CITY OF CHICAGO

Lead Service Line Replacement Plan

Executive Summary

April 2021

CDM Smith

Introduction

This lead service line replacement (LSLR) plan is designed to proactively position the City of Chicago (the City) to align with the evolving industry best practices and be in compliance with regulatory changes.

Low levels of lead exposure can impact IQ and attention spans in children. However, efforts to remove lead from children's environments have had an impact. Figure I.1 below shows that children's blood lead levels have decreased over time as additional lead regulations have reduced or removed lead from gasoline, paint, and water. While lead in water has been reduced through effective corrosion control treatment, the next step in continuing to reduce lead exposure levels should include replacing lead service lines (LSLs).

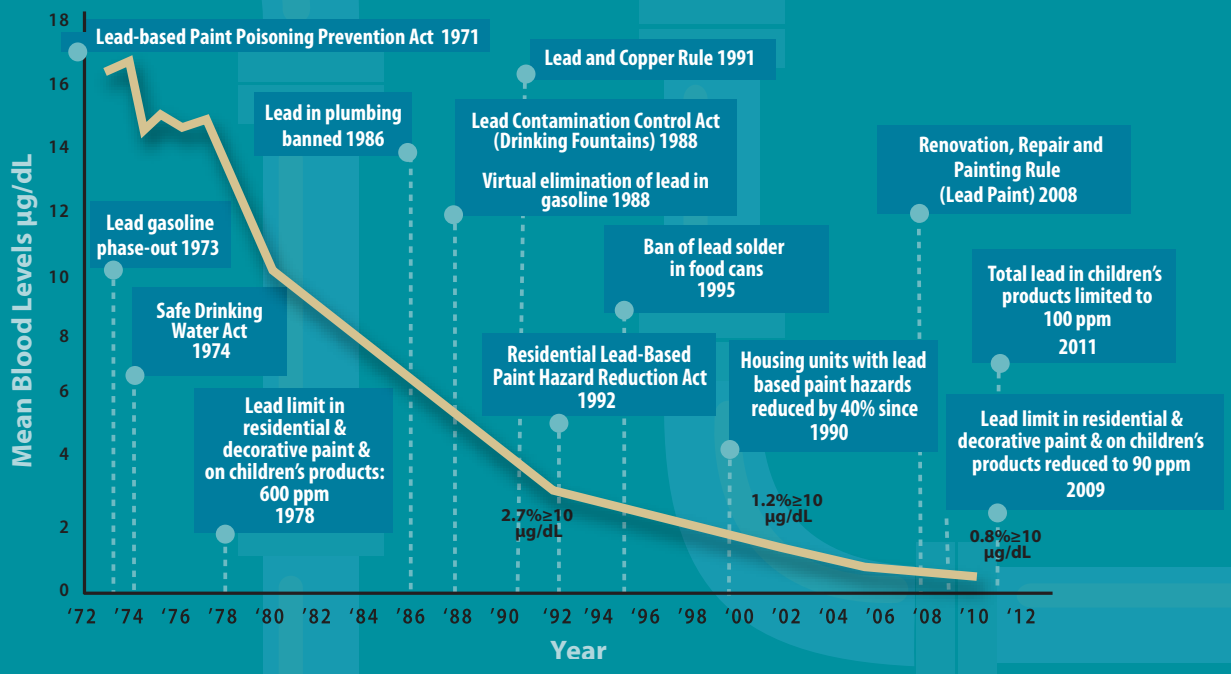


Figure I.1: Mean blood lead levels in children over time (Source: EPA)

Revisions to the federal Lead and Copper Rule (LCR) were published January 15, 2021 and require LSLR when a utility tests above 10 parts per billion (ppb) in the fifth liter water sample. Pending Illinois State and House bills would also require plans for LSLR. The City must prepare now to establish procedures and funding to meet the new regulatory requirements.

This plan details the first two phases of the full proposed program. Phase I focuses on replacing LSLs without taking on debt. It uses grant funding and loan principal forgiveness to begin full LSLR for low-income households with a particular focus on investing in disadvantaged areas. For people interested in replacing their own LSLs, the City will subsidize permit fees. Phase II focuses on full LSLR and adapting to the evolving regulatory environment. Phase II will build on the experience from Phase I to expand the program to replace the full LSLs when water mains are replaced and when water service lines leak or break.

The long-term goal is to remove all LSLs. This will be a multi-decade project and is estimated to cost six to ten billion dollars. As the City develops this ambitious program, the City will remain focused on creating an inclusive LSLR plan that benefits residents in all communities.

This executive summary includes the following sections:

ES.1 Lead Service Lines Background
Sources of lead and the regulatory environment

ES.2 LSLR Case Studies
Typical practices in other communities

ES.3 Proposed LSLR Plan
Summary of the proposed LSLR plan, including the size, funding, and target locations for Phase I and Phase II LSLR

ES.4 Encouraging Homeowner Participation
Options for logistical and financial support to encourage homeowners to replace the private side of the LSL

ES.5 Funding Opportunities and Financial Impact
Program costs and grant and loan financing options

ES.6 LSLR Technologies
Construction options for replacing LSLs

ES.7 Summary and Recommendations
Summarizes the LSLR phases, costs, and goals

Abbreviations:

AL: Action level (for federal lead limit)

CDBG: Community Development Block Grant

City: City of Chicago

DWM: Department of Water Management

EPA: Environmental Protection Agency

IDPH: Illinois Department of Public Health

LCR: Lead and Copper Rule (federal)

LSL: Lead service line

LSLR: Lead service line replacement

PLSLR: Partial lead service line replacement

ppb: parts per billion (units of lead)

SRF: State Revolving Fund (state loan program)

WIFIA: Water Infrastructure Finance and Innovation Act (federal loan program)

ES.1 Lead Service Lines Background

Sources of Lead Exposure

The Centers for Disease Control and Prevention (CDC) advises that "Lead-based paint and lead-contaminated dust are the most widespread and hazardous sources of lead exposure for young children in the United States."[1] However, lead can also leach into drinking water from the water service line between the house and the water main and from property's internal plumbing (leaded brass fixtures or leaded solder). With no identified safe level of lead exposure, the CDC recommends controlling all lead exposure sources for children.

In Chicago, lead in the drinking water is of highest concern in homes built prior to 1986. The Chicago Plumbing Code required LSLs until the EPA banned them nationwide in 1986. After 1986, pipes and fittings also had to have a lead content below 8%[2], and solder had to have a lead content below 0.2%. In older properties, lead can enter the water both from the LSL and/or from leaded fixtures. Because of the additional lead sources in the interior plumbing, removing the LSL may lower the lead concentration without completely eliminating it.

