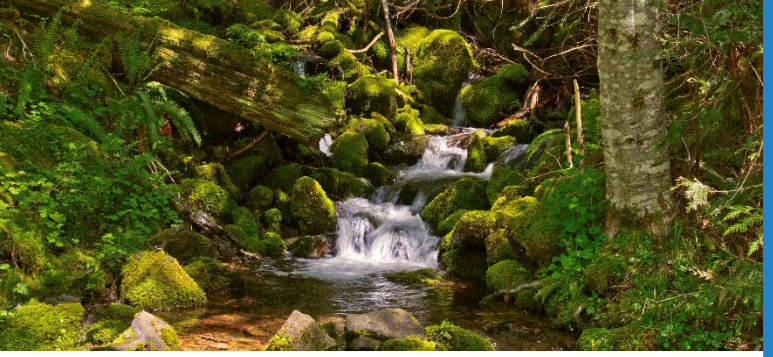
Parsons, Susan

From: Dee White <deewhite1@mindspring.com>
Sent: Monday, March 06, 2017 2:30 PM
To: Moore-Love, Karla
Subject: 8 Agenda item 215/235 for March 8 PWB contract with Confluence
Attachments: 8-22-16 EPA-OHA-PWB LCR Mtg Part 1_FinalDraft08222016(1).pdf; 10-11-16 Council Work Session v7.pdf; 00657_20161104_ic 9 interim lead plan from oha.pdf; City Auditor - City Recorder - Council Ordinance - 186513 Black & Veatch Corporation Water Quality Corrosion Study contract ordinance.PDF

Karla,

Please include these documents in the record for this agenda item. Please also send me a receipt that you have received. THANKS so much.

Dee White



PORTLAND WATER BUREAU
LEAD AND COPPER RULE

August 22, 2016
Meeting with OHA and EPA

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

Presentation Outline

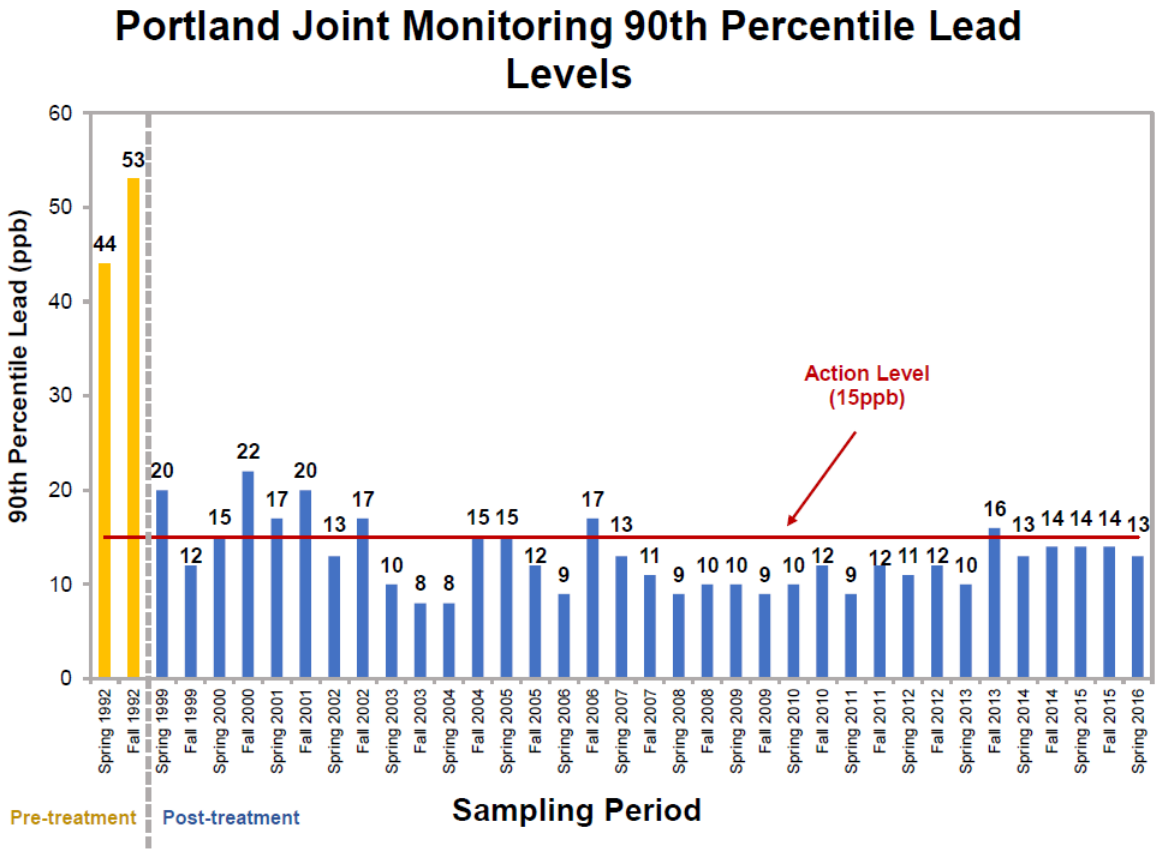
- Recap of April 21, 2016 meeting
- Update on PWB system
- Update on PWB's work with schools and daycares
- Update on customer sampling program
- Update on corrosion study
- Updated timeline
- Next steps

Recap of April 21, 2016 meeting

- Background on PWB and LHRP
  - LHRP Evaluation
- Introduction of Corrosion Study
  - Objectives and timeline
- Corrosion Control Decision Tree
  - Treatment considerations
  - Schedule considerations
- EPA's recommendations for testing select schools and daycares

System updates since April

- Spring LCR Monitoring
- Washington Park – Res 3
  - Lawsuit
- Corrosion study – on-going
  - Q2 report
- LHRP Evaluation going to Council on August 31



PWB's work with schools

- Portland Public Schools (PPS)
  - March – met with PPS to offer sample analysis of district wide sampling (per 3T) ~5000 samples.
  - May – PPS accelerated its sampling to be completed in the second half of June.
  - June – PPS sampled all water fixtures in schools – fountains, classroom/bathroom/utility/kitchen sinks, showers, hose bibs, etc.
  - June and July – PWB analyzed 1814 samples from PPS.
- Other Schools
  - May – PWB met with representatives from all Portland area public schools and offered technical assistance and free sample analysis.
  - August – PWB sent a letter to private schools in the Portland service area to offer technical assistance and free sample analysis.
- PWB is advising all schools to follow the EPA 3T guidance.
- Oregon Department of Education – Healthy and Safe Facilities

Portland Public School Results from PWB

- PPS sampled **all** water fixtures in schools – fountains, classroom/bathroom/utility/kitchen sinks, showers, hose bibs, etc.
- Levels much higher than found elsewhere including Community Centers.
- PWB reaching out to PPS to offer assistance in analyzing results.

	Portland Public Schools (PWB results only)			City of Portland Facilities
	All PWB Results	Consumptive	Non-consumptive	Consumptive
Number of Samples	1814	987	827	305
Minimum Lead Result (ppb)	ND	ND	0.22	ND
Maximim Lead Result (ppb)	13000	1950	13000	447*
Percent of Total Samples	100%	54%	46%	100%
Mean Lead (ppb)	34.1	21.7	48.9	6.50
Percent of Samples > 20 ppb Lead	22%	17%	29%	5.6%

PWB's work with daycares

- Emails and letters sent to 612 in-home daycares
  - 44 responses so far
- Letters with return postcard sent to 300 daycares in 8 languages
- Centers – Sending emails and letters to 261 centers
  - Offering analysis and technical assistance in sampling per 3Ts
- Provided analysis and assistance to other daycare providers upon request such as Headstarts

PWB's work with City Facilities

Prioritized sites:

1 - Infants, children, pregnant women primary population:
27 locations – 4 remaining to test

2 - Primarily serve the public:
372 locations

3 - Built or Plumbed 1985 or earlier:
96 locations

4 - All Other:
269 locations

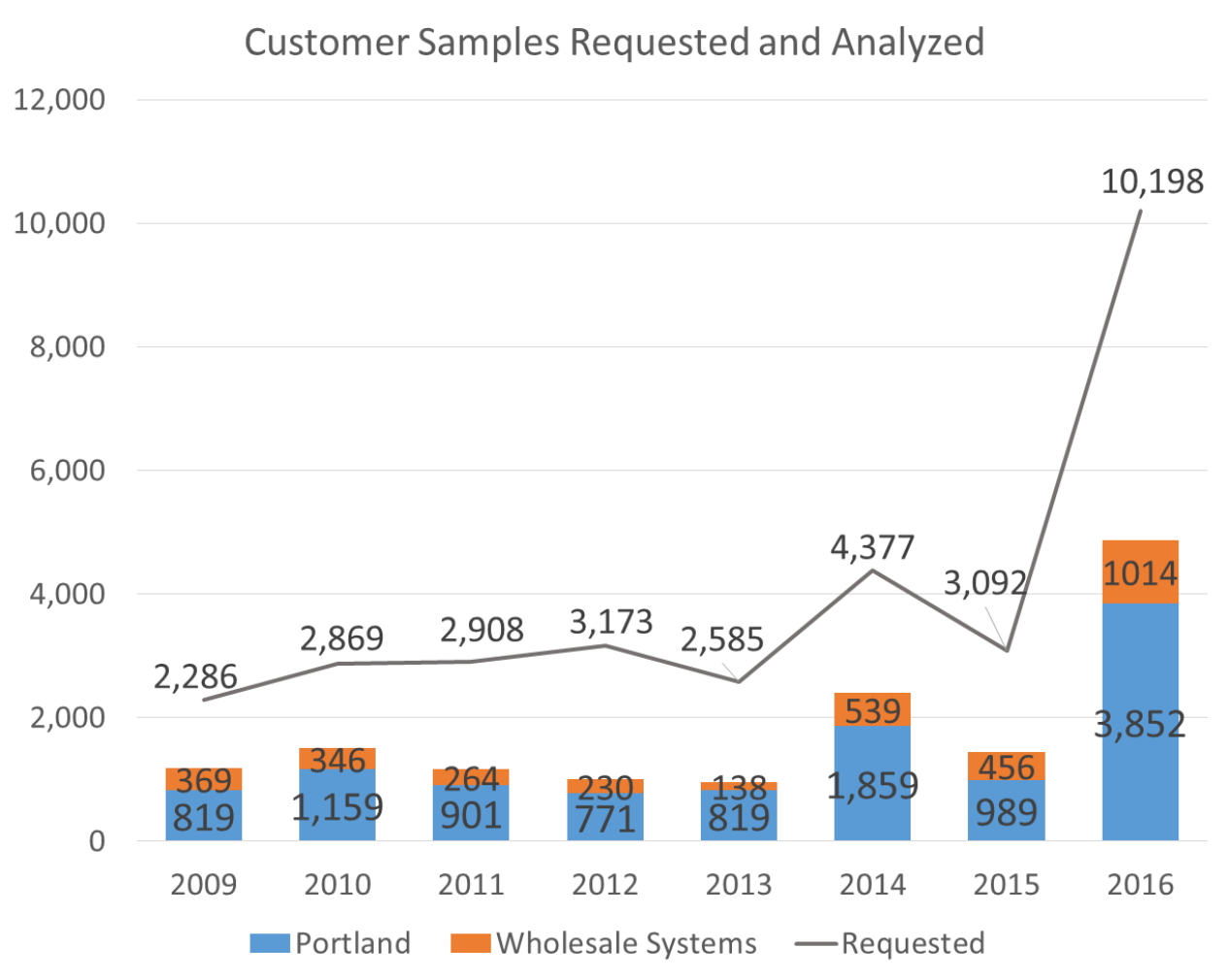
PWB sampling using 3Ts and providing guidance on communicating results.

