



Nick Fish, Commissioner  
Michael Stuhr, P.E., Administrator



1120 SW 5<sup>th</sup> Avenue, Room 600  
Portland, Oregon 97204-1926  
Information: 503-823-7404  
[www.portlandoregon.gov/water](http://www.portlandoregon.gov/water)

December 2, 2016

Lillian Shirley  
Public Health Director  
Oregon Health Authority  
Portland State Office Building  
800 NE Oregon St., Suite 930  
Portland, Oregon 97232-2162

**RE: Interim Lead Reduction Plan and Lead Hazard Reduction Plan Changes**

Dear Ms. Shirley,


Thank you for your November 4 letter approving our proposed schedule to implement enhanced corrosion control treatment. As always, we appreciate your thoughtful engagement and our shared commitment to protecting public health.

We have reviewed your letter and the suggested interim treatment measures and changes to the Lead Hazard Reduction Program (LHRP) carefully. Our response includes a brief system overview to provide context for the proposed measures, our proposed plan, and potential opportunities to shorten our approved compliance schedule.

Upon Oregon Health Authority's (OHA) approval, we will begin implementation of the individual plan components in accordance with the schedule identified.

We look forward to continuing our collaborative partnership with OHA, and to receiving your approval of the attached plan so that we can begin implementation.

Sincerely,



Michael Stuhr, P.E.  
Administrator

Interim Corrosion Treatment and Lead Hazard Reduction Program Changes

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Cc: Lynne Saxton, Director,  
Oregon Health Authority

Jere High, Administrator, Center for Prevention and Health Promotion  
Oregon Health Authority

Dave Leland, Drinking Water Program Manager  
Oregon Health Authority

Dan Opalski, Office of Water and Watersheds  
EPA Region 10

Nick Fish, Commissioner  
City of Portland

# Interim Lead Reduction Plan

Prepared by Portland Water Bureau

December 2, 2016

## 1. Introduction

The Portland Water Bureau (PWB) is committed to reducing all customers' exposure to lead in water at the tap. Consistent with the commitment we made in 2002, PWB is following through with implementation of agreed-to corrosion control treatment modifications. Recently, there have been significant changes to PWB's system, including the disconnection of the uncovered finished water reservoirs and a new multiple-level intake structure. Additionally, the scientific community has an increased understanding of the health effects of low-level exposure to lead. Therefore, PWB is proceeding with the steps included in the Corrosion Control Treatment Compliance Schedule approved by Oregon Health Authority (OHA) on November 4, 2016. PWB is also committed to implementing the interim actions proposed in this plan.

## 2. Background

Portland's primary drinking water source is the highly protected Bull Run Watershed, the largest water supply in Oregon. As an unfiltered surface water supply, the water parameters of our source water vary seasonally. The raw water pH is approximately 7 and the alkalinity ranges from 5-12 mg/L throughout the year. Portland also has a secondary groundwater source, which is used as an alternative supply when the Bull Run is shut down. It is used during turbidity events, as augmentation supply during hot and dry summers, and seasonally as the wells are brought online for an annual maintenance run.

With an unfiltered system and pristine water source, treatment of the Bull Run source is relatively simple. It consists of a primary disinfectant of free chlorine added at the Headworks facility in the watershed, followed by the addition of ammonia to form chloramines at the Lusted Hill Treatment Facility. At Lusted Hill, sodium hydroxide is also added as a corrosion control treatment to raise the pH at the distribution system entry point to 8.0. When groundwater is used, it is treated for corrosion control to match the Bull Run source.

Portland is fortunate that, unlike many American cities, lead service lines were never installed on either side of the meter, and PWB removed all known lead pigtails (2-3-foot service connections) from its system almost 20 years ago.

In Portland, the primary source of lead in water is not from the water distribution system. Rather, it is from a small subset of home plumbing—either copper pipes with lead solder or from brass plumbing fixtures. Copper plumbing with lead solder is mainly found in homes built or plumbed between 1970 and 1985. About ten percent of Portland’s housing stock was built during this timeframe and could potentially have this type of plumbing. In 1985, Oregon and then Congress banned the use of lead solder. In 2014, the amount of lead in plumbing fixtures was limited to 0.25%.

