



ENVIRONMENTAL POLICY
INNOVATION
CENTER

TAP INTO INNOVATION TO REPLACE LEAD PIPES

Menu of Options: Data and
Technology To Replace Lead
Pipes Faster



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THE ROLE OF DATA AND TECHNOLOGY IN REPLACING LEAD PIPES FASTER

Replacing toxic lead pipes is a clear solution to the problem of lead in drinking water. Whether we replace the nation's lead pipes over the course of the next decade or the next century, however, depends on the strategies we embrace, including the use of data and technology.

Many municipalities, especially smaller to medium-sized ones, struggle to implement effective lead service line replacement programs. Still others have yet to begin, despite [federal regulations](#) requiring all water systems to complete the first step - an initial lead service line [inventory](#) - by October 2024.

At every step of the lead service line identification, planning, design, and replacement process, access to new data tools and technologies can make a difference - and ultimately may help water utilities replace their lead pipes faster, efficiently, and equitably. Technology can help water utilities modernize and streamline their records and data collection methods, estimate and locate lead lines, facilitate data/asset management, better connect utilities to their customers, improve public outreach and communications, and ensure greater attention to equity. The US EPA's [Guidance for Developing and Maintaining a Service Line](#) issued in August 2022 outlined several areas where technology can play a critical role in lead service line replacement, from the use of predictive modeling, ground penetrating radar, and visual inspection using closed-circuit television to the use of online lead service line maps, field applications, and online data sharing. There are perhaps an endless number of ways that tools and technologies can improve and speed up lead pipe replacement, if public water utilities have access to them.

The Environmental Policy Innovation Center (EPIC) launched the [2021 Water Data Prize](#) to spur innovation around tools, templates, and new technologies that can help municipalities replace lead pipes faster. The entries to the prize shed light on the many available tools and technologies available to help public water utilities - some are open source and others require a fee for service. In addition to these entries, there are many more companies who didn't apply - but who also offer data and technology that may also help municipalities with their lead service line replacement programs.

EPIC created this reference guide, *Menu of Options: Data and Technology to Replace Lead Pipes Faster*, to share some of the service providers we encountered, through our 2021 Water Data Prize and other interactions, who offer data tools and technologies to public water utilities. This is a guide, not an endorsement, of a variety of service providers related to lead service line replacement, which we organized in the following categories: Asset Management, Mapping and Public Dashboards, Field Tools, Predictive Modeling Tools, and Communications. While not an exhaustive list, the Menu of Options aims to connect more public water utilities to available service providers who offer data and technology solutions.

Replacing 100 percent of the nation's lead pipes over the next decade is going to require multi-layered, innovative, and collaborative strategies. The data and technology represented in this Menu of Options represents one of many of the strategies required to make that happen.

KEY COMPONENTS OF LEAD SERVICE LINE REPLACEMENT PROGRAMS

PART 01

Data/Asset Management

We use the terms "data management" or "asset management" to describe the databases and tracking systems that indicate the location of the drinking water service lines, type of material, and other key details that are necessary to remove toxic lead pipes. Some companies provide services to water utilities to make the management and maintenance of this data easier. Other companies may pair this with other tools that aid in mapping which can be kept internal, shared with the public, or help inform proposals and contracts. Throughout this guide, we will describe which component of asset management is provided.

PART 02

Mapping & Public Dashboards

Maps and public dashboards are integral components of an effective lead service line replacement program as they foster community engagement and allow for better visualization of the lead service line inventories as well as improving communications to the public. Service providers offer mapping services for utilities to display lead service line inventory data for both internal and external purposes. Public-facing maps can serve as a platform for residents to check the material of their service lines, learn more about lead risks in their community, and track the progress the utility is making in getting the lead out. Internal maps may have more detailed information that aid the utility in their replacements.

PART 03

Field Tools/Water Sampling

A best practice in managing data is to track it in one central place or database, including variables such as the service line material. This data has historically been captured through paper records and are now being transferred to a digital system. Now, there are tools that utilities can use to track the data digitally through handheld devices that allow for the databases to be updated in real time. This can be particularly helpful when the utility is in the field checking service lines.

PART 04

Predictive Tools

Many water utilities do not yet have full inventories of service line material, and therefore do not know the location and composition of service lines which makes it challenging to identify where the toxic lead pipes are. To speed up the inventory process and identify where utilities should check service line materials first, some companies offer tools that help predict the most likely areas where lead is found. Depending on the service provider, predictions can be made at a municipal-wide level or household level. If a water utility has no records, public data such as the age of the household and socioeconomic status can be strong predictors of the presence of lead pipes; the predictive data can then inform where a municipality prioritizes field visits to confirm the presence or absence of lead pipes. However, the existence of even partial lead inventories can help provide better predictions.

