



**WATER SUPPLY CITIZENS
ADVISORY COMMITTEE**
to the Mass. Water Resources Authority

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WAC/WSCAC Joint Meeting

Location: Held virtually
November 6, 2020 – 10:30 am

Members in Bold in Attendance:

WSCAC:

Jerry Eves, WSCAC Chair

Michael Baram

Whitney Beals

William Copithorne, Town of Arlington

Steven Daunais, Tata & Howard

Andrea Donlon, CT River Conservancy

Bill Fadden, OARS

Bill Kiley, BWSC

Paul Lauenstein, NepRWA

Martha Morgan, Nashua River Watershed

Martin Pillsbury, MAPC

Janet Rothrock, League of Women Voters

Bruce Spencer

Kurt Tramosch, Wayland Wells

WAC:

Mary Adelstein

Zhanna Davidovitz

Wayne Chinouard (vice chair)

Martin Pillsbury

Dan Winograd

Taber Keally

Karen Lachmayr (chair)

Phillip Ashcroft

Adrianna Cillo

Stephen Greene

James Guidod, Advisory Board

Craig Allen

George Atallah

Kannan Vembu

Staff:

Lexi Dewey, WSCAC staff

Andreae Downs, WAC staff

Ace Peckham, WSCAC staff

Non-Members in Attendance

Corey Godfrey, Water Quality Manager for the
Littleton Water Department

Julie Bliss Mullen, CEO of Aclarity Water

Other Attendees

Amy Hunter, AECComm

Anthony Comeau, Natick water & sewer

Bob Magnussen, Waste Management

Bud Dunbar, Aclarity

Casey Chabchak, Natick Water & Sewer
Chris Curran, AECComm
Debbie Tatro, Sustainable Sharon Coalition
Denise Ellis-Hibbit, MWRA
Greg Eldritch, Water engineers
Heather Miller, Charles River Watershed
Association
Jeffrey Rosen, Corona Environmental
Consulting
Carey Snyder, Neponset River Watershed
Association
Lou Taverna, Advisory Board
Mary Scott
Patrick Smith, MWRA

Sascha Charles River Conservancy
Scott Newquist, Aquabat Technologies
Sean Navin, MWRA
Susan Herman, Town of Stoughton
Vanessa Nason, Charles River Conservancy
John Raschko, Mass Office of Technical
Assistance
Joe Nerden, MassDEP
Steve Davey
Steve Poggi, Waste Management
Bill Howard, Waste Management
John Dempsey, Brookline Solid Waste Advisory
Committee

Andreae Downs opened the meeting with a roll call and introductions from all attendees. She then requested a motion, a second, and a vote for WAC's October meeting minutes. The minutes were approved unanimously. Lexi Dewey then requested a motion to approve WSCAC's October minutes. Whit Beals moved, and Jerry Eves seconded. The minutes were approved unanimously. Lexi and Andreae reminded WSCAC and WAC members that the Conflict of Interest forms are due at the end of the year.

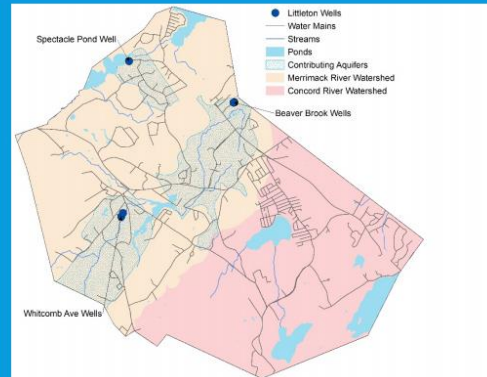
Andreae first shared a legal disclaimer for both committees, noting that any presentations are for educational purposes only, and participation at any meetings is not considered an endorsement by either committee or the MWRA. She then introduced Corey Godfrey, the Water Quality Manager for the Littleton Water Department.

Corey began his presentation, [The Long Road to Resilience](#). Littleton faces challenges typical to most small town water systems, including the discovery and removal options of PFAS contamination.

Littleton's water system is relatively small, pumping an average of 1 million gallons per day (although they pumped 1.8 mgd/day - nearly double their average – during the 2016 drought). Littleton is composed of 63% residential and 36% commercial/industrial users, and serves a population of just over 9,000 residents. They have three wellfields, three storage tanks (approximately 4 million gallons), and 80 miles of water mains.