In 1994, in compliance with the Lead and Copper Rule (LCR), PWB conducted an Optimized Corrosion Control Treatment (OCCT) study. The study recommended raising the pH of the water to 9.0 and alkalinity to 20 mg/L.

In collaboration with the Oregon Health Division (Drinking Water Section and Environmental Epidemiology Section); the Multnomah, Washington and Clackamas County Health Departments; and the Oregon Childhood Lead Poisoning Prevention Program, PWB proposed a comprehensive Lead Hazard Reduction Program (LHRP) as an alternative to optimized corrosion control treatment requirements of the LCR. This program is based on local risk assessment data from state and county health departments, and recognizes that children are exposed to lead mainly from lead-based paint and dust. The program incorporates established best practices to target children who are most at risk for lead poisoning. These interventions were expected to have a greater public health protection from lead exposure in Portland’s community than treatment alone.

The LHRP is a comprehensive lead reduction program. It includes four components:

1. Water treatment (currently raising the distribution system entry point pH to 8.0) and monitoring water quality parameters quarterly and at Tier 1 homes (those with verified lead solder in plumbing) twice a year.
2. Lead-in-water education and testing with free lead-in-water tests available to all Portland and wholesale customers.
3. Public education and community outreach on all sources of lead.
4. A home lead hazard control program which focuses on lead paint remediation in homes.

The US Environmental Protection Agency (EPA) delegated authority for oversight of drinking water regulations to OHA, which continues to be PWB’s primacy agency. Since 1997, OHA has approved the LHRP as equivalent OCCT because of its broader public health approach.

The 1994 OCCT study estimated that Portland’s compliance lead levels, collected at Tier 1 homes with verified lead solder in plumbing, would be reduced by 70-85% from pre-treatment levels by treating to pH 9.0 and alkalinity 20 mg/L. With the current treatment (pH of 8.0), Portland has seen significant – up to 70% – reductions in lead levels at these worst-case homes. Additional treatment is expected to provide further reductions in lead levels.

PWB currently partners with 12 of its wholesale systems to sample more than 100 Tier 1 homes through a Joint Monitoring Plan (JMP). Due to changes in sources of supply in some wholesale systems over the years, the JMP is currently being revised. It will be incrementally altered in the spring of 2017 and again in the fall of 2017. The final JMP will include only systems that use PWB's water as their sole source of supply.

Since increasing the target pH to 8.0 in April 2005, PWB has exceeded the lead action level of 15 parts per billion (ppb) in Fall 2006 (90<sup>th</sup> percentile of 17 ppb), Fall 2013 (90<sup>th</sup> percentile of 16 ppb), and most recently in Fall 2016 (90<sup>th</sup> percentile of 17 ppb). Over the same time period, 18,791 customer-submitted samples from homes all over the PWB service area had a 90<sup>th</sup> percentile of 5 ppb.

In 2014, in anticipation of changes to the water system, PWB secured funding to begin a water quality corrosion study.

A yearlong sampling effort has been completed and the data collected will provide further information regarding the mechanisms of lead release in PWB's system. A Request for Proposals (RFP) for a corrosion control treatment pilot study has been issued and it is anticipated the study will begin in Spring 2017.

### 3. Interim Plan Components

#### 3.1. Overview

OHA's November 4, 2016 letter requested an interim plan using existing treatment and water system facilities to further reduce lead in drinking water. PWB met with representatives from OHA on November 10, 2016, to receive additional guidance.

PWB also received written guidance from EPA on November 10, 2016 and met with representatives from the US EPA, EPA Region 10, and OHA on November 21, 2016 regarding expectations for an interim plan. All parties reiterated a commitment to the overarching objective under the LCR of minimizing lead exposure at customer taps.

EPA clarified several interim measures at the November 21 meeting. PWB's proposed action items are described in detail below and incorporates EPA's suggested measures (listed in *italic* at the beginning of each section).