Regulatory Lead Limits

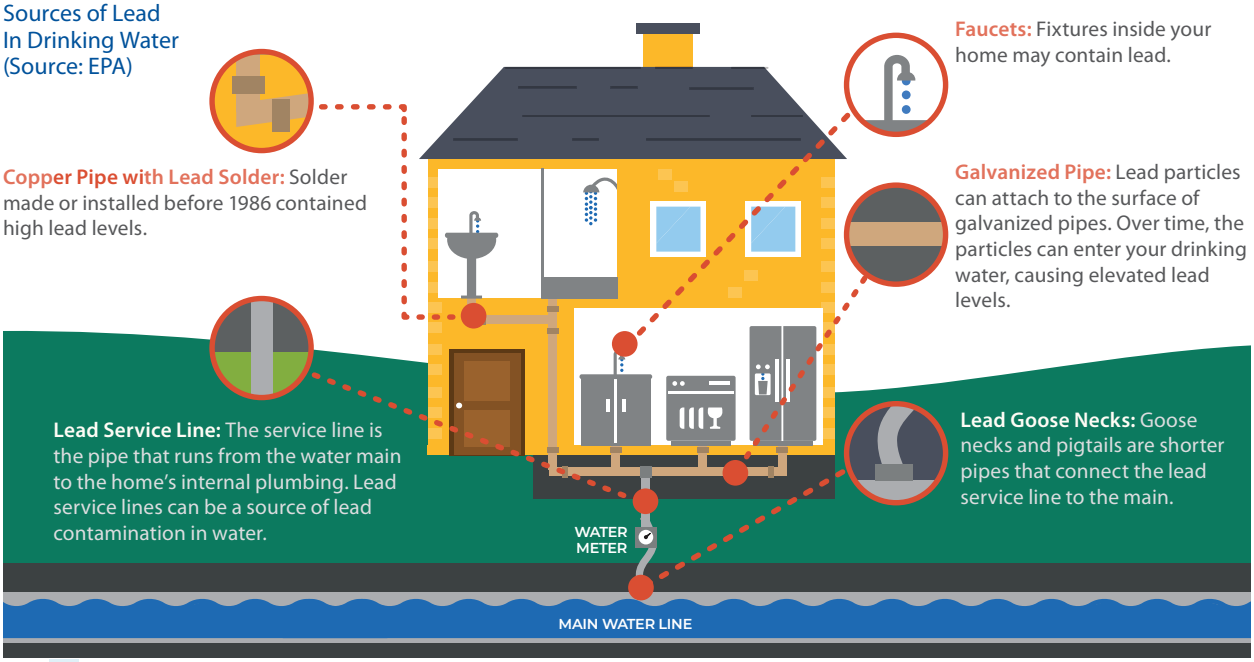
The federal Environmental Protection Agency (EPA) Lead and Copper Rule (LCR) requires drinking water utilities to monitor lead concentrations in first draw samples (the first liter of water after a minimum of 6 hour stagnation period). A minimum of 90% of samples must be below the action level of 15 ppb (parts per billion) for a system to be in compliance. When the action level is exceeded, a utility must re-evaluate their corrosion control treatment technique and may be required to replace their lead service lines.

The revised LCR was promulgated January 15, 2021 with a compliance date of September 16, 2024. It requires all large utilities to create LSLR plans, and utilities must begin LSLR if 90% of samples are not below 10 ppb in the fifth liter water sample. The fifth liter sample was selected to draw the sample from the LSL and is expected to be higher than the first liter for utilities with LSLs. Utilities will need to offer to replace the private

1 Source: https://www.cdc.gov/nceh/lead/prevention/sources/paint.htm

2 In 2014, the allowable lead content for pipes and fittings was further reduced to 0.25%.

Figure ES.1.1: Sources of Lead In Drinking Water (Source: EPA)



homeowner's expense) whenever the City plans on replacing the public side. The utility must also replace the public side if the homeowner replaces the private side. In addition, Illinois House and Senate bills have been proposed that would also require LSLR in Illinois.

History of Chicago Water Quality

With approximately 400,000 LSLs, Chicago is estimated to have the highest number of LSLs in the nation. However, Chicago has consistently been in compliance with the EPA LCR action levels. The Department of Water Management (DWM) adds a phosphate-based corrosion inhibitor at the water treatment plants, and this has succeeded in maintaining a 90th percentile lead concentration below 10 ppb in the first liter (Figure ES.1.2). Beginning in 2024, DWM will switch to sampling the fifth liter for regulatory compliance. DWM also maintains a robust sampling program which includes the option for any household to call 311 for free lead testing of their water. Free filters (with six free replacement cartridges) are offered to any household that has a meter, has tested above 15 ppb, or is alongside a water main or service line construction project.

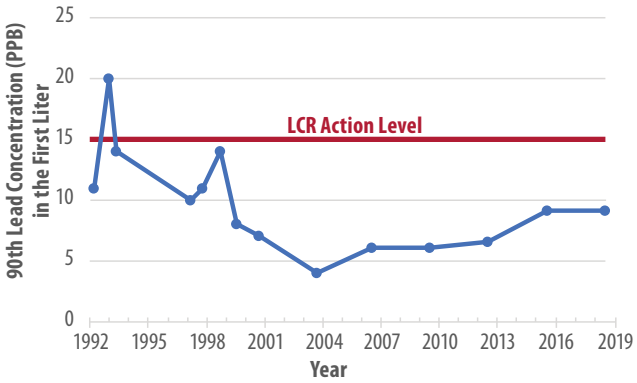


Figure ES 1.2: Historical 90th Percentile Lead Concentrations for City of Chicago in the First Liter Water Sample.

Lead Service Line Ownership

One challenge in replacing LSLs is that ownership of service lines is split between the homeowner and the City. The City owns the service line up to the B-box[3] (see **Figure ES.1.3**). The homeowner owns the remainder of the service line into the home or building. The City is only legally responsible for replacement of the