LITTLETON WATER SYSTEM AT A GLANCE

- 1 Million Gallons per Day (MGD) average
- 1.8 MGD peak during drought of 2016
- 63% residential, 36% commercial
- Population served = 9,046
- 3 wellfields
 - Beaver Brook
 - Whitcomb Ave
 - Spectacle Pond
- 80 miles of water main
- 3 storage tanks



The town has faced many challenges from the start of Corey's tenure in 2013, including the need for rehabilitation of storage tanks, revenue loss, staff turnover, and, at times, demand exceeding peak production. The water department identified priority projects which included replacement and rehabilitation of several wells and facilities, but they encountered roadblocks including disputes over water rights, abutters opposing a new treatment plant, and the town's rapid growth, which is placing increasing demands on the system.

ROADBLOCKS TO RESILIENCY

- Residential and commercial growth in Littleton has been increasing exponentially
- VeryFine/SunnyD facility purchased by Pepsi bottler in 2016
- New source development aggressively opposed by another Town
- Dispute over water rights to a potential surface water supply
 - Supreme Judicial Court
- Whitcomb Ave Water Treatment Plant aggressively opposed by small group of abutters
 - Superior Court
 - Legislative action
- PFAS found in Spectacle Pond well in 2019

A major roadblock they encountered was the discovery of PFAS in the Spectacle Pond well, which represents ½ of their pumping capacity, at levels higher than MassDEP's recently declared limit of 20

parts per trillion. The elevated PFAS levels were discovered before the limit was passed, but for public safety, Littleton began taking steps to mitigate these levels at the end of summer 2019.

As a first step, Littleton took the Spectacle Pond well offline and built a temporary transmission main, which moved water from another facility to the Spectacle Pond treatment plant, where the two waters were blended together, bringing the PFAS levels to below 20 ppt. This has worked as a short-term measure, but the town is not yet able to use the Spectacle Pond well to its full capacity, so water supply availability remains reduced.

A second important step was an informational campaign to the residents of Littleton, keeping them apprised of the situation and steps being taken. The town offered testing of private wells, provided bottled water credits to those in need, and began investigating the source of the PFAS contamination.

Once the emergency steps had been put in place, Littleton began looking for a more permanent solution. Due to the facility's age and the high levels of iron and manganese remaining in the water after filtration, they could not simply add PFAS filtration capabilities to the Spectacle Pond facility. A life cycle cost analysis showed it would be more cost-effective to build a groundwater transmission main from the Spectacle Pond well to the Whitcomb Ave filtration plant, and add the PFAS filtration to this location, despite the increased operating costs. After reviewing the pros and cons of the available options, Littleton decided on using a biological process, then UV, then granular activated carbon to remove the PFAS.

As Corey noted, "Water commissioners have authority under Massachusetts General Laws 111 sec. 173A and 173B to examine and protect water supplies and sources of supply and to take appropriate action to protect these. This includes watershed protection. Water commissioners must recognize this responsibility and provide whatever resources are required to operate the system in compliance with MassDEP regulations. Thus, the water commissioners or their designees are directly responsible for taking action as required, to protect source water quality." (<https://www.mass.gov/service-details/water-commissioners-and-local-boards-roles-and-responsibilities-for-drinking-water>)

To investigate the source of the PFAS in Spectacle Pond, they collected samples from 77 various water sources. PFAS was present in 72 of the locations, with 41 having levels higher than 20 ppt. This makes it difficult to locate where the PFAS may be coming from. There can be many sources, but the town has been able to determine three major potential contributors, and is looking into cost recovery from these sources.

Corey concluded by commenting that resiliency is a difficult goal to reach, but it is worth it.

SUMMARY

- Resilience is a worthy goal
- It may take your entire career to achieve it
- There will be many roadblocks along the way
 - Deteriorating infrastructure
 - The need to significantly increase water rates
 - Staff turnover and loss of institutional knowledge
 - Emerging contaminants
 - Water wars
 - NIMBYs
- Strive for resilience anyways

Corey was asked about the sources of PFAS. He responded that some is from firefighting foam, and another potential source is from either a landfill or a nearby quarry.

Corey was asked how long PFAS testing had been going on. He responded that they started at the beginning of 2019, before Massachusetts had declared a limit, because they were aware that PFAS contamination was in the area.

In response to additional questions, Corey confirmed that PFAS levels do fluctuate, and they're looking to determine patterns. Spectacle Pond itself does have some PFAS contamination, and some tributaries have very high levels.

Kannan Vembu asked what filtration options they researched, and Corey said they considered one called greensand, a combined process that used granular activated carbon and ion exchange, and the biological process that they selected.

John Raschko asked whether they had tested the landfill leachate, and Corey confirmed they had.