## 3.2. Action Items

### 3.2.1. Conduct Comprehensive Corrosion Control Treatment Study

*A comprehensive corrosion control treatment study that evaluates the effectiveness of each of the following treatments: (i) alkalinity and pH adjustment, (ii) Calcium hardness adjustment; and (iii) Phosphate or silicate based corrosion inhibitor.*

PWB is beginning a comprehensive corrosion control treatment pilot study to evaluate the effectiveness of various corrosion control treatments including alkalinity and pH adjustment; calcium hardness adjustment; and phosphate- or silicate-based corrosion inhibitors. The results of the pilot study will be used to recommend optimized corrosion control treatment for full-scale implementation. An RFP for the pilot study is currently out for bid; proposals are due in December 2016. PWB anticipates selecting a consultant in January 2017 and issuing a Notice to Proceed (NTP) to the selected consultant in March 2017 following City Council approval. An 18-month pilot study, per EPA's OCCT Technical Guidance Manual (2016), is planned with anticipated completion in summer 2018.

### 3.2.2. Raise pH from 8.0 to 8.2

*PWB's existing facility should raise the pH from (8) to pH (8.2).*

As previously noted, the current pH target at Lusted Hill (the entry point to the distribution system) is 8.0. Raising the pH above 8.0 reduces theoretical lead solubility and may result in a decrease in lead at customer taps. The pH target at Lusted Hill will be raised from pH 8.0 to pH 8.2. To avoid unintended adverse impacts to water quality, this pH change will be made incrementally as recommended in EPA's OCCT Technical Guidance Manual (2016). The pH target at Lusted Hill will initially be increased by 0.1 pH units, or to 8.1, and maintained until collection of Spring 2017 LCR Tier 1 home sampling in May 2017. Following review of Spring 2017 LCR results with OHA, the pH target at Lusted Hill will be further increased to 8.2. This pH increase to 8.2 will be made no later than July 1, 2017 and maintained until implementation of modified corrosion control treatment as recommended by the corrosion control pilot study.

Prior to any changes in treatment, PWB provides notice to wholesale customers. Upon OHA's approval of the above pH increase, PWB will issue the notice to wholesale customers and increase the pH target at Lusted Hill to 8.1 within 14 days of OHA's approval.

### 3.2.3. *Manage Water Age*

*Comprehensive water age management plan including (a) storage tank drain/fill practices to reduce water age; (b) ongoing unidirectional and hot spot (high water age or high lead tap) flushing program.*

Reducing water age can improve water quality by stabilizing/increasing the chlorine residual as well as reducing nitrification. PWB actively manages water age in the distribution system through a variety of techniques including the following: a robust nitrification monitoring and action plan, taking distribution system storage tanks out of service seasonally, deep cycling storage tanks, adding mechanical mixers to decrease stratification, lowering storage tank levels, adjusting regulator levels, installing new regulators to change the water supply into an area, draining/cleaning storage tanks ahead of schedule if dictated by water quality, and conventional and unidirectional flushing.

In addition, PWB will prepare a water age management plan that documents these practices within 90 days of OHA's approval of the proposed plan. As part of this process, PWB will identify whether additional steps can be taken to decrease water age in the system, and if so, will implement these practices.

### 3.2.4. *Target Flushing and Public Education and Outreach Based on Investigative Sampling*

*Use current LCR tap sampling results as a basis for an investigative sampling program to identify problem areas (age, construction) to target flushing, public education and outreach and prioritize LSL (lead service line) replacement, if applicable.*

While results from PWB's water quality corrosion study indicate that elevated lead levels are not geographically concentrated, within 90 days after approval of this plan PWB will further evaluate current LCR tap sampling results to identify whether problem areas exist. If so, targeted investigations will determine appropriate mitigations.

PWB's education and outreach program is extensive and targets risk factors, including age of home as well as presence of children/pregnant women in the home. If lead results from either an LCR home or a voluntary customer sample exceed 15 ppb, PWB staff call those customers directly to discuss the results and steps that can be taken to reduce lead levels at the tap (including flushing residential premise plumbing). Follow-up sampling is also offered.

