Halifax Water's Continually Evolving Lead Program: Guided by Research and Best Practice

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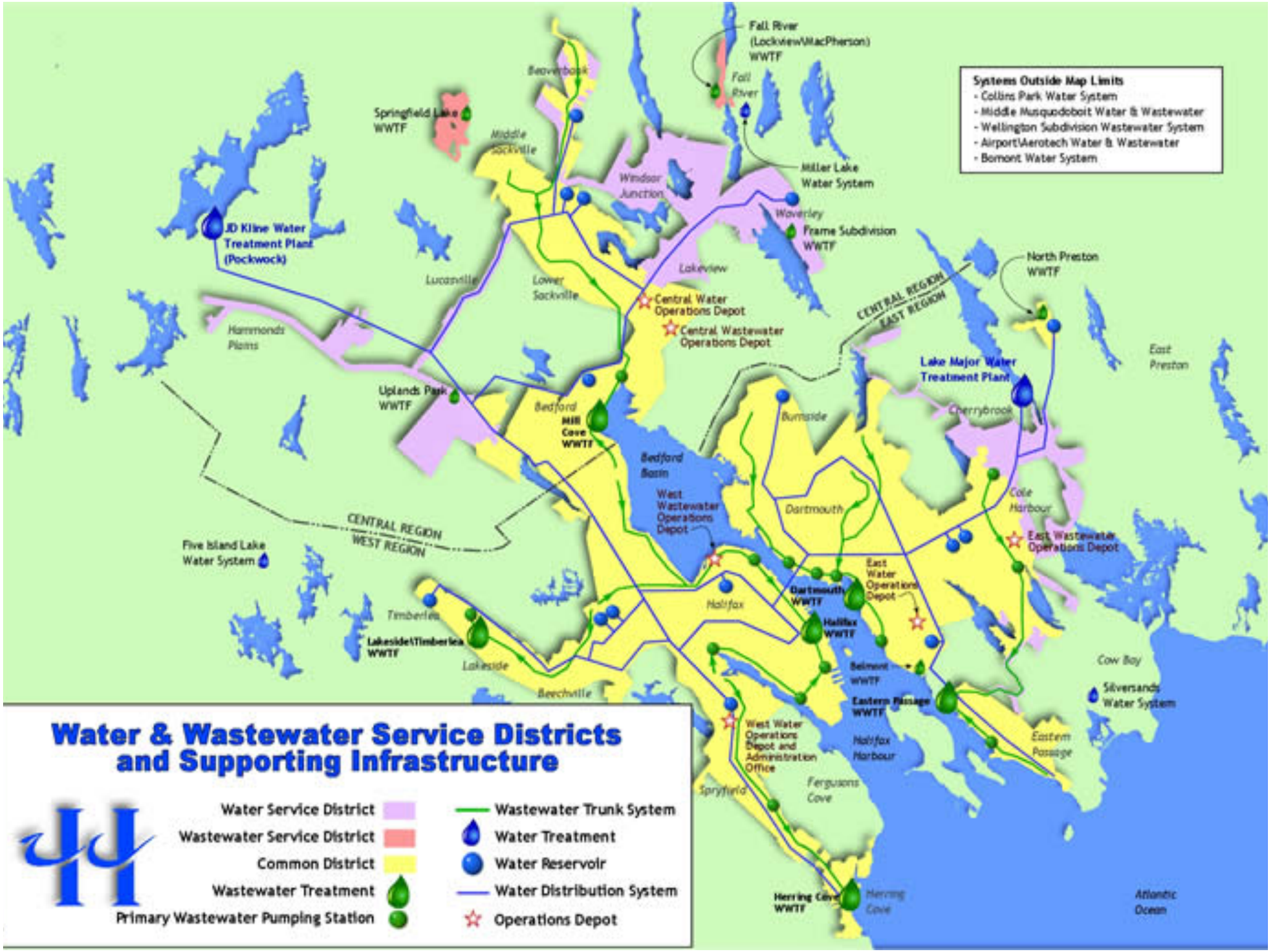
Providing world-class services for our customers and our environment

Presentation overview

- Background: Halifax Water and Lead
- Understanding Lead Release: Impact of Research
- Current Halifax Water Lead Programs
- New Lead Initiatives
- Path Forward

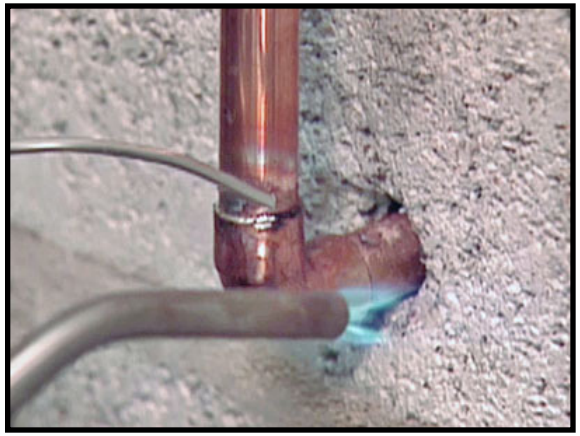
Halifax Water


Systems Outside Map Limits
- Collins Park Water System
- Middle Musquodoboit Water & Wastewater
- Wellington Subdivision Wastewater System
- Airport\Aerotech Water & Wastewater
- Bomont Water System
Fall River (Lockview\MacPherson) WWTF
Fall River
Beaverbank
Springfield Lake WWTF
Middle Sackville
Windsor Junction
Miller Lake Water System
Waverley
Framo Subdivision WWTF
JD Kline Water Treatment Plant (Pockwock)
Lucasville
Lower Sackville
Lakeview
Central Water Operations Depot
Central Wastewater Operations Depot
North Preston WWTF
CENTRAL REGION EAST REGION
Hammonds Plains
Uplands Park WWTF
Bedford
Mill Cove WWTF
Lake Major Water Treatment Plant
East Preston
Cherrybrook
Burnside
Bedford Basin
West Wastewater Operations Depot
Dartmouth
Cole Harbour
East Wastewater Operations Depot
CENTRAL REGION WEST REGION
Five Island Lake Water System
East Water Operations Depot
Dartmouth WWTF
Halifax
Halifax WWTF
Timberlea
Lakeside\Timberlea WWTF
Lakeside
Beechville
Belmont WWTF
Eastern Passage WWTF
Cow Bay
Silversands Water System
West Water Operations Depot and Administration Office
Halifax Harbour
Eastern Passage
Fergusons Cove
Spryfield
Herring Cove WWTF
Herring Cove
Atlantic Ocean
Water & Wastewater Service Districts and Supporting Infrastructure
Water Service District
Wastewater Service District
Common District
Wastewater Treatment
Primary Wastewater Pumping Station
Wastewater Trunk System
Water Treatment
Water Reservoir
Water Distribution System
Operations Depot

