COLLABORATING TO REPLACE LEAD SERVICE LINES

Lead Service Lines Get Flushed!
AGENDA

- Background on the Collaborative
- Flushing Overview
  - What it is in the context of LSL replacement
  - When and why it is done
- Communicating about Flushing
  - Common challenges
  - Examples of how some utilities and cities are getting the word out
- Q & A
Current Members

- American Public Health Association
- American Water Works Association* 
- Association of Metropolitan Water Agencies* 
- Association of State Drinking Water Administrators
- Blue Green Alliance
- Children’s Environmental Health Network*
- Clean Water Action*
- Environmental Defense Fund*
- Green and Healthy Homes Initiative
- Justice and Sustainability Associates
- Learning Disabilities Association of America
- National Center for Health Housing
- National Association of County and City Health Officials
- National Association of State Utility Consumer Advocates
- National Association of Water Companies
- National Conference of State Legislatures
- National Environmental Health Association
- National League of Cities
- National Rural Water Association
- Natural Resources Defense Council
- North East Midwest Institute
- RESOLVE*
- River Network
- Rural Community Assistance Partnership
- Trust for America’s Health
- United Parents Against Lead
- Water Research Foundation

* Steering Committee Members
How is the Collaborative funded?

The Collaborative is currently supported by Spring Point Partners and by in-kind contributions from its members.

The Collaborative also thanks its previous funders the Kellogg Foundation and the Pisces Foundation.
SPEAKER INTRODUCTIONS

- Amanda Reddy (moderator)
  - Executive Director, National Center for Healthy Housing

- David Cornwell
  - CEO, Cornwell Engineering Group

- Lynn Thorp
  - National Campaigns Director, Clean Water Action and Clean Water Fund
HOME FLUSHING TO REDUCE LEAD

February 6, 2019
WEBCAST
Thanks to WRF 4584 and on-going 4713 as well as previous AWWA WITAF funding
OUTLINE

- Background
- High Velocity Flushing vs. Displacement
- Why HVF?
- Lead Removed During HVF
- Example Before and After HVF Profiles
- Current Recommendations
BACKGROUND

- Sources of Lead and How that Relates to Flushing
- What is a Profile Sample?
• Lead pipes and brass fixtures form scales or films on the surfaces. Those scales contain particles with lead.
• If disturbed, the particles can come off, releasing high intermittent lead.
LEAD SOURCES

Home plumbing can be galvanized pipe with lead or even lead pipe

In home brass valves and faucets allowed to contain lead (pre-2011/14)

Pre-1986 copper pipes have lead solder

Either side of service line could be lead or galvanized

Diagram courtesy DC Water (WRF 4584)
Instead of only collecting the 1st L Sample Collect a series of 1 L Samples One after the other Often takes 10 to 15 Samples

Be prepared
• It goes faster than you think
• Best results are with two PEOPLE
  ❑ one to collect
  ❑ one to hand bottles
EXAMPLE PIPE VOLUMES TO STREET

UNDERSTANDING YOUR WATER SERVICE PIPE

Diagram courtesy DC Water (WRF 4584)
TWO FLUSHING TYPES

Water Displacement
High Velocity Flush (HVF)
WHAT IS A WATER DISPLACEMENT

• Objective – replace water in house and service line with fresh water from water main in street
• This is really not a “flush”—nothing is flushed out of the system, water is just moved
• Often the homeowner is told to run water 30 sec to 2 min by different agencies
EXAMPLE TIME FOR DISPLACEMENT

- It often takes 3 to 5 min to get past lead release from LSL
- 30 sec is often start of LSL lead
- Here, lead is still being released at 2 min, and it continues to 3.5 min

Normal household flow (usage) rate ~1 gpm (4/L/min) from DeOreo et al. 2016
WHAT IS HVF

- Objective – clean out lead in the home or service lines after disturbance
- This requires a high velocity to scour the particles out
- Why—Disturbances to service lines release lead particles that get caught elsewhere in the plumbing and are released at the tap for several months after
EXAMPLE OF THE IMPACT OF A PARTIAL LSLR WITHOUT HVF

