Tackling stormwater pollution from contemplation to implementation—doing the right thing

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ABSTRACT | Town of Arlington Town Engineer Wayne Chouinard's leadership is advancing a new standard of stormwater practice for small-scale, affordable stormwater controls in Massachusetts. By collaborating with EPA, the University of New Hampshire Stormwater Center, and the Mystic River Watershed Association, Mr. Chouinard has developed a new standard detail for an innovative infiltration trench retrofit. Since 2014, Arlington has installed 31 of these systems and plans to install 20 more next year. Nutrient removal performance curves show that these systems can significantly remove phosphorus in the appropriate context. The work has sparked collaborations with surrounding communities that are focused on advancing green infrastructure throughout the watershed and revitalizing the Mystic River, considered impaired by phosphorus since 2007.

KEYWORDS | Stormwater, infiltration, nutrient removal, performance curves, Arlington, MS4, Mystic River watershed, green infrastructure

Wayne Chouinard, Arlington town engineer, inspects an infiltration trench chamber

DOING THE RIGHT THING

"They're really just holes in the ground." Wayne Chouinard is being both accurate and modest as he describes the infiltration trenches that helped earn him an Environmental Merit Award from EPA Region 1 this fall.

It is true that "Wayne's drains," as they are known among his colleagues, are just ditches, some open and vegetated, some beneath the surface. To focus on the simple structure, however, is to overlook the art, one that Chouinard has honed since he became the town engineer of Arlington, Massachusetts, in 2011.

Under his leadership, infiltration trenches have become a new standard of practice for Arlington. The design and installation of each is informed by the ones that came before. As a result, this network of cost-effective, small-scale stormwater controls is reducing the flow of phosphorus and other pollutants off the landscape, helping Arlington comply with its new Municipal Separate Storm Sewer System (MS4) permit and contributing to a revitalization of the Mystic River and its watershed.

"This approach is only workable when you have local champions like Wayne who collaborate and innovate to solve problems," says Newton Tedder, senior permit writer, EPA Region 1. "His environmental leadership has provided a cleaner, healthier environment for the town's citizens and the watershed as a whole."

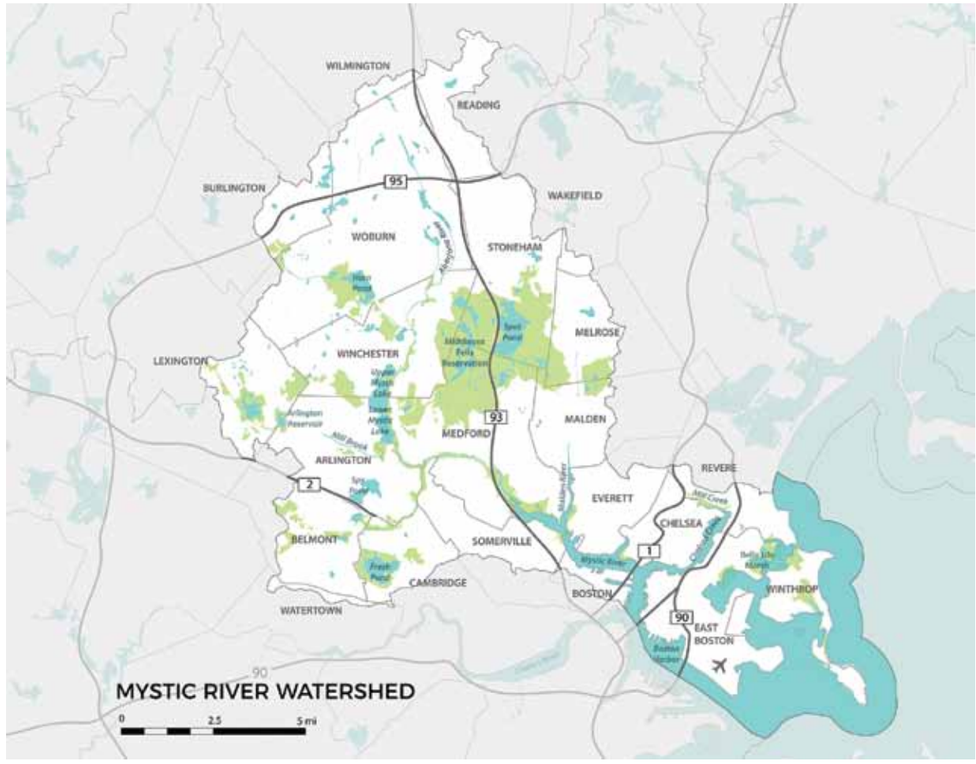

Figure 1. Overview of the Mystic River Watershed—one of the great urban rivers of New England, the Mystic has become the focus of a federal, state, municipal, and non-profit partnership committed to improving water quality and environmental conditions and creating open space and public access

New Career, New Partners

Mr. Chouinard began his career in home construction in the 1990s. From there, he transitioned into consulting, reviewing site plans for municipalities. Moving from building to plan review and from the private sector to the public, there has been one constant in his career.

