



Lead-free water for all: Making the case for rapid lead pipe removal across the U.S.

Six steps to scaling up equitable lead pipe replacement

Introduction



The pandemic laid bare **deep health inequality** in the United States.

Thousands perished due to poor healthcare coverage or exposure to the Covid-19 virus in their frontline work. Unimaginable loss sparked a collective cry to right these wrongs.

But the solutions are complex.

These health inequities are deeply embedded in underlying systems.

Not only in how and to whom we provide healthcare, but in the very way our cities are built. **How can we address these interconnected injustices?**

We can start by ending a more-than-century-long health scourge: lead leaching into drinking water from lead service lines and the lifelong harm it brings, particularly to children in low-income communities. First exposure to this toxin is often through baby formula made with lead-tainted water, causing irreversible brain damage to infants—adding another obstacle to the path out of poverty for communities.

Moreover, data pointing to a lead pipe presence tends to be of poor quality, incomplete, and scattered, rendering problem areas invisible and making remediation efforts more complex. Ripping out underground plumbing to test for and replace lead pipes is costly—so cities seek certainty about the location of lead pipes. Now several forces are dovetailing that make lead pipe replacement for communities that suffer most from lead exposure far more visible, affordable, and urgent.

First, earmarked federal funding for lead pipe replacement (\$15 billion as of August 2021) in the Infrastructure Investment and Jobs Act delivers generous—though far from enough—financial resources to jumpstart investment in clean drinking water. Second, the nation’s sharp focus on remedying health inequities made more stark by Covid-19 demands action. We can start by ensuring safe drinking water for all.

Third, alarmingly, harm from lead in water appears to worsen when only the public sections of lead pipes are replaced, leaving the cost of replacing the private portion—the section of the pipe between the curb and

a private residence—to the homeowner. This is because lead peels off into water when pipes are broken apart or rattled in big digs, compounding the impact of deep-seated injustices in impoverished neighborhoods that already suffer from poor quality education, housing, infrastructure, and food.

So-called partial pipe replacement has been a common practice in some cities due to private property access and funding issues; this approach largely limits removal to under streets and sidewalks, as property owners who must pay for work under and around private homes may be unwilling or unable to fund this work, increasing the likelihood of lead exposure in low-income areas. Recent Environmental Protection Agency (EPA) Lead and Copper Rule revisions seek to reduce the use of partial replacements. But more efforts are needed to ensure full lead pipe removal.

Fourth, in the wake of the Flint, Michigan, lead pipe disaster—where thousands of people were exposed to lead, sparking ongoing lawsuits against the city and state—EPA will soon revise its Lead and Copper Rule, a measure that aims to reduce the flow of lead-tainted tap water. All states will be required to inventory their lead pipes within three years and to reduce the minimum amount of allowable lead in water to 10 parts per billion (ppb) from 15 ppb.

Fifth, federal, state, and local pandemic-triggered American Rescue Plan funds for replacement have a ‘use by’ date of December 2026, adding urgency to tap these resources soon. Sixth, robust alliances between

private firms, scientists, and community leaders seeded over the pandemic have laid the groundwork for tight collaboration on this issue.

Last—but certainly not least—are artificial intelligence (AI) advances that can detect lead pipe locations with far more accuracy, based on the collection and analysis of a broader set of demographic, city, utility, and third-party data from underused sources such as university research, homeowner records, and household surveys. This materially boosts the probability of locating lead pipes when digging—and strengthens the case for funding and action.

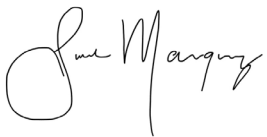
These forces intersect with The Rockefeller Foundation’s mission to harness innovation to improve the wellbeing of the world’s most vulnerable people, presenting an ideal opportunity for the Foundation to catalyze efforts to inventory and replace lead pipes rapidly, equitably, and affordably, and to scale up the use of new technologies in this endeavor.

More precise lead pipe location forecasts based on machine learning can make lead pipe removal more affordable. To expand such work, The Rockefeller Foundation partnered with water analytics firm BlueConduit in 2019 to use its AI-based tool to identify likely lead pipes in four post-industrial cities with a high likelihood of lead in low-income neighborhoods: Benton Harbor and Detroit, Michigan; Toledo, Ohio; and Trenton, New Jersey. These pilot projects, covering services to 1 million people, aim to publicly track progress so that peer cities can build on their learnings.

With these efforts well underway, in July 2021 The Rockefeller Foundation convened 47 water quality experts, utility managers, technologists, academics, analysts, local philanthropists, and public officials from 13 U.S. cities to identify the work required to secure funding and guidance for rapid, less costly, and more equitable lead pipe replacement. New funding sources and momentum to fix long-standing health injustices point to robust potential for scale up.

By bringing together bright and committed minds, we hope to help cities build a case to fund lead service line replacement. “We believe in driving systems change, in building bridges for cross-sectoral collaboration with public officials and philanthropists—in fundamentally rethinking business as usual,” explained Zia Khan, Senior Vice President for Innovation at The Rockefeller Foundation, at the convening’s start.

Based on insights exchanged at the convening and additional research, we’ve created this handbook, distilling six critical steps to secure funding for and to fast-track lead pipe replacement, including case studies, a grant proposal template, and additional resources. We look forward to learning of your progress in our collective race to end poisoning from lead-tainted drinking water, forever.

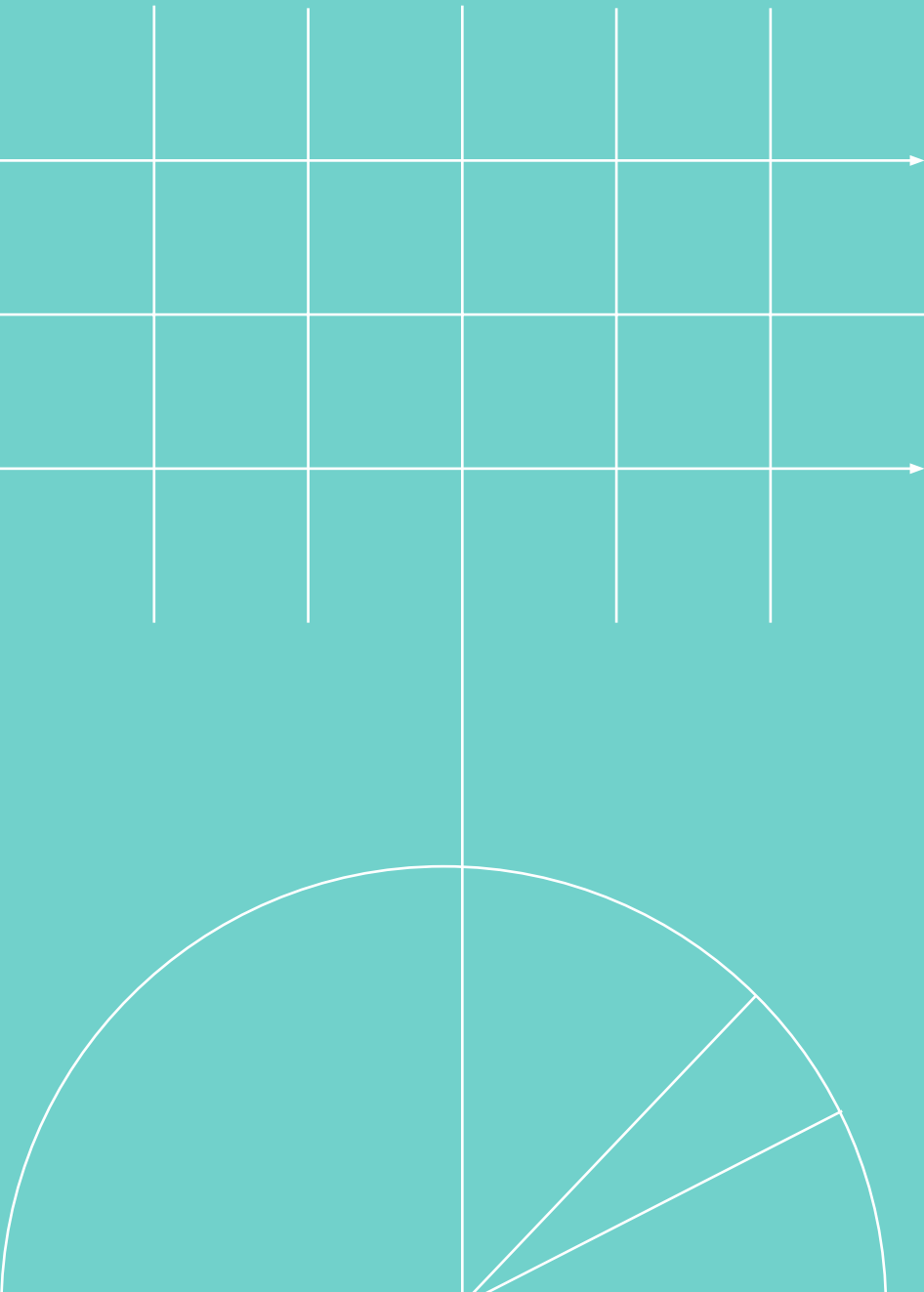


Sue Marquez

Manager and Data Scientist, Innovation,
The Rockefeller Foundation



Executive Summary



In July 2021, as the world continued to reel from the Covid-19 pandemic, 47 experts assembled virtually to tackle a silent tragedy that has plagued impoverished inner-city dwellers for over a century: **lead poisoning** from tap water piped in through lead service lines.