PWB's LHRP: Lead in Water Education & Testing

Voluntary Customer Sampling

2016 (Jan-Aug) 90th Percentile

Portland: 4.3 ppb
Wholesalers: 9.4 ppb



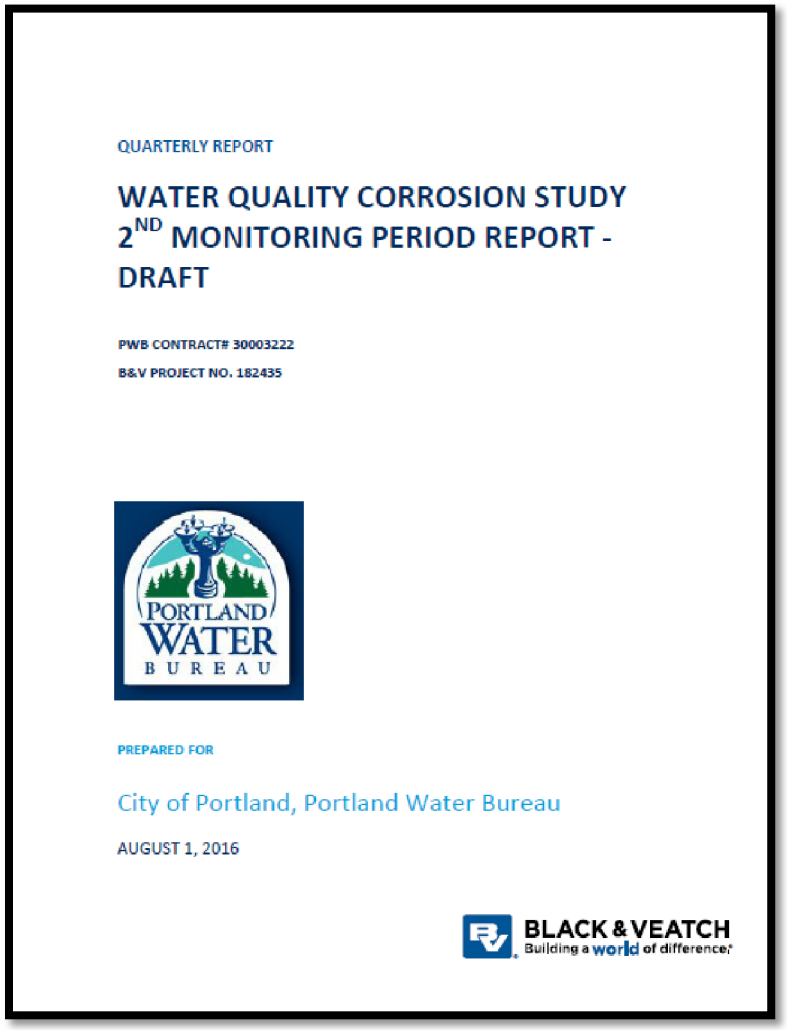
Presentation Outline

Corrosion Study

- Q2 Update and Preliminary Results

Corrosion Control Decision

- Decision Tree
- Schedule


QUARTERLY REPORT

WATER QUALITY CORROSION STUDY
2ND MONITORING PERIOD REPORT -
DRAFT

PWB CONTRACT# 30003222

B&V PROJECT NO. 182435

PORTLAND WATER BUREAU

PREPARED FOR

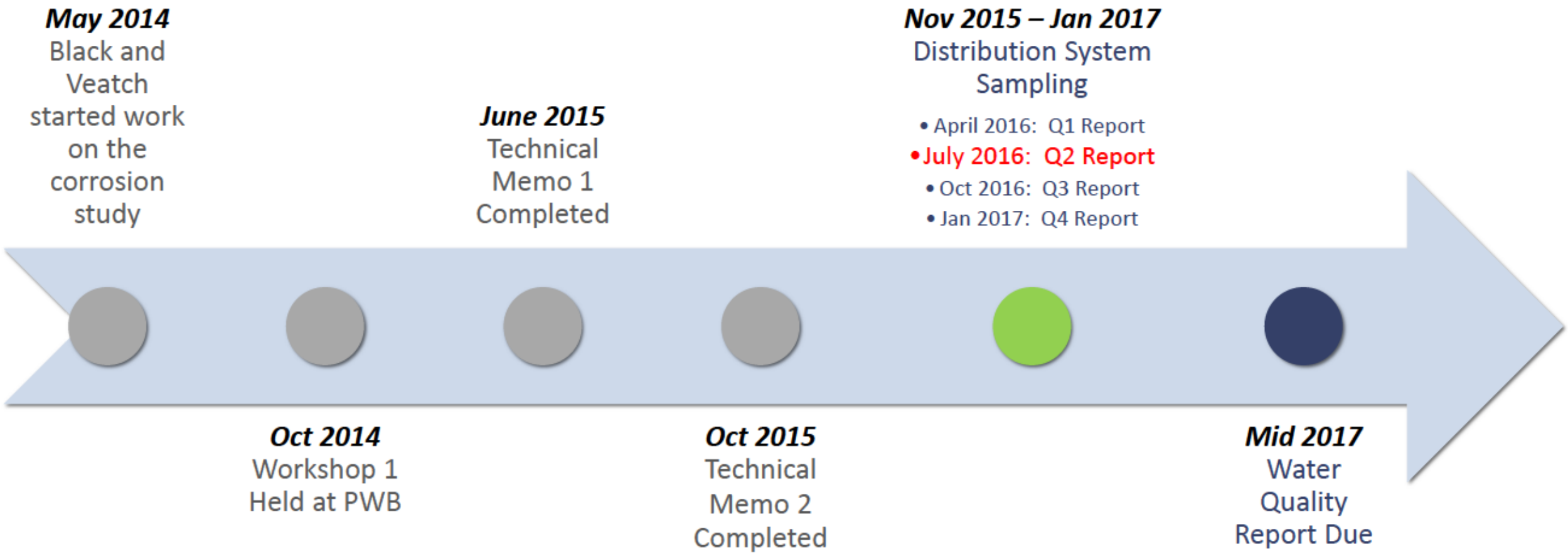
City of Portland, Portland Water Bureau

AUGUST 1, 2016

BLACK & VEATCH
Building a world of difference.

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

Water Quality Corrosion Study Project Timeline



Recap: Water Quality Corrosion Study Objectives

Project Objectives

- Better understand the causes of lead release in PWB's system
- Identify data gaps and conduct additional sampling required to better understand the role of water quality on lead release
- Specific questions to address include:
  - *Is uniform corrosion contributing to lead observed in LCR samples?*
  - *Is scale release (caused by hydraulic or physical disturbances) or dissolution (caused by chemical changes) contributing to lead observed in LCR samples?*
  - *What premise plumbing and fixture materials are contributing to lead release for PWB customers?*
  - *Is nitrification or other microbiological activity contributing significantly to lead release?*
  - *What impact does the use of groundwater have on lead release?*
  - *Are operational changes affecting lead release in the distribution system? If so, how?*

Recap: Study Sampling Plan

Utilize data from existing programs:

- TCR
- Nitrification
- LCR (tier one homes and water quality parameters)
- Voluntary customer sampling

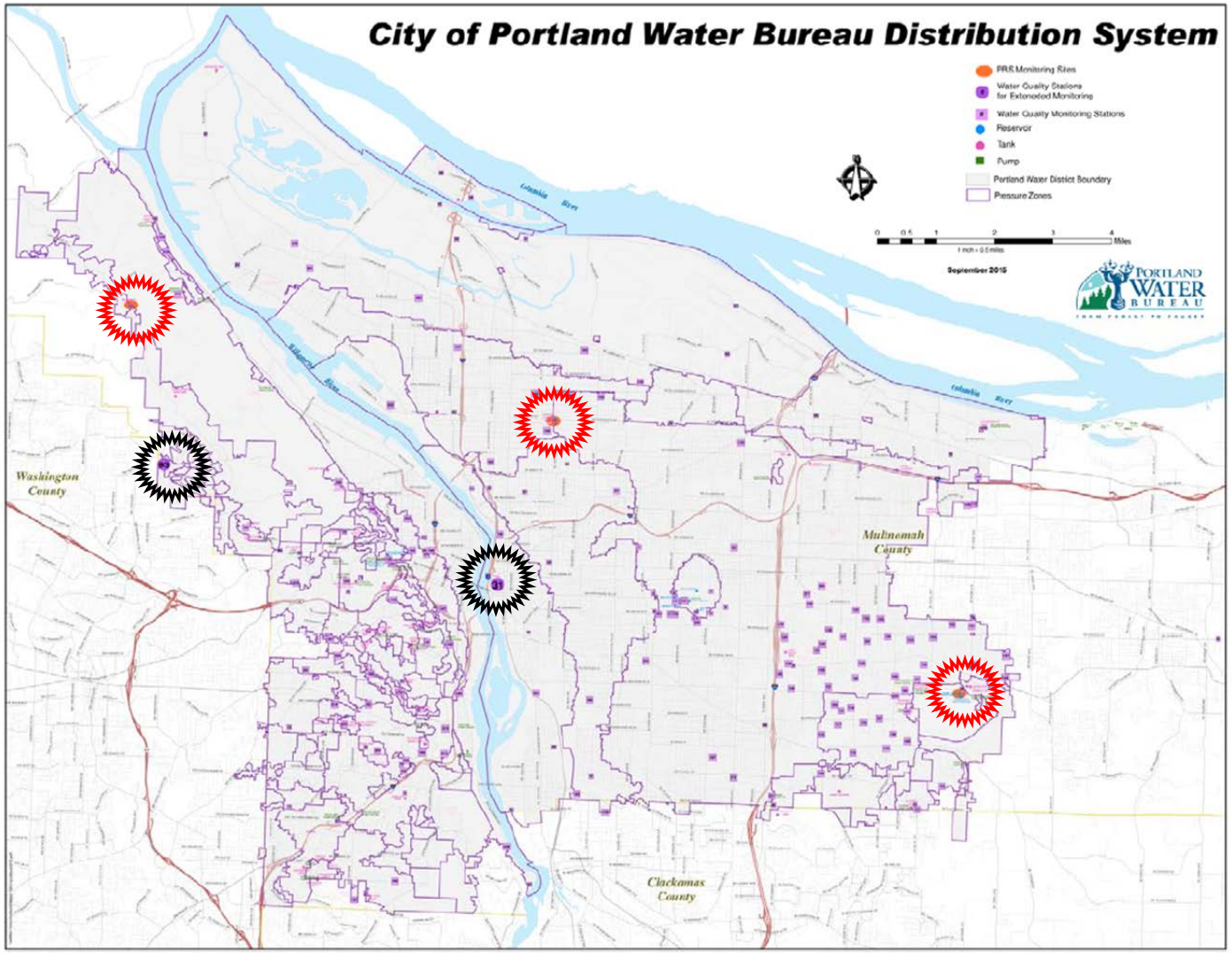
Collect new data:

Weekly sampling over the course of a year in the distribution system

- 3 Process Research Solution (PRS) Monitoring Stations were installed
- 2 distribution system sites

Follow-up sampling at select LCR and customer homes

- Goal is to sample ~ 50 customer homes as well as several of PWB's Tier 1 homes with elevated lead levels



= PRS Stations

= Distribution system sites

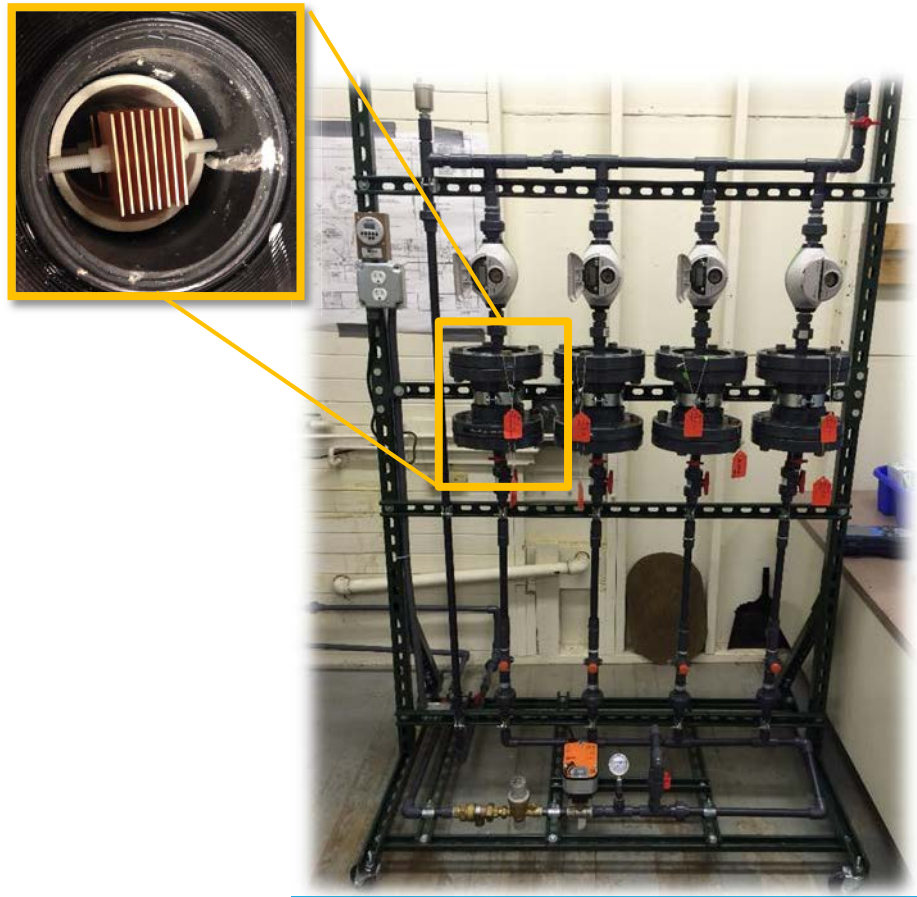
Recap: PRS Stations

These stations allow for controlled stagnation cycles to replicate worst case water quality as seen in customer homes

- Previous PRS monitoring station results have tracked well with LCR first draw samples in other systems

Each station includes four stagnation chambers, each containing different metal types

- Copper with Lead Solder
  - Represents material commonly found in Portland Tier 1 homes
- Galvanized Iron
  - Galvanized iron plates represent indoor piping and plumbing fixtures commonly found in Portland homes
- Brass
  - Similar to galvanized iron, brass plates represent indoor piping and plumbing fixtures commonly found in Portland homes
- Lead
  - Even though PWB does not have lead service lines, lead is used in order to magnify the response of lead to the water characteristics