3 A b-box is a buffalo box (a shutoff on the water service line).

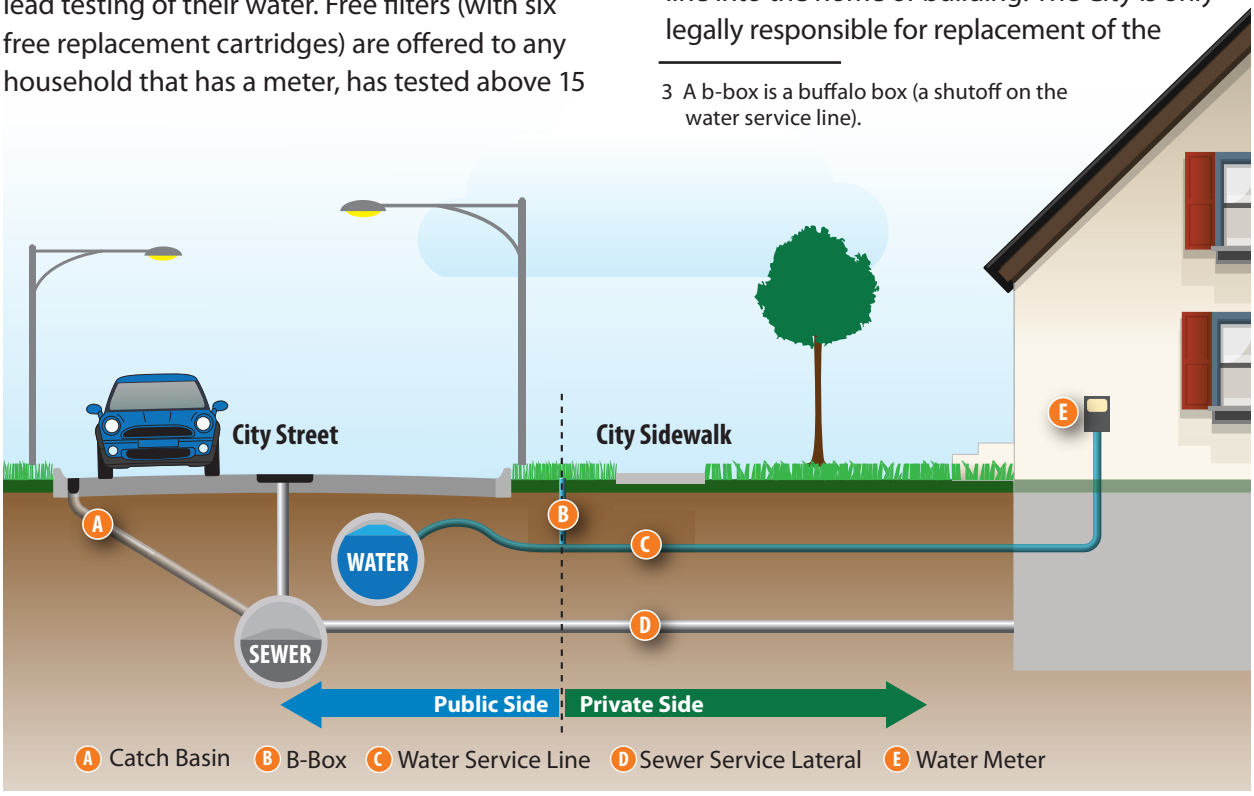


Figure ES.1.3: Water service line ownership is split between the City and the homeowner at the B-Box. The City owns and is responsible for maintaining the water service on the public side between the water main and B-box. The homeowner owns and is responsible for maintaining the water service from the B-box to the interior plumbing. The lead portion of a water service line typically ends at the first shut-off valve inside the house. In Chicago, both the sewer and the water service line will need to be replaced for properties where the water service and sewer service are in the same trench.

public side. As a result, replacing the full lead service line requires coordinating the work between the homeowner and the City. When only part of the service line is replaced, it is considered a partial lead service line replacement (PLSLR). The revised LCR limits PLSLRs to locations where the homeowner declines to replace the private side or for emergency repairs, because PLSLRs have the potential to temporarily increase lead corrosion. The City is reviewing options to support the homeowner in the private side LSLR.

ES.2 LSLR Case Studies

Data on other cities' LSLR programs is in Appendix A – *Summary Table of Case Studies*. It includes the amount of subsidy each community is providing for LSLR, how they're funding their program, their estimated number of LSLs, and their construction technique.

LSLR Subsidies

- Typically, water utilities subsidize the replacement of the private side of the LSL when the replacement is done as part of a water main replacement program. This subsidy ranges from the utility using their own contractor to replace the full LSL for free to providing partial grants or low-interest/no-interest loans to the homeowners. A special program is often established to provide additional subsidies to low-income homeowners. For LSLR outside of a water main replacement program, subsidies are usually less generous, and many utilities do not pay for the private side replacement for homeowner initiated replacements.

LSLR Funding

- Utilities are typically self-funding or taking out loans (State Revolving Fund [SRF] low interest loans with principal forgiveness) or using limited grants to pay for LSLR programs. Two high-profile cities (Newark, NJ and Flint, MI) have received significant grant or SRF Loans (with principal forgiveness) for LSLR, but both cities had lead action level exceedances.

Rate of LSLR

- While reported material inventories are being continually updated, Chicago is expected to have more than twice as many LSLs as other large utilities. Most communities report fewer than 100,000 LSLs. Annual replacement rates in other communities have ranged from 250 to nearly 10,000 LSLR per year.

ES.3 Proposed LSLR Plan

Due to the large number of legacy LSLs, the City's LSLR program will necessarily be a multi-decade process. To help prioritize replacements and set reasonable short-term targets, the program has been broken into phases:

- **Phase I:** This phase maximizes the LSLR that can be done with grant / loan principal forgiveness funding, prioritizes low-income homes, and helps develop strategies for scaling up in Phase II.
  - **Equity LSLR (Grant Funded):** The City will replace LSLs at no cost to the homeowner for low-income residents whose properties have persistently tested above 15 ppb.[4] While citywide in nature, this program is designed to prioritize disadvantaged areas.
  - **Homeowner-Initiated LSLR Program (Homeowner Funded):** For homeowners interested in paying for their own LSLR, the City will waive standard permit fees and provide advice for screening and selecting a contractor.
  - **Block Level LSLR (SRF Loan Principal Forgiveness Funded[5]):** This program is

4 Persistently high lead means that the follow-up sampling by DWM is above 15 ppb. When a homeowner performs their initial sampling (upon requesting a sample kit from DWM), the first draw sample may be elevated without potentially having high lead from the lead service line. Upon receiving the high lead results from the initial homeowner sample, a DWM engineer will be dispatched to the home for follow-up and more extensive investigation and sampling. If the follow-up DWM sampling is above 15 ppb for lead, then the homeowner will qualify as having persistently high lead in the home. Flushing and other recommendations will be provided to residents that initially tested above 15 ppb.

designed to test and evaluate coordination logistics for construction and homeowner outreach. It will provide full LSLR for homeowners on one block in a low/moderate income area alongside a water main replacement.

- **Phase II:** This phase focuses on avoiding PLSLR and meeting new regulatory requirements. The Equity LSLR Program and Homeowner-Initiated LSLR initiated in Phase I will also continue.
  - **LSLR Alongside Water Main Replacements:** The City will coordinate with homeowners to replace LSLs alongside replacing water mains.
  - **LSL Break Replacements:** The City will coordinate with homeowners to replace rather than patch broken and leaking LSLs.

Table ES. 3.1 Summary of the Phase I LSLR

Program	Target # of LSLR	Who Pays for Service Line	Approximate Cost to City per LSL (1)	Proposed City Subsidies	Approximate Annual Cost to City (1)
Homeowner-Initiated LSLR	100	Homeowner (2)	$400 (3)	Up to $3,100	$40,000 (3)
Equity LSLR	600	City	$25,000 (limited restoration)	Public and Private side	Up to $15 M in 2021 (CDBG grant)
Block Level LSLR Replacements Alongside Water Main Replacements	50	City	$25,000 (limited restoration)	Public and Private side	$4 M available (SRF Principal Forgiveness)

(1) Cost represents construction cost only. Engineering, construction management and program management costs not included. Costs are in 2020 dollars and not inflated for future years.

(2) The revised LCR includes a requirement for the utility to pay for the public side if the homeowner replaces the private side. This program will be re-evaluated in 2023 in order to meet this regulatory compliance schedule of January 2024.

(3) The direct cost of materials normally paid for by permit fees is $400 and includes a new meter and B-box; City labor and equipment costs not included.

Table ES. 3.2 Summary of Phase II LSLR

Program	Target # of LSLR	Who Pays for Service Line	Approximate Cost to City per LSL (1)	Proposed City Subsidies	Approximate Annual Cost to City (1)
Homeowner-Initiated LSLR	100	Homeowner (2)	$400 (3)	Up to $3,100	$40,000 (3)
Equity LSLR	400-800	City	$25,000 (limited restoration)	Public and Private side	TBD (Grants)
Replacements Alongside CIP Water Main Replacements (estimated at 10 to 20 miles of water mains)	160 LSLs per mile or 2,400 for 15 miles	City pays for public side; homeowner pays for private side (4)	$13,000 (5)	Public side only (4)	$45 M (5)
Service Line Breaks	4,500	City pays for public side; homeowner pays for private side (4)	$15,000 (current costs for repairs are approximately $5,500)	Public side only(4)	$67.5M (current costs approximately $25 M)

(1) Cost represents construction cost only. Engineering, construction management and program management costs not included. Costs are in 2020 dollars and not inflated for future years.

