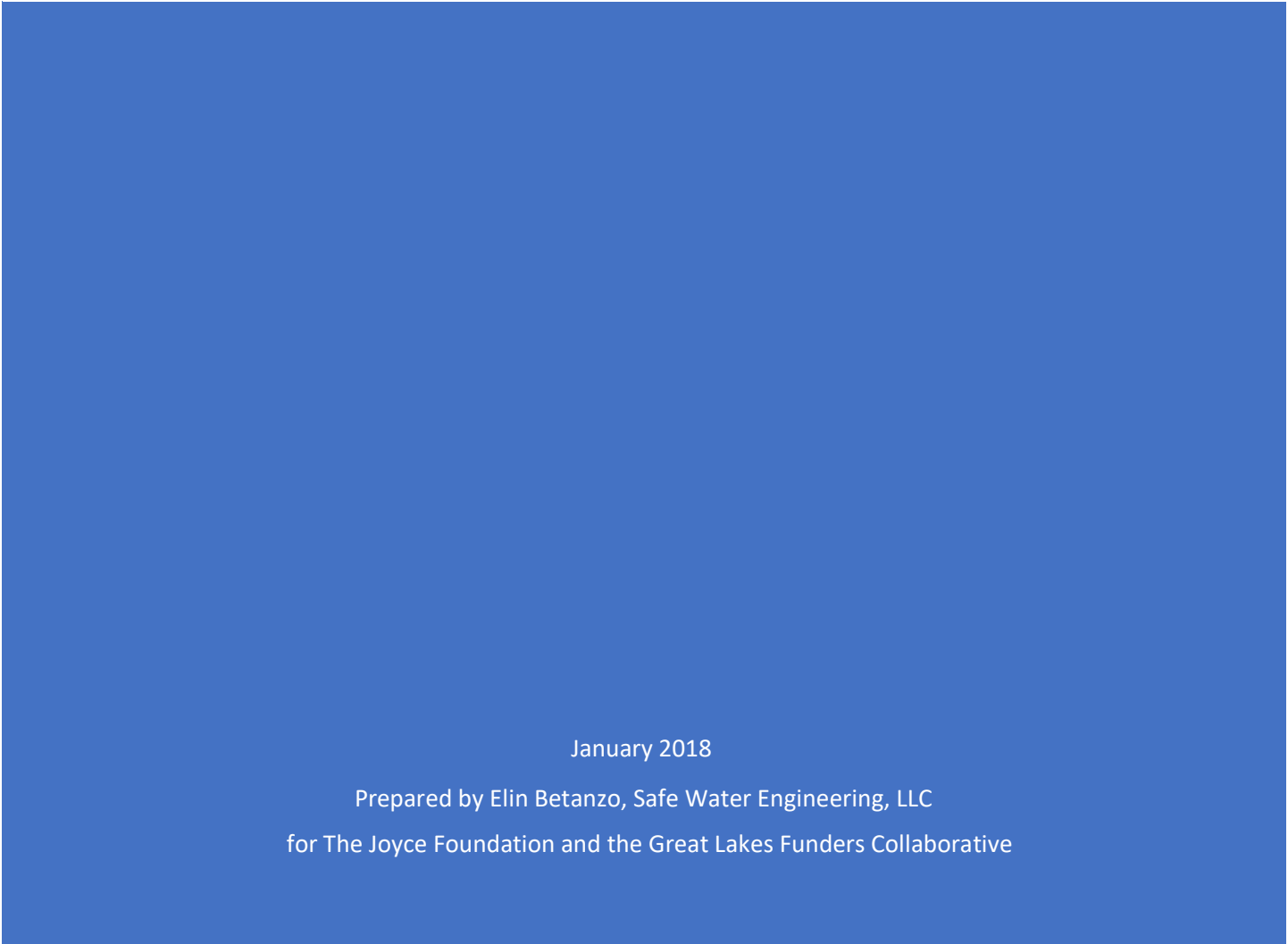




OPPORTUNITIES FOR ADDRESSING LEAD IN DRINKING WATER

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Opportunities for Addressing Lead in Drinking Water

This report was prepared to provide funders in the Great Lakes region with an overview of critical issues surrounding lead in drinking water and specific strategies that could be used to address those issues and reduce lead exposure through drinking water. These topics are presented as a series of issue briefs that describe challenges, data gaps, and opportunities for reducing the risk of exposure to lead in drinking water and for increasing community involvement in decisions affecting drinking water. Each of the issue briefs includes the following:

- an explanation of the issue and its relevance to drinking water and public health protection;
- strategies that can be used to address the issue challenges, data gaps, and opportunities;
- organizations working in the issue area and specific organizations or geographic areas that might be ready to initiate work in the issue area; and
- references and resources.

The organizations identified in this document have shared information about their work publicly via website, press release, conference presentations, or similar venues. The organizations listed here do not represent a comprehensive investigation, but they reflect work that has been visible and for which information is available to the public. Organizations described in this report have not been contacted regarding their interest in pursuing additional projects or seeking funding. Although not a complete literature review, the references and resources listed in this document include fundamental documents, manuals, and reports regarding each issue plus examples of current work in these issue areas.

Throughout this document, strategies are highlighted in **red** that are high priority strategies that can be implemented quickly with high impact, or are time critical. A swift, modest investment in these strategies may lead to real near-term improvements in the provision of safe drinking water.

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1. Remove Barriers to Full Lead Service Line Replacement (FLSLR)

The Lead and Copper Rule (LCR), adopted in 1991, establishes requirements for lead and copper sampling at customers' taps and additional steps that must be taken when high lead is measured in those samples. The LCR established an action level of 15 ppb for lead, which is an indicator of corrosion control effectiveness rather than a measure that is protective of public health. The LCR establishes a Maximum Contaminant Level Goal of 0 ppb for lead, showing that no level of lead is safe to drink. The LCR relies on corrosion control to reduce exposure to lead in drinking water.

If 10% of samples collected at a public water system (PWS) exceed 15 ppb the system must use corrosion control and begin a lead service line replacement program, replacing 7% of their lead service lines (LSLs) each year. In the original LCR, PWSs were expected to replace full LSLs, going from the water main to inside the customer's home. However, water utilities sued, saying they did not have authority to replace LSLs on private property (see figure 1). As a result, PWSs are only required to replace LSLs that are under their control. In most jurisdictions this means that LSLs are only replaced from the water main to the property line, a practice called partial lead service line replacement (PLSLR).

Concerns about lead release during PLSLR have been raised dating back to 1991 (USEPA, 1991). According to the U.S. Environmental Protection Agency Science Advisory Board (USEPA SAB, 2011), "Both full LSLR and PLSLR generally result in elevated lead levels for a variable period of time after replacement." The available data indicate the duration and magnitude of the elevations may be greater with PLSLR than full LSLR. The practice of PLSLR leaves LSLs in place, continuing to expose residents of those homes to lead in drinking water. PWSs have not been maintaining records for private side service lines because they are not the responsibility of the water system. As a result, both the water system and the residents do not have the information they need to prevent lead exposure through drinking water. The current standard of PLSLR is increasing exposure to lead in drinking water rather than achieving the goal of risk reduction.