PART 05

Communications

Communicating effectively and proactively is a critical element of a lead service line replacement program. There are several service providers who offer communications support that include templates or custom materials for emails, text messages, door hangers for residents and assistance with press releases and website content. These services range in scale - they can complement existing communications within the water utility or provide full services for the utility.

120Water

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>120Water</u> is a comprehensive solution used by water professionals across the country to manage critical lead and drinking water programs. Comprised of secure cloud-based software, services, and point-of-use kits, 120Water's solution provides tailored workflows for complying with lead and water quality programs to protect public health. Working with hundreds of utilities across 38 states, 120Water customers have inventoried over 3 million service lines that impact more than 10 million individuals. Their team of water, policy, and technology experts have supported over 8,000 sampling events, partnering with water systems and government agencies such as Citizens Energy Group, the City of Providence, RI, the City of Asheville, NC, and Chicago Public Schools to protect public health and provide clean drinking water to all communities. *<u>120Water won the Inventory category for the 2021 Water Data Prize.</u></p>
✓	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

ESRI: ArcGIS Solutions

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>ESRI</u> provides a subscription-based service for water utilities and state regulators to manage geospatial data related to lead pipe inventories and replacements. Depending on the subscription, users can manage all data through online services that enable staff across the utility to simultaneously edit and update information from the field (using <u>Survey123</u>) or from the office - this enables up-to-date service line inventorying, the validation of service line materials from field staff, monitoring replacement and regulatory compliance. Additionally, ArcGIS <u>provides templates</u> for water utilities to easily import and visualize lead pipe data, as well as create public-facing versions of the data to easily communicate information around inventories and replacement to the public.</p>
✓	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

BlueConduit

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>BlueConduit</u> is a software company that provides subscription-based asset management, mapping, and predictive modeling to water utilities. BlueConduit's service line inventory management platform is an interactive dashboard where customers can access high-quality service line material predictions, and then easily update the inventory based on field surveys and as replacements commence. With the inventory data, utilities can then determine which information they would like to communicate to the public. BlueConduit provides easily-accessible map visualizations that can be viewed on the water utility website. The platform also prepares annual compliance reports for utilities.</p>
✓	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
	Communications	

CDM Smith

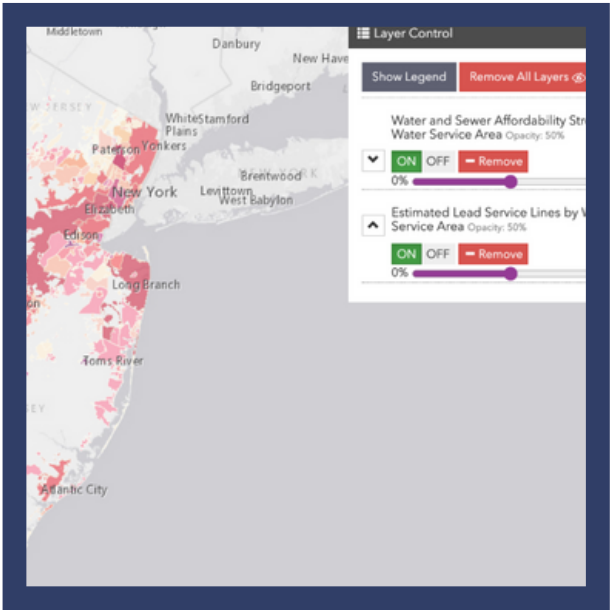
FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>CDM Smith</u> is a construction engineering company with teams that can provide asset management and mapping support, design, and implementation of water sampling plans, communications, and lead service line replacement. Through field work, they develop an inventory, and then CDM Smith centralizes the data in a cloud-based platform to easily share and keep updated, as well as publish a public-facing version with additional communications about what to do if you have a lead service line. Additionally, CDM Smith's communication materials are released in multiple languages to ensure accessibility of the information to all community members. CDM Smith also facilitates relationships between the municipal government and community partners to ensure LSLR moves forward at the speed of trust.</p> <p><u>*CDM Smith won the Overall Prize for the 2021 Water Data Prize for their work in Newark, New Jersey's successful lead service line replacement program.</u></p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>Center for Geospatial Solutions (CGS)</u>, a part of the nonprofit organization Lincoln Institute of Land Policy, works to ensure that organizations of all sizes have access to data and advanced technologies to improve decision-making for land and water conservation and climate action, with a focus on social equity. Through this work, CGS partners with nonprofits, local governments, and water and wastewater utilities to collate and prepare data on lead service lines into a map that can be used for prioritizing which pipes to replace and communicating progress with the public. They also can support the development and implementation of cloud-based field-based tools like Survey123 to develop and update inventories that automatically sync with other data and maps.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	



Q: What are ways to prioritize equity in lead service line replacement programs?