Parameters Monitored As Part Of The Water Quality Corrosion Study

Field

- pH
- Temperature
- ORP
- Chlorine residual
- Monochloramine
- Free ammonia
- Turbidity
- Conductivity
- ATP

Lab

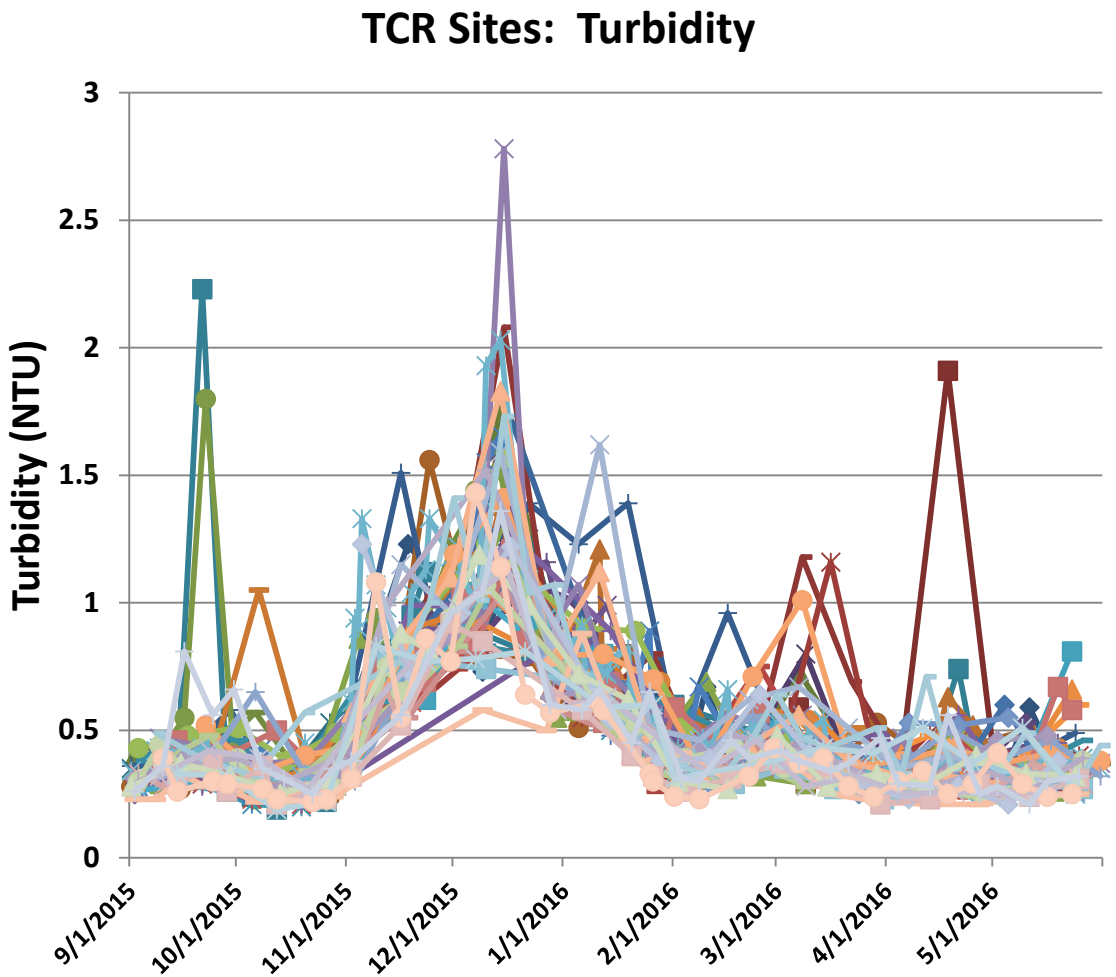
- Total and dissolved metals
  - lead, copper, aluminum, arsenic, cadmium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, zinc
- Total organic carbon
- Dissolved organic carbon
- Total phosphorus
- Alkalinity
- Hardness
- Chloride
- Sulfate
- Nitrate
- Nitrite
- TDS

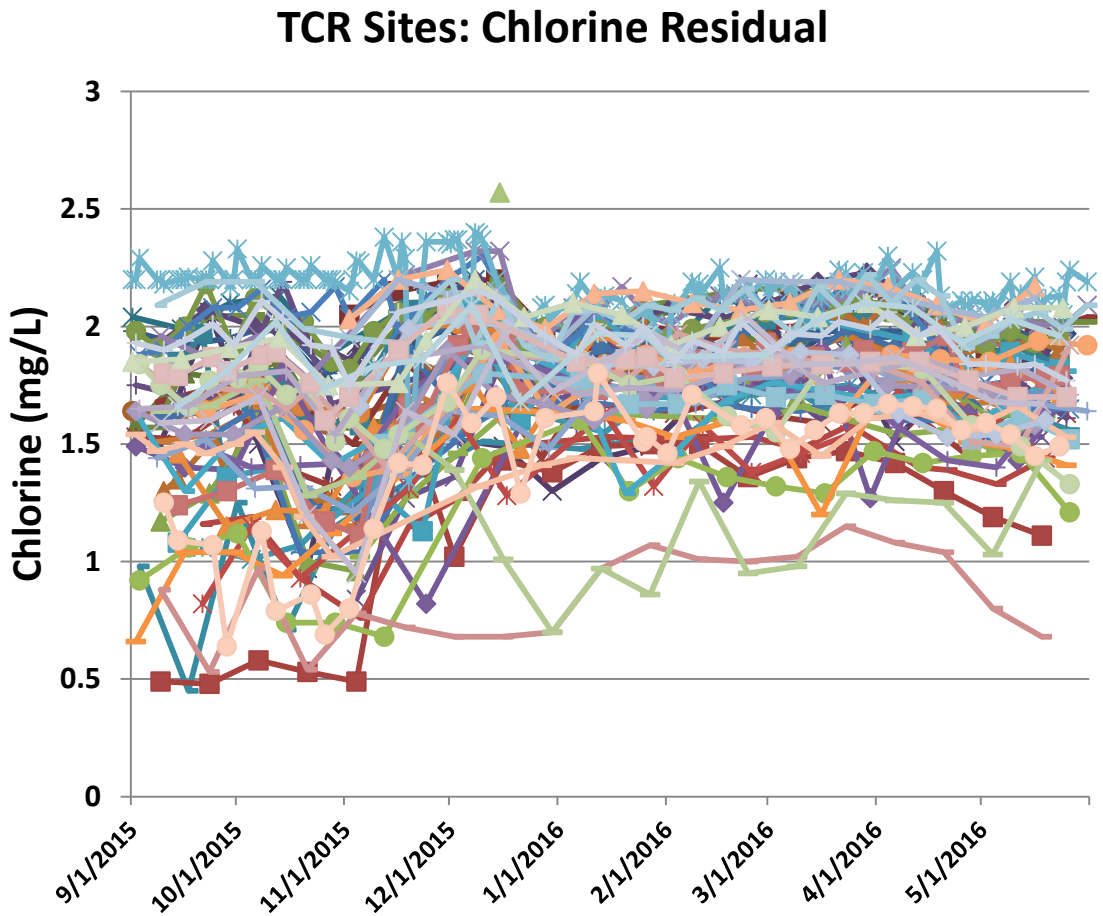
Data Sets Used in the Corrosion Study

Data Set	TCR Monitoring (Alk, Cl2, pH, Temp., Turbidity)	Nitrification Monitoring (Cl2, ORP, HPC, Free NH3, Nitrite, Nitrate, pH, Temp., Turbidity)	LCR Compliance (Total Pb, Cu, Fe, Mn, Zn)	WQP Compliance (Alk, pH)	Voluntary Lead* (Total Pb, Cu, Fe, Mn, Zn)	Supplemental In-home (All parameters)	Extended WQSS and PRS Station (All parameters)
Uniform Corrosion	Alk, pH, Temp.	ORP, pH, Temp.	Total Pb	Alk, pH	Total Pb	All parameters describing uniform corrosion	All parameters describing uniform corrosion
Biostability of Water	Cl2, Temp.	Cl2, Free NH3, Nitrite, Nitrate, ORP, Temp.	Total Pb, Cu	N/A	Total Pb, Cu	All parameters describing biostability	All parameters describing biostability
Scale Transport	Turbidity	Turbidity	Total Pb, Cu, Fe, Mn, Zn	N/A	Total Pb, Cu, Fe, Mn, Zn	All parameters describing scale transport	All parameters describing scale transport

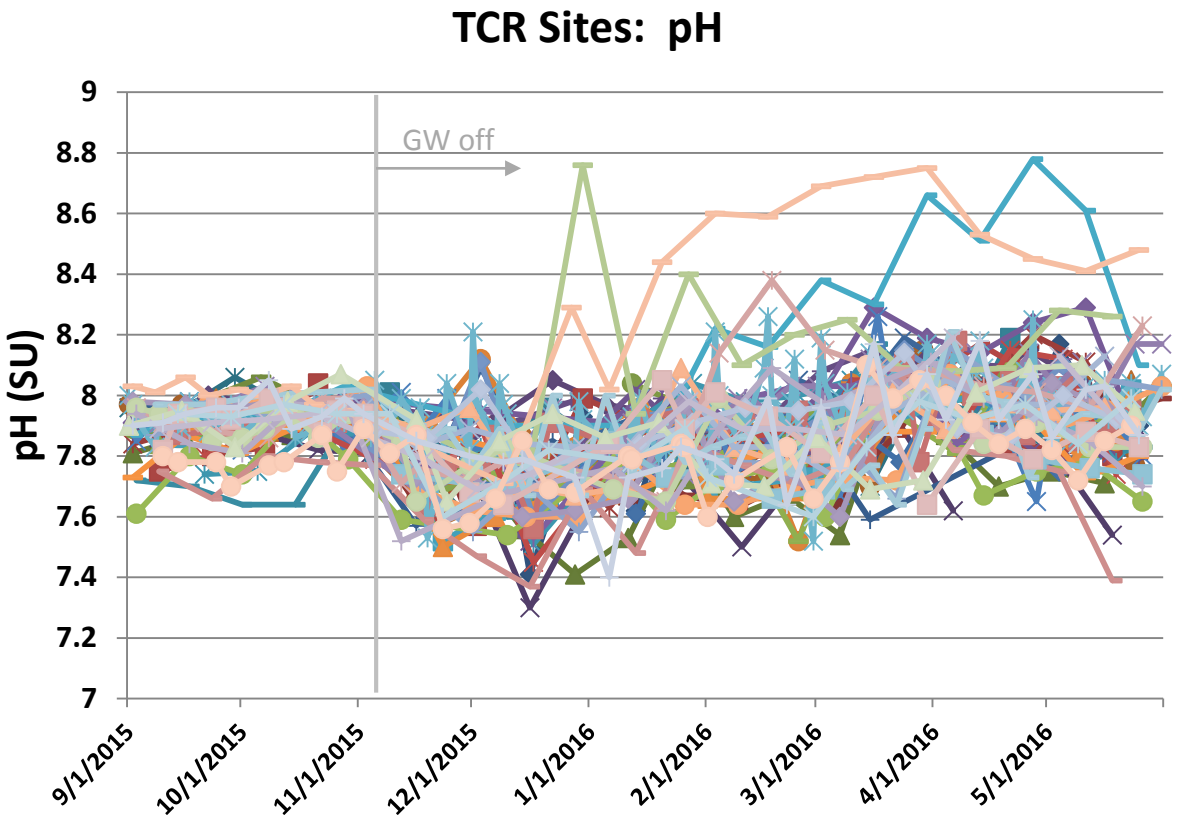
Notes:
* Currently lead is the only parameter measured due to high sample volume