Convened by The Rockefeller Foundation, city officials, scientists, and philanthropists sought to forge ties to expedite **nationwide lead pipe replacement**. Participants explored ways to tackle lead-triggered harm that disproportionately affects poor communities of color unable to pay for pipe replacements, just as Americans cried out to correct prior health injustices.

Technological change is proving to be a key driver. Using artificial intelligence to analyze expanded data sets—including those in handwritten notes, annotated maps, and service records—five years prior in Flint, Michigan, had materially boosted the odds and speed of finding lead pipes versus the prior ‘excavate, test and replace’ method, while cutting costs by tens of millions of dollars. The material identified as likely coating pipes was correct 70% of the time versus 14% for prior excavations. Historically, the cost of exploratory digging to identify the makeup of an individual pipe has made up around 40% of its total removal cost, wasting thousands of dollars per pipe on fruitless ‘false positive’ pursuits.

Spearheading this predictive model were two assistant professors at Georgia Tech and the University of Michigan who subsequently created analytics firm BlueConduit to expand their work, focusing its algorithm on highly concentrated lead pipe clusters in communities engaged in pipe replacement efforts. They hoped to help cities prioritize digging based on the highest likelihood of finding lead among those who most suffer from its toxicity.

The time was right, The Rockefeller Foundation decided, to scale up such efforts across the country, first by partnering with BlueConduit to pilot this work in four cities: Benton Harbor and Detroit, Michigan; Toledo, Ohio; and Trenton, New Jersey; and next by exchanging ideas from these and other cities’ lead pipe replacement learnings at a virtual convening in July 2021.

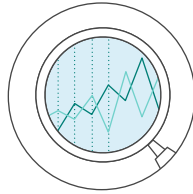
In lively discussions, experts shared anecdotes, workarounds, tips, and tricks to start, expand, and accelerate lead abatement work already underway. Below we lay out six critical and enabling steps that peer cities may find useful as they pursue lead pipe removal projects. Each step is then explored in more detail, with case studies that illustrate real-world learnings from those who have undertaken this work. We hope this information can help guide the search for funds and ensure that strategies for equitable lead pipe replacement are at the forefront of lead abatement work.

«This is a once in a generation opportunity to solve this problem [that] we've been stuck with for 130 years.»



Tom Neltner
Chemicals Policy Director,
Environmental Defense Fund

Six steps to fast-track lead pipe replacement in your city



1. Get as granular and visual as possible with data to tell a compelling story to funders, communities, the public, and decision makers

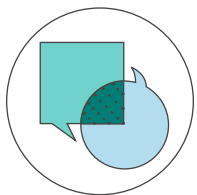
Collect and analyze compelling

demographic, health, housing, and environmental data using artificial intelligence to paint a more accurate and complete picture of lead service lines in your city. Consider incorporating maps to demonstrate areas of focus and boost your odds of finding financing. Be sure to attribute all data sources.



2. Forge partnerships with organizations that have the skills, knowledge, and connections that your city or utility lacks to expedite lead pipe removal efforts

University researchers or think tanks with expertise in finding and analyzing data can help identify neighborhoods with lead pipes. Faith-based organizations may have tight connections with affected communities. Funders will be keen to learn of recent efforts to engage such partners and the tasks they would undertake to tackle this work through Letters of Support, with precise information about how their involvement will speed up, expand, and cut the cost of lead pipe removal, particularly in low-income communities.



3. Reach out to affected communities through trusted leaders, channels, and organizations to alert them of the risks of lead in water and of pipe replacement opportunities

By addressing privacy and financing concerns, highlighting job opportunities, and articulating positive health outcomes in multilingual meetings led by local leaders, residents will be more inclined to approve lead pipe removal below and around their homes. Channels might include community forums, online messaging, webforms, and op-eds in community papers. Pilot projects that demonstrate the ease of working with a city on pipe replacement will also help spread the word, accelerate work, and generate goodwill.



4. Consider non-traditional financing vehicles and partners

Reaching out to philanthropists, social entrepreneurs, community banks, hospitals, and local businesses can

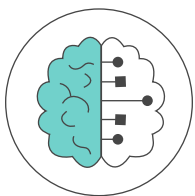
help grow the universe of grants and no- to low-interest loans. Other possibilities include revolving funds linked to the Safe Drinking Water Act, bonds, innovation challenges, and prizes.



5. Launch a campaign to raise awareness of and build broad support for pro-replacement policies, funding, and projects

Frame the need for lead pipe

replacement around environmental justice and health equity concerns. Through local champions, raise awareness of the need for full pipe replacement and bring lead poisoning to front page topics such as inequitable health outcomes. Consider engaging pro-bono lawyers and environmental organizations to advocate for statewide lead pipe removal deadlines; an end to partial pipe replacement; and mandatory disclosure notification and home inspection for lead pipes and their replacement if found before any sale or rental—all on environmental justice grounds.

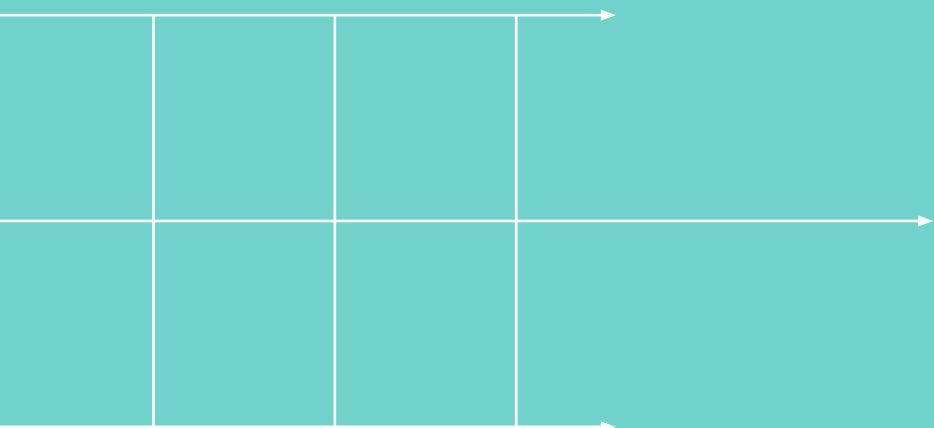


6. Think creatively about key challenges

Challenges might include access to lead lines on the home side, distrust of government and science by residents,

and resistance from private utilities. Pilot projects can surface solutions to obstacles; local messengers offering valued services like water testing or filters can foster trust and help garner approval for private home access for pipe removal work. Workarounds include immediate replacement of lead pipes found by plumbers doing routine work on water mains or repairing broken or leaky pipes, to reduce the cost of excavations.

Quick Facts About Lead in Drinking Water



Lead-tainted water: Harms and remedies

Among all ages, the fallout from lead exposure includes damage to the heart, brain and kidneys. Some 400,000 deaths a year are linked to lead, which is harmful at any level. This is particularly pronounced among low-income communities of color where historically absentee landlords contributed to neglect and under-investment in safe housing solutions. Black children in the U.S. are much more likely to have higher levels of lead in their blood than their White or Hispanic peers. Moreover, more children of color missed tests for lead in their blood during the Covid-19 pandemic, while the risks of lead exposure increased during remote learning at home. These compounded harms make ending lead poisoning a pressing environmental justice issue.

The damage from lead pipes extends well beyond rustbelt cities in Illinois, Michigan, New Jersey, New York, and Ohio, which have the most lead service lines (about one quarter of all lead pipes in the U.S. are in the first three states). Up to 10 million homes risk exposure from lead-tainted water due to the nation's aging infrastructure. Flint, Michigan's, all-in removal was exceptional, triggered by public outcry (nearly 57% of its then-residents were Black). But the damage was done.

Meanwhile, healthcare, special education, and justice system remedies continue to drain municipal coffers. Altarum's analysis of the costs of lead exposure pegs annual economic loss per year from lead at \$84 billion in medical and welfare costs, lower worker productivity, and premature deaths linked to lead exposure (from

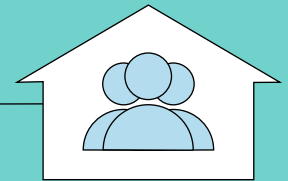
both tainted tap water and paint). Nationwide almost 60 million people do not drink their tap water, due in part to distrust about its safety. Conversely, just \$1 invested in lead pipe removal returns \$1.33 in economic benefits, and boosts tax revenue.

"When lead was finally restricted from paint, it was said that the nation's IQ increased," said Dr. Mona Hanna-Attisha, Founder of Hurley's Children Hospital's Pediatric Public Health Initiative, in her April 2021 testimony to the House Ways and Means Subcommittee on Trade. But the missed potential is immeasurable.

QUICK TAKE

10M HOUSEHOLDS

UP TO 10 MILLION HOUSEHOLDS ARE AT RISK FROM LEAD-TAINTED WATER IN THE U.S.