Sources of lead in Halifax drinking water

- **Water in water mains in Halifax is virtually lead-free.**

Lead Service Lines (Stopped use in 1950's)



Lead Solder (banned in 1986)

Brass Fixtures, pre-2014 can contain up to 8% lead

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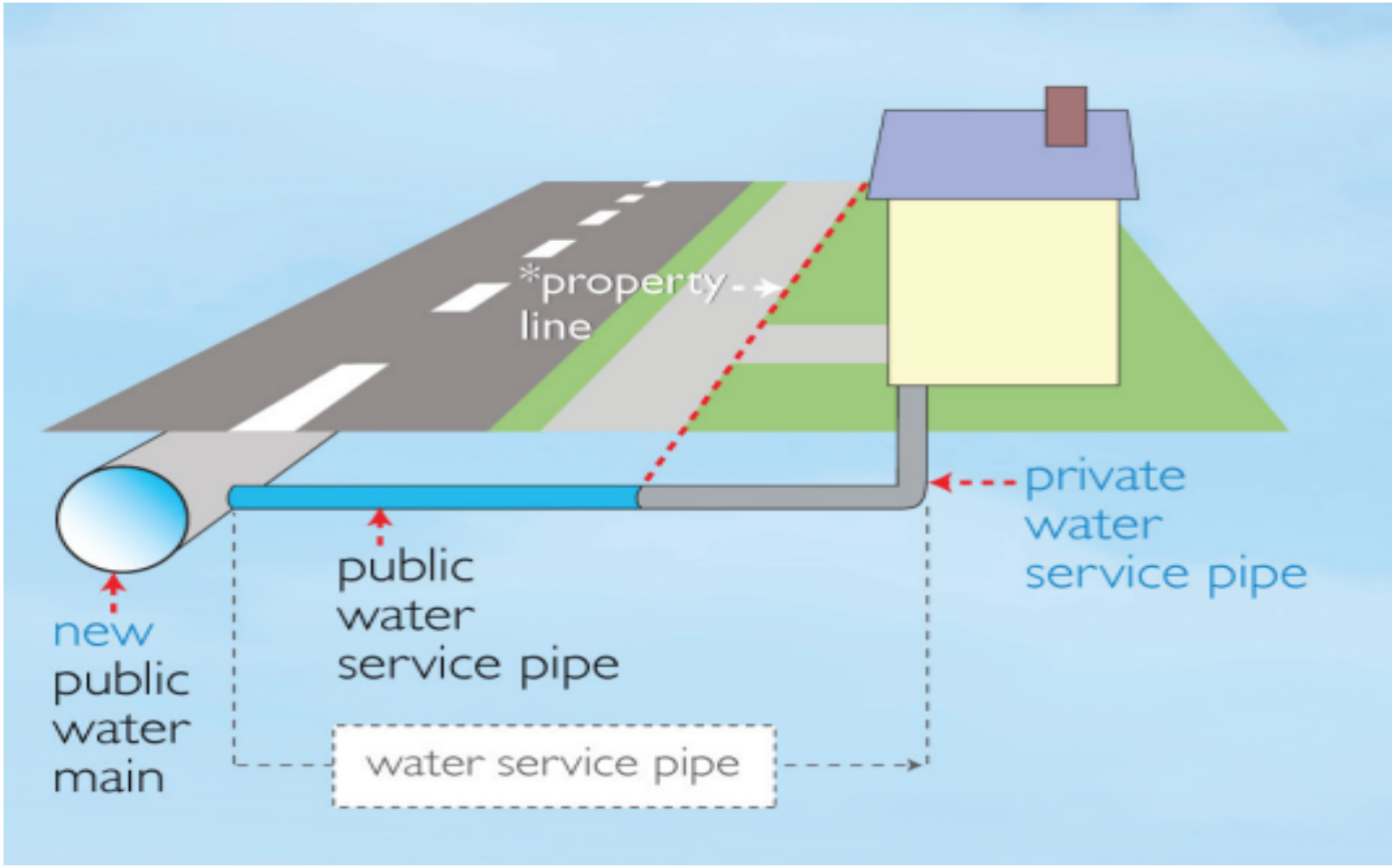
Getting the Lead Out – A Shared Responsibility