(2) The revised LCR includes a requirement for the utility to pay for the public side if the homeowner replaces the private side. This program will be re-evaluated in 2023 in order to meet this regulatory compliance schedule of January 2024.

(3) The direct cost of materials normally paid for by permit fees is $400 and includes a new meter and B-box; City labor and equipment costs not included.

(4) The City is reviewing options for private side subsidies, including low-interest loan and grants.

(5) Full road re-pavement may be required instead of repaving only the areas disturbed by LSLR. If this ends up being necessary, it could add approximately $3 million per mile to the cost of LSLR during block-level replacements.

5 While this would be an SRF loan, the SRF program will provide up to $4 million of loan forgiveness for LSLR in 2021, and so these funds would not need to be repaid.

- **Phase III:** This phase will focus on expanding and scaling up the four Phase II programs. The City can explore opportunities for block-level LSLR independent of water main replacements when construction costs are optimized.

ES.3.1 Phase I

Equity LSLR Replacements

Program Goal: This program is designed to ensure that low-income residents, particularly those in disadvantaged areas, are able to access LSLRs by providing free replacements to low-income homeowners that have water that consistently tested above the EPA action level. This program will continuously accept applications as new funding is applied for annually.

Funding: This program will continuously apply for grant funding to make this an on-going program. The City has identified up to $15 million of funding available from Community Development Block Grants (CDBG) to fully fund this program in the first year. The CDBG money must be reallocated every year and does not automatically rollover if it is not spent in the planned year. While DWM's application was not selected for a U.S. EPA Water Infrastructure Improvements for the Nation (WIIN) grant in 2020, DWM will monitor this program for funding in future years. In 2021, SRF plans on providing up to $4 million of principal forgiveness for LSLR, which could also contribute to this program. The SRF principal forgiveness can be re-applied for every year,[6] and so the City should strive to utilize this money every year.

Because this program targets low income households, the homeowner is not expected to contribute to the cost of the LSLR in this program.

Criteria: The first group of high-priority properties will be owner-occupied homes that have tested persistently above 15 ppb. Currently, any resident can receive a free lead test by calling 311. Any home that tests above 15 ppb receives a follow-up visit from DWM staff that includes an additional sequential sample. If any samples from this sequential test above 15 ppb, they will qualify as high-priority under this program. In addition to referrals through 311 sampling, any property recommended by the Illinois or Chicago Department of Public Health will have the water tested for lead and will be added to the program if the results are above 15 ppb.

The criterion for low-income will be driven by the grant agency providing the funding for a specific replacement. The initial funding will be from CDBG, and with this source, homeowners must have an income less than 80 percent of the area median income. Homeowners will need to submit an application documenting their household income to participate.

Number of LSL Replacements: In the initial year, the program anticipates targeting 400 to 800 LSLR.

Proactive outreach will be undertaken to low and moderate income areas in order to increase

6 The available amount changes year to year.

Lead Mitigation in Schools and Daycares

While older homes in Chicago typically have LSLs, public schools do not. Only one CPS building has a LSL and plans are underway to replace it. Options for testing and evaluating private schools are under review. All licensed daycares are required by the State of Illinois to test their water for lead and report their results to their licensing office and post their results for parents to see. Daycares that test above 2 ppb are already working on lead mitigation plans. The City plans on developing a LSLR program targeted specifically for daycares that are not able to meet the 2 ppb limit with their mitigation plans in coordination with state regulatory agencies.

Lead Sequential Sample Results
One or More Samples >15 ppb

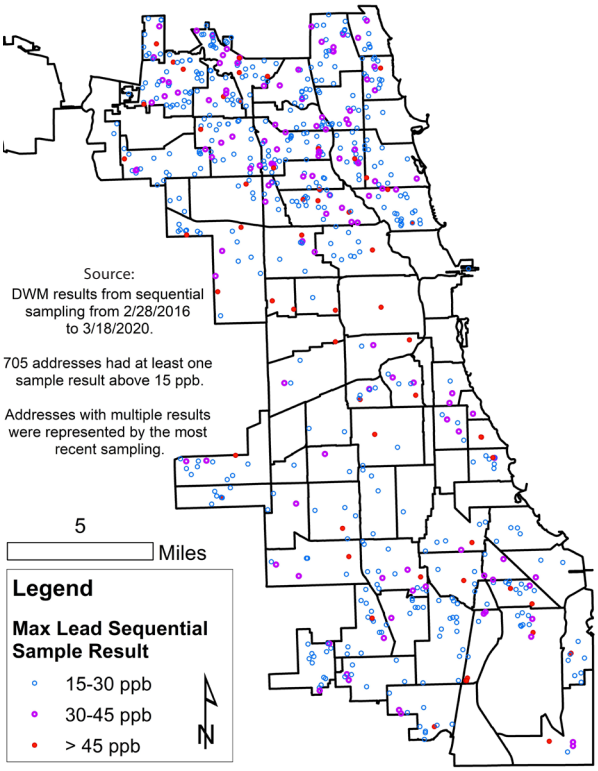


Figure ES.3.1 Location of homes that have tested above 15 ppb in the sequential lead sampling. Any resident can request free lead testing. However, because sampling is based on requests, not all neighborhoods are equally sampled. In order to promote equitable participation by low income residents, the City plans on specifically reaching out to residents of disadvantaged and under-sampled areas to encourage them to have their water tested.

Potential Equity Program Construction Zones
Similar Number of Low Income Households in Low/Mod Income Areas (Source: HUD Data)

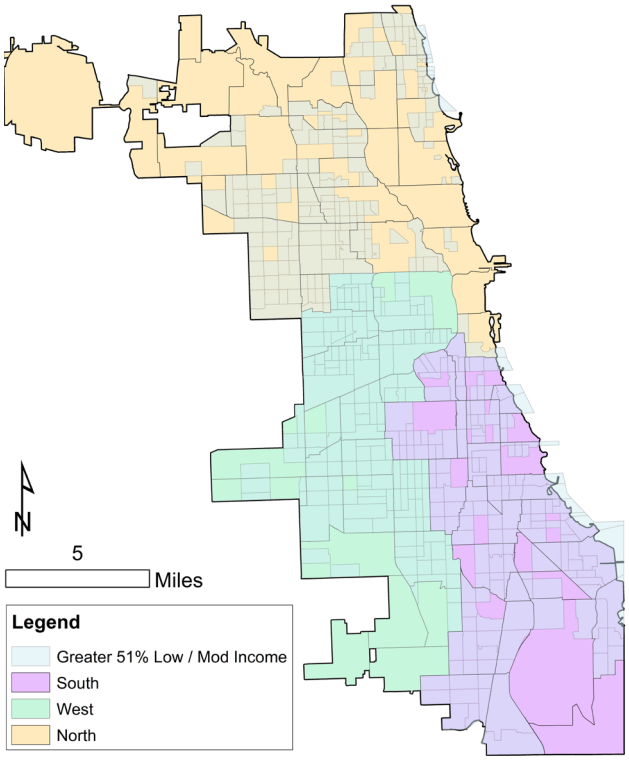


Figure ES.3.2 Goals for LSLR in disadvantaged census tracts will be set and monitored throughout the program. The project will divide construction into three zones with similar number of low-income households residing in disadvantaged census tracts in each zone.

the number of households in disadvantaged areas participating in the program.