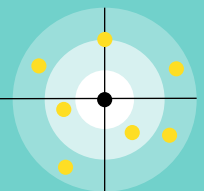
\$1.33 IN ECONOMIC BENEFITS PER \$1 INVESTED IN LEAD REMOVAL

RETURNS ARE SEEN ACROSS HEALTH AND EDUCATION OUTCOMES, LIFETIME EARNINGS, AND MORE*



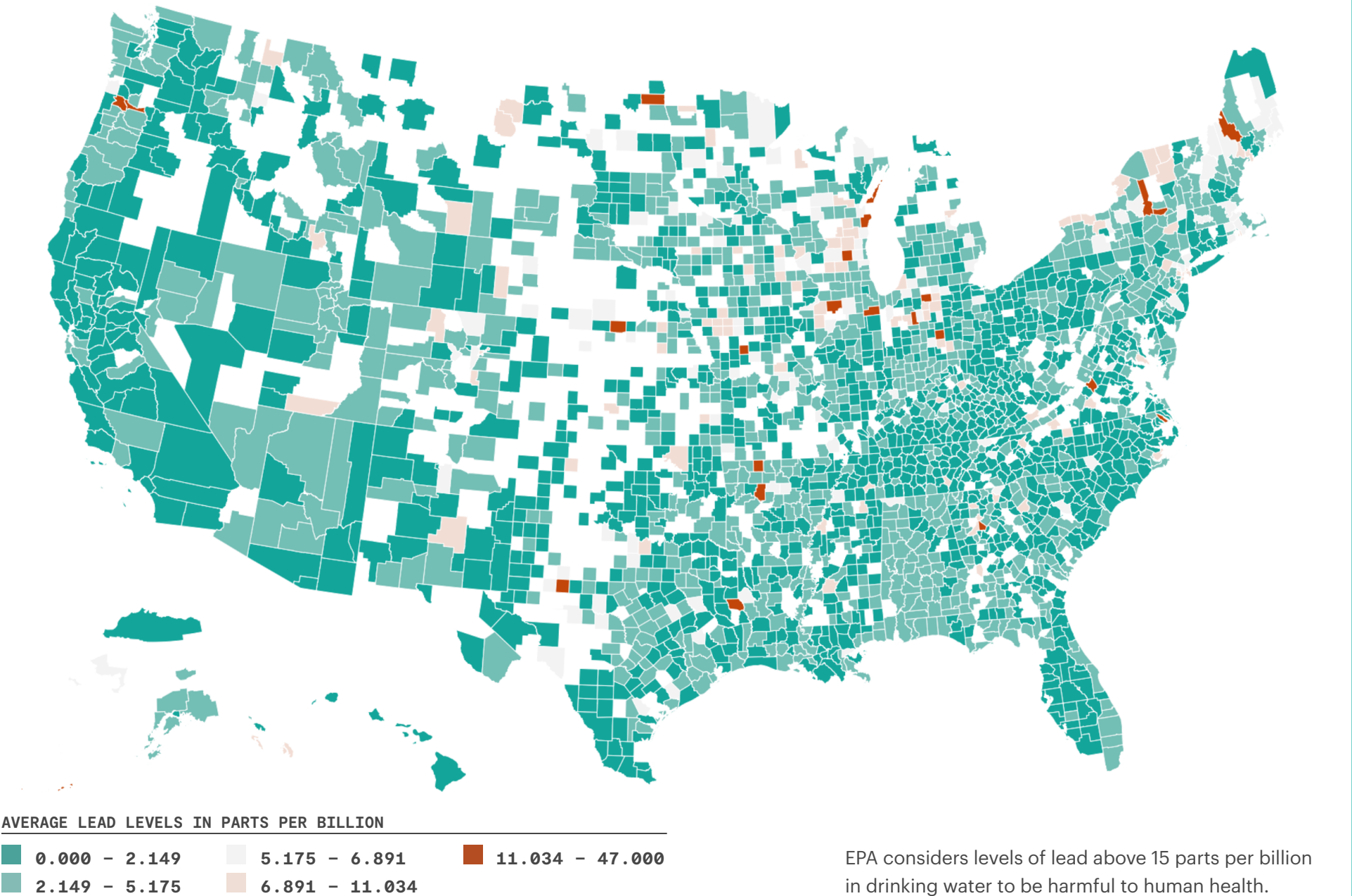
5X MORE ACCURATE THAN BIG DIGS

POWERFUL DATA ALGORITHMS CAN HELP PINPOINT LEAD PIPE LOCATIONS MORE ACCURATELY, SAVING CITIES TIME AND MONEY



* Source: "10 Policies to Prevent and Respond to Childhood Lead Exposure," by The Health Impact Project, the Robert Wood Johnson Foundation and The Pew Charitable Trusts

Elevated lead levels across the U.S. (2013 - 2019)



Timeline of U.S. lead pipe legislation

Though awareness of lead's adverse effects took root in the 1960s, lead pipes were only banned in the U.S. in 1986. Since then, pipes have increasingly been made from copper and plastic. Rapid progress is possible. From the 1970s to 1994, the percentage of U.S. children aged five and under with elevated blood lead levels (10 ppb or above) fell sharply to 8% from 88% after laws limiting or eliminating lead content in gasoline, soda cans, paint, and plumbing took effect. Newly built homes reduced the portion of homes with lead-based paint and pipes. But up to 10 million homes are still at risk from lead pipes, particularly in low-income communities and those of color.

1986



LEAD PIPES BANNED

The federal government bans the use of lead in plumbing. However, housing stock built before 1986 may still contain lead pipes or fixtures.

1991



LEAD AND COPPER RULE (LCR)

First federal legislation limits the concentration of lead and copper in drinking water.

2016



FLINT WATER CRISIS

The Flint water crisis sparks a series of updates to the Lead and Copper Rule. Among states, some place a higher priority on bolstering and expanding their lead pipe replacement programs.

2020



START OF REVISIONS TO THE LCR

Changes in exceedance thresholds and the required replacement of service lines are under consideration.

2021



EXTENSION OF THE LCR REVISION PERIOD

In June 2021, EPA extends the period for LCR revisions to December 2021, to allow for more input from the public.

CASE STUDY

City of Newark: Replacing lead pipes in record time

Newark, New Jersey, leads the nation for its fast, coordinated, and affordable replacement of 20,000 lead service lines in just two years, thanks to factors ranging from completed inventories to community engagement to unconventional funding sources to new lead pipe removal statutes.

Under pressure from EPA after the city exceeded its allowable lead levels in tap water samples in 2016, the city of 285,000—with about 3 in 4 of its residents renting their homes—joined Cincinnati, Denver, and Washington D.C. in robust efforts to swap in pipes made of safer materials. By way of comparison, Flint, Michigan, replaced half as many pipes in five years.

Here are elements that contributed to Newark's rapid success:



LEGISLATION

Newark first passed an ordinance allowing its water utility to replace lead pipes at all locations, including on the private side of a lead line, on public health grounds. Full access to the private side of plumbing helped the city quickly estimate the size of the problem. As Eric Schwartz, BlueConduit Co-Founder noted, “Central to that is clearing out some of the legal underbrush to make sure that the utility is free to replace service lines without any impediment.”



COMPLETED INVENTORIES

Earlier efforts to count and locate lead service lines laid the groundwork for public, political, and community-based campaigns to galvanize support for lead pipe removal and funding.



FUNDING

The large number of lead service lines in Newark provided a strong case for funding to replace lead pipes, winning ample funding and requiring no cost sharing. To finance this effort, the city of Newark received Essex County approval to sell \$120 million in AAA-rated bonds, saving the city nearly \$15 million.



WORKFORCE PREPAREDNESS

Trained plumbers and pipefitters rapidly replaced pipes.



ACTIVISM AND ECONOMIC OPPORTUNITY

Local organizations clamored for change; an apprenticeship program engaged locals in pipe removal efforts.



METRICS

A consultant kept tabs on contractors as they replaced over 1,000 pipes per month.



THE RIPPLE EFFECT

As Newark wrapped up its lead pipe replacement work in July 2021, New Jersey Governor Philip D. Murphy signed a bill requiring for the first time that all lead service lines be replaced in 10 years. New Jersey joins Michigan as a state requiring full replacement of the lead service lines—or replacement of an entire lead pipe, including the residential and public sections.

«Newark's two- to three-year timeframe followed citizen pressure, litigation, and press coverage. After a lot of controversy, they are now a national model.»



Erik Olson

Senior Strategic Director, Healthy People & Thriving Communities Program, Natural Resources Defense Council

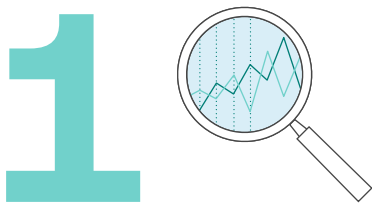


A Guide to Scaling up Lead Pipe Replacement



Six steps to fast-track funding for and replacement of lead service lines

The steps below synthesize key learnings from discussions among city officials, utility leaders, academics, philanthropists, and technologists, to expedite the securing of funds for and implementation of lead pipe replacements.



Data: Get as granular and visual as possible with data to tell a compelling story to funders, communities, the public, and decision makers

A true assessment of the scale and location of lead service lines across a city is a powerful tool to secure funding and accelerate efforts for their replacement. Prior assumptions may be inaccurate or based on poor quality data; prioritizing replacements based on a homeowners' ability to pay may bring the unintended

consequence of delayed replacement in low-income neighborhoods. Moreover, private home information in those areas is often scant, meriting exhaustive, inclusive, detective-type approaches to find and analyze additional data.

Collecting and analyzing compelling demographic, health, housing, and environmental data using artificial intelligence will help paint a more accurate and complete picture of lead pipes to make a solid case for their removal. For example, in frequent operations like inspecting meters or infrequent ones like replacing them, technicians should note the makeup of service lines and continually update their lead pipe databases. This will help boost the efficiency of replacements due to constantly improving accuracy, resulting in the better prioritization of work.