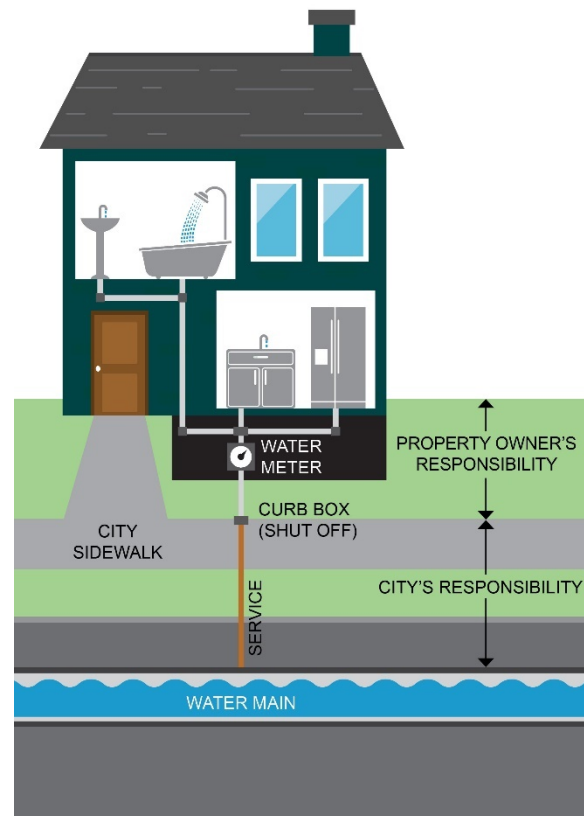


Figure 1: Service line responsibility in most jurisdictions throughout the United States.



Figure 2: A lead service line

To prevent the risk of increased lead exposure, the practice of PLSLR should be eliminated to the extent possible. Water utilities cite a number of barriers to implementing FLSLR. While there are a handful of water utilities that have managed to implement FLSLR programs, most of these forward-looking water utilities are addressing these barriers on their own, leaving the barriers in place for less sophisticated water systems.

A focused and systematic approach to eliminating barriers to FLSLR at the state level will be a very effective strategy for reducing risk of exposure to lead in drinking water. This will take the burden off water utilities that are trying to address this alone and free them up to replace pipes. It will also eliminate the most frequent excuse water utilities provide when explaining why they do not replace full LSLs.

Strategies:

- State level policy changes:
 - 1.1 **Identify the most effective mechanisms for providing authority to replace LSLs on private property and advocate for those policy changes at the appropriate level of government that allows the most water systems to utilize the policy changes (e.g., state, county, local).**
 - 1.2 Identify the policies, regulations, and case law that prevent PWSs from replacing LSLs on private property and using utility funds to complete this work.
 - 1.3 Identify strategies that have been used at specific water utilities to overcome limitations to working on and funding infrastructure improvements on private property.
 - 1.4 Identify innovative policy and funding mechanisms that can help water utilities break out of restrictions that have been placed on them.
 - 1.5 Organize PWSs to speak as a group to advocate for these changes.
- Develop community support for FLSLR
 - 1.6 Develop education programs for elected decision makers and staff about lead in drinking water and the importance of FLSLR.
 - 1.7 Develop public education and outreach to develop grassroots support for investment in LSLR for entire communities.
- Assist water utilities:
 - 1.8 **Identify funding sources and funding strategies to pay for private side LSLR without pushing the cost on low-income customers and contributing to dramatic rate increases.**

- 1.9 Fund demonstrations of FLSLR at state and regional water system conferences to give water utilities an opportunity to observe the process and consider how it could be implemented at their own utility.**
- 1.10 For identified policy and funding strategies, provide draft policy documents, waivers, and customer forms that can be easily adopted and implemented by individual water utilities per state or local requirements.**
- 1.11 Compile best practices and lessons learned from Flint’s FLSLR program, the largest scale LSLR program in the country, and share with PWSs to jump start their FLSLR programs.
- 1.12 Provide facilitation services for a water utility(ies) to coordinate LSLR projects with other planned infrastructure improvements including roads, gas, electric, sewer, and storm water infrastructure to demonstrate how LSLR can drive infrastructure renewal with multiple benefits.
- 1.13 Provide facilitation or technical assistance for a group of utilities to develop LSL replacement programs in partnership to share best practices, multiple approaches to the same problems, and share resources to increase efficiency.
- 1.14 Provide training programs/Certification for LSLR contractors to demonstrate they are using proper LSL removal practices, including thorough service line identification procedures, customer notification, filters, flushing, and sampling.
- 1.15 Assist with pilot FLSLR projects in low-income communities.
- 1.16 If water utilities that take on FLSLR programs are sued regarding use of rate payer funds for private improvements, support a non-profit legal organization to intervene so that limited utility funds are not diverted from critical work.

Organizations working in this area:

- The [Lead Service Line Replacement Collaborative](#) is compiling relevant information and presenting case studies on LSLR.
- The Environmental Defense Fund has compiled a [list](#) of water utilities that are working on LSLR programs.
- *State of Michigan:* Michigan Department of Environmental Quality is working on a revision to the state LCR and may require FLSLR in the revised rule.
- *State of Wisconsin:* Wisconsin has made a LSLR grant program available to PWSs and is actively supporting replacement of LSLs. They have already completed one year of implementation and may have data available for analysis to examine the effectiveness of the new program.
- *Madison and Milwaukee, WI; Lansing, MI; Grand Rapids, MI; Philadelphia, PA; Galesburg, IL:* Cities that have completed FLSLR programs or are currently implementing FLSLR programs.
- *Kenosha Water Utility* in Wisconsin gave a demonstration of LSLR at the Wisconsin AWWA annual meeting in 2017.
- The USEPA’s Environmental [Financial Advisory Board](#) prepared a report on [Financing Lead Risk Reduction](#).
- The effort to create the proposed Toledo Area Water Authority may include a fund to replace all LSLs, with the cost universally and equally covered by all communities in the authority regardless of whether each community has LSLs.

Cautions:

- Some water utilities may be accelerating rates of PLSLR to appear as good actors. Look closely at water systems that advertise that they are replacing LSLs. They may not be implementing FLSLR.
- The American Water Works Association and the EPA's National Drinking Water Advisory Council (NDWAC) have asserted the need to remove LSLs, but they have not endorsed any regulatory requirements for FLSLR or actual replacement goals.
- The Water Research Foundation (WRF) has funded a [Full Lead Service Line Replacement Guidance](#). However, this [press release](#) lists research participants that have been actively avoiding and resisting FLSLR over the past decades and have insisted that these practices were not harmful to their customers.