Construction Logistics: City contractors will complete the full LSLR (both public and private side). The City will be divided into three zones, and one contract will be awarded for each zone to the lowest responsive, responsible bidder. A right of entry form will be provided to each homeowner for review and signature prior to commencing construction work.

Timeline: The program was announced in Fall 2020. The LSL replacements are anticipated to begin in 2021.

Homeowner-Initiated LSLR

Program Goal: The City will facilitate homeowners interested in replacing their own LSL by subsidizing standard permit fees and providing guidance for selecting a contractor on their website www.LeadSafeChicago.org.

Funding: The homeowner will pay for the LSLR. The City will subsidize standard permit fees. While standard permit fees total to approximately $3,100 per replacement, the direct cost of materials is approximately $400. The remainder of the fees cover work performed by City employees.

Criteria: This program is open to any resident in Chicago with a LSL that is replacing the LSL with

the same size copper service. This program does not have any income or lead testing restrictions. The program is open to rental properties.

Number of LSL Replacements: The number of LSLRs under this program will depend on public interest. In the past 18 months, there have been approximately 40 permits issued for LSLR (unrelated to a renovation), and so the program is anticipated to be small. Depending on program popularity, the number of subsidized replacements may be capped based on available annual funding.

Construction Logistics: The www.LeadSafeChicago.org website will provide a list of locally licensed plumbing contractors and a list of suggested questions and information to be requested from contractors when requesting a proposal for LSLR.

Timeline: The program was announced in Fall 2020, and has been in effect since January 1, 2021.

LSLR Alongside Water Main Replacement

Program Goal: Replacing LSL alongside water main replacements requires coordinating between multiple households and the water main construction. Starting this program on one block will provide the opportunity to gather information and experience necessary to limit change orders and delays to future water main construction projects. Additionally, costs and potential savings identified during this program will improve the accuracy of the cost estimating for replacing LSLs alongside all water main replacements, including any private side subsidy. Lastly, this program will provide the opportunity to gauge the effectiveness of outreach techniques and messages to homeowners.

Funding: DWM applied for $4 million of principal forgiveness from the SRF program for 2021.

Criteria: DWM is identifying potential block-level LSLR locations. The selected site should include a variety of residential conditions and a mix of construction techniques would be used during this phase to best match site-specific conditions. The site should also be in a low/moderate income area and already be designated to require a water main replacement in the near future.

Number of LSL Replacements: The program will target approximately 50 properties for full LSLR.

Construction Logistics: The City will contract to complete the full LSLR (both public and private side). A right of entry form will be provided to each homeowner for review and signature prior to commencing construction work.

Timeline: Homeowner outreach will begin as soon as the project is approved. This work is anticipated to occur in 2021.

ES.3.2 Phase II

The City is in the process of fully developing these proposed Phase II programs. Phase II is expected to significantly expand the annual LSL replacement rate.

LSL Replacements Alongside Water Main Replacements

Program Goal: Water main replacements require cutting and reconnecting water service lines. Replacing LSLs alongside the water main replacement will provide for construction efficiency. The road closure, demolition, and reconstruction can be done once for the benefit of multiple homes. In-person outreach and follow-up testing and inspections can similarly be conducted more efficiently.

Once the proposed revisions to the LCR pass, water utilities or cities are expected to have three years to develop an approved LSLR plan and are expected to be required to coordinate with the homeowner to replace the full lead service line during water main construction.

Figure ES.3.3 The block replacement location should be planned for a water main replacement, be in a low/moderate income area, and have a variety of home types to evaluate different construction techniques.

Funding: Funding for the public side of the LSLR is anticipated to be included in future capital planning budgets. Currently, State funding is limited. For example, the Illinois SRF principal forgiveness funding does not currently take into account the number of LSLs in each community. As this program expands, the State should be petitioned for additional allocations for communities with more LSLs.

The City is reviewing financial support options for the private side replacement, as described under 'Encouraging Homeowner Participation.' If private side subsidies are proposed, the funding source cannot be from DWM water rates due to fund restrictions.

Criteria: This program will incorporate LSLR into DWM's water main replacement program. DWM currently uses historical condition and criticality data to prioritize water main replacements. A variety of data sources can be combined in the future to adjust the prioritization to include LSLRs. LSLR prioritization would include data that DWM already holds, such as water usage, water testing results, and the LSL inventory and combine it with publicly available data from government organizations. This includes census data on child populations, low income areas, and vacancy rates. This information can be used in the future in conjunction with the prioritization criteria for water main replacements to identify areas that are priorities for both programs. The selection process can be optimized annually to identify which areas should receive water main and LSLR based on the most recent information.

Number of LSL Replacements: With LSLR occurring alongside water main replacements, DWM could target 10 to 20 miles per year of water main replacement. This would result in approximately 1,600 to 3,200[7] LSLRs annually. Currently, the City is finishing a 10-year expedited water main replacement program that targets approximately 100 miles of water main replacements per year. After 2022, water main replacements are planned to return to a target rate of 1% per year (approximately 30 miles). However, the addition of LSLR would be anticipated to reduce the number of miles that could be replaced each year.

Construction Logistics: The City is reviewing options for homeowner support in replacing the private side. Options are described under 'Encouraging Homeowner Participation.'

Timeline: Program planning is actively underway. As program and funding details are finalized, the City will develop a time line for the program implementation.

7 A typical mile of water main would be expected to impact approximately 160 LSL, but this number varies significantly based on the specific mile of water main replaced.

Figure ES.3.4 Replacing lead service lines on both sides of the street alongside the water mains requires opening the full street instead of just half as is normally done for water main replacement alone. While trenchless construction is typical in other cities' LSLR programs, local regulations prohibit trenchless construction methods in the street.

Service Line Break Replacements

Program Goal: The City will establish new policies to handle broken and leaking LSLs. Currently, broken and leaking LSLs may be repaired and left in place, but under the proposed revisions to the LCR, water utilities or cities will have to coordinate with the homeowner to replace the full LSL.

Funding: Funding for public side LSL repairs currently comes from DWM's operating budget.[8] However, this budget is not currently large enough to replace the entire public side of breaks and leaks. Additional funding will need to be allocated for this budget.

The City is reviewing options for financial support for the private side replacement, as described under 'Encouraging Homeowner Participation.' If private side subsidies are proposed, the funding source cannot be from DWM water rates due to fund restrictions.

Criteria: This program will apply to all homes with lead service line breaks and leaks. The locations of these replacements will be determined by locations of breaks and leaks.

Number of LSL Replacements: The City typically has 4,000 to 5,000 breaks and leaks per year.

Construction Logistics: The City is reviewing options for homeowner support in replacing the private side. Options are described under 'Encouraging Homeowner Participation.'

Timeline: Program planning is actively underway. As program and funding details are finalized, the City will develop a time line for the program implementation.

ES.3.3 Phase III

Phase III will focus on widespread, systematic replacement of LSLs throughout the City. It will build on the capacity developed in Phase I and Phase II to increase the rate of LSLR. In this phase, LSLR locations will be targeted based on prioritization factors including tested lead concentrations, vulnerable populations (i.e. young children), water usage, density of LSLs, history of partial LSLR, and planned construction activities.