"Anyone who touches a service line is required to provide some information regarding the material that they observe," said Janet Aristy, Chief of Online Permitting at the New York City Department of Environmental Protection.

Predictive modeling maps can also fortify the case for financing. Key metrics will show funders how the city plans to track work. And as the process unfolds, campaigns with compelling data visualizations and maps can alert residents to lead pipe risks and replacement opportunities. Data-rich stories about those affected by lead-tainted water may move households to work with advocates and those in power to lay the groundwork for new statutes and funding to expand lead pipe replacement.

Finally, tracking success metrics will keep communities abreast of progress, further the case for additional funds, show peers the results of best practices, and fortify relations with philanthropists and other funders for future environmental justice work. Be sure to attribute all data sources.

«A model is only as good as the data you put into it. There are different ways to identify lead service lines but how can we verify the rest? How many unknowns could be lead?»



Kira Smith

Environmental Engineer, U.S.
Environmental Protection Agency

Exploring innovative methods to find lead

The Water Research Foundation and Cleveland Water Alliance are exploring different frequencies and sounds to test for lead through electrical resistance measurements. While they've not yet found a solution that is 100% effective or scalable, their research continues. Other possibilities to find lead in service lines include visual inspections, lead swab kits (on an individual basis—each customer must inquire about his or her own lines), service line cameras, visual scratch tests, and magnets.



CASE STUDY

City of Trenton: Exploring unknowns to expand lead pipe replacement

When cities exceed national limits for lead in water, they are required to take action. This was the case for Trenton, New Jersey: samples of water in some neighborhoods passed minimum lead thresholds, leading EPA to require that the city replace a certain percentage of its lead service lines each year.

Acting on the advice of a task force of statewide nonprofits, community organizations, water utility experts, and key state agency officials, the utility began by building a full inventory.

Trenton Water Works (TWW), the city's water utility, underwent an extensive review of available residential records of pipe materials. However, information in many residences was lacking, most likely due to issues around access (requiring additional time and cost to verify). More information was needed.

To gather data, the city's water utility, TWW, turned to water analytics firm BlueConduit for a predictive model of the city's water service line inventory to help prioritize replacement efforts, first focusing on high-lead clusters (1,000 pipes or more) in Trenton and in Hamilton Township.

Work began by calculating the degree of uncertainty through data analysis and modeling. BlueConduit found that 99% of the composition of public lines (under roads and sidewalks, for example) was known, versus less than 10% of those under homes.

These findings, paired with existing city and inspection data, helped generate average home-by-home lead pipe probabilities, helping TWW prioritize three clusters for its third phase of replacements. Data was used to produce a predictive map with real-time updates on inspections, test results, and replacements.



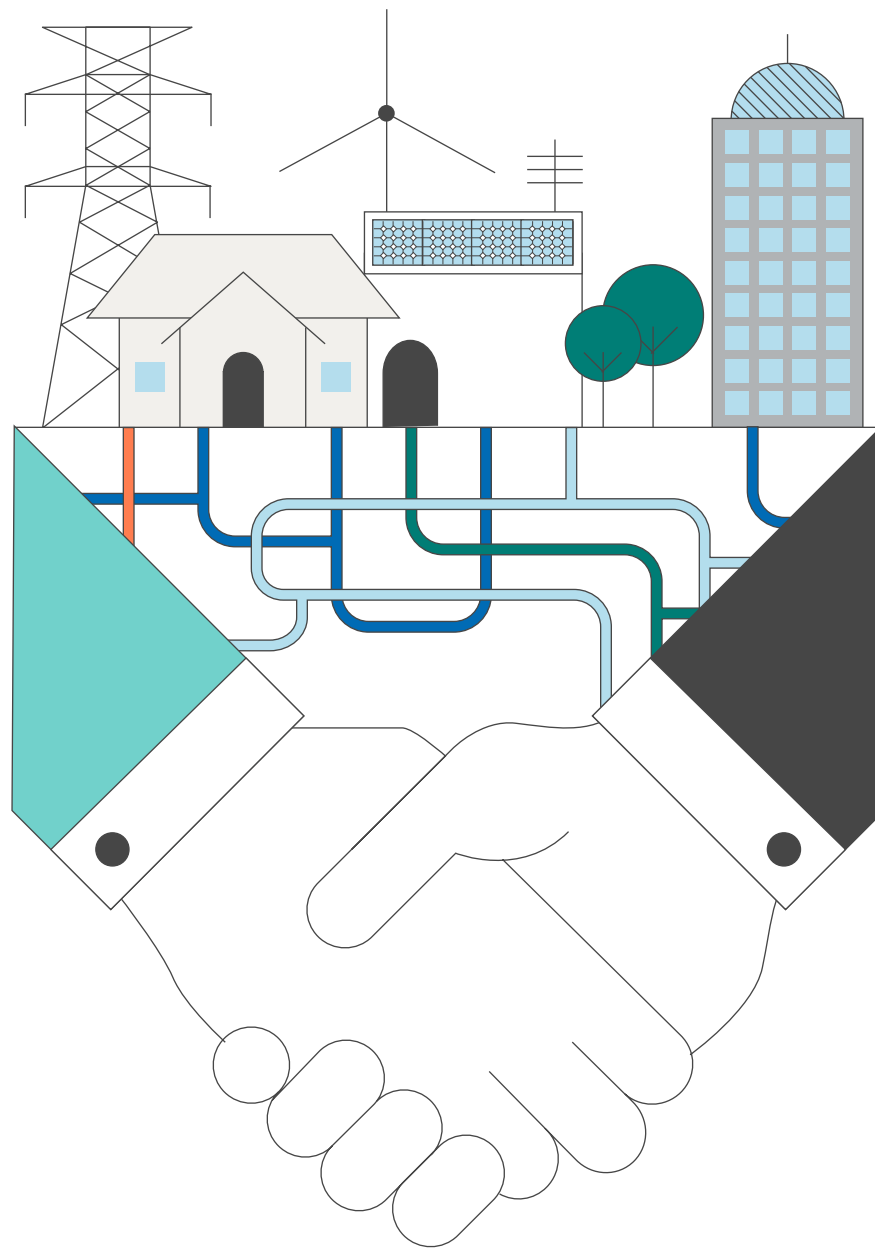
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Partnerships: Turn to organizations with the skills, knowledge, and connections that your city or utilities lack to expedite lead pipe removal efforts

Utilities and officials will need to stretch beyond their core skill sets to tackle the unique complexities involved in finding funding for and executing rapid lead pipe replacement. Partnerships can help fill in competency gaps and improve the quality of planned work.

Begin by working closely with other departments and regulators. Alliances might include a multi-agency task force or tie-ups with university researchers or think tanks with additional data or data science skills to identify likely neighborhoods with lead pipes. At a project's start, it may be more important to know what you don't know. As Beatrice Miringu, Sustainability Coordinator of the City of Toledo put it, "A task force can bring together all departments involved to see what information they might



have, that can be very helpful [in ways] that we may not even be thinking about.”

Such collaborations also ensure that what is in grant applications meets what reviewers want to see. “It’s crucial to learn the art of presenting technical information in a way that is easy to read, to get your point across,” cautioned Jim Surhigh, a Consulting City Engineer from Hubbell, Roth & Clark, Inc. for the City of Birmingham, Michigan. “There’s a certain talent needed for writing a good grant application.”

For outreach, education, and water filter distribution, tapping community, environmental, public health, and faith-based organizations with tight connections to affected communities may be most effective.

Funders will be keen to learn of recent efforts to engage such partners and of the tasks they would take on to tackle this work through Letters of Support, with precise information about how their involvement will speed up, expand, and cut the cost of lead pipe removal.

«It’s important to elaborate on how all partner organizations complement the city’s work. For example, outreach—how the partner has more rapport with residents than the city. How they are more localized. Be specific.»



Sue Marquez

Manager and Data Scientist,
Innovation, The Rockefeller
Foundation



CASE STUDY

City of Toledo: Partnerships help make the case for funding

EPA's State Environmental Justice Collaborative Problem-Solving Cooperative Agreement ([SEJCA](#)) Program allocates funds to address local environmental and public health issues within an affected community, including those linked to lead pipes.

The grant program specifies eligibility criteria based on the proportion of residents living under the federal poverty line, earmarking funds for under-resourced communities harmed by toxic air, soil, building materials, and water.

That was the route [Toledo](#), Ohio, took as it sought funds to verify the number and location of its estimated [nearly 30,000](#) working lead service lines in 2020. Since the formation of the Toledo Water Council in 2019, neighborhood groups have pushed for more affordable and clean water, and the replacement of lead service lines. Higher levels of lead in blood were found in about

[19,000 Toledo children](#) in 2016, almost double the rate of their statewide Ohio peers.

However, with staff primarily composed of chemists, logisticians, and service delivery teams, the utility lacked the core skills to rapidly identify and engage with communities suffering from lead poisoning.

To fill these gaps, the city worked with [water analytics firm BlueConduit](#) to compile possible sources of neighborhood-level data including historical, social, environmental, and economic data dating back to 1897. Homes for which data is sparse are rarely prioritized for lead pipe removal (you can't manage what you can't measure, after all). City archives included many records about service line materials, but officials expressed skepticism about the records' accuracy. As part of their collaboration, BlueConduit proposed a list of homes for the city of Toledo to inspect, to verify the accuracy of historical records and reduce potential biases in the city's data. BlueConduit's analysis showed wide discrepancies from historical records.