PWB does not have lead service lines on either side of the meter, and therefore does not have a lead service line replacement program.

### 3.2.5. Target Flushing and Investigative Sampling Based on Water Quality Complaints

*Tracking of customer water quality complaints to identify problem areas for flushing and investigative sampling.*

PWB has a customer water quality complaint tracking system, used to identify areas for flushing as well as follow-up investigative sampling (if needed). Similar to section 3.2.4, if problem pocket areas are identified, targeted investigations/mitigations will be employed. PWB will expand the investigative sampling program, particularly with regard to turbidity, color, and metallic taste and odor complaints.

### 3.2.6. Homeowner Incentives

*Accelerate and provide incentives, such as homeowner subsidy, for lead service line (LSL) or premise plumbing replacement if/where applicable.*

As stated above, PWB does not have lead service lines, and therefore does not have a lead service line replacement program.

We understand EPA may allow service line and premise plumbing replacement to be eligible for Drinking Water Revolving Loan Funds. In 2017, PWB will work with EPA and OHA to investigate the feasibility of a program to help customers replace plumbing or fixtures that contain lead. If a feasible program is identified and adopted by federal or state agencies, PWB will be a full partner in promoting the program as widely as possible to its customers.

### 3.2.7. Establish Interim Water Quality Parameters (WQPs)

*State sets additional interim WQPs (authority under 141.82 (h)) such as pH, alkalinity, and LSI (Langelier Saturation Index).*

WQP samples are collected as part of the LCR sampling program and analyzed for pH and alkalinity. Since PWB is proposing changing the target pH entering the distribution system, it is prudent to also adjust the existing minimum WQP levels. PWB will work with OHA to revise WQP levels.

### 3.2.8. Increase Unidirectional Flushing and Encourage Premise Plumbing Flushing



In addition to the above steps, PWB is currently engaged in the following activities to adjust water quality in the distribution system and increase education/outreach regarding lead in water.

#### *Flushing Study and Increased Unidirectional Flushing*

Unidirectional flushing can decrease nitrification and other microbial growth, which can be factors in lead release. There is also ongoing work in the water industry evaluating the effects of high-velocity flushing on the removal of particulate lead from premise plumbing.

PWB is working with Seattle Public Utilities and the Water Research Foundation to develop unidirectional flushing guidance for the water industry. Through this study, PWB will identify adjustments that can be made to the existing unidirectional flushing program to more effectively improve water quality. Starting in FY 2017, PWB plans to add a staff position to the unidirectional flushing program to increase the amount of flushing that can be completed.

#### *Outreach/Education on Flushing Premise Plumbing*

Flushing of premise plumbing by customers is an easy and effective method to reduce lead levels at the customer tap. As part of its existing education program, PWB encourages all customers to flush their premise plumbing after water has been standing for an extended period of time. PWB has documented up to 90% reduction in lead levels between standing and running (flushed) samples. If elevated lead levels are found in standing samples, PWB offers follow-up test kits for both standing and running samples. This provides customers with actual results from their own tap showing how flushing can dramatically decrease lead levels. PWB will continue to conduct outreach and education on the importance of flushing premise plumbing.

### 3.2.9. [Implement Changes in Lead Hazard Reduction Program \(LHRP\) to Protect Vulnerable Populations](#)

For over 20 years the LHRP has targeted education and outreach about reducing lead exposure from all sources to those most vulnerable, with a focus on children under six and pregnant women. PWB will continue these activities and assess the four components of the LHRP, as outlined below, as part of its efforts to continuously improve the program's effectiveness.

**Water Treatment and Monitoring:** As outlined above, in the short term, PWB will be increasing the distribution system entry point target to 8.2 and working with OHA to revise water quality parameters.