"The hobby part of engineering for me has always been hydrology—I'm fascinated by runoff calculations," laughs the Natick, Massachusetts native. "When I came to Arlington, I wanted to know, How can I do more of that stuff?"

At the time, little was being done with stormwater at the municipal level. Old regulations were driving the standard of practice and contributing to municipal projects that, as Mr. Chouinard describes it, "went awry." There was opportunity for change, but in Arlington's compact urban landscape, there was not much space or money for new ideas.

The best advice Mr. Chouinard received at the time was to educate other people and himself. He started an informal series of talks on stormwater, inviting others to give presentations. He began to collaborate with the Mystic River Watershed Association (MyRWA), a non-profit that promotes water quality and environmental preservation, and he eventually joined the Mystic River Watershed Steering Committee.

Together with his new colleagues, he began to write grants to pay for some of the ideas they generated. Several of these were funded by EPA. This enabled Mr. Chouinard to meet people in the association, who quickly transitioned from being "those regulators" to becoming "my co-workers."

"Once I started working with all of these groups, I could see that we were all peers in the Mystic River," Mr. Chouinard says. "They probably could see my passion for all of this, and I liked theirs. Before I knew it, it had flourished into a great working relationship."

Small-scale, Affordable, and Effective

Mr. Chouinard's connections eventually led him to work with the University of New Hampshire Stormwater Center (UNHSC), a research, testing, and educational facility that serves as a technical resource for water managers, planners, and design engineers around the country. Together, they collaborated with EPA on a pilot project to explore

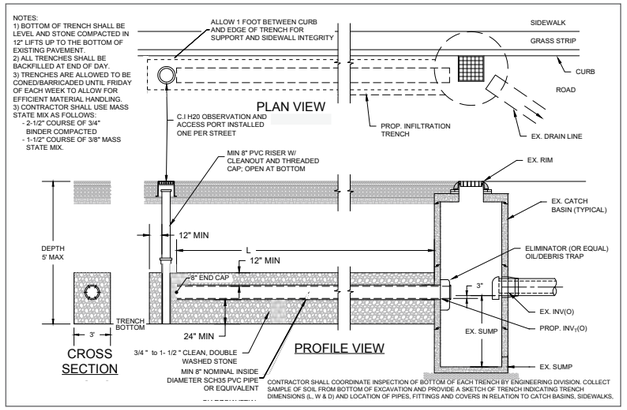

Figure 2. Design detail and specifications for the infiltration trenches

Table 1. Modeled costs and infiltration trench performance*

Unit	Cost ($)
System	2,200
IC treated per acre (per ha)	18,857 (44,000)
TP per lb (per kg)	24,750 (55,000)
TN per lb (per kg)	3,930 (8,609)
TSS per lb (per kg)	86 (190)
Volume eliminated per cf (per m^3)	0.11 (4)

*Based on the EPA's cost memo and the Massachusetts MS4 permit Appendix F

how Arlington and neighboring Winchester could reduce nutrient pollution, specifically phosphorus, in stormwater discharges.

"We put our heads together to see what we could do that was small scale and affordable," Mr. Chouinard explains. In Arlington's urban landscape, infiltration trench retrofits made sense (see Figure 2).

UNHSC scientists provided performance curves for pollutant load reductions for the proposed trenches; these turned out to be essential for tracking their effectiveness. UNHSC scientists continue to monitor one of the installation sites to refine the curves (see Figure 3).

"Before they formalized the nutrient removal numbers, I didn't know how much these designs could achieve," says Mr. Chouinard. "Having that spreadsheet gives us something to point to, to show we are making progress and can track it. People don't question it because it's from the UNH Stormwater Center."

Since 2014, Arlington has installed 31 infiltration trenches. In 2019 alone, the town installed nine systems for less than $20,000 (Table 1), with an annual reduction of nearly 1 lb (0.45 kg) of phosphorus and 1,296 gal (4,906 L) of runoff across the nine 2019 installations.