Next, Toledo turned to [Freshwater Future](#), an environmental organization that works with local communities to tackle ecological issues in the waterways of the Great Lakes region. Toledo tapped the group to gather input through ongoing consultations with residents, and to lead community-based educational efforts, informing residents of possible actions to reduce their exposure to lead. "There's more to it than getting pipes out of the ground. There's a communication component. There's a lot of public health work here," said BlueConduit Managing Director Ian Robinson.

Including academic and private sector partnerships and Letters of Support in its grant application helped Toledo secure a \$200,000 EPA Environmental Justice grant. Freshwater Future is using \$50,000 of this for education and outreach; \$30,000 is earmarked for supplies, including water filters that residents will use after replacement.

Finally, Toledo secured a \$2 million grant from the Ohio Water Development Authority to fund replacement of lead service lines on the homeowner's side. Low-income residents often have no means to pay for replacement, though they might be at greater risk.

As part of the grant, in a collaborative and consultative manner, Freshwater Future worked with six affected communities who had both a high likelihood of lead pipes and a history of active engagement in water quality issues. Later, BlueConduit created an interactive public-facing map for Toledo for local communities to understand the gravity of the problem, so that they could take steps to reduce their risk. The map is periodically refreshed based on data from the utility's field work, and on feedback from the community.

Toledo has completed its targeted data gathering and begun replacements—and should get more for its spend based on more accurate counts before excavation. The city is budgeting roughly \$200 million for lead line replacement by 2029—if 5,000 of these lines are replaced per year.

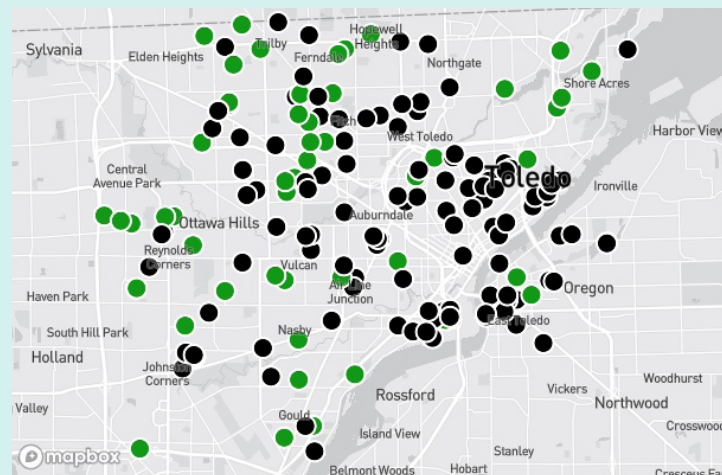
Toledo officials hope that building partnerships with diverse stakeholders, particularly community groups, will persuade decision-makers to allot more funding for lead pipe replacement.

«Showing continued support of neighborhood communities in the environmental justice area helped the city of Toledo get the grant. It showed several partnerships and engagement with other stakeholders through [environmental organization] Freshwater Future.»



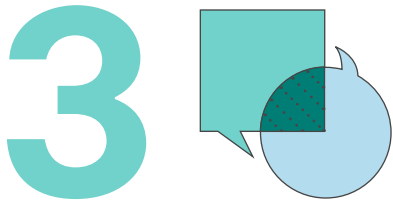
Beatrice Miringu
Sustainability Coordinator,
City of Toledo

Richer data leads to more accurate predictions



INSPECTIONS ● RECORDS MATCH ● RECORDS DO NOT MATCH

Comparing historical records to the results of new physical inspections helped Toledo understand patterns in discrepancies, for more accurate future predictions.



Outreach: Connect with affected communities through trusted leaders, channels, and organizations to alert them to the risks of lead in water, and to flag pipe replacement opportunities

The manner in which citizens are contacted is a critical lever for success. “An anti-science atmosphere can undermine our ability to convey to people that there are certain things that are not based upon philosophy or opinion, such as the threat posed by lead to human health. Science and data suggest this is a serious problem. Even with physicians talking about threats to children’s health, for example, people upon occasion have difficulty accepting that information. How do we combat this skepticism to implement sound public health measures? How do you reach people and get them to understand the danger of lead in their water pipes?” asked Dave Kohn, Deputy Commissioner of Regional Partnerships at the City of Chicago Department of Water Management.

It is not easy. But, by addressing privacy and financing concerns, highlighting job opportunities, and articulating positive health outcomes in multilingual meetings led by local leaders, residents will be more inclined to engage in lead abatement efforts.

Channels might include community forums, online messaging, webforms, Q&As, and op-eds in community papers. Pilot projects that demonstrate the ease of working with a city on lead pipe replacement will also help spread the word, accelerate the work, and generate goodwill.

«Concerns we’ve heard include, ‘Will water department staff or inspectors be looking for people who may be undocumented, will they issue fines for any code violations they may observe in the home?’ We have assured them that our **ONLY** interest is to identify lead service lines and replace them—there is no hidden agenda.»



Dave Kohn

Deputy Commissioner, Regional Partnerships at City of Chicago Department of Water Management

CASE STUDY

City of Chicago: Garner goodwill and spread the word with a lead-pipe replacement pilot project

Chicago has more lead service lines than any other city in the United States—nearly 400,000 at last count. In fact, until 1986 the city *required* lead service line installation.

To start its replacement work, which Chicago will conduct over 50 years at a projected cost of \$6 to \$10 billion, the city selected a specific block on its Southwest side to engage communities and to troubleshoot replacement issues before scaling up efforts. It chose a block with a diversity of situations, ranging from residences built right up to the property line, to others further set back from the street, to multi-unit residences.

“The block had an array of engineering challenges. We said, ‘We’re offering to replace lead service lines on this block completely free, at no cost to homeowners,’” recalled Dave Kohn at the City of Chicago, noting the involvement of the Chicago Health Department in community meetings as a trusted source of information.

Replacements will be done free of charge for homeowners with incomes 80% below the regional median average. These initiatives are funded by some \$15 million in the city’s Equity Replacement Program’s Community Development Block Grant. Additionally, legislation introduced in Springfield would authorize adding a small fee to most water bills statewide, which could generate an estimated \$200 million a year to speed up service line replacements.

“One of our objectives is to generate word of mouth and good buzz among the community, to say ‘The city came out here. They replaced the main service line and our lead service line. They were great to work with. It didn’t cost me anything, and we were given plenty of notice,’” observed Kohn.

The department has also dispelled concerns that could cause households to resist replacement of lead service lines. One frequently heard objection is that the installation of new service lines, which requires the installation of a water meter if the residence did not already have one, will result in higher water bill amounts. In fact, it is often the case that installation of meters typically lowers water bills as homeowners pay only for actual water usage instead of estimated charges.

“We’re using this as an opportunity to get community leaders and people at the grassroots level beginning to talk to their neighbors about the value of lead service pipe replacement and how easy it is to work with the city,” Kohn said.



Funds: Consider non-traditional financing vehicles and partners

Framing the need for lead pipe replacement around environmental justice and health equity concerns will encourage city officials to seek a range of funds for lead pipe removal work. The two key vehicles that cities have pursued are State Revolving Loan Funds and WIIN grants. Key to securing such funds is spelling out how any planned inventory or replacement work will meet EPA's strategic goals.

"Conditioning federal funding on full lead pipe replacement is a great idea. Any organization that receives EPA funding, even loans, for any purpose cannot discriminate based on race, ethnicity or national origin. That is a requirement of Title VI of the Civil Rights Act of 1964," noted Tom Neltner, Chemicals Policy Director at the Environmental Defense Fund.

With health inequity squarely on states' radar screens, there are also a number of low-interest loans, including some \$2 billion annually since 2017 in federally provided State Revolving Loan Funds (SRF) linked to the Safe Drinking Water and the Clean Water Acts. However, utilities and cities are not taking advantage of grants and low-interest loans, perhaps because they are unaware.

A study by EPIC ([the Environmental Policy Innovation Center](#)) found that only 7% of eligible drinking water systems received assistance from SRFs in the past decade. Moreover, less than 20% of state SRF assistance to municipalities has been through grants in the past decade—the rest was largely through loans, and even no- to low-interest loans require payback. Cash-strapped cities in the Covid-19 era may be unable to repay.

Reaching out to local foundations, social entrepreneurs, wealthy individuals, community banks, hospitals, and local businesses can help grow the universe of grants and loans. Other options include bonds, financial challenges, and prizes to raise funds. Among states that have created funds to finance lead abatement projects are Michigan, New Jersey, New York, and Wisconsin. Water Bills were the preferred financing route for Indiana and Pennsylvania.

«More needs to be done to ensure the State Revolving Funds money goes to the communities who need it most, who may not have the capacity to take on more debt. This is especially important because it appears that allocations of State Revolving Funds for lead service line replacement (and other water infrastructure) will increase, based on legislation now moving through Congress.»