References and Resources:

- US EPA. (1991). Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper. (Federal Register 56, 26460).
- US EPA. (2011). Science Advisory Board Evaluation of the Effectiveness of Partial Lead Service Line Replacements, EPASAB-11-015.
[http://yosemite.epa.gov/sab/SABPRODUCT.nsf/RSSRecentHappeningsBOARD/964CCDB94F4E6216852579190072606F/\\$File/EPA-SAB-11-015-unsigned.pdf](http://yosemite.epa.gov/sab/SABPRODUCT.nsf/RSSRecentHappeningsBOARD/964CCDB94F4E6216852579190072606F/$File/EPA-SAB-11-015-unsigned.pdf)
- [AWWA C810-17 Standard for Replacement and Flushing of Lead Service Lines](#). Published in October 2017.

2. Improve LCR Requirements and Implementation

Both the Flint and the DC Water Crises occurred while the water systems were technically in compliance with the LCR. The governor of Michigan has called the rule “dumb and dangerous.” There are many weaknesses of the LCR that allowed these crises to happen that have been well documented. In 2004, when the extent of the DC Lead Crisis became apparent, the USEPA identified the need for both short-term and long-term revisions to the LCR. The short-term revisions were finalized in October 2007; the EPA is still working on the long-term revisions with the most recent schedule stating that a proposal may come out in 2018.

The National Drinking Water Advisory Council (NDWAC) convened a Lead and Copper Rule Workgroup to evaluate problems with the LCR and identify regulatory strategies to address those issues. The NDWAC endorsed the workgroup recommendations in December 2015, and the EPA has indicated that they are relying heavily on these recommendations for the pending rule proposal. One of the workgroup members provided a dissent to the recommendations and since publication others have raised concerns about the recommendations. Specifically, the recommendations:

1. Replace triggered mandatory LSL replacement programs with a long-term goal of full LSL replacement without any enforceable requirements. In order to be effective, the revised rule must include enforceable deadlines and a ban on PLSLR.
2. Propose a water testing strategy that would eliminate all lead sampling according to a sampling plan at high-risk homes and would rely only on customer requested samples using protocols selected by the resident, not the water system. This approach is not scientifically defensible and would substantially weaken the public health protection of the rule. It would prevent identification of the next lead crisis.

There are many opportunities for policy analysis and data development to inform the revised LCR. Once the revision is proposed, EPA will accept comments and new data for consideration. There should be a public comment period of about 90 days during which an analysis of the complete rule package should be completed. EPA will then begin the process of preparing the final rule. EPA often considers new information that becomes available that would have a major impact on the rule requirements if it becomes available during the final revision. If a substantial set of new data becomes available, EPA may release a Notice of Data Availability so that all stakeholders can be aware of the new information that will influence the final rule. This is a critical time period for developing data and policy analysis to improve the regulation of lead in drinking water for years to come. The following sections break down strategies in the categories of policy analysis, scientific research, and pilot projects.

Strategies:

- Regulatory, Legislative, and Compliance Analysis

2.1 Comprehensive independent review and analysis of the USEPA’s LCR revision proposal (expected 2018), including all support documents (e.g., the economic analysis). This analysis should be completed by non-water industry science and policy experts to identify and draw attention to requirements that may weaken public health protection and identify proposed changes that will improve public health protection and ease of implementation. The water industry will likely advocate for requirements that will

minimize the burden on PWSs and place responsibility for LSLR onto private citizens; environmental and public health advocates must provide a rigorous and scientifically sound analysis to refute any requirements that might endanger public health.

- 2.2 Draft effective LCR requirements to be adopted and implemented at the state level. Smart and effective state rules may persuade the federal rule to follow state leadership. There is still time to implement this strategy, even after the initial EPA LCR proposal.
 - Michigan is expected to propose a [revised LCR](#) in January of 2018.
 - 2.3 Using current compliance data, analyze the correlation of water quality parameters (WQPs), WQP violations, lead 90th percentiles, and lead action level exceedances. WQP monitoring under the LCR is supposed to be an indicator that predicts lead release. WQP violations are supposed to be an early warning of a pending lead crisis. The NDWAC proposes dropping lead sampling and increasing reliance on WQPs. There must be rigorous data to support that WQP monitoring will be equally protective of public health.
 - 2.4 Compile and analyze the range of lead detected via LCR sampling in different states to better illustrate the potential exposure to lead via drinking water. Analyze and map lead 90th percentiles across the state, comparing between systems that do and “do not” have LSLs and those that do and do not have “optimized” corrosion control. Document changes in lead levels after sampling procedures were updated in 2016 to determine if changes were more effective at identifying lead in drinking water.
 - 2.5 Evaluate LCR oversight and PWS support from state primacy agencies; relate quality of oversight to utility compliance data and occurrence of violations.
 - 2.6 Evaluate implementation of the LCR by PWSs and States. Quantify the occurrence of the compliance and sampling issues that occurred in Flint and DC across the region and quantify the limitations they present for identifying the risk of lead in drinking water. This should include a compilation of sampling protocols currently in place, actual documentation of LSLs, and spot checking lead concentrations using lead profiling sampling protocols. Document where accepted interpretations of the LCR continue to result in elevated lead exposure.
 - 2.7 Assess the adequacy of state budgets to provide appropriate oversight of drinking water programs and compare state budgets with water oversight outcomes. For example, “Michigan’s drinking water program might have one of the lowest levels of financial support within EPA Region V while having one of the largest, if not the largest, number of community water systems to regulate.” ([Flint Water Advisory Task Force Report](#), page 11).
 - 2.8 Quantify the budget needed at the state level for comprehensive oversight of the Public Water System Supervision (PWSS) Program compared to current funding levels. Advocate for fully funding state programs that oversee drinking water quality.
 - 2.9 Develop tools to improve and facilitate EPA and state oversight and enforcement of LCR.
- Scientific Research, data collection and analysis to better characterize the occurrence of lead and effectiveness of LCR requirements
 - 2.10 Implement a sampling program in a city with many LSLs but no documented lead problems that is equivalent in scope to sampling implemented in Flint. Flint has been described as the most thoroughly sampled water system, perhaps in the entire world. The problem is that there is no control data for comparison with a system with none of the challenges faced in Flint. For all the water quality problems that have been revealed in Flint, it is possible that if

a well-functioning system was sampled to the same extent, the same problems would be identified.