"Working with Wayne was effortless," observes UNHSC Director Dr. James Houle. "Stormwater management is increasingly focused on expensive, high-yield engineered controls. Wayne knew there was another option—an 'everyday' approach in which the town could make improved stormwater management part of the culture. Now, infrastructure improvements routinely include stormwater improvements. This do-it-yourself attitude will not only save the river but also will help the town and taxpayers avoid higher costs in the future."

New Standard of Practice for the Watershed

Over six years, Mr. Chouinard has adjusted the trench detail to incorporate what they learn and adapt it to new sites. They have found that connecting the trenches to existing catch basins lowers installation costs. The first systems were

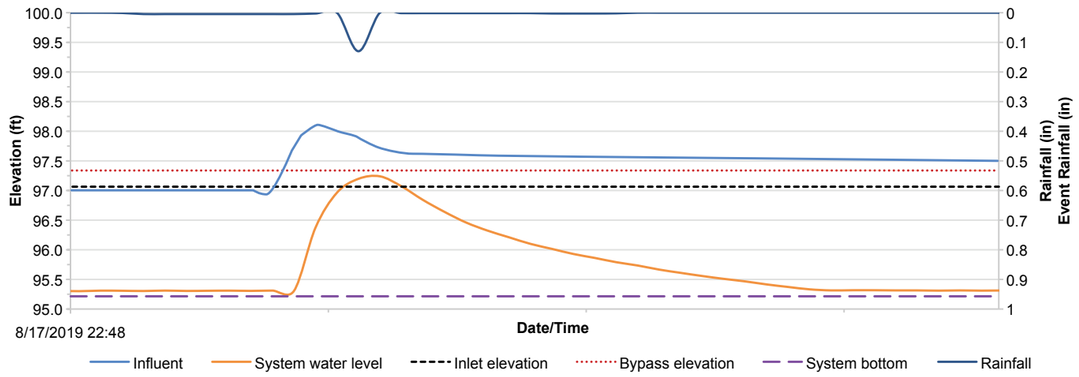

Figure 3. Monitoring results from one of the installed trenches: water level (blue) entering the system; small peaks above the bypass (red-dotted line) indicate overflow. Everything below the bypass line indicates infiltration into the ground, yielding volume and pollutant reductions.

Alongside infiltration trenches, Arlington has employed other small-scale stormwater control systems, including (left to right) porous pavement, rain gardens, and updated outfalls

installed under pavement, but they determined it was more practical to sometimes divert the flow into open grassy areas. Sandier subgrade soils are more likely to increase phosphorus uptake and being selective about where the trenches are installed can significantly increase the impact of the investment.

Nuances like these are contributing to a new standard of practice for Arlington, the bar for which keeps getting a little higher.

"Every year we have another collaboration that pushes us forward, and every single year we learn something new," says Mr. Chouinard. "I try to document it all so anyone can pick this up. I wanted to make this scalable and easy for a young engineer and other communities to implement."

This approach has prompted neighboring towns to learn more and incorporate some of the low-cost nutrient reduction strategies used in Arlington. Mr. Chouinard is often called on to give presentations for other communities and national webinars, and he is happy to do so, even though "the most fun is when I get to put something in the ground. I just really love my job."

"Wayne jumped into this work with enormous creativity, energy, and enthusiasm," says Andy Hrycyna, watershed scientist with MyRWA. "The designs he worked to develop are being rolled out across the watershed. It's a great testament to what can happen when agencies and municipal officials engage in collaborative conversation."

It is also a testament to how one great idea can attract significant funding for watershed improvement. MyRWA recently received a $498,715 grant from the Massachusetts Department of Environmental Protection to build 50 more trenches in Arlington and in nearby Medford and Winchester in the coming years.

The end game? A revitalized Mystic River where people can enjoy boating and fishing, one with healthy wetlands that support wildlife and provide other benefits. Mr. Chouinard sees the path for this laid out in the town's MS4 permit as the way to get there.

He predicts that "over the next 20 years, we will see progress and it will all be steered by the permit. We need to keep putting in these systems, tracking their effectiveness, and changing our approach based on what we learn. We can't just keep repeating the past; we need to do the right thing."

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ABOUT THE AUTHORS

- Dr. James Houle is the director of the University of New Hampshire Stormwater Center, where he leads the center's growing body of research projects. His expertise includes the diffusion of innovative stormwater management solutions; the design and implementation of green infrastructure and low-impact development strategies; system operations and maintenance; and water resource monitoring.
- Dolores Jalbert Leonard is founder of Roca Communications, a woman-owned, strategic communications firm dedicated to positive social and environmental change. She delivers communications solutions and facilitates co-learning experiences for organizations focused on advancing clean water, healthy ecosystems, and resilient communities.

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