8 Water service line leak repairs typically cost DWM between $4,000 and $7,000.

ES.4 Encouraging Homeowner Participation

The City is only legally responsible for the public side of the LSL, and this did not change under the revisions to the LCR. The homeowner is responsible for the private side. However, providing support logistically and/or financially to the homeowner will make the goal of removing the full LSLs from the system more achievable. Removing the full LSL is important because:

- Partial LSLR can lead to a short-term increase in lead in the drinking water.
- Some funding sources (for example, SRF loan principal forgiveness) will only pay for full LSLR.
- Partial LSLR will not count as replacements under the revised LCR if the City is under a requirement to replace LSLs due exceeding the 10 ppb trigger level.
- Removing the full LSL will have additional construction efficiencies by preventing the City from needing to return and perform new work on the same site.

The City can encourage homeowners to replace their LSL in a variety of ways, primarily through logistical or financial support.

ES.4.1 Logistical Support

Logistical support can be a way to encourage homeowner participation without additional cost to the City; however, depending on the level and type of support, it may increase the City's potential liability for work performance. Planning will continue to monitor the regulatory environment, which may require the City to provide a contractor for LSLRs associated with planned City work.

The range of logistical support options include:

- **Offer No Logistical Assistance:** The homeowner would be responsible for finding their own contractor and obtaining multiple cost quotes. This option has the least liability for the City.
- **Provide a List of Local, Licensed Contractors:** The City can request contractors submit proposals that include qualifications for LSLR and costs for typical installations or use existing lists of all licensed, bonded contractors. A website could provide general typical costs for replacements and questions homeowners should ask to evaluate contractors.

  Phase I will start with a list of all licensed, bonded contractors. As the program progresses, it is recommended to increase the logistical support to provide a list of contractors with fixed unit cost quotes.
- **Provide a List of Contractors with Fixed Unit Cost Quotes:** The City could request contractors submit firm bids for performing LSLR based on unit costs. Homeowners could select a contractor from this list and use the negotiated costs for their LSLR.
- **Allow the Homeowner to Use the City's Contractor:** The City could provide the homeowner with a price for replacing the private side of the LSLR at the same time as the public side using the same contractor. This quote would be provided in advance of the work so that the homeowner could choose a different contractor. This option would allow the LSL to be replaced completely as part of one mobilization rather than having two contractors working at separate times. However, even with contract documents placing liability on the contractor for the work, homeowners may still attempt to involve the City in settling contractor disputes.

  This option is recommended for replacements of LSLs alongside water main replacements and LSLs with leaks or breaks on the public

side because the City will already have a contractor mobilized to these sites. Under the revised LCR by 2024, the City will be required to offer that the homeowner may use the City's contractor for planned work.

ES.4.2 Financial Support

The City has no legal obligation to provide financial assistance for the private side of the LSL. Additionally, water rate revenue is restricted from being used on private property. However, subsidies are typically necessary to achieve widespread full LSLR instead of PLSLR. Under the new LCR, only full LSLR count towards replacement goals if replacements are occurring due to a trigger or action level exceedance. Additionally, a program that leaves homeowners with the full cost of private side replacements is very likely to result in an unequal distribution of LSLR by area wealth.

The range of financial support options include:

- **Offer No Financial Assistance:** The homeowner would be responsible for paying for the full private side replacement.
- **Loan:** Low- or no-interest loans are typically offered with an overall dollar limit and paid back as an additional fee on each water bill or property taxes over the subsequent 5 to 10 years. The interest rate on loans could be set to cover the City's overhead costs in administering the program.

  This option can be considered for moderate and high income homeowners with service line breaks or high-priority homes. The terms should be set to result in reasonable monthly payments.
- **Partial Grant / Reimbursement:** Grants or reimbursements typically cover a fixed dollar amount, fixed percentage, or leave a fixed amount to the homeowner. While grant funding would be equally accessible to all income levels, a reimbursement system may limit LSLR to homeowners who can afford to pay the money in advance and wait for reimbursement.

  For LSLR alongside the water main replacements, the City should consider including additional financial incentives since non-participation will result in a partial LSLR. Because LSLR will be more efficient if they can be done simultaneously as a block rather than as individual replacements, it would benefit the City to incentivize homeowners to replace their LSLs at the same time as the City's work.
- **Full Grant:** Grants for the full cost of private side LSLR could be provided to all homeowners or on an income-based sliding scale. Some residents may still refuse to have their LSLs replaced, even if it is free. An income-based sliding scale system would require additional administrative overhead to review and approve financial aid applications.

ES.4.3 Outreach and Public Communication

A LSLR program needs clear communication and engagement with the public. For programs where the homeowner needs to perform the private side replacement on the City's schedule, such as for water main replacement projects, public outreach should begin months prior to the beginning of the work in order to have time to engage and educate the public. Further advanced outreach would be required if the homeowners will need to provide significant financial contributions.

Stakeholder Engagement

The City will need to partner with the public to achieve full LSLR and so understanding the community's concerns will be key in creating an accessible and successful program. Engaging stakeholders such as City representatives, nonprofit and community-based organizations, policy experts, and other local agencies will be instrumental in developing a program responsive to community concerns and priorities.

Education and Outreach to the Public

The public outreach will include a mix of methods to ensure that all populations have accessible information. This would include:

- General information through flyers in water bills, FAQs, handouts in public areas, and the website www.LeadSafeChicago.org
- In-person group information through public presentations and open houses
- Outreach through partner organizations, such as CDPH, alderman, community-based organizations, and other non-profits
- Specific questions answered through a dedicated email address and 311
- Outreach to impacted properties through door hangers, phone calls, emails, and visits

The City has already launched www.LeadSafeChicago.org as a single website that provides transparent information about the sources of lead, frequently asked questions, what the City is doing to protect residents from lead, and what residents can do to protect themselves from lead.

ES.4.4 Ensuring Equity in LSLR

All LSLRs will be centrally tracked through a single database to ensure that the program is being implemented in an equitable manner across Chicago. The locations of City-initiated LSLR would be reviewed annually for balance between communities.

ES.4.5 Options for Homeowners to Decline Replacement and Access

Homeowners will not always be willing to participate in or communicate with the program, and the City cannot currently require that a homeowner grant access to their private property or require homeowners to pay for replacing the private side of the LSL. A waiver form will be used for homeowners who do not wish to participate. Communication attempts will be documented for homeowners who are non-responsive. These homes would still be provided with free point-of-use filters with six replacement cartridges.

ES.5 Funding Opportunities and Financial Impact

ES.5.1 Program Costs

Current estimates for a typical full LSLR is $15,000 to $26,000,[9] depending on site-specific features and selected construction technique. The actual copper water service materials and installation is estimated to cost $4,000 to $7,000 and the private drain replacement[10] $2,500 to $3,500, but both would vary based on actual site length. The remainder of the cost is the related work for pavement and sidewalk demolition and repair, water main tapping and access pits.

For approximately 400,000 LSLs, this has a total program construction cost (not including inflation) of $6 to $10 billion dollars.[11] Program costs will be towards the higher end if all LSLRs are required to replace private drains due to proximity to the water service line.[12] Program

9 Cost include the public and private side of the LSLR and markups for General Conditions, insurance, bonding and contingency.