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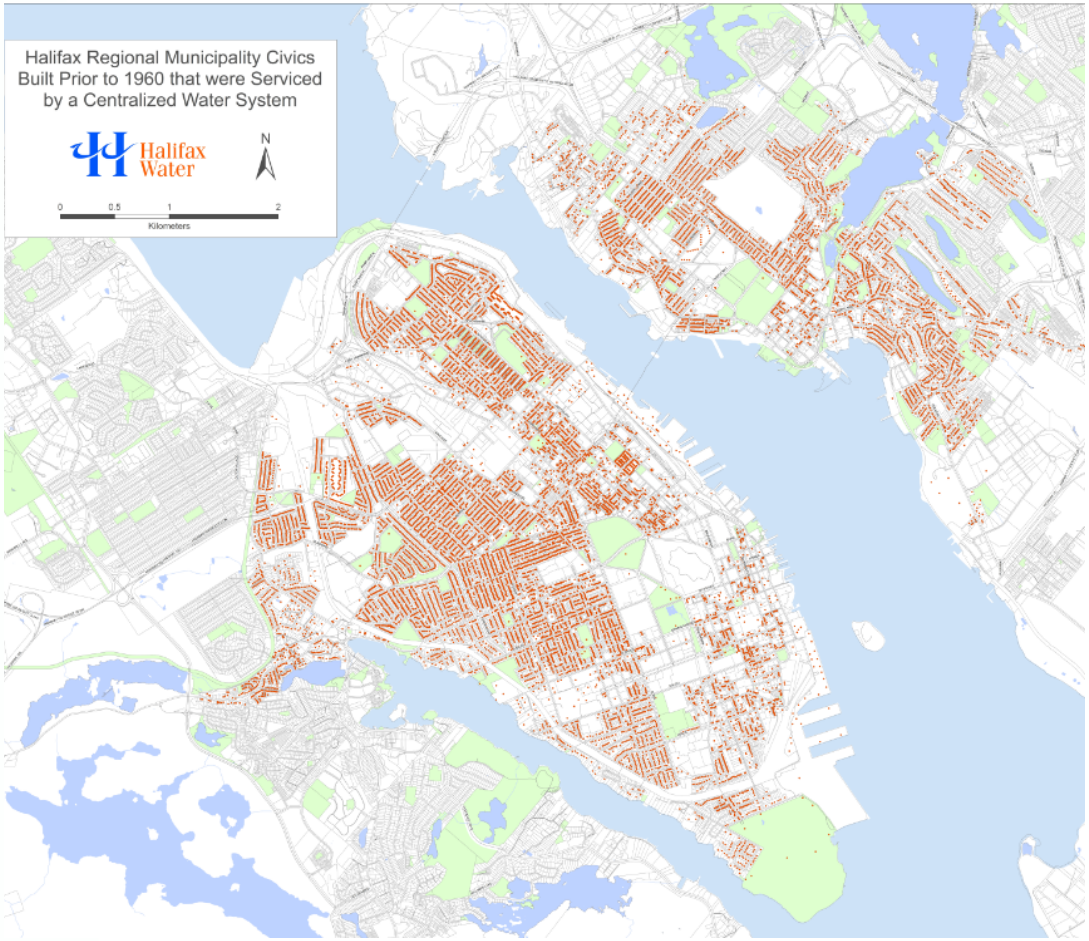
Halifax Water and lead

- **Approximately 15,000 LSL's at one time.**
  - 2,500 public LSL's remaining today.
  - Private LSL's: ???
- **Halifax Water has a corrosion control program in place.**
- **Halifax Water has always been compliant with regulatory sampling requirements.**



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Issues With the Historic Approach to Lead

- **Industry shift towards removal of all LSLs**
  - Current rate of replacement (25 per year) will take 100 years to replace only the public portion of the lead service line
- **Estimate that historic large scale replacement programs had <10% uptake of private renewal**
  - Leaves partials that still need to be addressed
  - No reliable estimate of how many private LSL's remain
- **Coordination with City pavement management and street renewal program leads to partial replacements**

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Understanding Lead Release: Impact of Research

- NSERC/Halifax Water Industrial Research Chair in Water Quality and Treatment

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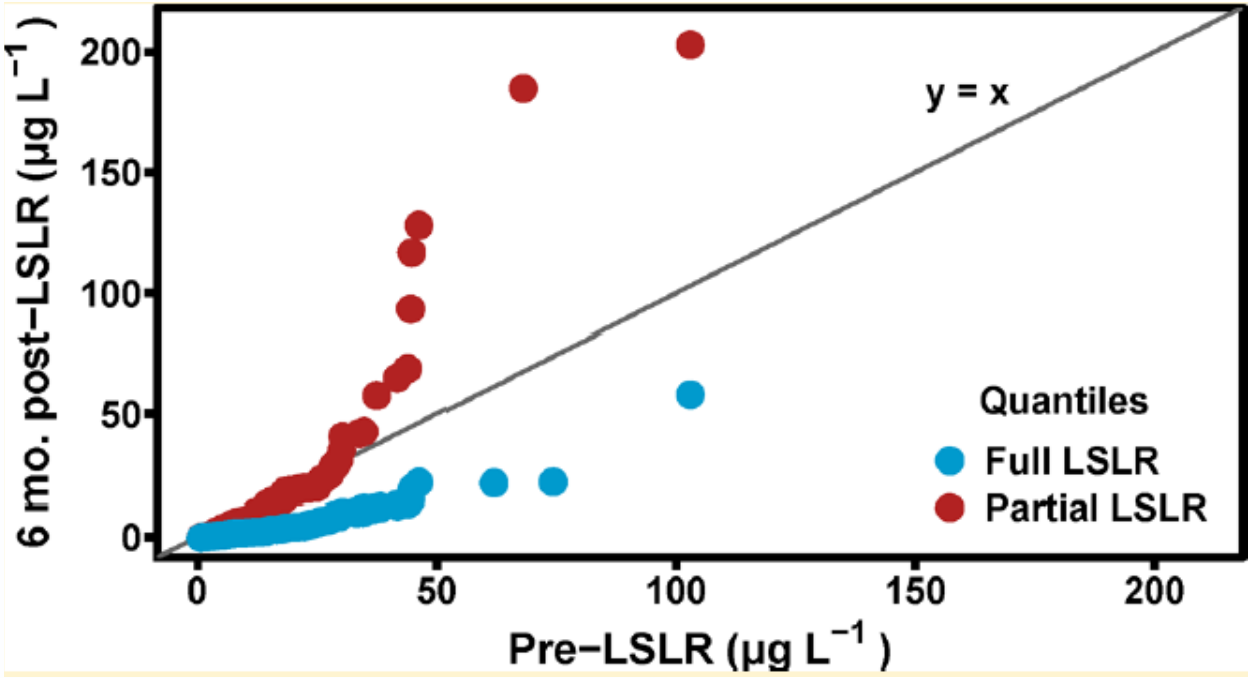
Partial Replacements and Lead Release

- **LSL replacement sampling program**
  - Samples: Pre-replacement, 72 hrs, 1, 3 and 6 months post replacement
  - After 6 months:
    - ✓ All full LSLR samples were below pre-replacement values
    - ✓ Many partial LSLR were above pre-replacement values