A: New Jersey Future and Jersey Water Works used mapping to highlight the convergence of affordability stress, lead levels in drinking water, and estimated lead service lines. This helps inform lead service line replacement programs by showing vulnerable and at risk households that can be prioritized.



CityWorks

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>CityWorks</u> is a consulting firm subsidiary of Trimble Company that builds GIS-centric tools and workflows for asset management, field tools for inventory development, permitting, and construction prioritization. Their products are developed from ESRI's ArcGIS platform and designed to guide municipalities and utilities through each step of the LSLR process, from surveying and inventorying to mapping and creating public-facing dashboards, and lastly to establishing transparent communications with the public.</p>
	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

Cloudpoint Geospatial

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>Cloudpoint Geospatial</u> is a consulting firm that creates templates and workflows developed from ESRI's ArcGIS tools to make sure data is accurate, accessible, shareable, and editable. Cloudpoint Geospatial offers an inventory development tool that incorporates customer data on the total number of service lines, service line composition, and total number of suspected lead service lines. With this information, Cloudpoint Geospatial amalgamates this data into a comprehensive and editable digital map with the ability to add summary statistics of progress - both the map and summary charts can be used in communicating with the public.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
	Communications	



Q: What does effective communication about progress look like in practice?

A: The City of Platteville created a dashboard when starting their journey that is updated in real-time using a mobile application and can be used as an example for other utilities starting their lead-free water journey.

Platteville Lead Service Line Replacement Program

The City of Platteville has applied for a grant for 2021 to assist in the replacement of up to fifty of the remaining private lead service lines in the City. The grant will provide up to \$1,140 grants for each lead service line.

Platteville has also committed to replacing the public side of known lead water service lines. For example, in 2021 the Dewey Street project will replace any lead lines found on the public side.

How do I replace my private lead service lines?

1. First search for your property address in the map (use the magnifier glass in the upper right) or pick from the list on the right.
2. If your address is listed, follow [THIS LINK](#) to more details and access to the forms.

- Select a plumber (or severs) from the **LIST OF PRE-QUALIFIED PLUMBERS** and pick your quote.
- Complete the **LEAD SERVICE REPLACEMENT APPLICATION** and return it and the quote to City Hall.
- Have your work completed no later than December 31, 2021.
- Submit your **REQUEST**.

2022 Grant Funds Reserved (\$57,000 Available)

\$35.3k / \$57k

Private Lead Service Lines

140 Eligible for Replacement

Grant Status of Known Properties with Lead Service

- Eligibility 2 Unknown
- Funds Awarded: 480
- Funds Reserved: 32
- Has Not Applied: 110
- Not Eligible 3
- Replaced Without Funds: 18

2018-2021 Grant Funds (Checked Out: 1,537,000 Grant Award)

\$533.13k / \$600k

A dashboard that is frequently updated with household-level information and a tracker of how many pipes have been replaced is great tool to build trust and transparency with the community.

Center for Neighborhood Technology

FEATURES		DESCRIPTION
	Asset Management Databases	<p><u>Center for Neighborhood Technology (CNT)</u> is a nonprofit organization that supports community groups, advocates, policymakers, and governments through research and tool development to create sustainable and equitable communities. They collaborated with BlueConduit and the IBM Service Corp Project to create the <u>Lead Service Line Prediction Community Playbook</u>. This community playbook offers guidance on for data collection and analysis methods, lead service line predictive analytics, and service line inventory management. The community playbook has been utilized in Washington, D.C., and Evanston, Flossmoor, Hazel Crest, and Naperville, Illinois. *<u>Center for Neighborhood Technology</u> won the Wildcard category for the <u>2021 Water Data Prize</u>.</p>
	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
	Communications	



Q: Are there non-invasive methods to inspect and identify lead service lines?