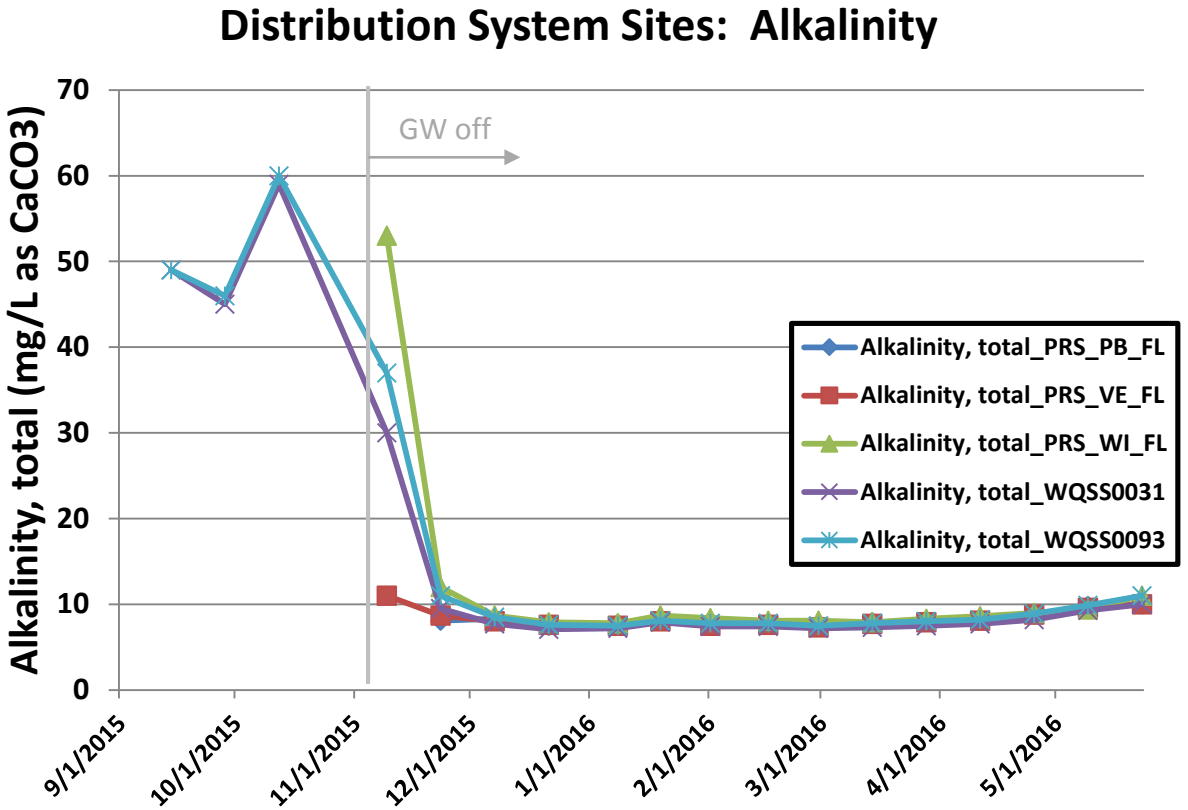
TCR Results


TCR Sites: Turbidity
Turbidity (NTU)
3
2.5
2
1.5
1
0.5
0
9/1/2015
10/1/2015
11/1/2015
12/1/2015
1/1/2016
2/1/2016
3/1/2016
4/1/2016
5/1/2016


TCR Sites: Chlorine Residual
Chlorine (mg/L)
3
2.5
2
1.5
1
0.5
0
9/1/2015
10/1/2015
11/1/2015
12/1/2015
1/1/2016
2/1/2016
3/1/2016
4/1/2016
5/1/2016

Effect of Groundwater





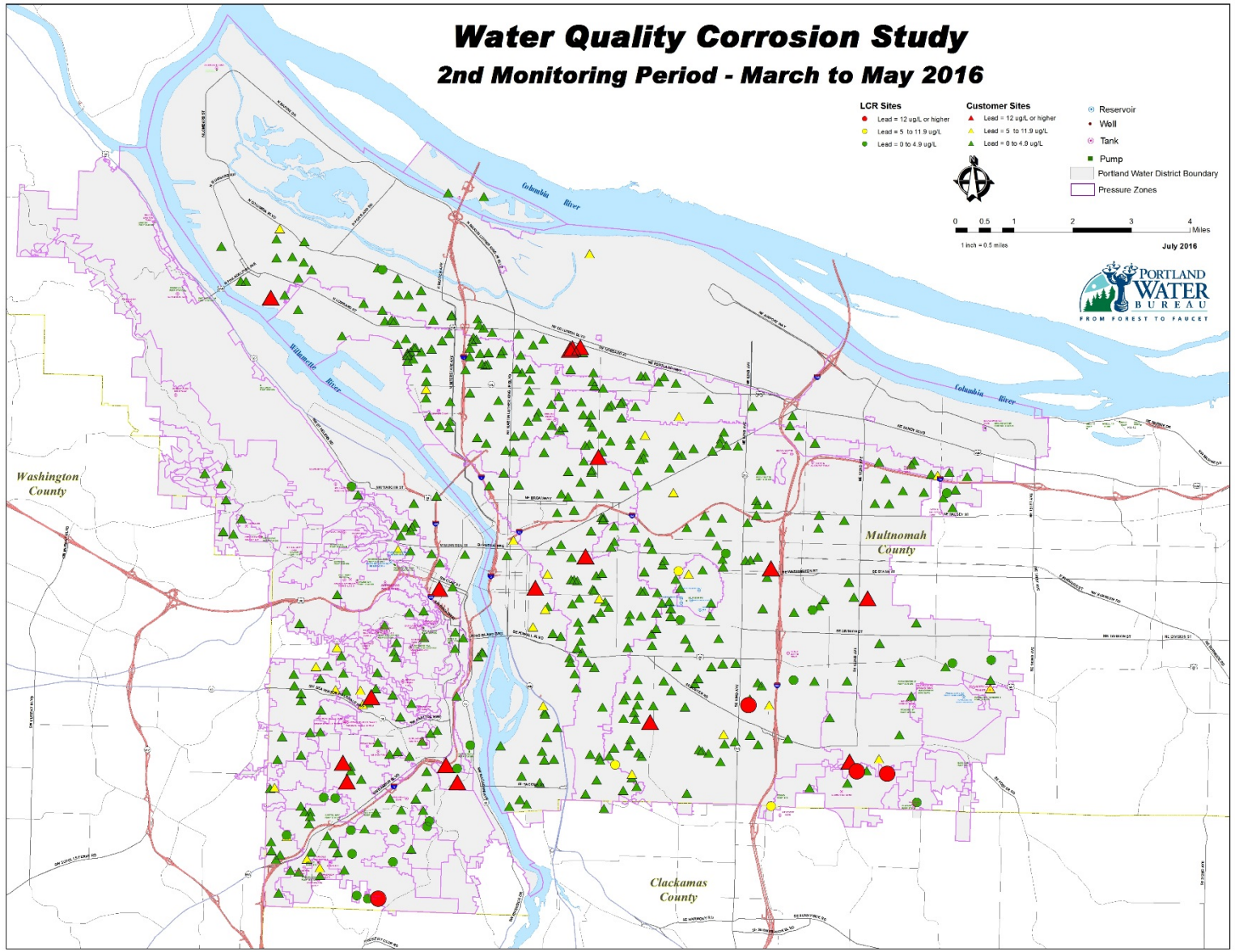
Lead Observed During Q2 (Customer And LCR Samples)

Voluntary customer samples

- The 90th percentile lead concentration for the voluntary customer samples analyzed in Q2 was 5 ug/L
  - Slightly up from 4.3 ug/L for the voluntary customer samples analyzed in Q1
- 15 of 550 voluntary customer samples (2.7%) exceeded 15 ppb
  - 4 of 271 samples (1.4%) exceeded 15 ppb in Q1 2016

LCR Tier One Home Samples

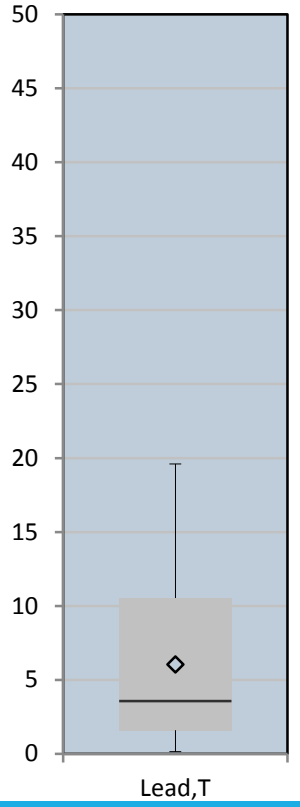
- 3 of 31 Portland homes had results over the action level



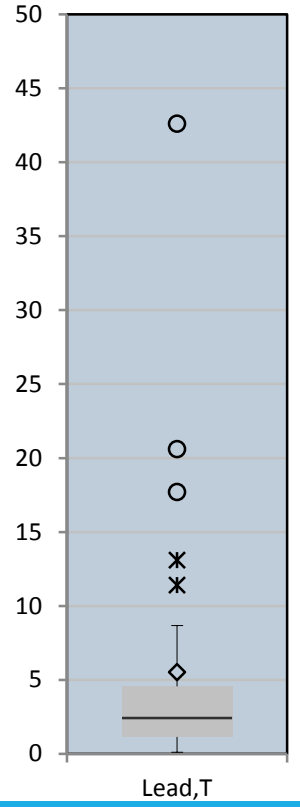
LCR Results (PWB Only)

LEAD

Q1 (Fall 2015)

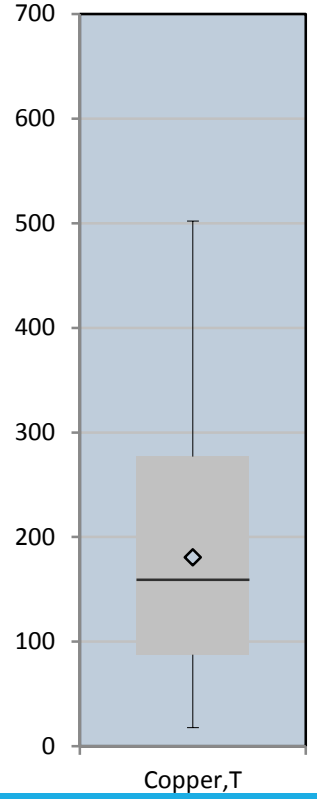


Q2 (Spring 2016)

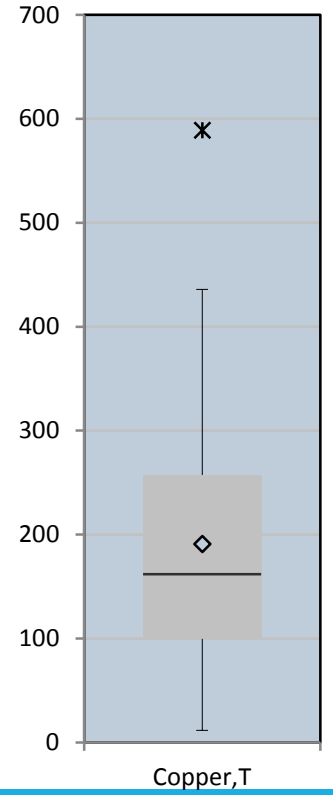


COPPER

Q1 (Fall 2015)

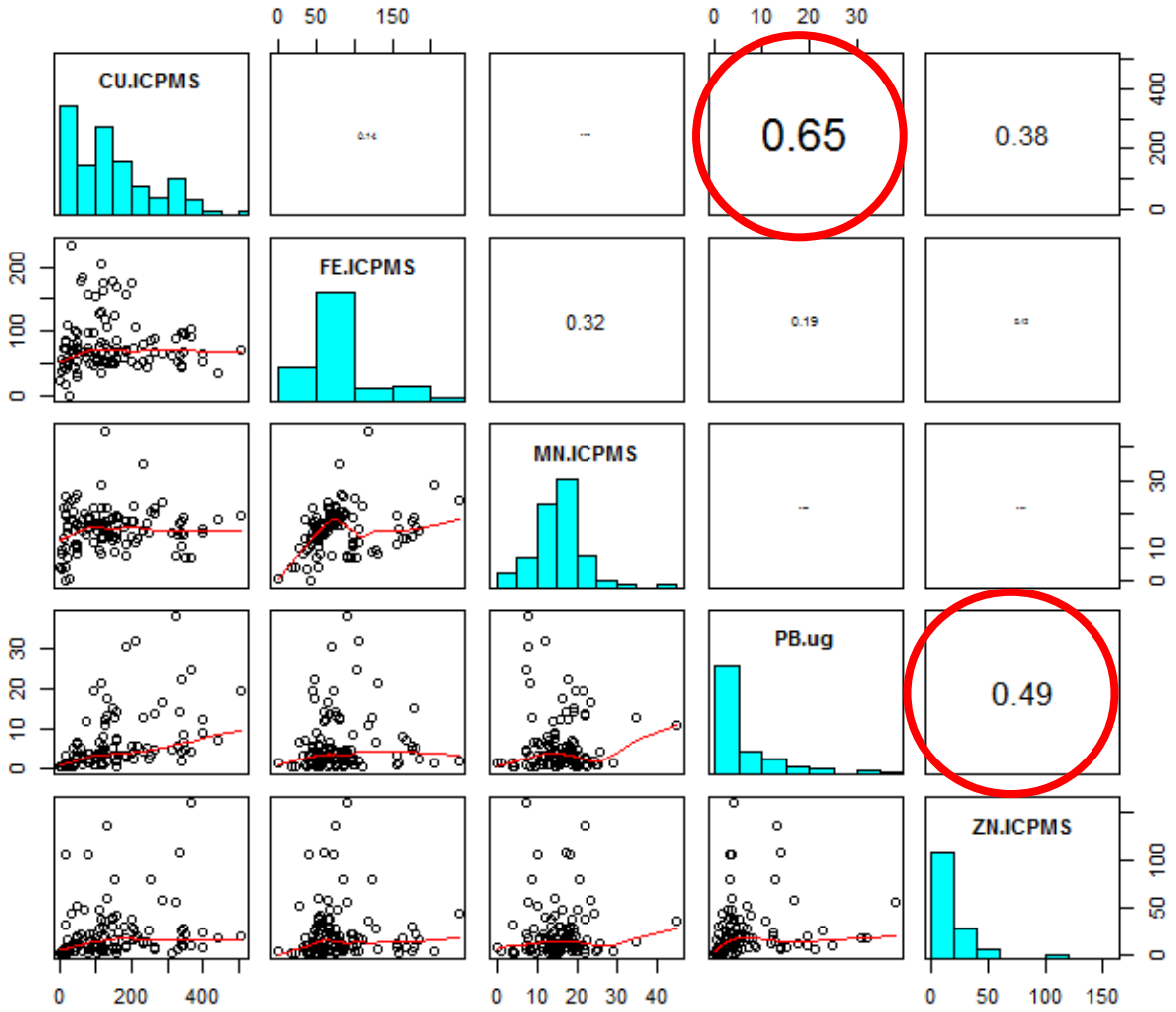


Q2 (Spring 2016)