Figures from: Trueman et al., (2016) *Environmental Science & Technology 50:7389-7396.*

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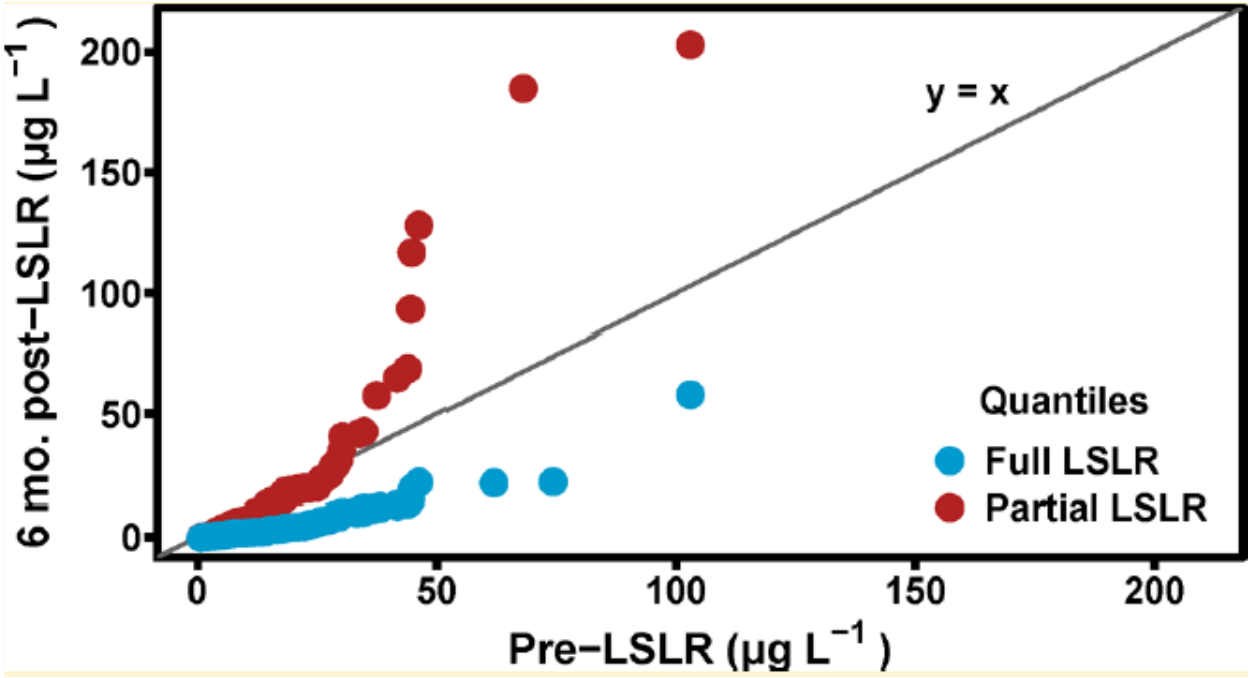
Partial Replacements and Lead Release

- **Impact: Halifax Water stopped conducting partial replacements in 2012**
- **Industry is moving towards removal of all lead service lines, public and private**



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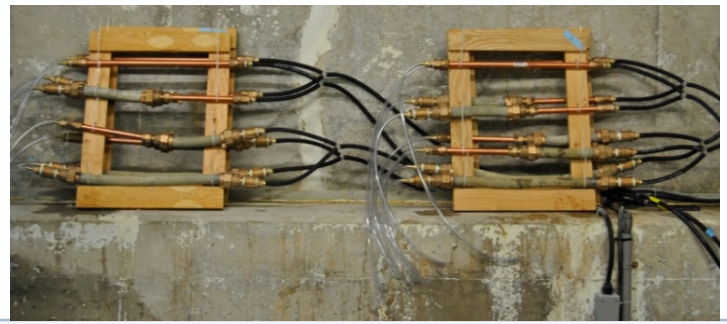
Particulate Iron, Phosphate and Lead Release

- **Pilot scale research showed:**
  - Correlation between cast iron mains and lead release
  - Doubling of orthophosphate dose leads to decrease in lead release