Data has shown high lead can last for 6 months (SAB) Without HVF
EXAMPLE OF THE IMPACT OF A FULL LSLR WITHOUT HVF
DISTURBANCES IN ADDITION TO SERVICE LINE REPLACEMENTS

• Water System Initiated
  ✓ Meter replacement or maintenance
  ✓ Water main replacement/maintenance
  ✓ Water main flushing (Friedman 2016)

• Other Work in the Street
  ✓ Maintenance or replacement of wastewater, electrical, and other utilities
  ✓ Street and sidewalk replacement and maintenance

• Homeowner/Resident Activities
  ✓ Construction or other vibration causing activities (esp. in basement, walls containing plumbing, or kitchen/bathroom)
  ✓ Return from long vacation (“disturbance” is running tap water after sitting stagnant for so long)
WHEN TO PERFORM HIGH VELOCITY FLUSHING (HVF)

• When the City informs you about a disturbance
• After a lead service line replacement anywhere between the street and your house
• If you have had high lead results

This type of flushing can break loose lead containing particles in pipes inside the house as well as in the service line between the house and the street
HOW TO PERFORM HIGH VELOCITY FLUSH

• Open all faucets in the house starting from lowest to highest level
• Leave faucets running at the highest rate possible for at least 30 minutes
• After 30 minutes, turn off all faucets in the same order they were turned on
• Replace aerators/screens at each faucet

SHOW ANIMATION
Examples of Lead Removed During an HVF
TOTAL METALS REMOVED DURING A HVF

2 min, 4 min, and 6 min Fe data are all >190
## Estimated mass of total lead removed during whole house flush

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Weighted Average</th>
<th>Total Lead During Flush</th>
<th>Mass of Total Lead Removed in 30 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>N01</td>
<td></td>
<td>22.4</td>
<td>36.9</td>
<td>24,780</td>
</tr>
<tr>
<td>N02</td>
<td></td>
<td>7.4</td>
<td>19.4</td>
<td>4,310</td>
</tr>
</tbody>
</table>

### Partial Lead Service Line Replacement

<table>
<thead>
<tr>
<th>Location</th>
<th>Time</th>
<th>Weighted Average</th>
<th>Total Lead During Flush</th>
<th>Mass of Total Lead Removed in 30 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>N01</td>
<td></td>
<td>2.4</td>
<td>55.1</td>
<td>3,998</td>
</tr>
<tr>
<td>N02</td>
<td></td>
<td>6.2</td>
<td>18.7</td>
<td>3,458</td>
</tr>
<tr>
<td>N04</td>
<td></td>
<td>0.7</td>
<td>45.4</td>
<td>944</td>
</tr>
<tr>
<td>N05</td>
<td></td>
<td>1.2</td>
<td>59.1</td>
<td>2,160</td>
</tr>
<tr>
<td>N11</td>
<td></td>
<td>2.6</td>
<td>36.0</td>
<td>2,790</td>
</tr>
<tr>
<td>N12</td>
<td></td>
<td>0.3</td>
<td>41.6</td>
<td>391</td>
</tr>
<tr>
<td>N13</td>
<td></td>
<td>0.8</td>
<td>45.0</td>
<td>x</td>
</tr>
<tr>
<td>N14</td>
<td></td>
<td>5.3</td>
<td>45.0</td>
<td>x</td>
</tr>
<tr>
<td>N21</td>
<td></td>
<td>28.5</td>
<td>58.0</td>
<td>49,517</td>
</tr>
<tr>
<td>N22</td>
<td></td>
<td>2.5</td>
<td>52.0</td>
<td>3,866</td>
</tr>
</tbody>
</table>

x = flushing rate not measured – used average of all other locations
PROFILE SAMPLING BEFORE/AFTER LSLR (PARTIAL OR FULL) AND HVF
**IMPACT OF AERATORS ON LEAD RELEASE**