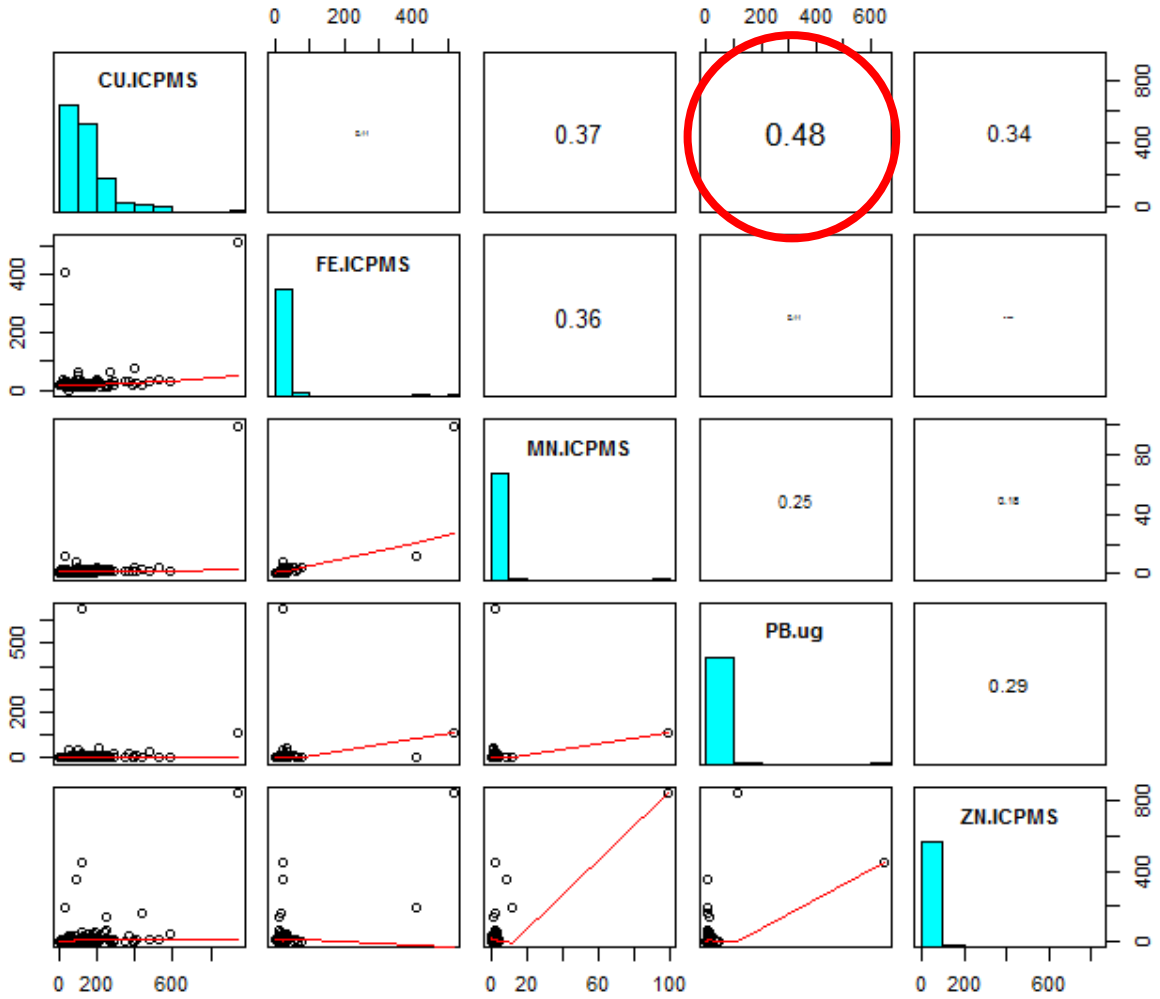


Metals Co-occurrence (LCR Data)

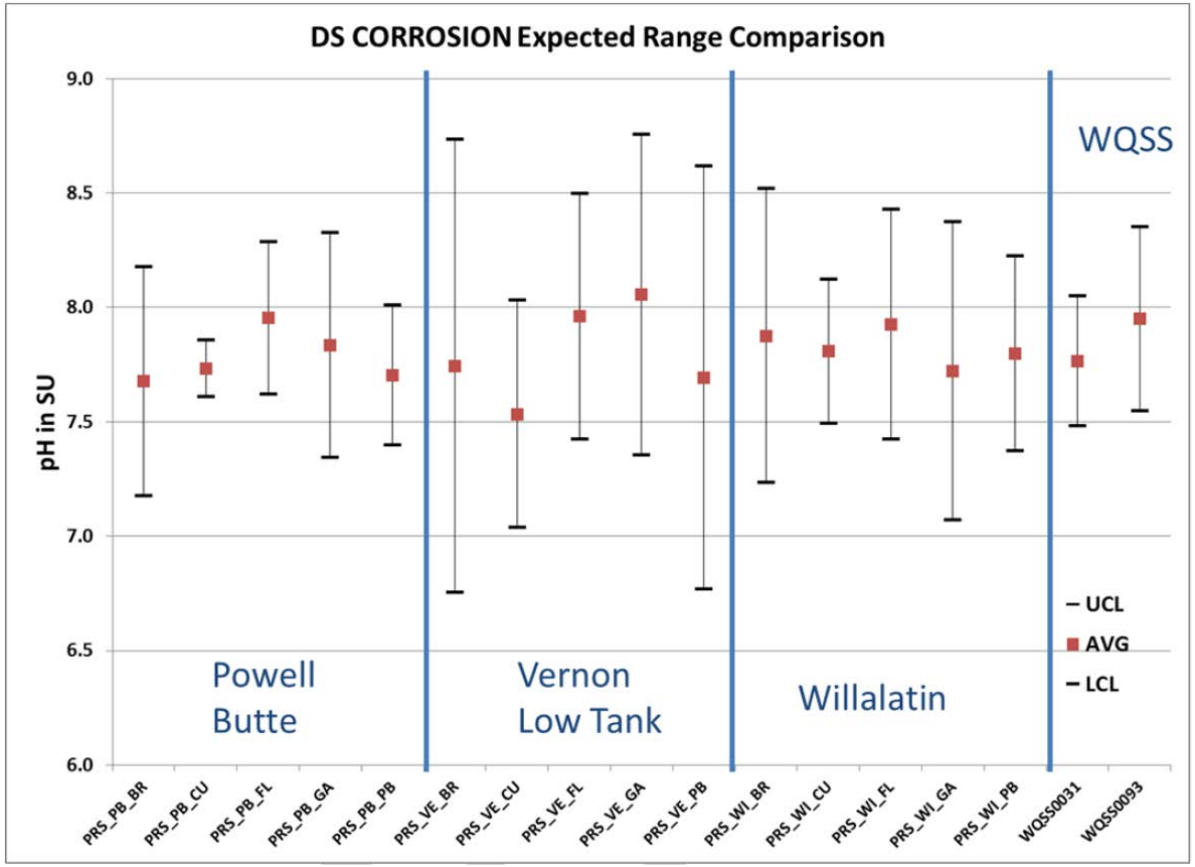
Q1 (Fall 2015)

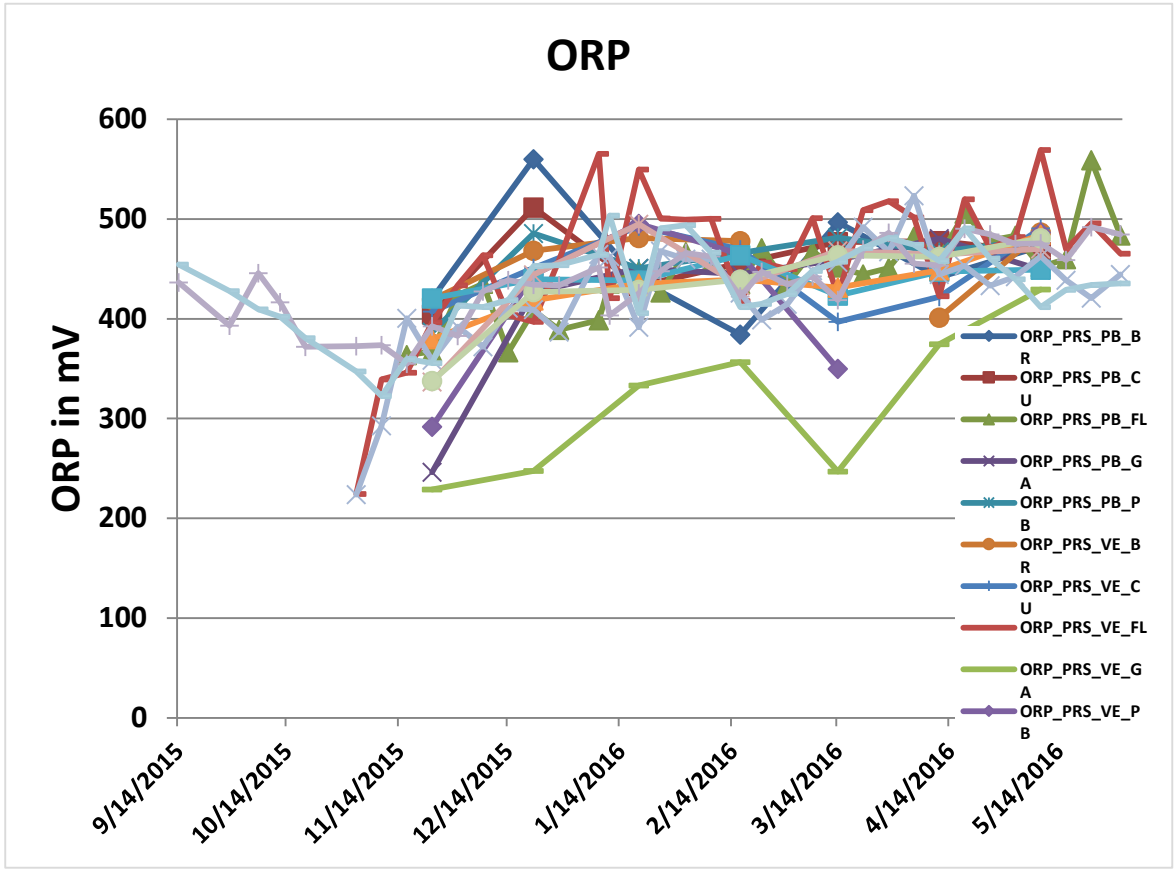


Q2 (Spring 2016)