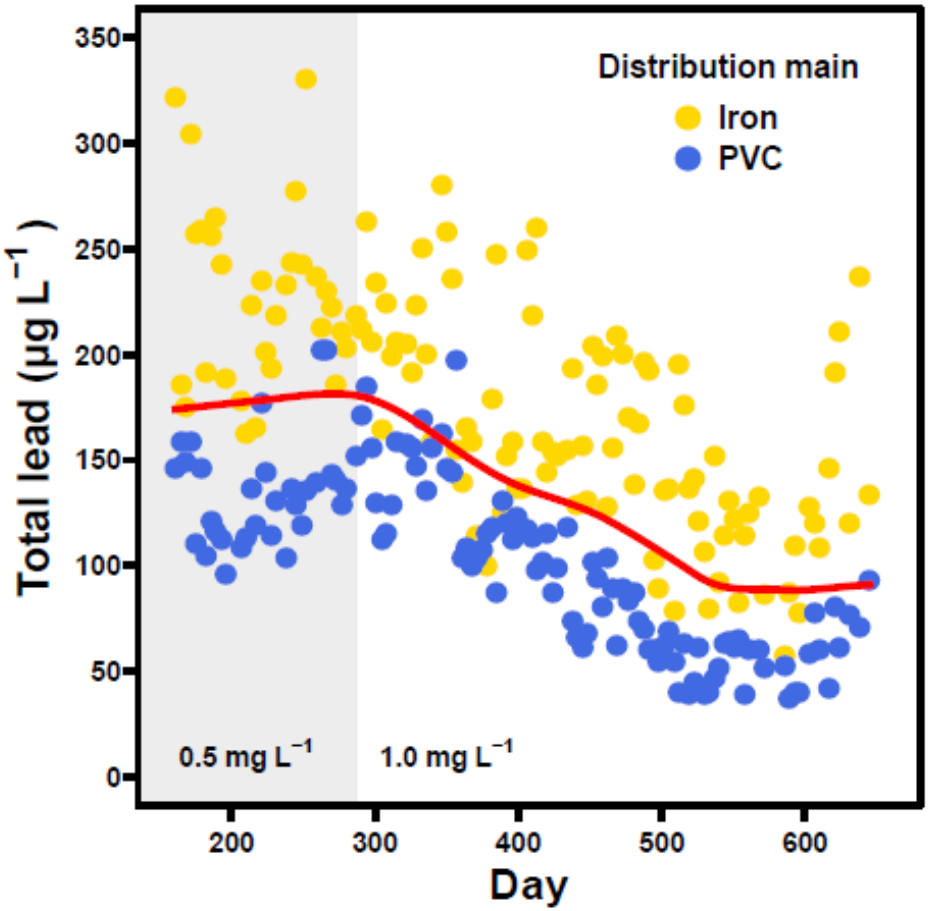


Figure from: Trueman & Gagnon (2016) *Environmental Science & Technology 50:9053-9060.*

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Particulate Iron, Phosphate and Lead Release

- **Impact:**
  - Halifax Water will target areas of distribution system for LSLR
  - Implemented doubling of orthophosphate dose in April 2016, and initiated a bimonthly sampling program in 40 homes to monitor change in dose at full-scale
  - Installing dedicated pipe racks in distribution system to be able to monitor changes to corrosion control strategies in the future.

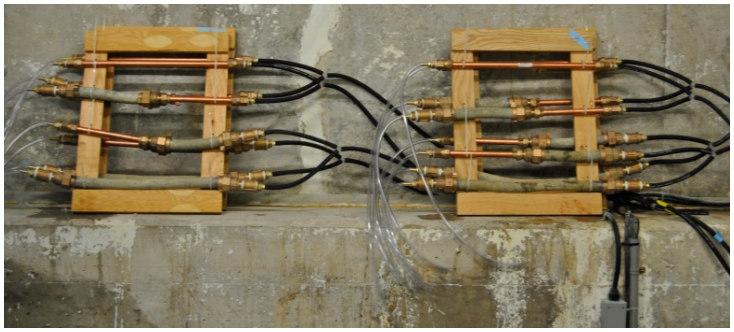

Figure from: Trueman & Gagnon (2016) *Environmental Science & Technology 50:9053-9060.*

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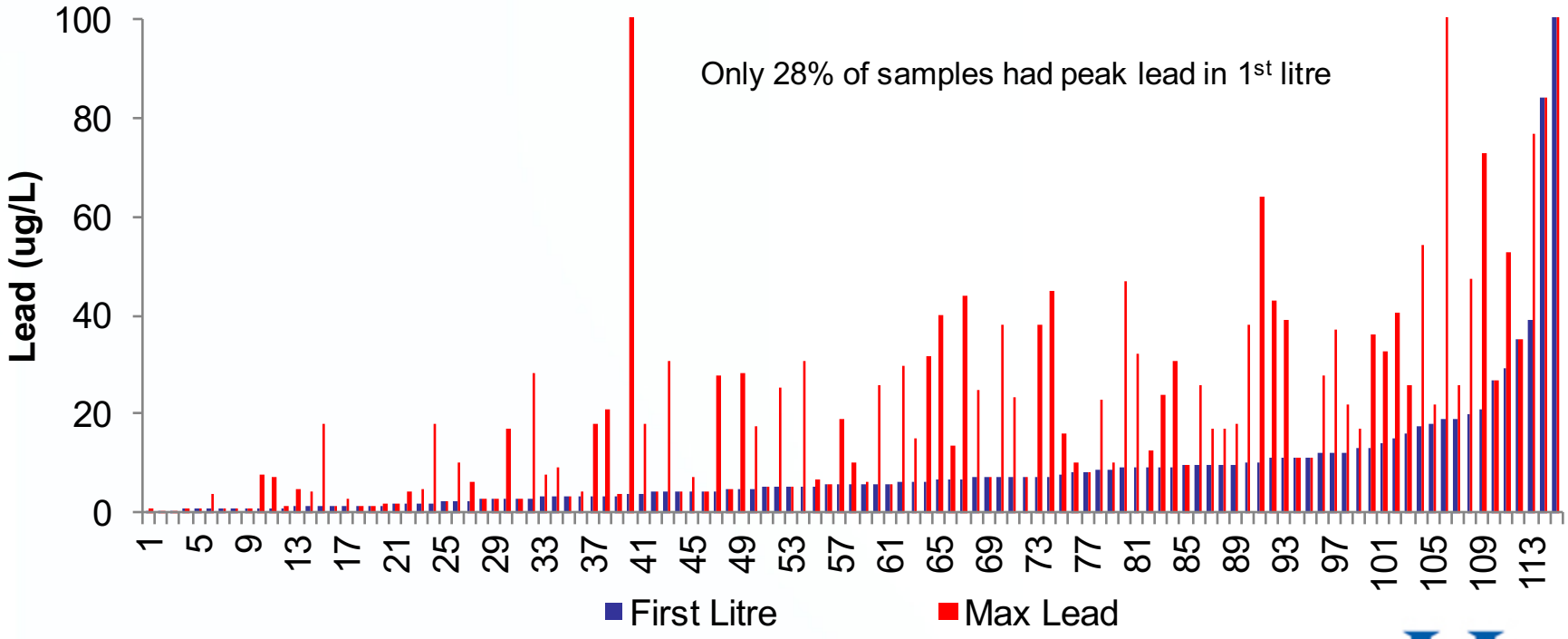
Customer sampling for lead exposure

- **Current USEPA Lead and Copper Rule and Health Canada Guidelines use 1-L first draw sample post 6 hr stagnation for corrosion control compliance**
  - Profile sampling in Halifax, and other research (WRF 4569) confirms this type of sampling does not capture peak lead