10 Private drains are the pipes connecting the house drain to the sewer system. Under Illinois Department of Public Health (IDPH) and Chicago Plumbing codes, they must be 10 feet to the side of or 18 inches below water lines or made of water main quality material. In Chicago, private drains were historically installed in the same trenches as the water service, and so the majority of properties will need to replace their private drain with water main quality pipe as part of the LSLR.

11 The construction costs do not include related costs, such as design, construction management, inspections, follow-up water testing, and community outreach.

12 Other cities in the US are not typically required to replace the private drain during LSLR and so have been able to utilize trenchless construction to reduce costs.

Workforce Development and Diverse Contracting

Through the LSLR Program, the City will invest billions of dollars in infrastructure improvements to all communities in Chicago. The City wants to further invest in communities by making sure that residents across Chicago have the skills and opportunities to qualify for these construction jobs. The City is reviewing case studies from cities around the country to identify successful policies, including developing minority-focused apprenticeship programs, requiring local hires in disadvantaged areas, and setting minority hiring goals for journeymen and laborers, in addition to the traditional Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) goals.

costs will be lower when they occur alongside water main replacement projects because then the road demolition and repair costs are partially covered by the water main replacement work.

ES.5.2 Program Funding Sources

City staff and CDM Smith evaluated a wide range of funding mechanisms that are currently or anticipated to be available to the City to fund the Phase I and Phase II LSLR programs. The City has and will continue to explore grant opportunities for LSLR to minimize the financial impact to the City and its residents. Phase I programs are anticipated to be funded through available CDBG grant funds and SRF principal forgiveness.

As the City evaluates the implementation of the Phase II program with LSLR alongside water mains and service line breaks, the goal is to first maximize available grants and the SRF Loan Program, which has up to $4 million in principal forgiveness. The City will also look for opportunities to reduce costs where possible, and Phase I will provide an opportunity to identify efficiencies as well as potential changes in current practices and regulations that can be assessed for cost and schedule savings.

The grant options reviewed for the LSLR programs include:

- **Community Development Block Grants (CDBG):** Up to $15 million is anticipated to be allocated to LSLR for 2021. These grants can be re-applied for annually but compete against other city programs. If the funds are not used in their assigned year, they are not automatically available the following year. Funds can only be used for low-income homeowners.
- **The Federal Water Infrastructure Improvements for the Nations (WIIN) Act:** This is a competitive grant program that focuses on communities with elevated lead, and so the City is less competitive for this grant. The City's LSLR application was not selected in the 2020 review.
- **ReBuild Illinois:** This program awards up to $5 million for infrastructure programs, with an emphasis on shovel-ready projects. The City should monitor if a similar program is available next year when the LSLR program is in implementation.
- **State Revolving Fund (SRF) Principal Forgiveness:** In 2020, communities could have up to $1 million principal forgiveness for full LSLR. In 2021, up to $4 million is available for principal forgiveness. The SRF program does not currently consider how many LSLs a City has when allocating principal forgiveness. As this LSLR program expands, the City should discuss changing the funding allocation formula to consider LSL burden.

The two primary loan programs available for water infrastructure projects are SRF (for principal amounts above the forgiveness limit) and Water Infrastructure Finance and Innovation Act (WIFIA). Both offer low interest rates and long repayment periods, and the SRF program includes limited principal forgiveness. Table ES.5.1 provides the general loan terms compared to issuing bonds.

Table ES.5.1. Comparison of Major Debt Funding Instruments Available to the City

	Estimated Interest Rate	Repayment Period
SRF (Illinois EPA)	1.84%	20 years
WIFIA	2.88%	35 years
Bonds	3.0-4.5%	30-40 years

ES.6 LSLR Technologies

The two primary construction methods for LSLR are open cut and trenchless installations. Trenchless construction techniques can be cheaper by reducing road and sidewalk demolition and restoration. However, local restrictions on trenchless techniques in the right-of-way and State regulations on water/sewer separation make open cut more common in Chicago.

ES.6.1 Open Cut Construction

Open cut installation involves digging a trench from the water main in the road to the residence (Figure ES.6.1). Chicago licensed plumbers most commonly install water services with this method.

Advantages

- Contractor familiarity with the technique
- Can replace private drain with water main quality pipe where existing conditions do not provide water/sewer separation

Disadvantages

- Large disturbance area and longer construction times
- Higher restoration costs

ES.6.2 Trenchless Construction

Trenchless installation involves installing a drilling pit at the right-of-way and a receiving pit at the home. The water service is installed underground through an existing or newly created pilot hole between the pits (Figure ES.6.2). Fewer contractors will be familiar with these techniques.

Advantages

- Smaller disturbance area
- Lower restoration costs and shorter restoration timeframe

Disadvantages

- Trenchless installation in the public right-of-way is prohibited by current regulations. Trenchless can currently only be used on the private property.
- Risk of accidentally hitting other pipes / utilities on the property
- Would not allow for simultaneous replacement of the private drain where existing conditions do not provide water/sewer separation

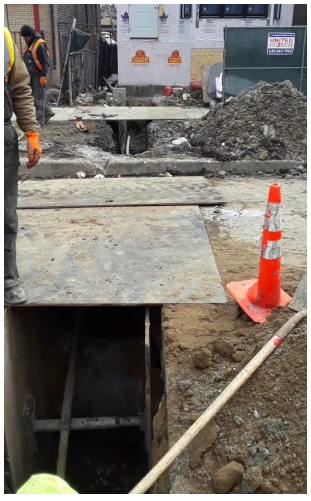


Figure ES.6.1: Open Cut Service Line Installation

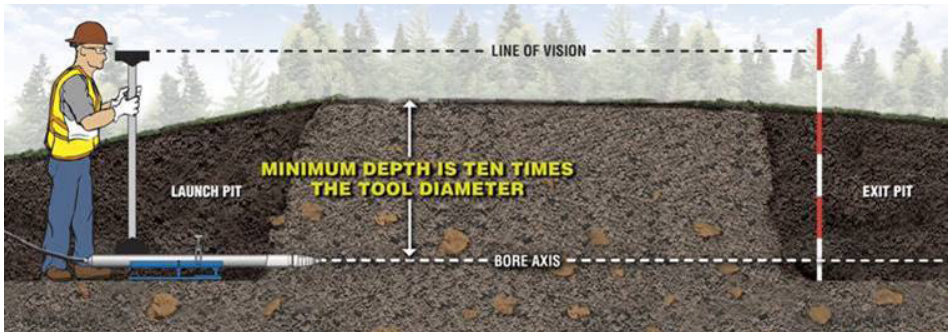


Figure ES.6.2: Two Pits, with Ground Between Undisturbed, Used in Trenchless Service Line Installation

ES.7 Summary and Recommendations

The City of Chicago (City) is in compliance with current regulations related to lead and is being proactive by developing a lead service line replacement (LSLR) plan. With nearly 400,000 lead service lines in the City and a projected cost of 6 to 10 billion dollars, proactive planning is essential to minimize the impact on City rate payers. As such, this replacement plan is divided into phases to maximize available grant funding opportunities while maintaining compliance with current and pending regulations.

Phase I LSLR Program

Phase I focuses on replacing LSLs with high tested lead levels in low-income homes in disadvantaged neighborhoods. This program will be funded using available CDBG funds with no financial burden on the homeowner or water rate payers. This program will be unique to Chicago as many other cities have not put as much emphasis on disadvantaged neighborhoods and low income residents.