- 2.11 Develop non-invasive LSL detection methodology to be the primary means of LSL identification to avoid expensive excavation and lead release and exposure associated with disturbance. Pilot the most promising strategies at PWSs with ongoing LSLR projects.
 - The WRF has an ongoing project identifying [Service Line Material Identification Techniques](#). Techniques under investigation include new applications of minefield detection instruments and electric currents.
 - [A rapid method for LSL detection](#).
 - 2.12 Research to supplement the [EPA Transdisciplinary Research into Detecting and Controlling Lead in Drinking Water Request for Proposals \(RFP\)](#). In this RFP, the USEPA sought proposals to (1) identify communities that are at a high risk of experiencing the adverse health effects of lead in drinking water; (2) identify opportunities to mitigate these risks; and (3) conduct educational and outreach efforts so that water system managers and the general public are aware of these risks and opportunities. The data collected through this RFP will be important to inform an improved LCR. Once the grants are awarded and the project strategies are identified, there may be opportunities to fill in research needs that are not emphasized by the winning project teams.
 - 2.13 Develop innovative sampling technologies for real time drinking water data at the tap. Such technology would improve the role of citizen science in decision making, and could also be used to determine whether any individual glass of water is safe to drink, reducing filter waste and improving water efficiency. Real-time lead data would be a complete game changer for LCR compliance and improving public health protection.
 - University of Michigan team [developing lead sensor](#).
 - University of Wisconsin [research team](#).
 - 2.14 Assess corrosion mechanisms of lead solder and brass fixtures. Much of the literature and corrosion control strategies focus on LSLs, but the corrosion mechanism for lead solder and lead containing fixtures might be different than for LSLs. Old lead solder, and lead containing fittings and fixtures will remain in homes and businesses long after all the LSLs are removed.
- Pilot studies and water system interventions to demonstrate feasibility of lead reduction strategies that could become part of a revised LCR
 - 2.15 Prepare information for water utilities to develop a filter distribution program for addressing lead exposure during short term construction or until LSLs can be replaced. This would assist water utilities in selecting appropriate products that meet utility needs, streamline the purchase process, and identify potential funding strategies to cover the cost. Information should include considerations for implementing a filter distribution program and resources for purchasing filters.**
 - 2.16 Prepare case studies describing effective filter funding and distribution strategies.
 - 2.17 Conduct research to study customer habits around adoption of PWS provided filters and identify strategies to encourage their use, especially during short term disturbances.
 - 2.18 Provide corrosion control training and mentorship programs across utilities with common source water to minimize lead release as much as possible. Corrosion control treatment is complicated and unique for each combination of source water quality and distribution

system materials. Most water utilities use sufficient treatment to comply with the LCR, but there may be opportunities to further reduce lead corrosion through treatment. This strategy can be used to identify barriers to optimal corrosion control and propose solutions.

- *Wyoming, MI* has conducted sampling beyond LCR requirements to explore lead levels in the system; may be considering whether additional corrosion control is necessary.
 - *Genoa Township, MI* added enhanced corrosion control due to new lead detected during their most recent round of LCR compliance sampling.
- 2.19 Provide technical assistance or comprehensive corrosion control evaluations for water utilities changing source water or treatment (e.g., Waukesha, WI) to demonstrate the appropriate scope of these studies and their ability to prevent a lead crisis.
- 2.20 Pilot for water utilities operating as part of a combined distribution system¹ to evaluate corrosion control and LCR data to determine corrosion control effectiveness and risk of lead release for the entire service area rather than compliance system by system.
- 2.21 Practical research on the effectiveness of daily flushing for exposure reduction. The USEPA LCR public education materials focus on the use of flushing to reduce potential lead exposure. However, there is still limited information for when flushing can accidentally increase lead exposure, and how to use flushing as a foolproof protection measure. It would be best if a wide range of PWSs would sample to evaluate the effectiveness of the flushing procedures they recommend.
- The WRF has two ongoing projects researching flushing techniques, [Evaluation of Flushing to Reduce Lead Levels](#), and [Flushing Guidance for Consumer Premise Plumbing and Service Lines to Avoid or Address a Drinking Water Advisory](#).
 - Dearborn, MI has independently designed their own flushing and sampling program with the primary goal of preventing customers from exposure to lead in drinking water during PLSLR.
- 2.22 Provide a water quality advisor on staff at City of Flint to properly navigate the fallout of the Flint Water Crisis.

Organizations:

- The Regulatory, Legislative, and Compliance Analysis section above identifies time-critical policy analyses that are necessary to create and support an improved LCR. While the WRF, university research groups, and individual water systems are making contributions to the science, the author is not aware of any organizations with sustained policy analysis funding for rigorous scientific, economic, and implementation analysis of the current and revised LCR.
- Earthjustice has completed [legal and policy analysis](#) regarding the LCR and the NDWAC Recommendations.

¹ A combined distribution system is where one or more public water systems purchase and distribute treated water from a wholesale water system. The retail systems are individually responsible for compliance with the LCR even though the wholesale water system typically provides corrosion control at the treatment plant for the entire combined distribution system. The Great Lakes Water Authority and its entire service area is an example of a combined distribution system.

- The Water Quality Subcommittee of the Flint Water Interagency Coordinating Committee (FWICC) may be planning a review of the USEPA's LCR proposal when it comes out ([see page 4](#)).
- The [US Water Alliance](#) is working on a policy document to identify priority policy improvements for addressing lead in drinking water, but this does not include a policy analysis.

Cautions:

The NDWAC recommendations provide great soundbites for improving the LCR, but their effectiveness depends on how EPA chooses to write these recommendations into regulation. When the USEPA proposes the new LCR it will be important to closely scrutinize the assumptions that have been made and the data available to support revised requirements. For an example of this ongoing policy discussion, see LaFrance (2017) and Levin et al. (2017).

References and Resources:

- LaFrance, David. "The Path From Flint." Journal AWWA. May 2017, 109:5.
- Levin, Ronnie, Edwards, Marc, and Schwartz, Joel. "A Different View of "The Path From Flint."" The Environmental Forum. May/June 2017. (I can provide a copy)
- The NDWAC recommendations, Lead and Copper Rule Working Group Report, and Statement of Dissent can all be found [here](#).
- Elin Betanzo at the Northeast-Midwest Institute prepared a [summary of clarifications](#) that would be needed for the NDWAC recommendations to provide improved public health protection as part of a revised LCR.
- The USEPA published a [white paper](#) in October 2016 outlining requirements they are considering for the revised LCR.
- Elin Betanzo at the Northeast-Midwest Institute wrote a [response](#) to the USEPA white paper.
- The Pew Charitable Trusts recently released [10 Policies to Prevent and Respond to Childhood Lead Exposure](#) that outline opportunities to reduce lead exposure for children. Drinking water recommendations headline the report. This report is notable because the authors clearly state that there is no recent epidemiological data that indicate any source of lead is more important than others. In contrast, health officials had been insisting for years that lead poisoning is a paint and soil issue, not a water issue.
- The [Flint Water Interagency Coordinating Committee](#) has prepared several reports that touch on LCR requirements, improvements needed, and implementation issues.
- The Flint Water Advisory Task Force prepared a [summary report](#) of the Flint Water Crisis and provided recommendations to address the many failures that resulted in the Flint Water Crisis.
- NRDC Report "[What's in Your Water? Flint and Beyond.](#)"
- Association of State Drinking Water Administrators Report, "[Insufficient Resources for State Drinking Water Programs Threaten Public Health.](#)"
- USEPA Region 5 published a [review of the Michigan Department of Environmental Quality's Drinking Water Program](#) that illustrates underfunding of the program and issues with LCR compliance oversight at the state level.