**Free Lead-in-Water Education and Testing:** PWB offers education and free lead-in-water testing to all retail and wholesale customers. In annual utility bill inserts, in the Consumer Confidence Report, and through targeted outreach in multiple languages, PWB offers information about easy steps to reduce exposure to lead in water and encourages customers, especially those most at risk, to test their water for lead. On average, over 3,000 customers

request a lead in water test each year. All customers are provided their results, and additional information, by mail. Additionally, customers with high results receive phone calls and are offered follow up testing to provide additional information on how to reduce lead levels at the tap. PWB is also working with district schools, daycares, and other facilities that serve young children and pregnant women to offer free lead testing and technical assistance.

In addition to existing efforts to notify those most at risk for lead in water through on-going and lead action level exceedance-required activities, PWB will work with the Multnomah County Health Department and OHA's Lead Poisoning Prevention Program to expand outreach out to those most vulnerable.

***Public Outreach and Education:*** PWB funds community partners to educate the public about the risks of lead exposure from all sources through a variety of mechanisms. Partner funding supports activities such as lead poisoning prevention workshops, hotlines, soil testing, blood lead level testing, and investigations of elevated blood lead level cases. These activities are all focused on reaching those most vulnerable to exposure from all sources of lead, particularly the lead paint and dust found in many homes throughout Portland and regional water system service areas. As described in OHA's November 4, 2016 letter, PWB is working with OHA's Program Design and Evaluation Services to evaluate the LHRP's education and outreach component. The recommendations of this evaluation will be used to guide any modifications to that component, which will be implemented by December 31, 2017. Additionally, PWB will continue to work with our partners, including OHA's Lead Poisoning Prevention Program, to identify improvements, while also seeking new community partners that can better reach those most at-risk.

***Home Lead Hazard Reduction:*** Because exposure to lead paint and dust is the greatest source of childhood lead exposure in Portland, PWB collaborates with the Portland Housing Bureau on the Lead Hazard Control Program, which is funded by a Housing and Urban Development Agency (HUD) grant. This program provides funding to low-income residents with a young child to reduce lead-based paint hazards from the home. PWB will work with the Housing Bureau to identify and implement potential improvements to the Lead Hazard Control Program while continuing to meet the requirements of the HUD grant requirements.

***Reporting:*** PWB will increase reporting to OHA on status, changes, and improvements to the LHRP from semi-annually to quarterly. These reports will include updates on the interim actions of this plan.

## 4. Other Considerations

EPA provided PWB with one written suggestion regarding chemical feed systems within the distribution system:

***Temporary chemical feed systems at storage tanks and pump stations with focus on pH stabilization and alkalinity.***

As discussed in the November 21, 2016 meeting, temporary feed systems at select distribution system sites would not be an appropriate strategy for reducing lead levels in PWB's system. This approach would not allow PWB to thoughtfully evaluate and address potential impacts resulting from a treatment change, which appears contrary to recommendations in EPA's OCCT Technical Guidance Manual (2016). Additionally, PWB has issued an RFP for a treatment pilot project, and those proposals are due in December 2016. Adding chemicals that have not been tested in the system is not recommended and could cause unintended consequences.

Further, having temporary chemical feed systems in unstaffed facilities greatly increases the potential for chemical feed issues (over- or under-dosing); distribution systems can take weeks/months to re-equilibrate after a chemical feed issue. Ultimately, PWB's distribution system is quite complex, composed of 180 pressure zones, 70 storage tanks, 39 pump stations and approximately 2,200 miles of distribution system pipeline. From PWB's water quality corrosion study, it appears that elevated lead homes are not geographically concentrated. Treatment only at certain locations instead of at the treatment plant would only affect customers served by those pressure zones.

## 5. Schedule Update

As noted above, an RFP for the corrosion control pilot study is currently out for bid. PWB is currently scheduled to begin the study in March 2017, before the approved date of July 2017. We anticipate completing the 18-month study in summer of 2018. Consistent with the agreed-upon schedule, this accelerated schedule may allow design work to begin as early as January 2018. In preparation for a shortened pilot study, PWB will issue an RFP for the treatment design in 2017, with plans to have a design consultant selected and under contract by December 2017.

PWB remains committed to implementing increased corrosion control within OHA's compliance schedule and will work with the selected pilot study and design consultants to identify opportunities for further schedule acceleration.