Rebecca Morley

Consultant for the Robert Wood Johnson Foundation

Federal funding for lead service line replacement

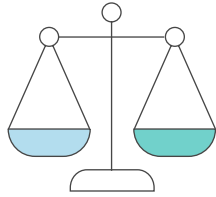
WIIN Grants: In 2020, EPA announced nearly \$40 million in grants under the Water Infrastructure Improvements for the Nation (WIIN) Act. According to EPA, the 2016 WIIN Act “addresses, supports, and improves America’s drinking water infrastructure. Included in the WIIN Act are three drinking water grants that promote public health and the protection of the environment. Since 2018, EPA has made available more than \$69 million to support the Lead Testing in School and Child Care Program Drinking Water grant program and \$42.8 million to assist public water systems in underserved, small and disadvantaged communities meet Safe Drinking Water Act requirements.”

EPIC’s Water Data Prize: Lead-free water edition

In 2020, the Environmental Policy Innovation Center (EPIC) created the Water Data Prize competition, awarding \$20,000 in prizes to startups, students, and researchers whose creative visualizations of drinking water contamination could help inform millions of consumers. In September 2021, EPIC launched a second Water Data Prize with \$15,000 in prize money to better communicate the risk of toxic lead pipes.

The goals are to spur the development of innovative ideas and best practices in visual and effective communications and for water utilities to meet new state and federal regulations on toxic lead water pipes while communicating the current lead-tainted water risk to customers. Ultimately, EPIC seeks ideas that help consumers either confirm that tap water is safe to drink or avoid contaminated water, and that help facilitate and speed utilities’ efforts to remove all lead water pipes, equitably and efficiently.

5



Campaign: Launch a movement to raise awareness of and gain widespread support for lead pipe replacement policies, funds, and projects

Engaging local champions in tying partial pipe replacements to a greater risk of lead poisoning and to front page topics such as inequitable health outcomes during the pandemic—and a fall in tap water tests and lead blood level checks over that time—will help foment widespread support for this work. Enumerating the large educational and economic returns from lead pipe removal will help expand such support among community advocates.

“It’s critical to have local voices at the table in federal policy decision making to make sure that resident priorities are represented,” noted consultant Rebecca Morley.

A respected leader delivering the message can help as well. In May 2021, for example, EPA head administrator Michael Regan [spoke at an event](#) at Chicago’s Jardine Water Treatment Plant to underscore the importance of replacing lead lines.

As for legislation, by staying abreast of regulatory changes and requirements and linking planned work to prior high-profile laws like the Clean Water Act, lawmakers are more likely to heed municipal demands. “While we can’t always come to consensus, we can provide information to EPA on implementation barriers, challenges, and opportunities,” said Wendi Wilkes, Manager of Regulatory and Legislative Affairs at the Association of State Water Drinking Administrators, a trade body. Calling out major challenges will prompt cities and utilities to take action and oblige leaders to find financing for and prioritize lead abatement projects.

Possible actions and policies include pro-bono lawyers litigating to end partial pipe replacement; mandatory disclosure notification of and home inspection for lead pipes before rent or sale; and statewide lead pipe removal by a certain date, on environmental justice grounds.

«The role of local citizens to keep an eye on and put pressure on government for action has been critical.»



Erik Olson

Senior Strategic Director, Healthy People & Thriving Communities Program, Natural Resources Defense Council

Partial line replacement or cost sharing: Ending practices that hurt low-income communities

Cities are realizing that forcing families to choose between the risk of greater exposure to lead and paying to replace a lead service line ultimately results in poorer health outcomes. That is what research by the Environmental Defense Fund and American University in Washington, D.C., showed: that requiring homeowners to pay for lead line replacements resulted in higher than expected rates of partial line replacement in low-income neighborhoods.

“Because of historic redlining and segregation these tend to be African-American communities. We see both racial and economic discrimination. If you don’t pay up, you are at increased risk of lead exposure that threatens your heart and your kids’ brains. That’s a big deal,” said Tom Neltner of The Environmental Defense Fund. In Washington D.C.’s prior loan program, “there was a real stratification based on income and race,” he added.

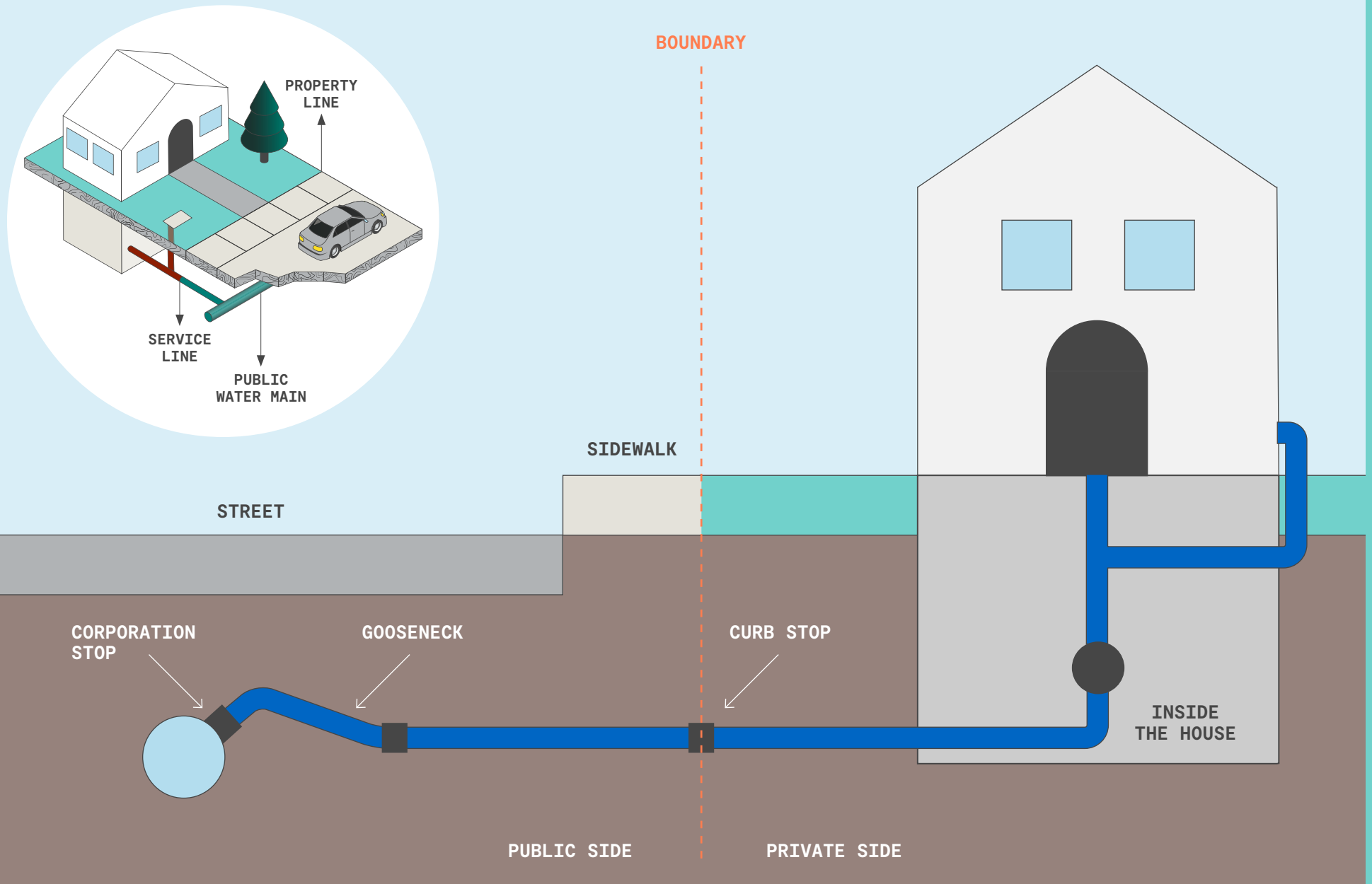
Now the city pays up to 100% of the replacement cost of lead pipes where partial replacement previously occurred, and will replace the private side of a lead service line when it does the public side, free of charge. [Washington D.C.](#) has also created an interactive map for residents to learn of the makeup of pipes around their home, and has mandated disclosure of lead pipes if found prior to sale or rent, punishable by fees, fines, or penalties. Cities including [Cincinnati](#) and Philadelphia, as well as states such as New York and Pennsylvania, also require disclosure in some form, though in some states implementation has been patchy.

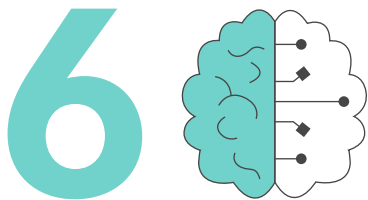
Similarly, when Cincinnati provided long-term, low interest loans, just 60% of the population participated because even low-cost loans are out of reach for many low-income households. Such methods, though well-intentioned, have an environmental justice and civil rights component.



Partial pipe replacements can worsen lead risks

Fully replacing lead service lines across private and public property is critical to avoid lead exposure from remaining lead pipes.





Think creatively about key challenges

Challenges might include distrust of government and science by residents, difficulty securing approval to replace lead lines on the home side, resistance from private utilities, and prohibitively costly work. Pilot projects can surface solutions for obstacles; trusted messengers offering valued services like water testing or filters can pave the way to private home access for pipe removal work.

For example, Ferndale, Michigan created a simple webform for residents to fill out to help determine if they have lead exposure, linked to a National Public Radio [‘How do you know if you have a lead service line?’](#) webpage, with step-by-step instructions, pictures, diagrams, and explanations for magnet and scratch tests. After testing, if households remained unsure of results, the webform allowed for the uploading of a photo, which the city subsequently verified, to identify the material on both sides of the service line, followed by a home visit if needed.