3. Improve Public Education About Lead in Drinking Water

The LCR is frequently characterized as a “shared responsibility” rule because PWSs control the corrosivity of water, but sources of lead in drinking water are found in service lines and in private homes. This shared responsibility depends on adequate public education about lead in drinking water and notifying residents whether they have a LSL. Public education has always been a critical part of the LCR, but opportunities for improvement are still there. The short-term revisions to the LCR in 2007 included many improvements in public education, including mandatory notification of lead results to sampled homes, but months can pass between the time a sample is collected and the time the sample results are delivered. As a reaction to the Flint Water Crisis, the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016 requires that when EPA becomes aware of lead data from individual homes developed by EPA or a third party that exceeds the lead action level, the water system, the state primacy program, or the EPA must notify the sampled home within 2-5 days. The USEPA recently released its [strategic plan](#) for complying with this new requirement. Michigan has a new [requirement](#) to issue a public advisory to its consumers within 3 days of the PWS learning of an action level exceedance at the PWS level. Ohio has taken the lead on new requirements to improve public notice and education. Ohio requires laboratories to complete lead sample analysis within 30 days, notify the water system by close of business the day after analysis is complete, and water systems must notify the consumer within 2 days of receiving the data.

Several strategies for improved public education were identified in the NDWAC recommendations and the dissent. For example:

- PWSs should notify all homes served by LSLs and inform residents how to protect themselves from lead in drinking water.
- Residents should receive clear information on the health risks of lead in drinking water, rather than distracting assurances that the water meets the requirements of the Safe Drinking Water Act.
- Residents with LSLs should be made aware of increased risk of lead release during construction and plumbing activities.
- All LCR compliance data and information should be made publicly available on the PWS website.

Even if all these recommendations are adopted, there are many opportunities to improve the effectiveness and delivery of communication and education materials. In addition to addressing the mandatory language of lead public education materials, the tone of materials offered by PWS and AWWA often lacks clarity and empathy for the customer. Materials frequently assert that drinking water is not a substantial source of lead exposure and that families should investigate other sources of lead in their homes before worrying about the drinking water. However, in contrast to lead paint and contaminated soil, drinking water is intended for human consumption, is necessary for survival, and we need to consume it for our entire lives.

Strategies:

- 3.1 Convene a focus group to test effectiveness of lead in drinking water communications; identify materials and delivery methods that more clearly convey the risk and steps**

customers should take to protect themselves. Test to ensure the materials are understood.

- 3.2 Convene a focus group to identify and meet the special needs of communities with low literacy rates and low access to traditional media that relies on innovative use of technology and social media.**
- 3.3 Develop and provide tested and effective “off the shelf” communications plans and education materials that PWSs can distribute during routine operations, maintenance, repair, LSL replacements, and water main replacements to protect customers from lead in drinking water.
- 3.4 Consider policies for service line disclosure to become a requirement with all real estate transactions, allowing purchasers to know whether the home is served by a LSL and allow replacement financing as part of a new mortgage.
- 3.5 Consider policies that would require replacement of LSLs as a condition for rental properties and require “lead-free” certificates for rental properties to ensure that there is no LSL serving the property.
- 3.6 Educate the public health community about the risk of exposure to lead through drinking water, and enlist them as spokespeople as part of community outreach.
- 3.7 Support citizen science and advocacy by supporting websites where residents can post their own lead data from certified labs to avoid reliance on PWSs that do not release data.

Organizations:

- [We the People of Detroit](#) and the [People’s Water Board](#) in Detroit have been working to improve citizen science and neighborhood communications regarding drinking water quality.
- The [Campaign for Lead Free Water](#) is a startup working to educate the public about lead in drinking water and provide grassroots support for an improved LCR.
- The [Great Lakes Water Authority](#) has prepared comprehensive but text-heavy materials on lead in drinking water.
- *Green Bay Water Utility, WI* has been working with a customer relations company to educate and inform their customers.
- Environmental Defense Fund reviewed [housing disclosure policies](#) for LSLs in March 2017.
- [Greater Cincinnati Water Works](#) published a searchable map showing locations of LSLs and offers free lead test kits to customers.

Cautions:

- PWSs have a long history of downplaying the risks of lead in drinking water, and required public education text from USEPA perpetuates weak outreach materials that maintain that PWSs are not responsible for lead in drinking water. Outreach materials frequently insist that a lead problem is limited to a single home even when data are not available to support this assertion.
- Some standard statements in USEPA materials can actually cause increased lead exposure. The standard CCR language encourages residents to flush for 30-45 seconds before drinking water. If a home with an LSL uses this flushing strategy, they may end up drinking water that has been in contact with the LSL for an extended period and drink more lead than if they drank the first liter out of the tap.

- Policies requiring LSL disclosure could have disproportionate impacts on low-income people, making their properties unsellable or unrentable. The impacts and benefits of these types of policies should be fully explored before adoption and implementation.

References and Resources:

- The Horsley Witten Group has prepared lead in drinking water information fact sheets via the W.K. Kellogg Foundation for the [National Drinking Water Alliance](#). These materials are essentially a repackaging of USEPA materials.
- The American Water Works Association (AWWA) has prepared a [variety of materials](#) for outreach and public education.
- The [Lead Service Line Replacement Collaborative](#) compiled a wide variety of outreach materials.

4. Maximize Impact of the Reducing Lead in Drinking Water Act

The USEPA proposed the *Use of Lead Free Pipes, Fittings, Fixtures, Solder and Flux for Drinking Water* rule in January of 2017. This regulation is intended to codify and clarify requirements under the Reduction of Lead in Drinking Water Act of 2011 (RLDWA) and the Community Fire Safety Act of 2013 (CFSA). The RLDWA revised the definition of lead free by lowering the maximum lead content of the wetted surfaces of plumbing products (such as pipes, pipe fittings, plumbing fittings and fixtures) from 8% to a weighted average of 0.25%, and created exemptions such that pipes, fittings, and fixtures not anticipated for use in potable water systems are not required to be “lead free.” This means that most products labeled “lead free” are not actually lead free. Further, plumbing components containing any quantity of lead that are not intended for potable water systems can be sold on the same shelves as those materials that are “lead free” even when they have the same look and function as those components that meet the definition of “lead free.” This proposed rule attempts to establish labeling and certification requirements for plumbing products that are “lead free,” which are critical for consumers to be able to properly identify plumbing products for drinking water applications.

This rule is an essential companion to the LCR, which depends on corrosion control to reduce exposure to lead in drinking water. While corrosion control is effective for reducing lead exposure at the tap, it is not foolproof for preventing lead exposure because any time lead is in contact with drinking water there is a risk of exposure. Even when corrosion control is being used, if lead is present in household plumbing, different water use and water quality conditions can lead to lead release within homes. Lead free plumbing is the foundation of public health protection from lead in drinking water. An effective system for defining and labeling lead-free plumbing is critical for creating a baseline of preventative public health protection as residents replace their household water infrastructure over time.