- **Profile Volume (L)**
- **Total Lead (µg/L)**

Need to Remove Aerators and Screens during Flush

**Aerator ON**

**Aerator OFF**
IMPACT OF FLSLR AND HVF

- Pre-LSR
- 1 day after FLSLR
- 1 day after flush
- 1 month
- 2 month
- 3 month

Total Lead (µg/L) vs. Profile Volume (L)
IMPACT OF FLSLR AND HVF (2)

This home still had a lead source inside the house
IMPACT OF FLSLR AND HVF ON PEAK TOTAL LEAD

Peak Total Lead (µg/L)

- Filtered
- Particulate

pre-LSR, post-LSR, post-flush, 1-mo, 2-mo, 3-mo
IMPROVEMENT IN CUMULATIVE TOTAL LEAD—ALL SITES

Cumulative Total Lead

- 1 day after FLSLR
- 1 day after flush
- 1 mo
- 2 mo
- 3 mo

Lead was lower after HVF except once

Difference = later date - pre-FLSLR (negative means improvement)
RECOMMENDATIONS - DISPLACEMENT

- Perform after absent from home $\sim > 4$hrs
- Can calculate volume needed
- Absent calculation—run a faucet 5 min
  - Can leave aerator on
  - Use normal to high flow rate
- If use a different faucet after above displacement
  - Run for about 1 min to displace water leading to that faucet
- When using water for consumption—a low flow will reduce particulate lead release
RECOMMENDATIONS-HVF

• Perform after a disturbance
• Follow instructions provided
• Lead can still be elevated—especially in first month
  – Have water tested
  – Use lead removal filters if desired
• Only use cold water for consumption, boiling etc.
• Regularly clean aerators
• When using water for consumption—a low flow will reduce particulate lead release
Flushing After Replacement: Challenges & Practices

Challenges

- How best to communicate with customer
- Customer follow-up
- Customer concerns about water usage
How to Communicate with Customers?

Multiple methods

- Leave behind brochures, packets
- Doorhangers
- Web content – sample video

Denver Water: https://youtu.be/3cvhYFoiyec
AFTER LEAD SERVICE LINE REPLACEMENT

Replacing an entire lead service line reduces your risk of exposure to lead. But there are steps you should take after replacement.

IMMEDIATELY FLUSH ALL FAUCETS.

Start in the basement/lowest level and work up, one faucet at a time.

- Remove the aerator and clean it.
- Run cold water at full flow for 10 minutes.

FOR THE NEXT 30 DAYS, FLUSH AT LEAST ONE FAUCET DAILY.
IMPORTANT HEALTH INFORMATION

After a lead pipe replacement, a temporary increase in lead will likely occur in your tap water. Lead levels can potentially remain elevated for a few months after a lead pipe is replaced.

To minimize lead exposure, filter your cold tap water for all drinking and cooking purposes, including water used for making ice, beverages and infant formula.

DC Water is providing you with a filter certified for lead removal and replacement cartridges. Please use your new filter according to the manufacturer’s instructions. Filter cartridges should be routinely replaced after you have filtered 40 gallons of water or two months of use, whichever comes first.

Immediately after construction
• Flush all household faucets by opening each cold water faucet, working from the lowest level (preferably the basement) to the highest level in your house.
• To flush each faucet, remove the aerator and fully turn on the cold water faucet at maximum flow for approximately ten minutes.
• After flushing, clean each faucet aerator. Lead particles and sediment can build up in the screen.
• Do not use hot tap water for drinking and cooking. Always use cold tap water, including water used for making ice, beverages and infant formula.

For 30 days after construction
• Each day, flush your plumbing by opening at least one cold water faucet for 10 minutes.
• Remove and clean the kitchen faucet aerator. Lead particles and sediment can build up in the screen.

After six months
• Filter your tap water for drinking and cooking until all sources of lead have been removed. Ensure filters are NSF Standard 53 certified for lead removal by checking the package or contacting the manufacturer.
• Use cold tap water not hot tap water for drinking and cooking, as well as making ice, beverages, and infant formula.
Intensive flushing

to clean your home’s drinking water pipes

Following lead or steel service line replacement, small pieces of lead or other debris may have entered the pipes in your house. That may lead to high levels of lead in the water you use to cook and drink for up to three months. Lead is harmful to everyone. Pregnant women, infants, children under the age of six, and adults with high blood pressure and kidney problems are at the most risk.