To speed replacement, minimize costs, and ensure a fairer share of pipe replacement, new work models also make a big difference. These might include using boring machines

rather than conducting full excavations as Lansing, Michigan did, cutting the per-pipe replacement cost by nearly two-thirds, or replacing lead pipes found while resurfacing roads, which Ferndale did. Or replacement during broken or leaky pipe repair or by plumbers during work on water mains which can halve the tear out, test, and dig up costs—as Detroit and Denver do and as Chicago is slated to do soon.

“We’ve begun to look at lead service line replacement at the same time we’re replacing water mains,” noted Dave Kohn of the City of Chicago. The city has obtained a significant grant from EPA for a pilot program for co-terminus water main and lead service line replacement.

«Fewer smaller municipalities are replacing lead service lines because they tend to be strapped for time, resources, and human capacities to deal with all of the challenges they are facing at the municipal level. EPIC is hoping to help these small municipalities identify and develop a plan for removing lead service lines. Funding is obviously a big piece to make this happen.»



Maureen Cunningham
Deputy Director of Water,
Environmental Policy Innovation
Center (EPIC)

CASE STUDY

City of Ferndale: Home access agreements and warranties for one year

Michigan's water systems are required to replace any portion of a line that contains lead from the water main to the water meter. However, the state's charter forbids spending public dollars on private services.

To gain access and make possible state-funded replacement of lead service lines, the city of Ferndale established an access agreement with homeowners that grants easement up to the curb side of the water meter for home-side replacements. The city takes on a warranty for the service line for the first year from the date of construction. This allows the city to use public dollars for private replacements.



Conclusion

As the world sets its sights on correcting disparities exposed over the Covid-19 pandemic, we have an unprecedented opportunity to end a deeply rooted health and environmental injustice.

Through a strategic combination of **data collection** and **analysis**, **multi-sectoral partnerships**, **targeted outreach**, diverse and more readily available **funds**, and **creativity** in finding these sources and tackling obstacles, we can create a world where a basic human right—lead-free tap water—flows to all.

There is much to be gained. Lead exposure erodes America's human capital, especially among those who already face economic or social hardship. Yes, removing lead from our infrastructure requires a large investment. But given the large social returns, the cleanup should start now.

In this endeavor, data science is a great aid to guide abatement programs. The novel use of machine learning to identify the likely location of lead pipes can materially speed up replacement efforts—fortifying the argument that local governments should prioritize resources for this work. Balancing technical advances with community needs will help ensure that data science innovations are used at scale. It's time to harness new data-driven approaches to secure clean, safe drinking water for all Americans.

References



Acknowledgments

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Glossary

A

Abatement: Practices and measures to eliminate exposure to hazards.

Action Level: The lead toxicity level established by EPA for drinking water. Requires that water systems optimize corrosion control treatments in their systems and that they provide community education programs and/or replace lead service lines. The action level defined for lead is 15 parts per billion in more than 10% of customer taps sampled. An action level is the level for enforcement.

B

BLL: Blood Lead Levels as measured by micrograms of lead per deciliter of blood (µg/dL).

Blood Lead Reference Value (BLRV): Blood lead levels that are above 5 micrograms per deciliter (µg/dL) according to the Centers for Disease Control and Prevention, to identify lead poisoning cases. Today's BLRV is the 97.5th percentile of blood lead levels from the sample population surveyed in the National Health and Nutrition Examination.

C

Corrosion control: Treatment to minimize lead dissolution in drinking water.

Cost sharing: A homeowner paying all or part of the cost of lead pipe removal.

E

EPA: Environmental Protection Agency.

L

LCR: Lead and Copper Rule. Regulation introduced in 1991 which establishes the reporting, action level, violations, and other policies regarding copper and lead abatement and control of these metal levels in tap water.

Lead exposure: Ongoing exposure to lead, leading to its absorption and accumulation in the body.

Lead poisoning: Lead builds up in the body, often over months or years. Even small amounts of lead can cause serious health problems. Children younger than six years old are especially vulnerable to lead poisoning, which can severely affect mental and physical development. At very high levels, lead poisoning can be fatal.

LSL: Lead Service Line, connecting the home to the water main.

LSLR: Lead Service Line Replacement.

N

NHANES: National Health and Nutrition Examination Survey. This annual survey conducted by the CDC has collected blood lead level data from a representative sample of the U.S. population since 1976.

P

Parts per billion: The concentration of chemicals present in water denoted as 1 ppb = 1 µg/L. One drop in one billion drops of water is about one drop of water in a swimming pool.

Private lead service line: The part of the lead service line that runs from the curb stop to the house. Water systems may differ in their definition of private lead service lines, often impacting replacement liability.

Public lead service line: The section of a pipe running from the water main to the curb stop.

W

Water main: The main underground pipe delivering water from the local water distribution system to the community.

Resources

Sharing lessons and best practices with peer networks can help speed the implementation of lead pipe replacement, particularly learnings that have helped solve unique challenges that cities of different sizes face. Here is a list of resources referenced in this report and cited by participants at the July 2021 convening:

I. Data and Innovation

Databases

- Census Bureau, for [demographic data](#) in its [American Community Survey](#)
- [Environmental Justice Screening and Mapping Tool](#)
- Health departments: zip code-level information on [childhood lead in blood levels](#)

Reports and webinars

- [Developing Lead Service Line Inventories](#) (8/2019)
- [Principles of Data Science for Lead Service Line Inventories and Replacement Programs](#) (9/2020)
- [Recordings](#) for “State Perspectives on the LCRR” and “The Michigan Experience: 5th Liter Sampling and Lead Service Lines”

II. Partnerships and Networks

- [American Water Works Association \(AWWA\)](#): An international nonprofit, scientific, and educational association founded to improve water quality and supply.
- [Environmental Policy Innovation Center \(EPIC\)](#): A nonprofit organization building and advocating for policies to improve the speed and scale of conservation, including of water resources. Awards the Water Data Prize, among other initiatives.
- [Lead-free NJ](#): Spells out policy options for removing lead from walls, soil, and water. Has tackled policies related to cost sharing and on how to accelerate lead service line inventories.
- [Lead Service Line Collaborative](#): A coalition set up by a group of organizations working on environmental justice issues to accelerate voluntary lead pipe replacement. Has identified innovations in 200 cities at state and local levels, with half of these cities committed to fully eliminating lead service lines. Disseminates information about tools and technical support to cities.
- [Water Equity Network](#): A coalition created in 2020 by the US Water Alliance. Brings together 25 U.S. cities for peer-to-peer learning exchanges and to share best practices to improve water equity. Holds weekly meetings.

III. Advocacy/Legislation

- [Association of Drinking Water Administrators](#): A group focused on regulatory frameworks whose members are 57 state and territorial groups implementing the Safe Drinking Water Act. The group provides regulatory updates, monitors and responds to requests for comments from EPA on lead and copper updates, and offers white papers and webinars covering lead inventory requirements, machine learning and data implementation, and upcoming Lead and Copper Rule revisions.
- [AWWA/ANSI C810](#): Guidance on how to fully replace lead pipes.
- [Natural Resources Defense Council](#): Tracks federal policy developments and the status of funding bills and authorization bills. Lobbies for just federal and state water policies.
- [US Water Alliance](#): Brings together community and industry perspectives for key federal water bills including permanent EPA funding for water affordability. Convening state policy makers for a briefing and peer exchange in Fall 2021.
- [Little Village Environmental Justice Organization](#): A Chicago-based organization that advocates for action on the undue burden of lead in water on Black and Latino communities.

IV. Community Engagement

- Crowd the Tap: An online site with a tutorial to identify the likely makeup of pipes, funded by EPA.

V. Campaigns

- Altarum's Value of Lead Prevention: The group's analysis of the cost of lead exposure pegged the total economic loss for one birth cohort (per year) at \$4 million or \$85 million over this age group's lifetime. Conversely, it calculated returns at \$1.33 for every \$1 invested in lead pipe replacement due to far lower medical, welfare, and special education costs.
- EPA Science Advisory Board: Addresses concerns about partially replaced lead service lines. The Board's research shows that lead levels increase due to partial line replacement.
- Equity Implications of Lead Related Policies: A report from Health Impact Project, The Pew Charitable Trusts, and Robert Wood Johnson Foundation. Among the 10 recommendations cited are reducing lead-based services and appointing trained Water System Managers at utilities to implement EPA-endorsed health-based action.
- Jersey Water Works: A collaborative created by New Jersey Future to permanently solve the lead in drinking water problem in New Jersey.

- Lead-Safe Cleveland: A multi-sectoral coalition of 450 organizations working together to find, fund, and replace lead service lines in Cleveland through the city's Lead Safe Home Fund.

VI. Funding

- EPIC's Water Data Prize (Fall 2021) and application form

VII. Meetings

- Monthly calls at the Environmental Policy Innovation Center (EPIC)
- Aspen Institute Water Roundtable (November 9-10, 2021)

Grant Template

This template serves as a guide for commonly-requested and highly valued information needed for structuring lead abatement grant applications. The guide is organized into key categories often requested in federal grants and state loans to qualify for water funding, including community data, partnership information, past project reports, and financing.

● Community Data

Community data is relevant data that describes the area where the city intends to work and the demographic characteristics of the beneficiaries of the project.