EPA's Guidance for Developing and Maintaining a Service Line

A: Inventory highlights CCTV cameras is one of many non-invasive methods used to identify lead service lines

The usage of CCTV cameras to visually inspect service lines is done either internally or externally by inserting the camera into the curb stop box to find visual markers that a service line is made of lead. While less invasive than exposing the service line completely, it relies on the assumption that the curb stop is made of the same material as the rest of the line. If the curb stop has previously been replaced, but the remainder of the service line has not, then it could lead to a missed lead service line.

Electro Scan Inc.

FEATURES		DESCRIPTION
	Asset Management Databases	<p><u>Electro Scan Inc.</u> is a hardware company that specializes in leak and pipe material detection. Their new product, <u>SWORDFISH</u>, is the first of its kind: a hand-held tool that detects if the buried pipe is lead by sending a small probe underground that measures electric resistance. Using low-voltage conductivity readings to locate and detect buried lead pipes, SWORDFISH can enter curb stops and basement meters without service disruption, eliminating the need for potholing or hydro excavation. Moreover, the SWORDFISH reads the service line material in real-time and the data is automatically uploaded to Electro Scan's Critical H2O cloud application.</p>
	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>Innovyze</u> is a subsidiary of Autodesk that provides robust engineering and design services for water utilities to manage assets and prioritize lead pipe replacement efforts. Their services enable users to also pair capital, operation, and maintenance budgets, as well as flooding, stormwater, and sewer information to guide decision-making.</p>
	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
	Communications	



Q: Are there useful guides to effectively communicate with the public about lead service line replacement?

A: American Water Works Association (AWWA)'s Communicating About Lead Service Lines: A Guide for Water Systems Addressing Service Line Repair and Replacement

Under the Safe Drinking Water Act, all water and wastewater utilities are mandated to communicate the risks associated with a Lead Action Level Exceedance. The American Water Works Association, or AWWA, published a comprehensive guide to help water utilities through this communication process. AWWA’s guide is intended to supplement other communications, while simultaneously offering new and customizable messages and templates.

KETOS

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>KETOS</u> has developed a robotic system for measuring water quality that is equipped to automatically sample, sense, transmit, and share results in an interactive online website. KETOS water quality testing provides on-site, lab-accurate data for lead, copper and other heavy metals enabling operators to easily consume water quality data in the centralized KETOS Smart Water Intelligence platform and prioritizes where to replace lead pipes. They have further developed a highly interactive and accessible mapping template that utilities can use to pair lead pipe data and actionable information about lead pipe risks and steps the city is taking to address them.</p> <p><u>*Ketos won the Mapping category for the 2021 Water Data Prize.</u></p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

Raftelis

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>Raftelis</u> is a management consulting firm that provides finance, assessment, communications, technology, executive recruitment, and strategic planning services for local governments and water utilities. Their core expertise is making complex information like lead and water quality understandable to all. Their team of communications, design and visualizations experts provide risk and crisis communications counsel; develop content, websites, and social media that's accessible to all audiences; and provide equitable community engagement techniques that reach all audiences where they are.</p> <p><u>*Raftelis won the Communications category of the Water Data Prize in both 2020 and 2021.</u></p>
	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

SimpleLab

FEATURES		DESCRIPTION
	Asset Management Databases	<p><u>SimpleLab</u> is the largest laboratory testing platform with more than 175 accredited water quality testing labs across the USA. Designed to give your team a full laboratory infrastructure overnight with no overhead cost, SimpleLab software offers full customization of your sampling kit and laboratory testing needs. Clients can use sophisticated APIs or an easy UI for fast test kit ordering, dropshipping, sample collection, smart laboratory selection, logistics, and data management. LCRR Services are now available for engineering consultants and drinking water utilities who are looking for help with easy distribution of lead and copper sampling kits in local communities.</p>
	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

Trinnex

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p>As a wholly-owned subsidiary of CDM Smith, <u>Trinnex</u> represents a 75-year legacy of infrastructure excellence coupled with software technology innovations. Trinnex helps infrastructure leaders advance the digital journey through proven processes and software, from powerful public-facing dashboards and machine learning models to help with service line inventory development and LCRR compliance to premium digital services such as digital twin design and development.</p> <p>*Trinnex's leadCAST software was born from the Newark, NJ lead service line replacement program of which <u>CDM Smith won the Overall Prize for the 2021 Water Data Prize.</u></p>
✓	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