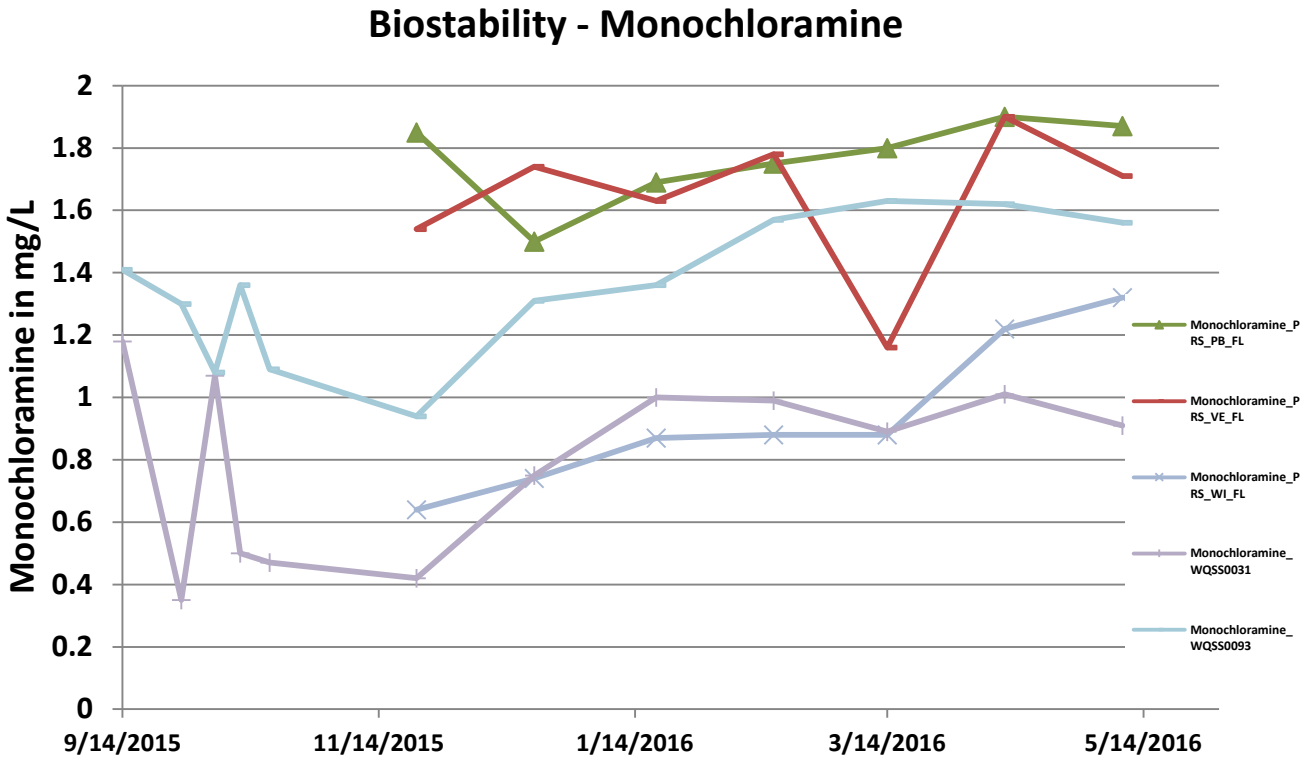


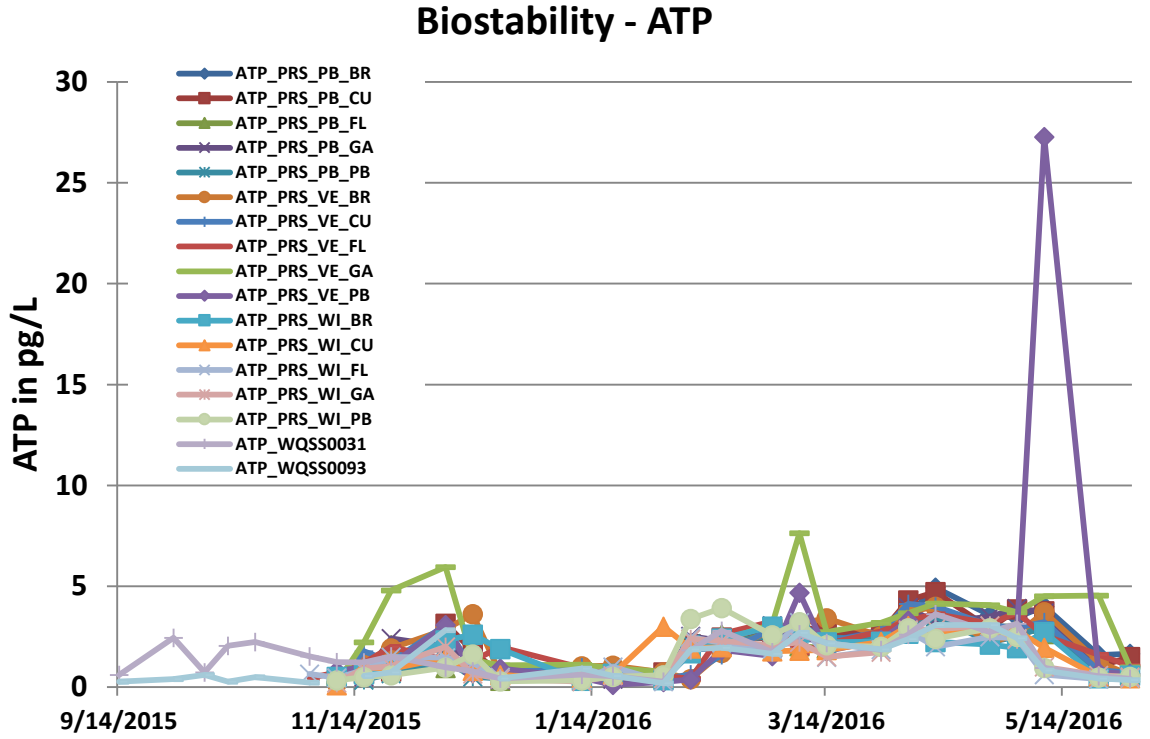
Preliminary Results: Uniform Corrosion



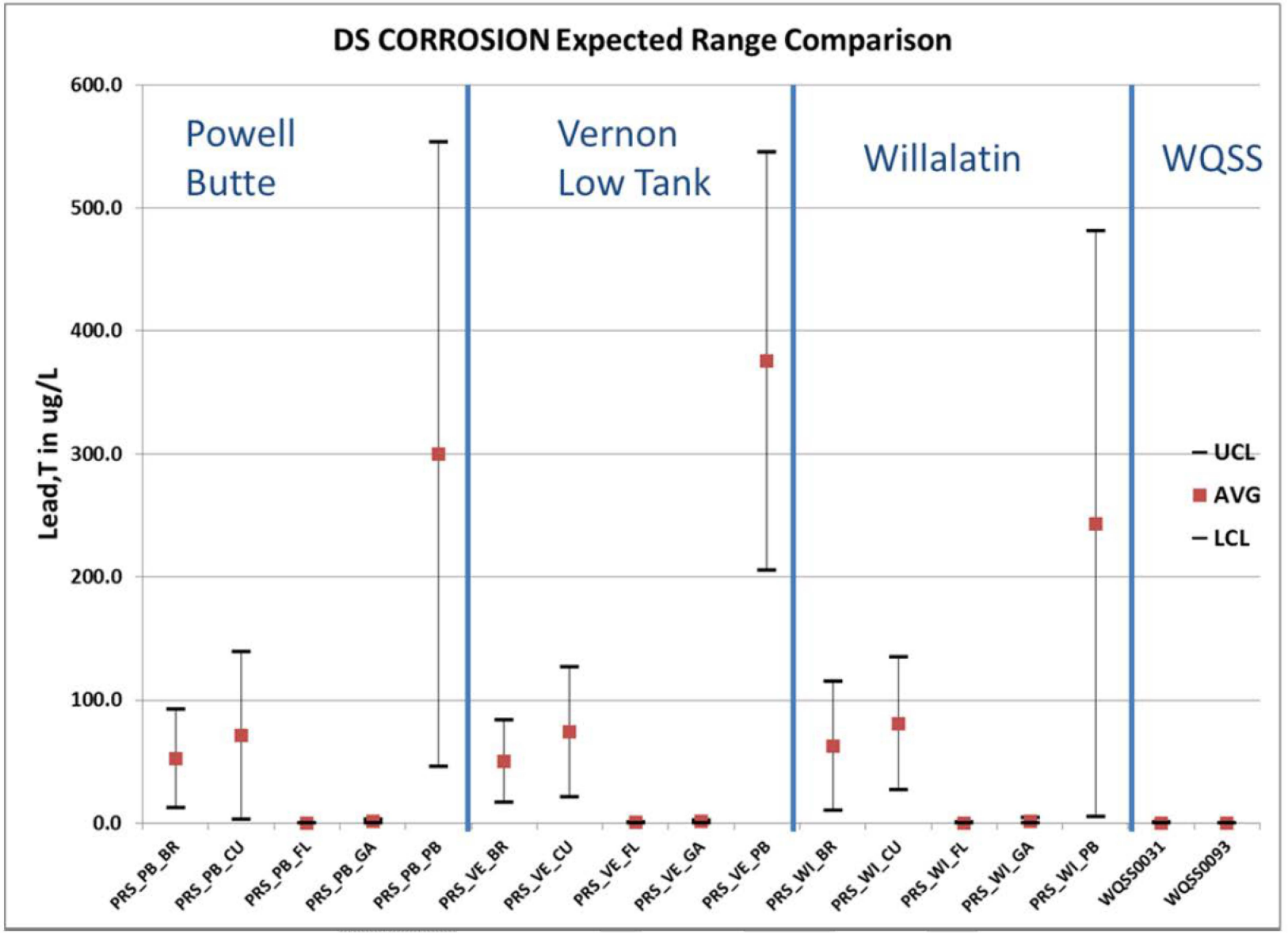


Preliminary Results: Biostability





Lead Release And Premise Plumbing Materials



Corrosion Indexes

Calcium carbonate precipitation potential (CCPP)

- CCPP for the Portland system in Q2 was generally between -6 and -7
- This indicates a very low potential for formation of calcium carbonate layer

Larson's ratio (LR)

- LR for the Portland system in Q2 was generally between 2 and 3
- This indicates that chloride and sulfate may be inhibiting lead carbonate formation and contributing towards increased lead solubility
- It is generally recommended to maintain a LR greater than 5 to ensure carbonate reactions are predominantly controlling lead solubility

Chloride to sulfate mass ratio (CSMR)

- The CSMR for the Portland system in Q2 was between 7 and 8
- While guidance varies, the literature suggests that values can increase the risk of galvanic corrosion when the ratio of chloride to sulfate is greater than 0.6

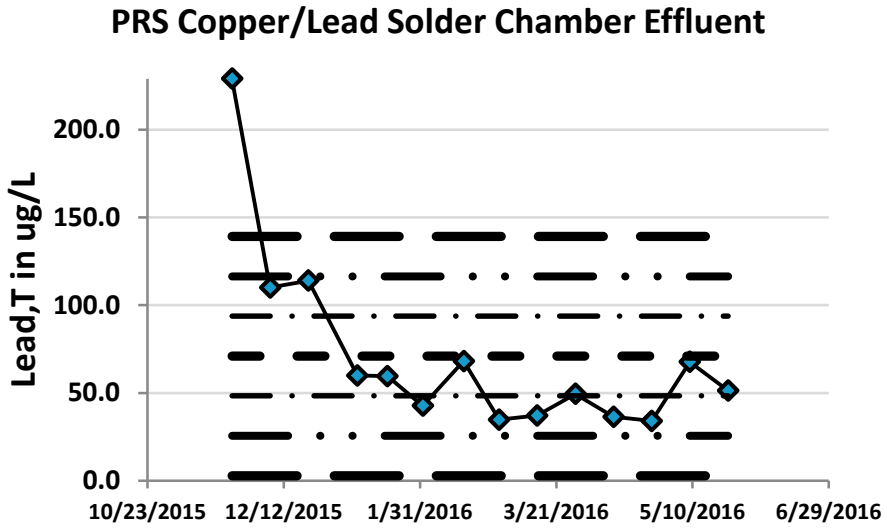
Q2 Results Summary

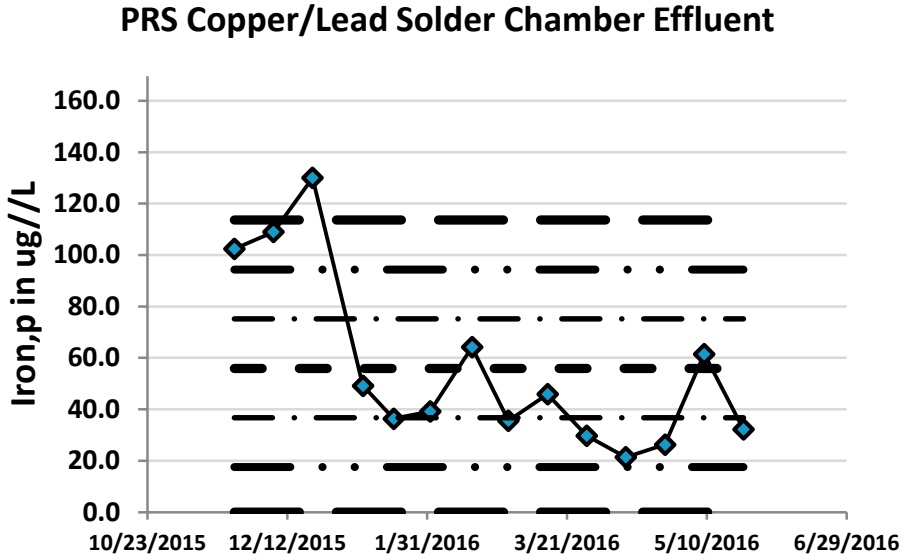
Roughly 50 to 70% of the total lead observed in the PRS monitoring station effluent and the supplemental customer sampling was in the dissolved form, indicating solubility processes related to lead release are occurring

Particulate lead release accounted for approximately 30% to 50% of the total lead release observed in most of the test chambers and supplemental customer sampling

- Occasional spikes in total lead were observed in the test chamber effluents that were predominantly in the particulate form
- These spikes in lead were strongly associated with similar spikes in particulate iron, manganese, and aluminum, indicating that release of these metal scales

Will continue to collect parameters that describe uniform corrosion to determine if a significant relationship exists between the water quality parameters and lead release





Water Quality Corrosion Study Objectives - Status

Project Objectives

• Better understand the causes of lead release in PWB's system	*DS sampling plan in progress*
• Identify data gaps and conduct additional sampling required to better understand the role of water quality on lead release	*Data gaps identified and mid-way through a sampling program designed to fill in those gaps*
• Is uniform corrosion contributing to lead observed in LCR samples?	*Yes, based on preliminary results it appears that uniform corrosion may be a significant factor in lead release in Portland's system*
• Is scale release (caused by hydraulic or physical disturbances) or dissolution (caused by chemical changes) contributing to lead observed in LCR samples?	*Q2 data indicates that this is also occurring*
• What premise plumbing and fixture materials are contributing to lead release for PWB customers?	*Preliminary results indicate copper/lead solder and brass fixtures may contribute most significantly in Portland's system*
• Is nitrification or other microbiological activity contributing significantly to lead release?	*Biostability has been good, but with nitrification season starting in Q3, more data should be available*
• What impact does the use of groundwater have on lead release?	*Q3 data should provide more insight to evaluate this*
• Are operational changes affecting lead release in the distribution system? If so, how?	*An operations log is being maintained and unusual water quality results will be investigated to evaluate whether operational changes could have caused these issues*