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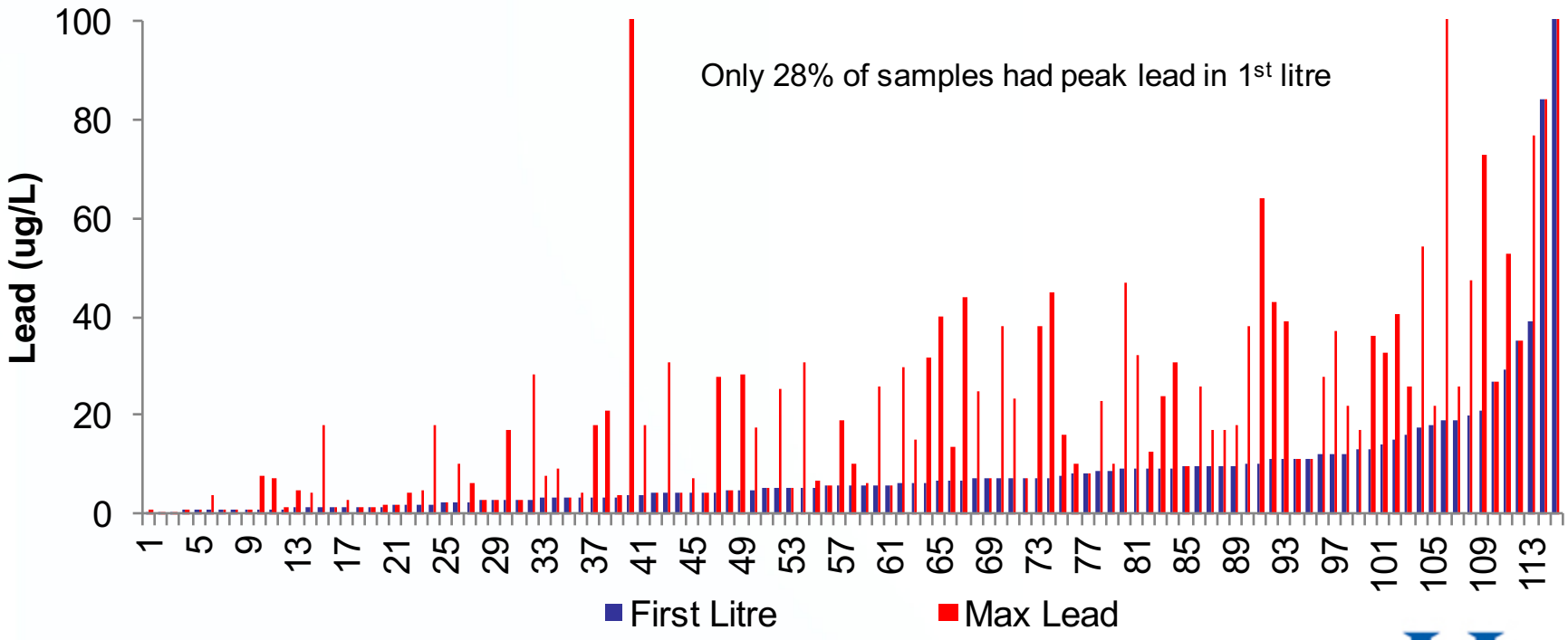
Customer sampling for lead exposure

- **Impact: in 2014 Halifax Water changed from first litre post-stagnation to profile sampling post stagnation for all customer lead sampling**
  - 4 x 1L and a 1 L flush sample post 6 hr stagnation



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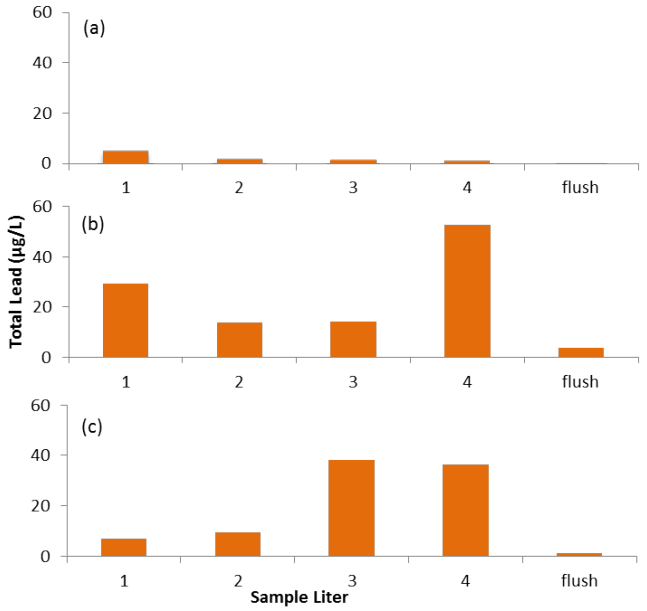
Lead exposure and corrosion control monitoring

- **Knowing what you are looking for can help to determine what the sampling/monitoring program should look like**
  - Compliance
  - Lead exposure
    - ✓ Profile sampling vs first litre vs flushed
    - ✓ Random daytime sample, 30 min stagnation, 6 hr stagnation
    - ✓ Bottle type, aerator, flow rate
    - ✓ Particulate, dissolved or total lead
  - Identification of service line material
    - ✓ Profile sampling combined with premise plumbing audit
  - Evaluation of corrosion control program
    - ✓ Distribution system sampling
    - ✓ Repeated customer sampling
    - ✓ Pilot/bench scale testing



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Current Halifax Water Lead Program

Current Halifax Water Lead Programs

1. Corrosion control treatment
2. Corrosion control monitoring
3. Customer sampling
4. Lead Service Line (LSL) Replacement Program
5. Exposure reduction initiatives post disruption/construction
6. Public outreach and education initiatives