This rule could establish weak labeling requirements that make it difficult for consumers to select appropriate lead-free products for their home plumbing needs. This would continue to create long-term problems that fall under the LCR, add costs to PWSs that must maintain compliance with the LCR, and continue to expose innocent residents to unnecessary lead in their drinking water whether served by PWSs or private wells. When operating under its typical timelines, given the January 2017 proposal, USEPA would be expected to publish the final rule in 2018 or 2019.

Even though plumbing manufacturers have been required to comply with the RLDWA since 2014, little is known about overall compliance with the RLDWA, state primacy agencies' actions to enforce the RLDWA implementation, the risk of exposure to the lead still allowed in lead-free products, or whether consumers are adequately informed about the risk of installing leaded products in their potable water systems.

Strategies:

- 4.1 Research to quantify the resources and actions the state primacy agencies are putting into enforcing and overseeing implementation of RLDWA. For example, are stores selling only properly labeled materials? Is pre-2014 inventory still for sale on the shelves? Is it easy for customers to identify materials intended for potable use and clearly distinguish them from

- leaded materials for non-potable applications? Are internet retailers providing adequate information on lead-containing and lead-free materials?
- 4.2 Focus groups to test the effectiveness of “lead-free” labeling of potable water pipes, fittings, and fixtures and customer awareness. Are leaded plumbing materials sufficiently identified to prevent customers from purchasing them? This effort would target plumbers, homeowners, and landlords that purchase and repair plumbing materials in private homes.
 - 4.3 Develop education programs to educate citizens about lead in plumbing to prevent homeowners from unintentionally installing plumbing that contains lead.
 - 4.4 Research to quantify actual lead release from plumbing pipes, fittings, and fixtures that meet the definition of lead free which can include up to 0.2% lead on the wetted surface.
 - 4.5 Investigate and identify companies that manufacture potable water materials that are actually lead free and verify through third party testing. Work to drive the market toward completely lead-free plumbing.

Organizations:

- [NSF](#) has a drinking water advisory task group that defines the third-party standard for compliance with the RLDWA.
- [Plumbing Manufacturers International](#) has been an active voice for industry during this process.
- [Earthjustice](#) submitted comments on the proposed rule.

Cautions:

- State primacy agencies are struggling with their basic roles in the Public Water System Supervision (PWSS) program. It is unlikely that any substantial funding has been allocated toward RLDWA implementation. State programs cannot afford to have their existing funds diverted to put more effort into this area.

References and Resources:

- This [USEPA website](#) includes the proposed rule and supporting documents.
- This [EPA brochure](#) illustrates the complexity of the current approach to labeling lead-free products.
- Michigan Radio ran [this story](#) in May 2017 to illustrate the issues surrounding “lead-free” plumbing
- Elin Betanzo prepared [comments](#) for the Northeast-Midwest Institute on the proposed rule.

5. Address Lead in Schools

The LCR includes mandatory lead and copper sampling requirements for schools, child care centers, or senior facilities that have their own water source (e.g., well). These schools are classified as Non-Transient Non-Community Water Systems (NTNCWS). The LCR allows NTNCWS to sample for lead as infrequently as every 9 years if they meet certain criteria. In many states, including Michigan, NTNCWS have oversight from the county health department rather than the state drinking water program. This means that the quality of guidance and technical assistance can vary significantly.

There are no federal lead and copper sampling requirements for schools, child care centers, or senior facilities that get their water from a community water system. Some states have recently issued new requirements for school sampling (e.g., Illinois, New York). The 1988 Lead Contamination Control Act recalled the use of drinking water coolers with lead-lined tanks, prohibited the sale of drinking water coolers that were not “lead-free” per the 1986 definition, and required development of sampling guidance for schools. The USEPA has provided sampling guidance in the form of the “3Ts for Reducing Lead in Drinking Water in Schools.”

Schools have been making strides in sampling programs but are still challenged in eliminating lead for good because they have long plumbing systems that hold large volumes of water. Extended periods without water use, like weekends or school breaks, can make corrosion control ineffective and allow fixtures with low lead content to leach into the drinking water. Sampling can be useful for identifying high-risk taps, but can continue schools down an endless path of continuous resampling without truly reducing the risk of lead exposure. Schools need to implement fool-proof methods for removing lead. Unfortunately, the RLDWA continues to allow lead in pipes, fittings, and fixtures; coupled with long stagnation times in schools, lead may continue to be released to drinking water even with products that meet the 2014 requirements.

The USEPA guidance encourages schools to sample every drinking water tap a single time. Single tap samples cannot clear a tap as a potential source of lead because lead release is sporadic. Consequently, a single low sample taken as a follow up to a high sample cannot clear that drinking tap as safe to drink, although this is how many schools have interpreted sampling data. This puts them on a whirlwind cycle of sampling and remediation with large expenses but unclear risk reduction. There is a huge opportunity to develop better risk assessment and remediation strategies for schools and compile the mix of stories of schools that have succeeded at lead abatement and those schools that continue to struggle despite their best efforts.

The recent attention on school water quality has focused on eliminating lead, but there are multiple water quality risks associated with long stagnation times in schools. To ensure that children have safe drinking water in schools that receive water from community water systems, any onsite work to address lead should also consider risks from copper (especially in newer facilities), disinfection byproducts, and microbial contaminants.

Strategies:

- 5.1 Compile case studies of effective elimination of lead in drinking water at schools that address common but misguided assumptions about lead in schools. Include lessons**

learned from failed attempts to remove lead from school drinking water to avoid cosmetic strategies that do not result in real risk reduction.

- 5.2 **Develop a website template for sharing statewide school lead testing data in a format that is transparent and accessible for parents and community leaders to evaluate data. Data should be accessible for evaluating within buildings, within school districts, and statewide to identify the greatest risk of lead exposure in schools.**
- 5.3 Develop new sampling methodology to stop the use of single samples to declare taps safe/not safe, potentially using automated sampling devices. This could be coupled with exposure assessment research to identify how and when students consume water in schools.
- 5.4 Develop strategies for maintaining water quality in schools and other complex plumbing facilities including use of consumption patterns, maximizing water flow, automated flushing, and Point of Use (POU) filtration devices. Ensure that strategies to address lead also properly consider microbial quality in schools.
- 5.5 Explore the use of POU filtration devices for designated drinking water taps to provide safe drinking water in schools until plumbing remediation can occur at the same time as planned large scale renovations to minimize cost.
- 5.6 Develop testing protocols that schools can use to verify new plumbing materials will not leach lead when bulk purchasing new plumbing pipes, fittings and fixtures.

Organizations:

- [Seattle Public Schools](#) adopted a school drinking water policy in 2004 and publishes annual reports of its data.
- NSF International is developing [NSF Standard 444](#) for Building Water Health that will include consideration of onsite lead hazards and microbial water quality in large buildings including schools. NSF is currently working with a committee on this process. NSF International has prepared information regarding [Lead-Free Products](#) for schools, but “lead free” products, by definition, can still contain lead as discussed in the previous section.
- MDEQ has made \$4 million available for [school lead testing](#), but less than 4% of those funds have been used.
- Illinois has new requirements for lead sampling in schools. Illinois may have a large data set available to further explore the strategies presented here. Ohio may be considering new school sampling requirements.
- Yanna Lambrinidou of Parents for Non-Toxic Alternatives and the Campaign for Lead Free Water has been active in studying lead in schools.