Instructions for intensive flushing

- Use cold from every faucet or tap in your whole house for at least 30 minutes. Start with taps in the basement or lowest floors and work your way up, opening all taps. Make sure drains are clear.
- Studies show that running quickly flowing water through a home’s plumbing every two weeks for three months after pipes have been disturbed by construction can lower lead levels in drinking water.

Full detailed instructions for intensive flushing are included on the back of this sheet.

How often? For how long? When to stop?

Perform flushing every two weeks. 30 minutes Do this for three months following lead or steel service line replacement.

DON’T FORGET!

- Daily Cleaning: If no one has used the water for six hours or more, run your COLD tap to get fresh water in your pipes BEFORE using cold water for drinking, cooking, making baby formula, feeding your pets, making ice, or watering vegetable gardens.
- Aerator Cleaning: Clean debris from aerators (also called screens) once a month after service line replacement. If aerators are old and worn, replace them with new ones. Aerators should be replaced twice a year.

Full instructions for intensive flushing

BEFORE YOU START

1. Always use COLD water when you rinse the pipes.
2. Locate all water faucets in the house where you can run the water without the sink or tub overflowing.
   - Be sure to include any laundry tubs and utility sinks.
   - Use showers that are not attached to bathtubs. Take off the showerheads, if possible.
   - If a shower is attached to a bathtub, just use the bathtub faucet.
3. Take off aerators (also called screens) from all faucets and showerheads.
   - If you cannot take these off, do not use the faucet for rinsing the pipes.
4. Make sure all drains are open and clear so water can flow freely down the drains. After you take off aerators/screens, quickly flowing water will splash and spray.

TURNING ON YOUR TAPS

5. After all aerators/screens are off, start opening faucets in the basement or on the lowest floor.
   - Open COLD water faucets all the way to let the water come out as fast as it can.
   - Keep the water running from all faucets at the highest rate possible.
6. Go up to the next floor.
   - Open all COLD water faucets there and let the water come out as fast as it can.
7. Continue until you fully open COLD water faucets on all floors of your house.
8. After ALL faucets are open fully, let the water run for 30 minutes.
   - TIP: You can save some of this water in buckets for washing your car or watering flowers. Never use this water for food, pets or in gardens that will be used to grow food.
9. After 30 minutes, go the basement or the lowest floor.
   - Turn off all the faucets.
   - Go to each floor and close the faucets in the order that you opened them.
10. Clean the aerators/screens and put them back on at each faucet.
   - If aerators/screens are old and worn, replace them with new ones.

What should I do after the lead service line replacement is completed?

The same day after GCWW or its contractor has completed installing the new copper service line or before the next water use, you should fully open the cold-water side only at every interior premise plumbing fixture and let the water run for 30 minutes to flush out the new service line. This should be done to remove any potential lead particles that may have come loose and become captured in the internal premise plumbing as a result of the replacement work. Hot water should not be used until the cold water has been run for 30 minutes.

Every morning or after any period of no water use for 6 hours or more, fully open the kitchen faucet or any bathroom faucet and let the water run for 5 minutes before using (such as first thing in the morning or when getting home from work). This can also be done by taking a shower, running dishwasher, or flowing the faucet. This should be done for 6-months or until the monthly water testing results are below 15 parts per billion (ppb). You will receive detailed instruction from GCWW on how to perform this work.

https://www.cincinnati-oh.gov/water/assets/File/Lead/FAQS_WMRO.pdf
Customer Follow-up

- Will customers follow all instructions?

- Cincinnati follow-up sampling — 3 days, then monthly

- Opportunity to check lead levels, reinforce flushing recommendations
Customer Concerns About Water Usage

- Concerns about cost and “wasting” water
- Regional/seasonal variations
- Denver – inside/outside landscape & plant watering
- Philadelphia – developing cost profiles on routine flushing
- Opportunity for research & creative communications
QUESTIONS?

www.lslr-collaborative.org