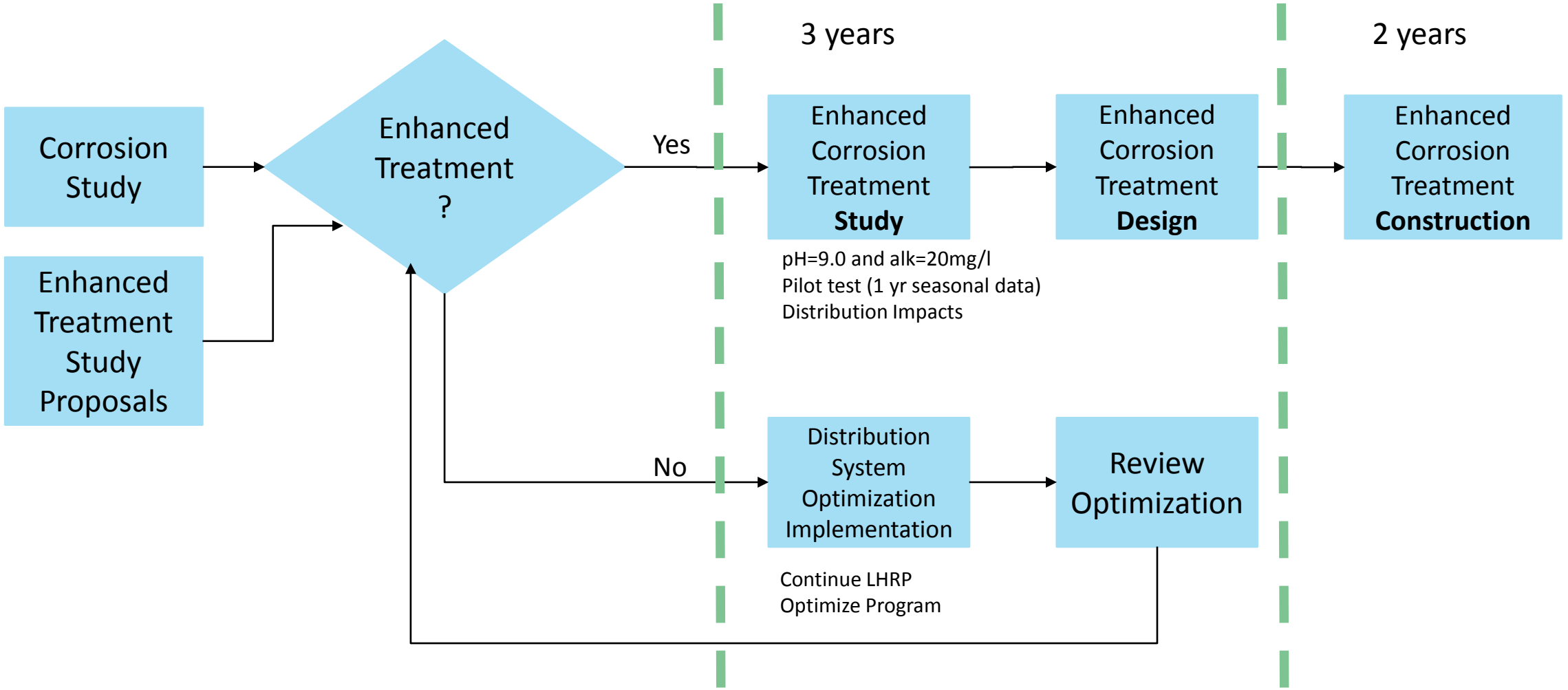
Corrosion Control Decision Treatment Considerations (Recap)

- Meet OCCT requirement of LCR
- Reduce corrosiveness of our water
  - Reduces lead and copper
  - Potentially extend useful life of our pipes
- Water should become more stable
  - System pH would be more consistent
  - Potential for greater formation of monochloramines above pH 8
- WQ Impacts – want to avoid unintended consequences
  - Potential red water
  - DBPs – THMs might increase, but HAAs might decrease
  - Aesthetics
  - Unknown

Corrosion Control Decision Treatment Considerations (Recap)

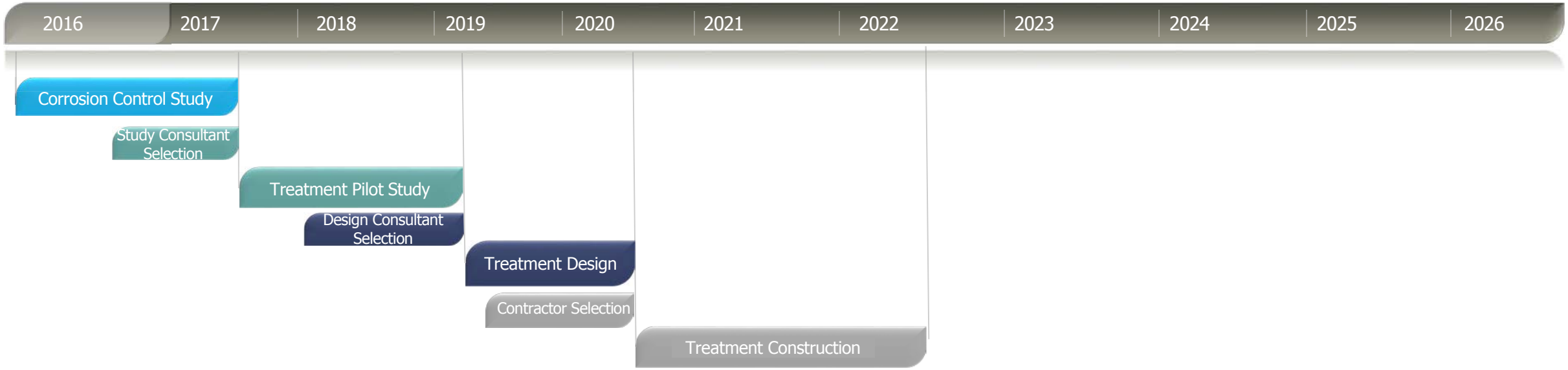
- Adding chemicals to Portland's water (Fluoride experience)
- Possible reduction in public health benefit if reduction of other sources of lead exposure is no longer funded
- Discharge issues
- Schedule
  - 5 year from completion of Corrosion Study
- Cost
  - Capital: approximately $15 Million
  - Operational: will be higher (chemicals, staffing, flushing)

Corrosion Control Decision Decision Tree

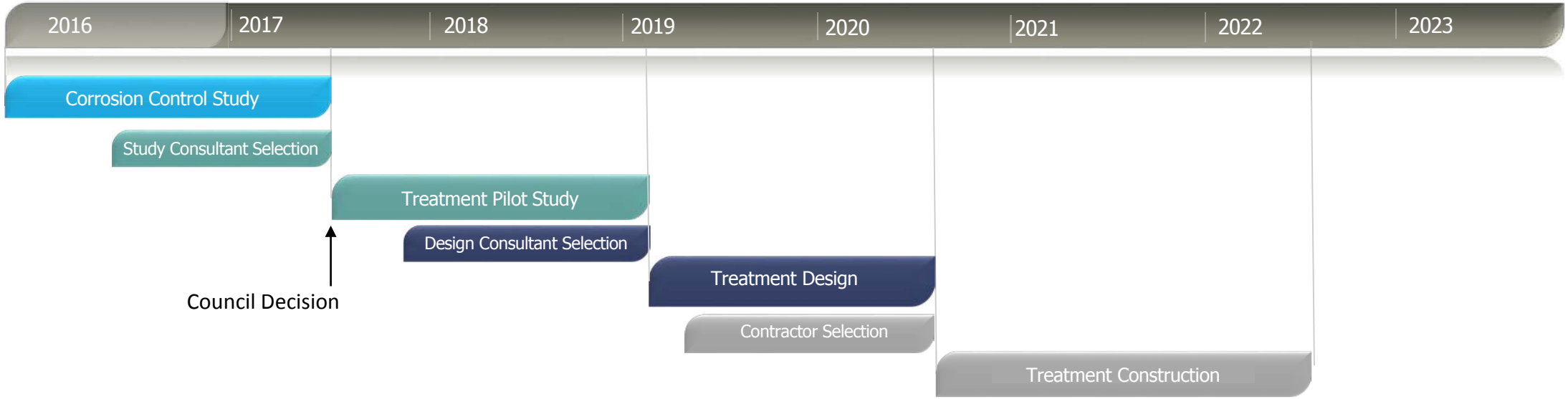


SCHEDULE PER STANDARD TIMELINE

ACCELERATED TIMELINE



ACCELERATED TIMELINE



Risks

- Council Approval
- Land Use/Permitting
- OHA Approval
- Procurement
- Legal Actions
- Available Resources

Corrosion Control Decision Preparations

- Corrosion Study – complete mid-2017
  - Mechanisms of lead release
  - Inform treatment decision
  - Expert Panel
- Pilot Study – Council Decision mid-2017
  - Professional Services Contract
  - Reviewing EPA OOCT Evaluation Technical Recommendations
  - Discussed process with OHA
- Putting together dedicated team – August 2016
- Portland Utility Board (PUB) update – August 2016
- Participate in EPA Training – August 2016
- Council work session – Fall 2016
  - Identifying key customers (brewers, industry)
  - Briefing legislators

Discussion

PORTLAND WATER BUREAU: Water Quality Update

Portland City Council Work Session
October 11, 2016

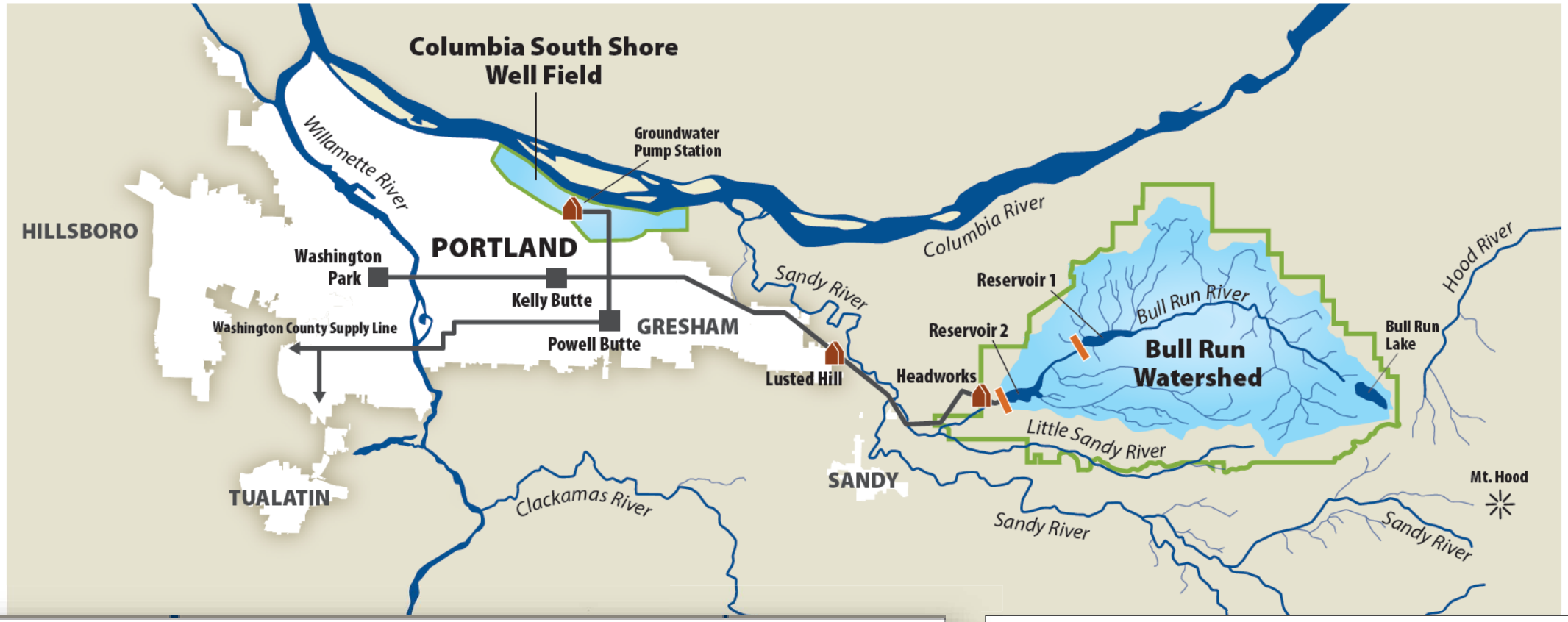
Michael Stuhr, Administrator
Scott Bradway, Water Quality Information