Project Abstract

- History of water infrastructure [in your city]
- Evidence of lead service lines
 - Efforts to locate and inventory lead pipes, with partners [list: city agencies, local organizations]
 - Briefly describe method or approach to creating inventory
- Any Action Level Exceedance (ALE) in previous years?
- Previous efforts/programs to replace lead service lines
- Plans to replace lead service lines
 - Estimated number of lines that will be replaced

- Note if on the residential side, and identify the material in new pipes
- Impact of replacement
 - On health of [number] disadvantaged community residents
 - On state of infrastructure
 - On quality of drinking water
 - On creation of new jobs
- High level summary of socio-economic information (e.g., poverty, SNAP recipients) about the community
- Ongoing stakeholder education and consultation integrated into project to minimize lead exposure
- Other outputs:
 - Research studies
 - Inventory database: creation, update plan, and ease of public access
- Outcomes / success metrics:
 - Reduced health risks
 - Infrastructure improvements

Environmental Justice and Public Health Issues

How do lead pipes affect disadvantaged communities?

- Insert map of likely target area – as granular as possible
 - Zip codes and/or census tracts are ideal
- Demographics checklist with census figures from American Census Survey

- Number of census tracts the city plans to serve; include tables and maps of the following information, if available:
 - Demographic breakdown (list percentage by ethnicity / race)
 - Median household income
 - Percentage of the population under 5 years old
 - Percentage at poverty level (as defined by the Federal government/Census Bureau)
 - Percentage of SNAP / free school lunch recipients
 - Other demographic comparisons versus neighboring counties
 - Concentration / clusters of impoverished zones referencing any available studies
 - Current / expected socio-economic trends exacerbating vulnerability
 - Whether Covid-19 has worsened lead exposure
- Why is this data relevant, based on local laws?
- Suggest inclusion of a map of (or data on) renters versus owners in targeted areas
- The incentive for homeowners to replace pipes in dwellings that are not owner-occupied is far lower and unlikely to occur unless mandated by law; renters by contrast are unlikely to have funds to finance replacement—if they do, such work—even if city-financed—requires owners' consent

- Use EPA Environmental Justice screening tool to create maps of targeted areas
- Project goal: supporting environmental justice efforts targeting households that are more likely to have lead

Relevant Statistics

- Estimated number of lead service lines
 - How did the utility arrive at that estimate of LSLs?
 - Describe inventory method
- Status of lead service replacement program
- Number of lines replaced thus far
 - Degree of accuracy of prior replacement methods
 - Reasons for inefficiency: outdated, incomplete records
- What remains to be replaced
- Unknown service leads (when material in pipes is unknown)
 - Plan for addressing unknowns?
- Cost of replacement per line and/or total cost
- Breakdown of the cost between private and public resources
- Portion of pipes on private / city side in sample found to have lead
- Methods used for replacement
- Planned educational programs, if any
- Database findings (if available) for lead pipe inventory purposes

Historical or Contextual Data

- Historical context of city's development
 - Has the city experienced any economic decline?
 - Population exodus (provide numbers from census) and urban blight
 - Sources of inequality or other factors that would explain why lead services lines exist and have persisted
- Provide relevant statistics:
 - Unemployment figures
 - Percentage of population living at or below the federal poverty level
 - Abandoned properties needing service line replacement
 - Retail activity trends; impact on tax base / deficits
 - History of distress / receivership (if any)
 - Impact on municipal workforce, budget, services provided
 - State of city today
 - Percentage of rental homes
 - Median income
 - Average home values
 - Cost burden to replace lead pipes

Partnership Information

Identify key partnerships needed for the successful execution of the project. These are partners that provide complementary skills to the project, such as community outreach, or research and data support from local academic groups.

Recent Efforts Supporting Underserved Communities

- Note previous efforts to serve vulnerable communities and reduce lead exposure, with brief detail of programs and organizations involved, noting goals met through prior programs
 - *Example:* The [city of] has implemented measures and programs in recent years to reduce lead exposure and remove lead hazards including [fill in, noting programs and partners].
- Include relevant ordinances or laws
 - *Example:* In [year], [city] passed a mandate requiring [agency] to do [action] to reduce lead exposure

Project Linkages and Partnerships

- Connect planned lead identification work to other EPA Strategic Plans and Goals or Revolving Fund priorities
 - *Example:* Safe Drinking Water Act or the Clean Water Act
- Name partners and legal entities of the organizations
 - *Example:* The [city of] plans to engage [name of the organization] in their [non-profit/funder/supporter/academic] capacity.
- What will they do?

- Describe the activities that will be carried out by the organization
- Elaborate how the partner organization complements the activities by the city to perform lead abatement
- What are their contacts, backgrounds, and prior successes?
- Why are their skills and/or connections relevant for this project?
 - *Example:* Collaboration is important in order to decrease lead exposure. The city of [city] will [describe planned work]. We hope to involve [organization] for [action].
- Plans for future studies to monitor presence of lead in water, including plans to engage any external organization(s)
- Community outreach and engagement (past and planned)
- Availability of information on the lead issue for the general public
 - On the web (provide links to relevant websites and webpages)
 - Advisories
 - Planned outreach work?
 - Q&As
 - Community engagement plans
 - Newspaper op-eds
 - Community forums
 - Mailers to customers with suggested steps to reduce exposure to lead in drinking water
 - Contacts for testing lead levels in children

- Information on how to get filters and replacement
- Press releases
- Water quality results in reports
- Initiatives and involvement of other organizations (e.g., the Health Department, with relevant links)
- Plan for notifying customers of the replacement of any publicly-owned portion of the lead service line

● **Fiscal Considerations**

Information related to sources of funding, estimated budget, agencies involved in managing the funds, and whether there are additional funds to ensure the completion of the project.

- Note if the city meets disadvantaged affordability criteria for the state's Drinking Water State Revolving Fund Program or equivalent
- Note need for funding assistance for safe drinking water supply based on
 - Average water rates
 - Average cost to replace lead service lines
- Prior lead abatement grant award provider(s), amount(s), and work undertaken (e.g., identification, inventory update, replacement)
 - List relevant outcomes
- Work to date on state of infrastructure/ replacing lead service lines; noting

- preponderance of these on the city versus private (home to sidewalk) side
- Challenges and findings from replacement (e.g., leakage, broken pipes)
- State of city's budget and ability to fund future lead abatement needs
- Plans for lead pipe replacement, testing, and communication (including frequency, criteria) to achieve expected outcomes
- Material that will be used, including for parts (e.g., valves); impact on contamination and reliability levels
- Testing of pipes, water samples, and blood levels in children—method, timing, frequency—for timely decisions
- Outreach to—and filters and cartridges for—residents
- Opportunity Zone
 - Insert map with Opportunity Zones and overlaps with planned work
- Demonstration that the applicant has considered corrosion control as an option for reducing the concentration of lead in drinking water
- Prior and planned monitoring, testing, and treatment of lead-tainted water, with current results and expected outcomes from future studies
- Planned notification of need for customer approval of replacement of lead service line on home side of the line, plus information about contractors' insurance to cover loss or damage to homeowner, and legal agreements to be obtained

- Plan for ensuring customers are provided filters certified to remove lead, in accordance with applicable standards established by the American National Standards Institute, along with no less than three months of replacement cartridges, and notifying each customer of premise flushing instructions within 24 hours of the conclusion of each lead service replacement

● **Project Management**

Include persuasive narratives of past projects the city has completed to prove they can successfully carry out complex projects, in addition to information on past grants received to perform upgrades of the water system.

Project Planning

- Outreach and scheduling of work
- Planned phases of the replacement work
- Public meetings and dialogues with representatives of the community
- Resources needed for collaboration, including examples of approvals to work on property
- Estimated number of lines replaced per day/year
- Likely time to completion
- Probability of finding lead lines based on records and history
- Partners who will help identify lead lines, if contracting with engineering or external teams
- Number of contractors needed
- Criteria for contracts and procurement, bids, and approvals in an inclusive, equitable process

- Estimated total cost of replacement
- Zones targeted for replacement
- Whether subsidies are available for residents for private replacement
- Step-by-step replacement process from sidewalk
- Estimated digging time and disruption
- Monitoring and success assessments
- Oversight of notification and bidding process, and of contractors
- Reporting process: who will oversee outreach and send progress reports?
- Other planned linked work (e.g., sanitation, sewers); describe the what, where, when, how, and why, plus expected benefits (e.g., safe drinking water)
- Cost effectiveness of digging just once
- Ongoing testing

● **Results and Measuring Progress**

- How this work will help meet EPA environmental, health and economic goals, including results and outputs:
 - Fall in lead levels metrics (water testing and Blood Lead Levels)
 - Number of lead service lines over time
 - Ongoing monitoring and corrosion treatments
 - Regularly informing residents of tainted water issues
 - Creation of a database for more accurate and complete information about the city's water infrastructure

- Projected environmental improvements / outcomes
 - Better health, especially in children
 - Avoided damages to water supply
 - Lower health costs
 - Less exposure to lead over time
 - Meeting compliance rules by replacing [number of] services lines by [date]

● **Covid-19 Data**

- Provide information showing how the pandemic disproportionately impacted already vulnerable communities, referencing, for example, unemployment and/or tax revenue trends (optional)
 - For example, provide a chart showing how the COVID pandemic has amplified well-known disparities in [city/county/zones]
 - Provide a table of Covid-19 statistics for [city/county/zones]