Phase I will also include a homeowner-initiated LSLR for homeowners who have the financial capacity to replace their LSLs. As such, the City proposes to subsidize permit fees, offer a free buffalo-box and meter, and provide a list of licensed contractors to encourage more homeowners to participate. In addition, information on how to replace the service line and how best to proceed with plumbing contractor selection will be provided.

Finally, Phase I will include a project for a single block of LSLR alongside a water main replacement. The City plans to fund this project using an IEPA SRF loan with the LSLR fully funded using principal forgiveness (capped at $4 million by IEPA and restricted to be used for only full LSLR). The City has submitted an application with IEPA and is reviewing locations for this project. This project provides the experience necessary to begin focusing on reducing the costs of LSLR and increasing construction efficiency.

Table ES.7.1 provides a summary of the Phase I Programs. The City will be unique in beginning their LSLR program with a focus on equity and prioritizing disadvantaged communities for early LSLR, while not burdening the City with additional debt.

Table ES. 3.1 Summary of the Phase I LSLR

Program	Target # of LSLR	Who Pays for Service Line	Approximate Cost to City per LSL (1)	Proposed City Subsidies	Approximate Annual Cost to City (1)
Homeowner-Initiated LSLR	100	Homeowner (2)	$400 (3)	Up to $3,100	$40,000 (3)
Equity LSLR	600	City	$25,000 (limited restoration)	Public and Private side	Up to $15 M in 2021 (CDBG grant)
Block Level LSLR Replacements Alongside Water Main Replacements	50	City	$25,000 (limited restoration)	Public and Private side	$4 M available (SRF Principal Forgiveness)

(1) Cost represents estimated construction cost only. Engineering, construction management and program management costs not included. Costs are in 2020 dollars and not inflated for future years.

(2) The revised LCR includes a requirement for the utility to pay for the public side if the homeowner replaces the private side. This program will be re-evaluated in 2023 in order to meet this regulatory compliance schedule of January 2024.

(3) The direct cost of materials normally paid for by permit fees is $400 and includes a new meter and B-box; City labor and equipment costs not included.

Phase II LSLR Program

Phase I is necessary to have the experience and community outreach to move smoothly into Phase II. Phase II will involve the City replacing LSLs during water main construction and when LSLs experience a leak or a break. This positions the City to comply with pending regulations and helps the City efficiently replace LSLs at the most opportune time – when crews are already mobilized to do construction work, and homeowners are most impacted by the construction or leak.

There are obvious challenges in light of the potential financial impacts and logistical hurdles related to the large number of LSLs in the City. An estimated 160 service lines are on every one-mile of water main and thus a 15-mile water main replacement program will result in nearly 2,400 LSLs that would have to be replaced. The City also experiences approximately 4,000 to 5,000 leaks or breaks on service lines annually. These challenges can be reduced by innovating more efficient and less costly ways to replace LSLs. This is why the water main project and grant-funded individual replacements in Phase I are essential to evaluate these opportunities. Table ES.7.2 provides a summary of the Phase II programs and costs.

By taking advantage of available funding and following a vision for program expansion, the City can begin the process of removing LSLs while being financially prudent and minimizing the impact to City residents.

Table ES. 3.2 Summary of Phase II LSLR

Program	Target # of LSLR	Who Pays for Service Line	Approximate Cost to City per LSL (1)	Proposed City Subsidies	Approximate Annual Cost to City (1)
Homeowner-Initiated LSLR	100	Homeowner (2)	$400 (3)	Up to $3,100	$40,000 (3)
Equity LSLR	400-800	City	$25,000 (limited restoration)	Public and Private side	TBD (Grants)
Replacements Alongside CIP Water Main Replacements (estimated at 10 to 20 miles of water mains)	160 LSLs per mile or 2,400 for 15 miles	City pays for public side; homeowner pays for private side (4)	$13,000 (5)	Public side only (4)	$45 M (5)
Service Line Breaks	4,500	City pays for public side; homeowner pays for private side (4)	$15,000 (current costs for repairs are approximately $5,500)	Public side only (4)	$67.5M (current costs approximately $25 M)

(1) Cost represents estimated construction cost only. Engineering, construction management and program management costs not included. Costs are in 2020 dollars and not inflated for future years.

(2) The revised LCR includes a requirement for the utility to pay for the public side if the homeowner replaces the private side. This program will be re-evaluated in 2023 in order to meet this regulatory compliance schedule of January 2024.

(3) The direct cost of materials normally paid for by permit fees is $400 and includes a new meter and B-box; City labor and equipment costs not included.

(4) The City is reviewing options for private side subsidies, including low-interest loan and grants.

(5) Full road re-pavement may be required instead of repaving only the areas disturbed by LSLR. If this ends up being necessary, it could add approximately $3 million per mile to the cost of LSLR during block-level replacements.

Appendix A: Summary Table of Case Studies

City	Number of LSLs	Program Description	Subsidy Provided to Residents	Program Funding Source	Construction Method
Cincinnati, OH	44,000	Passed ordinance to mandate LSLR, but postponing enforcement of the mandate/fine. Resident must replace within 30 days of receiving notice that line has been disturbed.	Homeowner pays if using their own contractor. Otherwise, Cincinnati subsidizes private side up to 40% of cost (up to $1,500) and offers a no-interest loan added to property taxes over 5-10 years. City covers cost of public side.	Donations, Capital budget	Pipe pulling (trenchless construction)
Denver, CO	64,000 – 84,000	Replace full LSL (public and private) when lead is discovered during water main or routine pipe replacement work. They are targeting a 15 year replacement program.	Volunteers to replace their LSL may be eligible for partial reimbursement of replacement cost. City covers cost of public side.	Denver Urban Renewal Authority (DURA), water rates, bonds, and sales of new connections	Pipe pulling (trenchless construction)
Detroit, MI	80,000	Replace full LSL (public and private) when lead is discovered during water main or routine pipe replacement work.	Full service line paid by city when replaced with water main work.	State funding	Boring (trenchless construction)
Milwaukee, WI	74,000	Passed ordinance to prohibit partial replacement or repair of LSL.	Owners of buildings with 1-4 dwelling units pay only $1,600. Special assessment financing over 10 years for private side costs. City covers cost of public side.	Various funding sources	Horizontal directional drilling (trenchless construction)
Newark, NJ	20,000	Passed ordinance mandating the removal of LSL following the requirement to begin removing LSL due to an exceedance of the lead action level.	Full LSLR cost is covered by the city, though whole line is privately owned.	State funding	Trenchless construction
Philadelphia, PA	60,000	Replaces LSL when discovered during water main work. Also offers no-interest loan to residents interested in volunteering to replace their line. Replace private LSL with water main work.	Covers full LSLR cost with water main work. When not part of water main work, provides no-interest loan for private side and covers cost of public side.	Low interest loan from Pennsylvania Infrastructure Investment Authority (PENNVEST)	Trenchless construction
Pittsburgh, PA	12,500	Working to identify and remove public side LSL. Can coordinate private side with public side replacement.	Covers cost of public side. Provide free private side replacement when the public side is replaced.	$49 million loan from State Revolving Fund, with some principal forgiveness	Pipe pulling (trenchless construction)