Paul Lauenstein asked if DEP had paid for any of the testing or mitigation, and Corey said that they had paid for some testing, and Littleton has also applied for grants. They're also planning on borrowing through the SRF program.

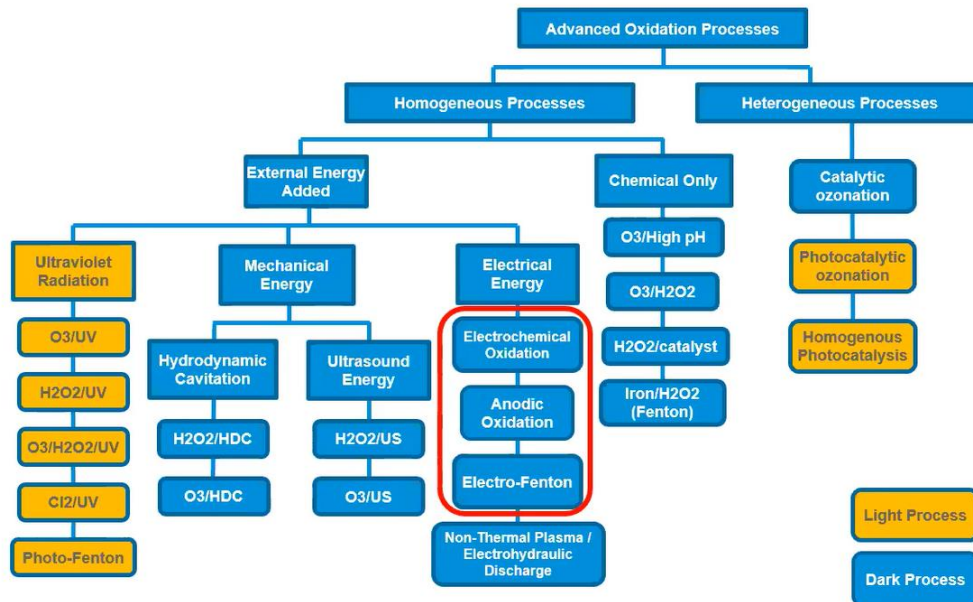
Corey was thanked for his presentation.

Andreae introduced Julie Bliss Mullen, CEO of Aclarity Water. Aclarity was founded in 2017, and is primarily funded by venture capital firms and grants. Julie's presentation is [here](#).

Julie began by commenting that there are a lot of contaminants, a major one of which is PFAS, and so there's a high need to develop technological solutions to resolve these contamination issues. Aclarity has developed an electrochemical advanced oxidation process, which destroys the chemical bonds in common contaminants such as PFAS, breaking them down into innocuous chemicals.

Electrochemistry is a subset of advanced oxidation processes. She noted that the major focus is oxidation, so the anodes are key. A positive anode and a negative cathode are placed in the water, and increasing the voltage increases the strength of the oxidants produced.

Electrochemistry is a Subset of AOPs



Source: Adapted from Sharma et al. 2011



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One of the key factors of the Aclarity method is that the process is significantly lower cost than other options on the market. The electrodes are long-lasting, there are no moving parts or chemical storage, and no need to store chemicals. They can process up to 1 million gallons of water a day, and are researching economies of scale for handling larger demands.

Aclarity also has gone through NSF/ANSI testing for disinfection, and achieved greater than 6.3 log removal. Julie shared a case study where, in an early installation in Africa, the users were going to have to use chlorine to sanitize the water, at a cost of \$3k/year. Aclarity was able to install a system that would remove bacteria and viruses, cost \$3k up front, and then \$200/year, for a lifetime of 10 years or more.

Julie then provided an example of nitrogen pollution from septic systems on Cape Cod. The Aclarity system converts nitrogen to nitrogen gas.