Cautions:

- Some schools have been on a treadmill of paying for extensive remediation only to go back and continue finding high lead in drinking water. Seattle, Philadelphia, Baltimore, and Washington, DC schools have had a complicated past with trying to remediate. Case studies must be carefully evaluated to determine whether ongoing sampling continues to verify “remediated” schools are lead free.
- Low-income school districts can suffer a disproportionate burden from remediation costs. These school districts tend to have older buildings with higher lead content in their potable water systems. New requirements for monitoring and remediation might require these schools to

divert funding from other necessary expenses such as teachers, supplies, and student services. Near-term interventions such as POU filters can be more cost-effective for providing safe water than extensive sampling programs.

- Some Detroit, MI schools have decided to implement onsite corrosion control systems. This is a concerning path for a troubled school district with a long record of poor building maintenance.
- Washington, DC has implemented a [testing program](#) where any tap measuring over their actionable level for lead will get a filter installed. However, taps with one lead-free sample will not be retested. Final provisions of the DC program are not consistent with previous public commitments and has raised concerns from [some stakeholders](#).
- Many guidance manuals for schools rely on temporary fixes such as disconnection, manual flushing, and bottled water. These are not sustainable solutions for schools.

References and Resources:

- [MDEQ School sampling guidance](#)
- USEPA's [3Ts for Reducing Lead in Drinking Water in Schools](#)
- Lambrinidou et al., 2010. "Failing Our Children: Lead in U.S. School Drinking Water" Volume 20, Issue 1, pages 25-47. <https://doi.org/10.2190/NS.022010eov>.
- Triantafyllidou, S., and Edwards, M. 2009. [Lead \(Pb\) in U.S. Drinking water: School Case Studies, Detection Challenges and Public Health Considerations](#).
- The Horsley Witten Group, Inc. prepared "[Managing Lead in Drinking Water at Schools and Early Childhood Education Facilities](#)." This report provides suggestions and some case studies for initiating school sampling programs but does not follow those case studies through to successful remediation of lead risks.

6. Engage Communities to Prevent or Address Future Crises

The Flint Water Crisis has resulted in a greater awareness of the safety of drinking water supplies in the United States. There is a new realization of the importance of community groups being involved in decision making for their local water utilities. This comes after a long period of acceptance that the Safe Drinking Water Act was sufficient for assuring safe water supplies and that the USEPA and state primacy agencies are providing adequate implementation and oversight. There is a need to help educate communities about drinking water in general, and lead in particular, so these groups can advocate for the safety of their drinking water. The following strategies describe approaches that can boost community engagement in drinking water decisions, both to prevent the next water crisis, and, if necessary, to identify and resolve a water crisis quickly and effectively.

Strategies:

- 6.1 Provide small training grants to non-profits, community groups, and the public health community to attend conferences and trainings hosted by the American Water Works Association at the national and state levels. These organizations are not currently represented at drinking water industry events, but they should have the opportunity to learn from technical presentations and hear the regulatory discussions that go on between PWSs and state primacy agencies. Further, the drinking water industry would also benefit from hearing perspectives from different stakeholders.**
- 6.2 Work with a public relations firm to develop templates and recommendations for consumer confidence reports (CCR) that meet all SDWA requirements but actually provide useful information to residents about the quality of their drinking water in a format that is easy for the average customer to understand. This is a critical starting point for initiating real community involvement in local provision of safe drinking water.**
 - The Great Lakes Water Authority (GLWA) is a retail-only system and does not provide water directly to individuals. In this capacity, it is not required to produce a CCR but it does provide most of the required data to its retail customers. It does have a communications team dedicated to helping the communities that buy water from the GLWA provide high quality information to their customers. This may put the GLWA in a unique position to assist with improved CCRs for a large number of PWSs that cover a wide range of low-income to high-income communities.
- 6.3 Develop a community toolkit for positive engagement with PWSs. Develop strategies for average citizens to directly engage with their water system and get transparent access to data in a way that generates positive change. This may include a continuum of escalation options that begins with mutual collaboration between the PWS and community groups and ranges up to aggressive media campaigns to address non-responsiveness.
 - Here is [story](#) about how a social media firestorm ultimately generated a PWS response to concerns expressed in the community.
- 6.4 Compile important questions citizens should ask to start conversations with water utilities.
- 6.5 Provide facilitation services to pilot and convene a citizen advisory commission on drinking water quality. Citizen advisory commissions are under consideration as part of a revised LCR in Michigan.

- 6.6 Prepare a water quality information resource for homeowners with unregulated private wells.
- 6.7 Develop a template for water crisis response procedures for drinking water emergencies, when PWSs need to distribute safe water with short notice (e.g., Flint, Toledo, West Virginia, Houston). Water systems are required to have vulnerability assessments and emergency response plans and update them every five years, but these focus on keeping the system operating during natural disasters and preventing terrorist attacks. PWSs should have a plan for providing safe water if something affects the quality of water distributed by the PWS. Such a plan should specifically identify strategies for providing water to at-risk populations including children, WIC recipients, low-income, undocumented immigrants, and populations disconnected from traditional media.

Organizations:

- The [Michigan Environmental Council](#) developed a [Drinking Water Toolkit](#) to help residents understand drinking water in Michigan and the types of questions people should ask to understand water safety in their home and community.
- The Great Lakes Environmental Law Center and [American Rivers](#) are collaborating on a Drinking Water Scorecard to compare drinking water regulatory and legislative protections across great lakes states. This tool will help citizens understand the rules that govern their water quality within their state and how it compares to neighboring states.
- The [River Network](#) is developing a [Drinking Water Toolkit](#).
- The [Milwaukee Water Commons](#) is working to educate decision makers and community members on water and drinking water issues to build a water centric community.

Cautions:

- There is a lot of new energy in this area. It should be used wisely.
- States and EPA have a lot of information that is ripe for repackaging to make it accessible to the average citizen, but new information must be developed to advance progress toward safe and reliable drinking water for all types of communities.

References and Resources:

- WRF prepared the report, [Social Media for Water Utilities](#).

7. Evaluate and Test Innovative Approaches to Safe Drinking Water

A long-term lack of investment in drinking water infrastructure has brought many leaders in the drinking water field to consider whether wholesale changes are needed in the way we consider and provide safe drinking water in the United States as we work on infrastructure renewal. Many of these initiatives focus renewed interest on fundamental good management approaches, such as asset management, “right-sizing,” integrated water management, and collaboration. Right-sizing is the current buzzword for addressing older cities suffering from population loss and oversized water systems that do not have the population base for both water use and rate-paying to maintain the existing infrastructure. There are other more innovative approaches that might combine on-site water reuse with POU treatment that can address multiple water resource management issues at one time. Current regulations may impose barriers for testing some of the decentralized innovative strategies.

