jobs in science, technology, engineering and mathematics – women accounted for smaller shares of employment. There are three broad categories of STEM occupations. Women accounted for 42.2 percent of full-time wage and salary workers in life, physical, and social science occupations and 25.2 percent in computer and mathematical occupations. In architecture and engineering occupations, 14.0 percent of full-time wage and salary workers were women.

Source: Bureau of Labor Statistics, U.S. Department of Labor, The Economics Daily, Women in architecture and engineering occupations in 2016 on the Internet at <https://www.bls.gov/opub/ted/2017/women-in-architecture-and-engineering-occupations-in-2016.htm> (visited March 13, 2017).



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# Job Opening

## Conveyance Engineer

New York, NY Office (or any of the NE Regional offices)

Candidates must possess 5 to 10 years of experience in the planning and design of water, wastewater, and stormwater pipelines.

### Required Experience:

The desired candidate will have experience in:

- Design of new pipelines and pipeline rehabilitation
  - o Preparation of pipe sizing calculations for conveyance systems
  - o Preparation of drainage area maps
  - o Surface runoff coefficients, invert, slope, velocity and hydraulic grade line evaluation
- Pipeline condition assessment and prioritization
- Sewer system evaluation surveys
- Familiarity with street design and reconstruction requirements
- Utility coordination - determination and resolution of vertical and horizontal utility conflicts
- Technical expertise in the layout and profiles of pipeline design in AutoCAD Civil 3D 2015
- Site survey requirements
- Knowledge of subsurface and geotechnical engineering requirements
- Development and review of technical reports, proposals, contract documents, resources studies, computer modeling and data analysis
- Preparation of contract specifications and drawings
- Office and field engineering support during construction

### Desired Experience:

- Experience in planning, design and construction for a range of pipeline diameters and types

- Site/civil design for conveyance systems
- Exposure to field investigations, pipeline construction and associated street reconstruction
- Preliminary site planning and layout coordination of plant sites
- Proficiency in the use of Revit/BIM, hydrologic/hydraulic modeling software such as HEC-RAS, HEC-HMS, Hydrflow or BOSS
- Trenchless technologies
- Familiarity with New York City street design and reconstruction requirements
- Knowledge of water and sewer design guidelines and regulations in New York City
- Project experience with New York City Department of Design and Construction (DDC)
- Experience with drainage design criteria and NYCDDC drainage design guidelines and layouts

### Position Requirements:

- Bachelor's Degree in Civil Engineering
- 5 to 10 years of experience
- PE required with ability to obtain registration in New York State
- Possess strong verbal communication and technical writing skills
- Effectively and proactively coordinate with various disciplines (Stormwater, Civil, etc.)

Contact: Eileen Feldman at [efeldman@hazenandsawyer.com](mailto:efeldman@hazenandsawyer.com)

## Resources

To advertise or to become a member, contact Rebecca Martin at 315-422-7811 ext. 5 or e-mail her at [rebecca@nywea.org](mailto:rebecca@nywea.org).

Visit [www.nywea.org](http://www.nywea.org) for information or see us on Facebook.



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# Operator Quiz Test No. 114 – Activated Sludge, Etc.

The following questions are designed for trainees as they prepare to take the ABC wastewater operator test. It is also designed for existing operators to test their knowledge. Each issue of *Clear Waters* will have more questions from a different section of wastewater treatment. Good luck!

- Which of the following is not used to monitor and adjust the return activated sludge flow rate in a conventional activated sludge system?:
  - MCRT
  - SVI approach
  - Settleability test
  - Clarifier sludge blanket indication
- Clouds of billowing sludge that occur throughout secondary clarifiers and sludge thickeners when the sludge does not settle properly are called:
  - Floater
  - Bulking
  - Blinding
  - Floc
- A good activated sludge composition will contain which of the following abundant protozoa:
  - Thiothrix and actinomycetes
  - Worms and nematodes
  - Rotifers and stalked ciliates
  - Filamentous bacteria and fecal coliform
- The term OUR can best be described as:
  - The amount of oxygen activated sludge uptakes at a specific rate
  - The amount of oxygen dissolved in wastewater
  - The amount of oxygen contained in an anaerobic digester
  - The amount of ozone needed to disinfect secondary effluent
- An aeration system is experiencing an increase in DO and an increase in floc over the secondary clarifier weirs resulting in higher than normal TSS in the effluent. The operator notices the blower output has remained constant. What can be the cause of this?:
  - An organic waste load
  - A toxic waste load
  - An inorganic waste load
  - A polymer leak making its way into the waste stream
- Of the following, the most precise piece of lab equipment for measuring liquid would be:
  - Beaker
  - Graduated cylinder
  - Erlenmeyer flask
  - Pipette
- How many gallons of a 15% sodium hypochlorite solution would be required to make up 115 gallons of 9% solution?:
  - 69 gallons
  - 192 gallons
  - 34 gallons
  - 155 gallons
- An anionic polymer will have:
  - A positive charge
  - A negative charge
  - A neutral charge
  - No charge
- Determine the hydraulic loading rate of a trickling filter using the following specifications:  
6250 gpm flow rate  
140' diameter  
11.25 MGD  
6' deep
  - 1585 MGD/ft<sup>2</sup>
  - 585 GPD/ft<sup>2</sup>
  - 975 GPM/ft<sup>2</sup>
  - 115 GPH/ft<sup>2</sup>
- What is the chemical formula for sulfuric acid?:
  - HCL
  - H<sub>2</sub>SO<sub>4</sub>
  - NaOH
  - HNO<sub>3</sub>