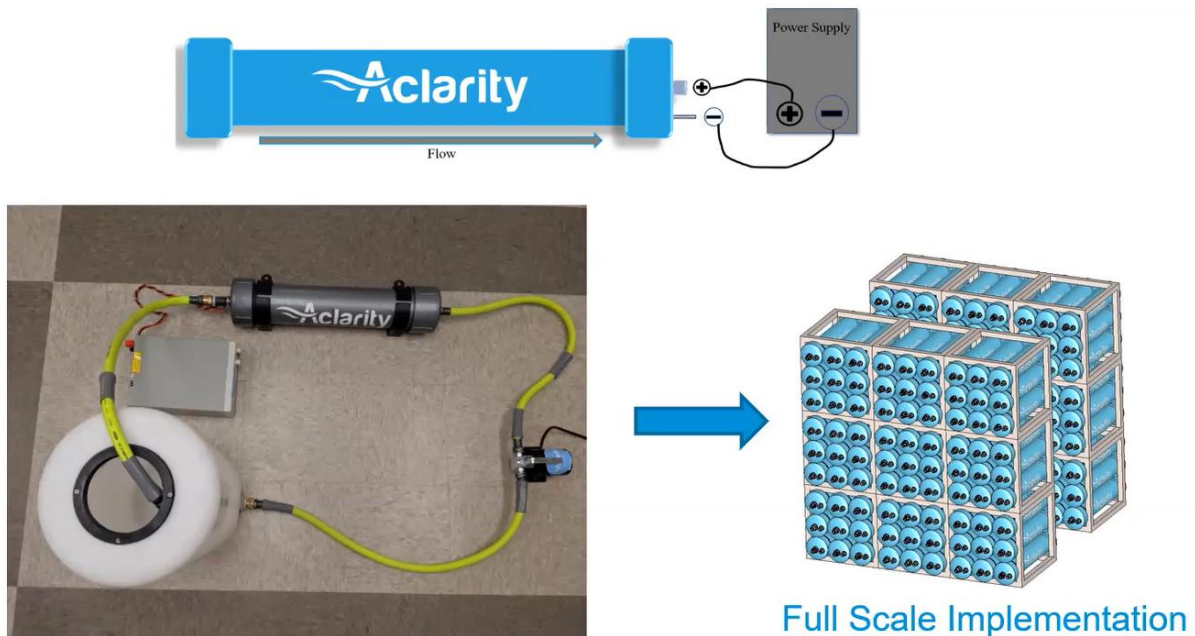
And finally, Julie shared an example about PFAS in landfill leachate. The current systems that are available involve filtering the PFAS through extensive processes, then replace the PFAS in the landfill. Aclarity destroys the PFAS and ammonia before discharging the leachate to the surface, saving millions of dollars.

A pilot of Aclarity's technology on concentrated PFAS (300 ppb) in drinking water focused on PFOA, in which they were able to reduce the levels by 66% in 80 minutes. The carbon-fluorine bonds are broken by free electrons, and then fragments are mineralized by hydroxyl radicals and other mixed oxidants. They've sold systems to the Air Force and Xylem, among others.

The technology is also applicable to wastewater treatment, converting ammonia/TKN to nitrogen gas and destroying pharmaceuticals and other contaminants. It uses less electricity than UV for disinfection. More capabilities are still being explored.

To work with customers, Aclarity offers a pilot test and then assists in searching for grants to cover the costs. Pilot tests demonstrate efficiency and optimize voltage, flow, and other factors.

Aclarity Pilot Tests: Pilot to demonstrate Efficacy, optimize voltage, amperage, flow, retention time \$6K, results (money back) guaranteed



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Julie concluded by pointing out that electrochemistry has the potential to become a highly disruptive technology.

John Raschko asked if there are any byproducts associated with the technology. Julie said yes, hydrofluoric acid and free fluorine are common byproducts, but there are very few others, as was verified by a third party analysis.

Taber Keally asked if the septic system addition can be added on to an existing septic system or if it requires an entire new system. Julie said it can be added on to current systems.

Jeffrey Rosen asked about scaling time frame, pointing out that according to the graphs, achieving PFAS removal would take hours. Julie explained that the graph is based on one reactor, and then they can size the number of reactors from that initial test. Jeffrey also asked about byproducts of microbial inactivation, and if there is a risk of feeding bacteria. Bud Dunbar of Aclarity responded that the bacteria may be fed in the beginning, but they are destroyed in the end process of decontamination. Jeffrey will discuss further with another Aclarity representative.

Kannan Vembu pointed out that electrochemical processes are generally high cost and maintenance, and asked why Aclarity would be an improvement. Julie responded that Aclarity's electrodes are a tenth of the

cost of competing electrodes and the oxidant levels are so high that they don't have to worry about biofilms. Additionally, they don't have to update moving parts, so there's little maintenance.

Jeffrey Rosen asked if the reactors are in series or parallel, and Julie said that for the most part, they're in parallel, and then the water is recirculated a few times before discharging.

Andreae thanked Julie for the presentation, and Andreae and Lexi confirmed next meeting times and topics.

The meeting was adjourned.

**WSCAC will next meet on December 8, 2020, at 10:00 am via Zoom.
Please visit [our website](#) for more information on this meeting.**

WAC will next meet Friday, December 4, 10:30 am, via Zoom