Strategies:

- 7.1 Develop a framework for evaluating the relative risk of regulated and unregulated contaminants in drinking water to identify priority infrastructure upgrades. For example, LSL removal should be a high priority for PWSs, but funding for LSLR could compete with more urgent health risks depending on source water quality and other infrastructure challenges. An assessment methodology is needed to balance infrastructure investments in light of site specific drinking water risks. In emergency scenarios, such a framework could be used to prioritize emergency response to immediate health risks.
- 7.2 Build upon ongoing asset management planning, particularly in Michigan and Ohio, to implement pilot studies for improved collaboration and consolidation that could result in right-sizing of PWSs.
 - Out of all fifty states, Michigan and Wisconsin have the largest number of PWSs, with over 10,000 in each state.
 - All Michigan community water systems serving over 1,000 people must have an asset management plan as of January 1, 2018.
- 7.3 Provide technical assistance funding for water systems serving fewer than 1,000 to facilitate their participation in asset management and improved planning strategies.
- 7.4 Compile case studies about how collaborating communities are effectively pooling resources and operating more efficiently.
 - The Oakland County Michigan Water Resources Commissioner is working on a single asset management plan that covers 28 communities.
 - Grand Haven, MI has had a cooperative arrangement with several western Michigan municipalities since the 1980's.
 - The Great Lakes Water Authority has several subject area workgroups that meet regularly that organize and discuss issues common to all of the PWSs that purchase water from GLWA, including lead in drinking water.
 - Michigan has initiated [two pilots](#) for regional cross-sector infrastructure assessments in southeast and western Michigan.

- 7.5 Research cost and implementation of POU treatment to meet water quality requirements under SDWA, rather than centralized treatment. This could provide an alternative system for addressing distribution system contaminants, and pave the way for onsite reuse.
- 7.6 Explore opportunities to directly incorporate drinking water infrastructure and management into integrated water management programs that tend to focus on waste water and storm water.

Organizations:

- Michigan recently convened a 21st Century Infrastructure Commission that produced a set of [recommendations](#) for a comprehensive look at infrastructure renewal in Michigan.
- The University of Michigan Water Center is exploring community and technical issues around [right-sizing water infrastructure](#).
- The US Water Alliance has made their [One Water](#) initiative a primary focus of their organization.
- The Great Lakes Commission recently released a "[Joint Action Plan for Clean Water Infrastructure and Services in the Great Lakes Region](#)."
- Manitowoc Public Utilities in Wisconsin offers technical and financial services to neighboring public utilities.

References and Resources:

- The USEPA published a [Drinking Water Action Plan](#) in December 2016.
- The President's Council of Advisors on Science and Technology released the report, [Science and Technology to Ensure the Safety of the Nation's Drinking Water](#) in December 2016.

8. Address Drinking Water Affordability

Drinking water affordability is a significant barrier to the provision of safe drinking water to all communities in the United States. Shutoffs in Detroit and Flint due to inability to pay have garnered international attention. Studies have shown this problem is just going to get worse given the poor state of current infrastructure and stagnant wages. Water systems need improved income to support infrastructure renewal, but water utilities are making decisions about rate increases and assistance programs independently, rather than making coordinated policy recommendations as an industry to state and federal decisionmakers. This is a major contrast to electrical and gas utilities, where companies are part of a well-oiled machine that lobbies on behalf of the industry to get low income home energy assistance program (LIHEAP) funding every year. Right now, the quest for affordability is originating from community groups, but water systems could be engaged in developing new funding and safety-net strategies for infrastructure renewal programs as an industry while simultaneously developing sustainable affordability programs.

Stemming from a history of neglect and violations, low income communities tend to have a distrust for water utilities and are more likely to rely on bottled water. When residents feel no trust or ownership in their PWS, it further complicates the relationship between affordability, willingness to pay, and confidence that an essential service is being provided. If customers do not trust the safety of their drinking water, affordability programs may not change their preference for alternative water sources. In contrast, reliable service frequently experienced in higher income communities can build ongoing support for the water utility, boosting willingness to pay for essential infrastructure upgrades. The lack of trust in low-income communities compounds affordability issues as people spend limited income on bottled water, lack a trusted relationship with their water utility, and have less money available to pay their water bills. The following short list of strategies is just a brief entry into the world of affordability.

Strategies:

- 8.1 Educate PWSs about government safety nets for other essential services to provide examples of what is possible and develop support for new strategies.**
- 8.2 Assist the water industry to organize a “Coalition to Keep the Water On” following the model of energy utilities such as the Coalition to Keep Michigan Warm. Use this coalition to advocate for better rate structure options and assistance programs.**
- 8.3 Pilot the use of a water access coordinator at a water utility that serves a population that utilizes assistance programs to coordinate services, streamline services across multiple utility safety nets, raise internal profile of customer challenges, and provide improved and dedicated outreach for assistance programs.
- 8.4 Explore water use habits of low-income communities using municipal and bottled water, identify their drinking water concerns, and work to build their trust in PWSs.
- 8.5 Pilot drinking water outreach and education programs in low-income communities to build confidence in their PWS. Encourage the community to be an active participant in water decision making.

- 8.6 Improve state primacy oversight of PWSs in low-income communities where there is a crisis of confidence.
- 8.7 Explore the use of public service commissions to set rates for PWSs in states that do not have them, such as Michigan. Compare water rates in states with public service commissions, such as Wisconsin, to rates in states without public service commissions.

Organizations:

- [We the People of Detroit](#) and [People's Water Board](#) have been working to stop water shut-offs in Detroit, implement affordability programs, and pass related legislation.
- Patrick Gubry at [EcoWorks](#) gave a presentation at the Michigan AWWA conference comparing and contrasting the energy and water sectors for their approaches to meeting the needs of low-income communities.

References and Resources:

- The US Water Alliance published their [Equitable Water Future Briefing Paper](#) in June 2017, and it will be releasing "An Equitable Water Future: Opportunities for the Great Lakes Region" in March 2018.
- The Environmental Finance Center at the University of North Carolina has extensive data and information about water affordability, including a [tool](#) to help utilities assess the affordability of water and wastewater services.
- Researchers at Michigan State University investigated water affordability nationwide in the article [Affordable Water in the US: A Burgeoning Crisis](#).
- The USEPA compiled case studies on customer assistance programs in their [Drinking Water and Wastewater Utility Customer Assistance Programs Report](#).

9. Conclusion

The Lead and Copper Rule has regulated lead in drinking water since 1991, yet there are still serious data gaps and shortcomings in the way we work to eliminate the risk of lead exposure in drinking water. As shown in these issue briefs there are many ways in which highly varied organizations can make progress in reducing the risk of exposure, including:

- Legal, scientific, and policy research
- Technical Assistance
- Advocacy
- Public Education, and
- Community Organizing.

Removing lead from drinking water will be a long-term effort that requires patience and persistence from many players, as well as political and public will to dedicate the resources and attention this issue deserves.