TruePani

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>TruePani</u> is an engineering, consulting, and data management firm that provides support for Lead and Copper Rule compliance by 1) developing lead service line inventories, 2) automating customer outreach, 3) designing and implementing water sampling plans, and 4) grant writing assistance. TruePani compiles various data sources within a cloud-based database that has been customized for service line inventory development. After organizing and digitizing existing records, TruePani develops an approach to identifying unknowns tailored to each water system. Investigation methods can include validated predictions, tap sampling, and visual inspections. Lastly, TruePani has developed a tool for the community to find the material of their service line, called <u>Locate Your Line</u>. This tool is an interactive survey that walks through inspection of service line material and allows for photo, material, and geospatial data submissions that can be shared with your utility or submitted to a national database.</p>
✓	Mapping & Public Dashboards	
✓	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

Uneath

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>Uneath</u> provides inventory development, asset management and public communications of lead pipe inventory assistance to water utilities through cloud-based desktop and mobile applications. They prioritize geospatial based tools that are easily accessible to all staff at water utilities from field staff to GIS managers, which enables field staff to upload information from their phone about assets and then office staff to automatically have the information integrated and up-to-date.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	



Q: Where can I find useful lead service line replacement outreach materials?

A: LSLR Collaborative's Communicating About Lead Service Lines: Outreach Materials

The LSLR Collaborative offers a host of communication tools that increase customer engagement and awareness including door hangers, pamphlets, fact sheets, emails, and website templates. LSLR Collaborative's communication tools have been employed in Newark, New Jersey, Washington, DC, Denver, Colorado, and Tacoma, Washington. EPIC is a proud member of the LSLR Collaborative.

Water Data Lab

FEATURES		DESCRIPTION
	Asset Management Databases	<p><u>Water Data Lab</u>, a data-driven consultant firm, provides an open source map template for lead service line data and tracking replacements. Once a utility has inventory data as a spreadsheet, utilities can use Water Data Lab's template for free to display this information in a map for internal use or for communicating externally with the public. Their goal is to lower the barrier to entry for utilities visualizing lead pipe information by providing industry-standard color schemes, legends and mapping software for those without ArcGIS or other services.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
	Communications	

WaterClick

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>WaterClick</u> is a technology company that enables water utilities to bring all digital service providers under one platform. Their staff vet digital service providers and then integrate services from qualified providers into one platform, with a focus on making the digital transformation easier for small to medium-sized water and wastewater utilities. Within WaterClick, water utilities have access to a range of services, two of which are tools to build a lead pipe inventory through asset records and the ability to easily manage construction and asset management for lead pipe replacement.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

WaterPIO

FEATURES		DESCRIPTION
	Asset Management Databases	<p><u>WaterPIO</u> is a national public communications firm that works exclusively in the water and wastewater sector. WaterPIO operates LeadCopperRule.com, which specializes in helping water utilities of all sizes manage the multiple public communication challenges created by the new LCR by focusing on building trust through proactive communications.</p> <p>WaterPIO and LeadCopperRule.com provide proven-successful internal and external communication plans, mass media and key stakeholder outreach, customer information messaging and materials, social media and web content, and everything in between.</p>
	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
	Field Tools or Water Sampling for Inventory Development	
✓	Communications	

WaterSuite

FEATURES		DESCRIPTION
✓	Asset Management Databases	<p><u>WaterSuite</u> provides integrated, cloud-based digital services for water utilities and primacy agencies to seamlessly manage data associated with compliance monitoring plans, service area boundaries and distribution systems. WaterSuite changes the dynamics of the interaction of utilities and primacy agencies by creating a cloud-based interactive system that organizes and simplifies compliance sampling programs.</p>
✓	Mapping & Public Dashboards	
	Predictive Tools for Inventory Development	
✓	Field Tools or Water Sampling for Inventory Development	
	Communications	

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The Environmental Policy Innovation Center (EPIC) is a nonprofit start-up based in Washington, DC focused on building policies that deliver spectacular improvement in the speed and scale of conservation and environmental progress.

EPIC is committed to finding and highlighting the best approaches to scaling up positive results quickly. Our program areas include water infrastructure and financing, endangered species, environmental markets and restoration, and the use of data and technology in producing conservation outcomes.

Our water work seeks to advance innovative policies that provide equitable access to safe, reliable, and affordable water for communities and nature to thrive. We do this by engaging diverse partners, exploring out-of-box solutions, and championing policy change to address disparities across water systems. We aim to accelerate innovation, eliminate funding disparities, replace toxic lead pipes, build public trust, and make water affordable.

EPIC believes that replacing lead pipes is a solvable problem, and that no one should be drinking lead-contaminated water. Our goal is therefore to find ways to speed up lead pipe replacement and eliminate this problem over the next decade.