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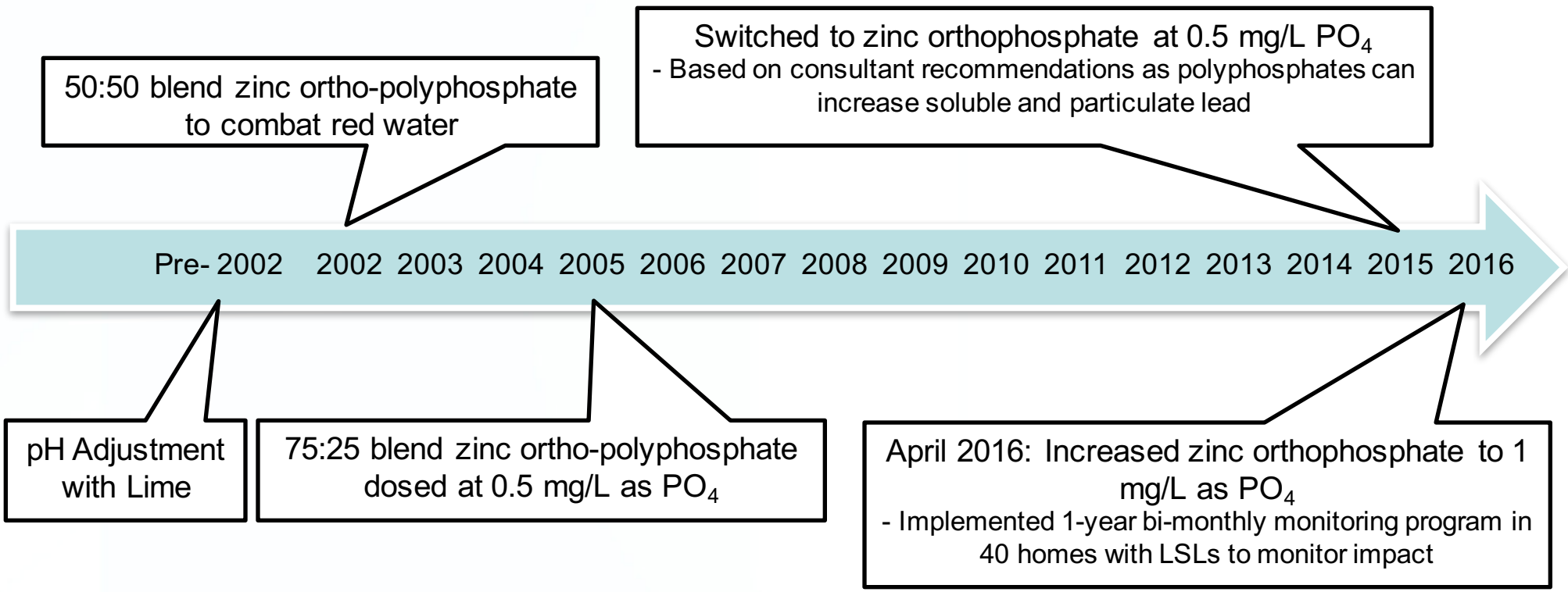
1. History of Corrosion Control Treatment



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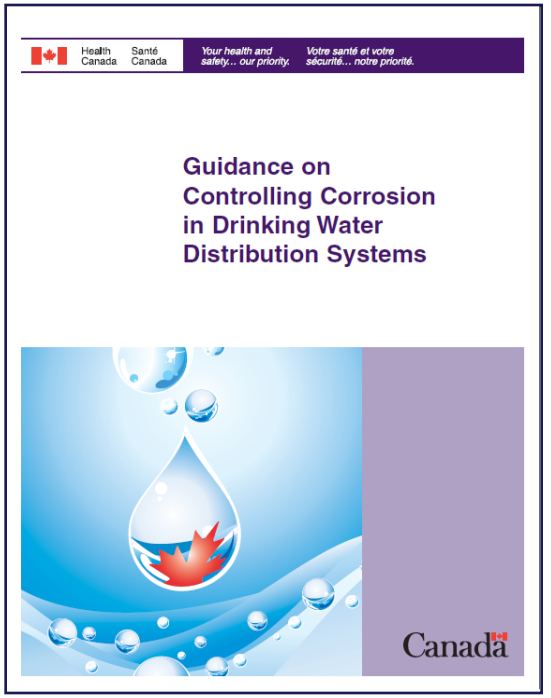
2. Corrosion Control Monitoring

- **Distribution sampling:**
  - Biweekly at 21 sites: PO_4, Al, Mn, Fe, Zn, Cl^-, SO4,
  - Quarterly monitoring of metal coupons at 10 sites
    - ✓ Measures corrosivity of water, not tendency for metal release
- **Bench and pilot scale research**
  - Dalhousie University
    - ✓ Outcomes: Best management practices for Lead Service Line replacements, sampling protocols and understanding corrosion control
  - Consultants
    - ✓ Analysis of pipe scales and recommendations on corrosion control treatment
- **Lead pipe racks in distribution system**

3a. Customer Corrosion Sampling - Residential Monitoring Program

- **Followed Health Canada protocol since 2011**
  - Tier 2 sampling since 2014
    - ✓ Target 100 homes, 50 with lead service
    - ✓ 4 x 1-L after 6 hrs stagnation plus 1L flush
  - Results of first L post stagnation have always had a 90th percentile <15 µg/L
  - Results letters provided to customers
    - ✓ explains results with instructions on how to minimize exposure if levels are above guidelines
- **Results from this program are generally not appropriate for assessing effectiveness of corrosion control program**



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3b. Customer Initiated sampling

- **In response to any customer inquiry about lead, Halifax Water offers complimentary sampling if records indicate they have unknown or lead service lines**
  - Same protocol as for annual residential monitoring
    - ✓ 4 x 1L profile after 6 hrs stagnation and 1L flush sample
  - Provide letters with results similar to annual residential monitoring
  - Have had significant increase in customer requested lead samples in 2016, from average of 15 to over 30 this year.

3c. LSL replacement sampling program

- **Offered to any customer undergoing a full or partial replacement.**
  - Over 200 customers participated since 2011
- **Sample analysis by Dalhousie University:**
  - Prior to replacement, 72 hrs after, 1 month, 3 months and 6 months
  - Same protocol as for annual residential monitoring

4. Lead Service Line (LSL) Replacement Program

- **Current policy of lead service replacement:**
  - Following a private replacement
  - When there is a planned or sudden disturbance of the water main or public portion of the service line:
    - ✓ When there is a leak in the public portion of the service line.
    - ✓ When there is a water main renewal project occurring on the street.
- **Closing the gap on public and private renewal timelines, new program 2016:**
  - Standing offer with 3 contractors to perform both public and private portions of renewal as one job to reduce time as partial LSL
  - Customers still have option to hire their own contractor, but will be subject to Halifax Water timelines for public portion
  - 10 customers have used the program since inception in July

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5. Exposure Reduction Initiatives Post Disturbance/Construction

- **Flushing instructions provided to customers post disturbance/construction**

- **New 2016: Point of Use Filtration units provided post disturbance/construction**
  - Tested several POU pitcher style filters at Dalhousie University for lead removal
  - Supply one filter pitcher and replacement cartridges post disturbance/construction

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Important
Post-Construction
Information for Residents

The following are important instructions to minimize lead exposure after pipe replacement.