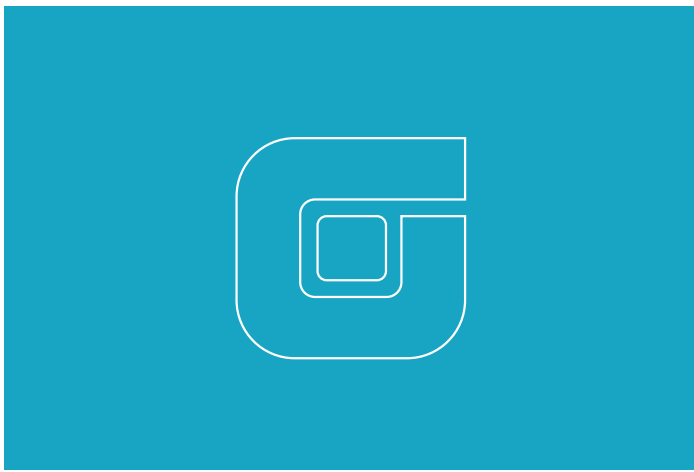
## Answers on page 62.

For those who have questions concerning operator certification requirements and scheduling, please contact Tanya May Jennings at 315-422-7811 ext. 4, [tmj@nywea.org](mailto:tmj@nywea.org), or visit [www.nywea.org/OpCert](http://www.nywea.org/OpCert).

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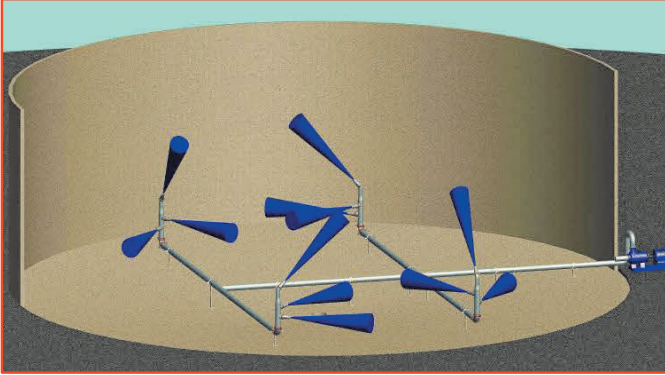
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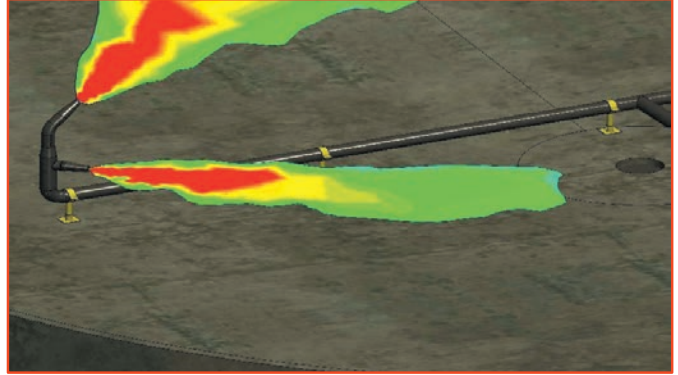


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# Customer Testimonial V: Environment One

Saratoga County Sewer District



The Saratoga County Sewer District has over 450 Environment One pressure sewer stations, many around Saratoga Lake.

Saratoga Lake was being contaminated with failing septic tanks. With the help from **Environment One** and **Siewert Equipment**, the old, high maintenance sewer stations were eventually replaced with E/One low pressure sewer stations.

Here is what **Saratoga County Sewer District Executive Director, Dan Rourke**, has to say about the installations:

"We are very happy with the reliability and performance of the E/One pumps. We are especially impressed with their high-head capabilities that we can get from their positive displacement, progressive-cavity design. This allows us to put in low-pressure sewer in more remote sites that we were never able to sewer before."



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