Date:_____

Halifax Water recently:

- ☐ Replaced the public portion of your service line
- ☐ Inspected the upgrades to your private service line
- ☐ Repaired your lead service line
- ☐ Other:_____

Following a lead service line replacement or repair, some customers may experience a temporary increase in lead levels in their water as a result of pipes being disturbed during construction; and in cases where a portion of the service line is lead, from the galvanic reaction between the lead and copper connection.

The reverse side contains important steps that are strongly recommended to minimize lead exposure after construction is complete and water service is restored.

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Important
Post-Construction
Information for Residents

Step 1 Immediately after construction:

- Flush your inside cold water plumbing at the highest achievable flow rate for approximately 60 minutes total to remove any lead particles or sediment dislodged during construction. Flush water throughout the house by opening cold water faucets one at a time, working from the lowest level to the highest level in your house.
- Do not open hot water faucets until the plumbing system is completely flushed.
- After flushing, remove and clean all faucet aerators. Lead particles and sediment can build up in the screen.

Step 2 For 3-0 days after construction:

- Each day, flush your plumbing by opening at least one cold water faucet for 10 minutes. Flushing can also be achieved by running appliances such as your dishwasher or washing machine.
- After flushing, remove and clean faucet aerators.

Step 3 For six months after construction:

- Use cold tap water for cooking and drinking. Hot tap water can cause a greater release of lead from plumbing.
- If water is not used for more than six hours (i.e., overnight, during work hours), flush the cold water tap for five minutes prior to drinking and cooking.
- Periodically remove and clean all faucet aerators.
- If you are pregnant, breastfeeding or have children under the age of six, consider using a household water filter. As per Health Canada's recommendation, make sure the filter is certified to NSF 053 International Standards for the removal of lead.
- Boiling water will **NOT** remove lead!

For more information on reducing lead exposure around your home, visit Health Canada's website at http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/lead-plomb-eng.php. If you have questions or concerns regarding the above recommendations, please call 490-4098 or visit:

www.halifax.ca/hrwc/WaterQualityandLead.html

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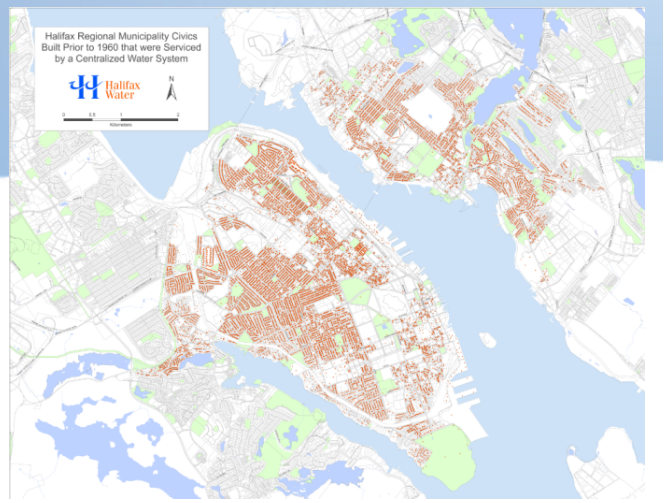
www.halifaxwater.ca

6. Public Outreach



- **Direct to customers:**
  - Pre- and post construction LSL Replacement Information to residents
  - Results letters to customers
    - ✓ LSL Replacement Sampling Program, annual residential program, customer initiated sampling
  - Outreach to residents during water main renewal projects
- **Website**
  - Hot spot map
- **Regional Associations**
  - Nova Scotia Association of Realtors
  - Building inspectors, plumbing associations
- **Broader outreach:**
  - OpFlow, Peer-reviewed journal publications (11 to date on corrosion), Watertalk, Stewardship Report


Distribution

Utility Adopts a Complete Lead Service Line Replacement Strategy

Halifax Water (Canada) has been challenged by lead service line replacement for decades. Recommending complete, rather than partial, replacement, the utility has adopted a proactive approach, advanced technologies, robust customer engagement, and an integrated plan.

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New lead initiatives/activities for 2016

Summary of new lead programs/initiatives 2016

- **LSL Replacements:**
  - 50 Public LSL's Replaced as of October 14, 2016.
  - Result of Flint and initiation of bi-monthly monitoring program
- **Corrosion Control Sampling/Monitoring**
  - Initiated bimonthly monitoring of 40 lead service customers to monitor change in corrosion control
  - Installing dedicated lead pipe racks in distribution system for sampling
  - Increased requests for customer initiated sampling
- **Closing the gap:**
  - Implemented a process for a single private contractor to do both the public and private LSL in the same operation.
- **Protecting Public Health**
  - Initiated program to provide POU filter devices post disturbance or renewal
- **Inventory**
  - Developed a map of home construction pre-1960
  - AMI meter installations, information gathering

Path Forward

Path forward: Developing Strategies for LSL Replacement

- **Based on National Drinking Water Advisory Council Recommendations to the EPA**
  - Replace all LSL's within a reasonable time frame
    - ✓ Both public and private
  - Communicate with Customers
    - ✓ Shared responsibility
  - Develop an accurate Inventory
  - Continued corrosion control
  - Continued sampling and monitoring

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Summary

- Halifax Water's lead program is an evolving process based on research and best practice
- Moving forward, goal is for removal of lead service lines so that remaining lead sources can be controlled through optimized corrosion control treatment.
- Continued research partnership with Dalhousie University to further knowledge base and guide practices and ensure that monitoring programs are representative and provide value.

Questions or Comments?

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