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

Presentation Outline

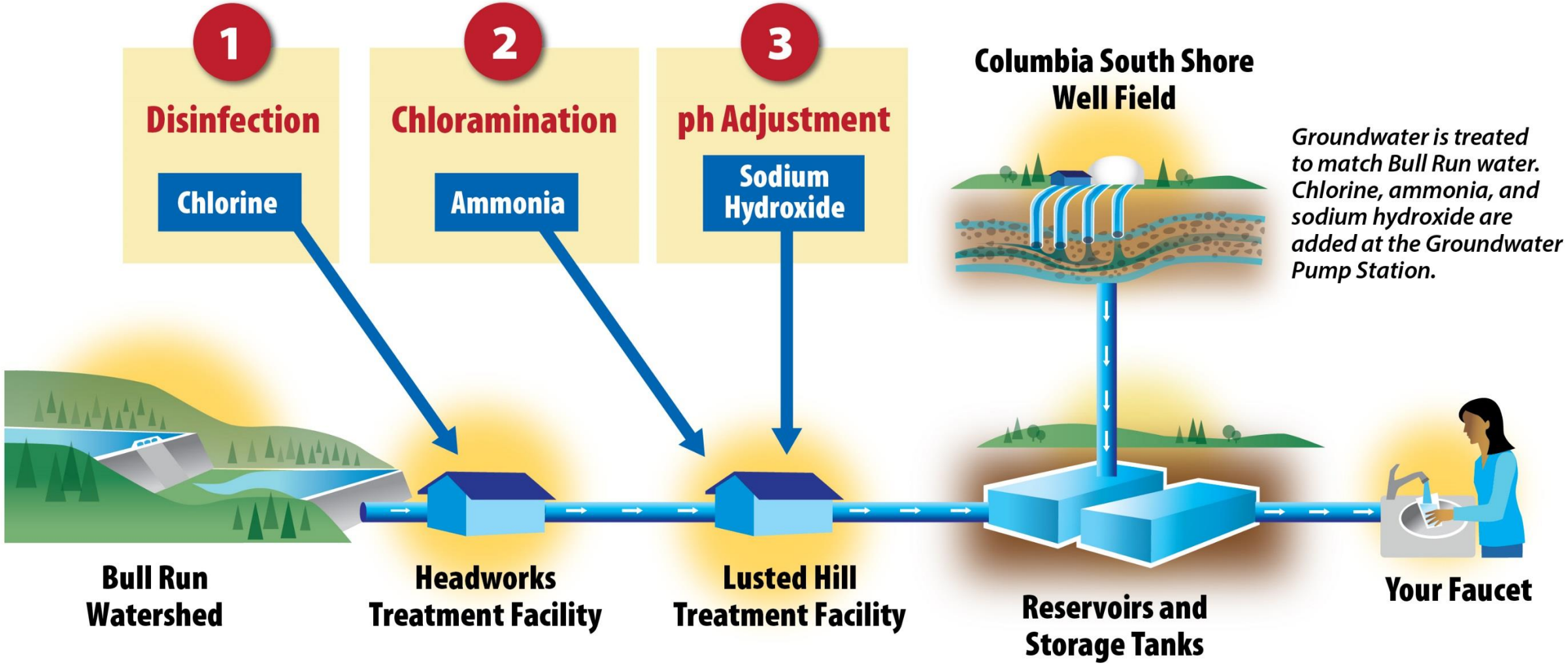
- Introduction
- System Overview
- Why Now?
- Portland's Compliance History
- Lead Hazard Reduction Program
- Our Work with Community Partners
- Water Quality Corrosion Study
- Next Steps

Service Area and Water Sources



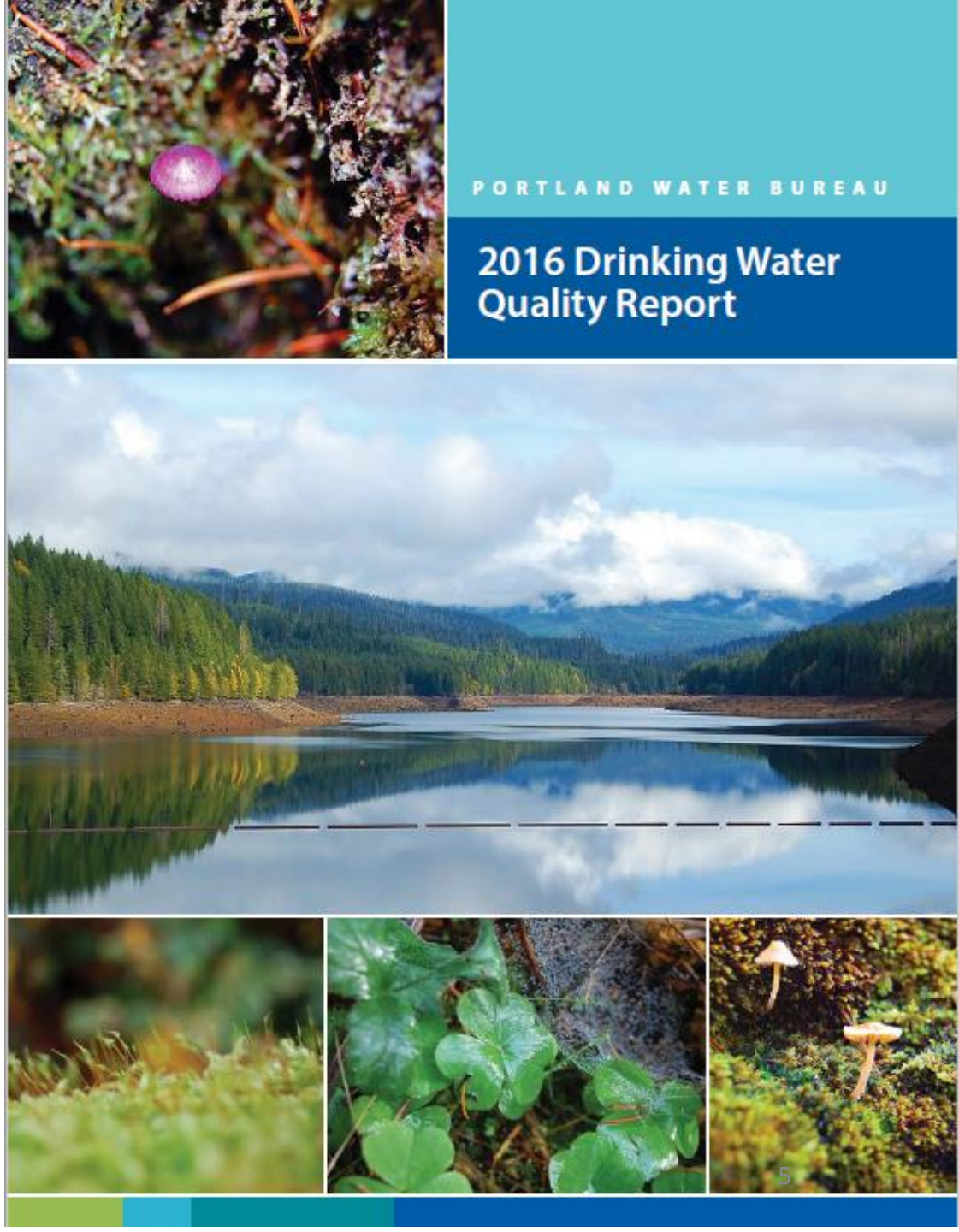
- 588,000 retail customers
- 370,400 wholesale customers
- 19 wholesale water districts
- 101 million gallons per day average

Supply System Overview



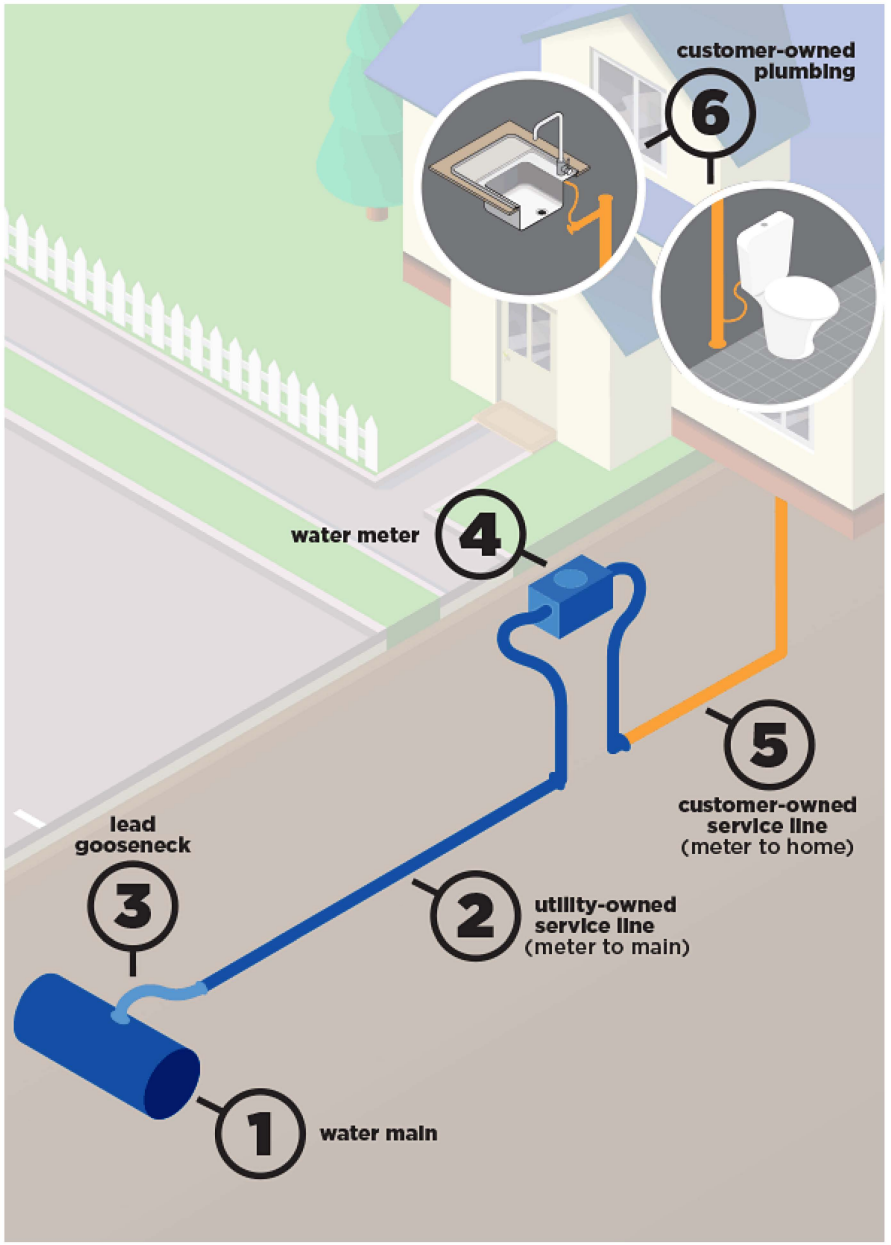
Water Quality Report

- Monitor for more than 200 regulated and unregulated contaminants in drinking water
- Collect and analyze over 11,000 samples each year
- Annual Report contains information about our water



Water Quality Overview

- In compliance with all state and federal regulations, including the Lead and Copper Rule
- Portland has never used lead service lines and does not have lead pipes in our distribution system
- Removed all known lead pigtails/goosenecks



Environmental Exposure

- Copper pipes and lead solder - most common in homes plumbed or built from 1970 – 1985 (banned by Oregon in 1985)
- Home plumbing fixtures installed prior to 1985 can also contribute to lead in water (limited by Oregon in 1985, reduced significantly by Congress in 2014)
- In Portland lead paint is the greatest source of exposure to lead (banned by Congress in 1978)

Water System Improvements

- Solder
  - Worked with Oregon to ban lead-based solder in water systems in 1985
- Pigtails
  - Removed all known lead pigtails (>10,000) in the distribution system by 1998
- Meters
  - Replaced 364 large lead-component meters serving schools, hospitals, childcare facilities, community centers, public housing, and large apartment buildings from 2001-2008.

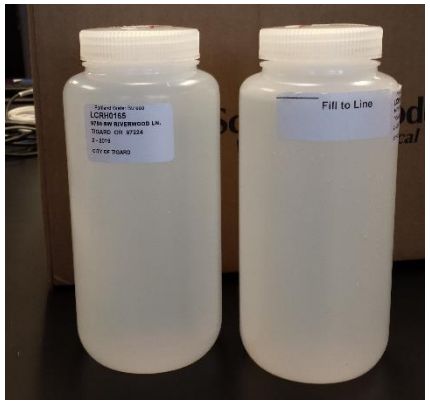
Compliance History

- EPA enacts Lead and Copper Rule, requires corrosion control in public water systems (1992)
- City develops a comprehensive approach; State approves program as optimized treatment (1997)
- Technical Advisory Committee recommends long-term water chemistry changes (2002)
- Water Bureau begins Water Quality Corrosion Study (2014)

Lead Hazard Reduction Program

- State Approved Compliance Program (1997)
- 4-part program meets federal regulatory requirements

Water Treatment & Monitoring

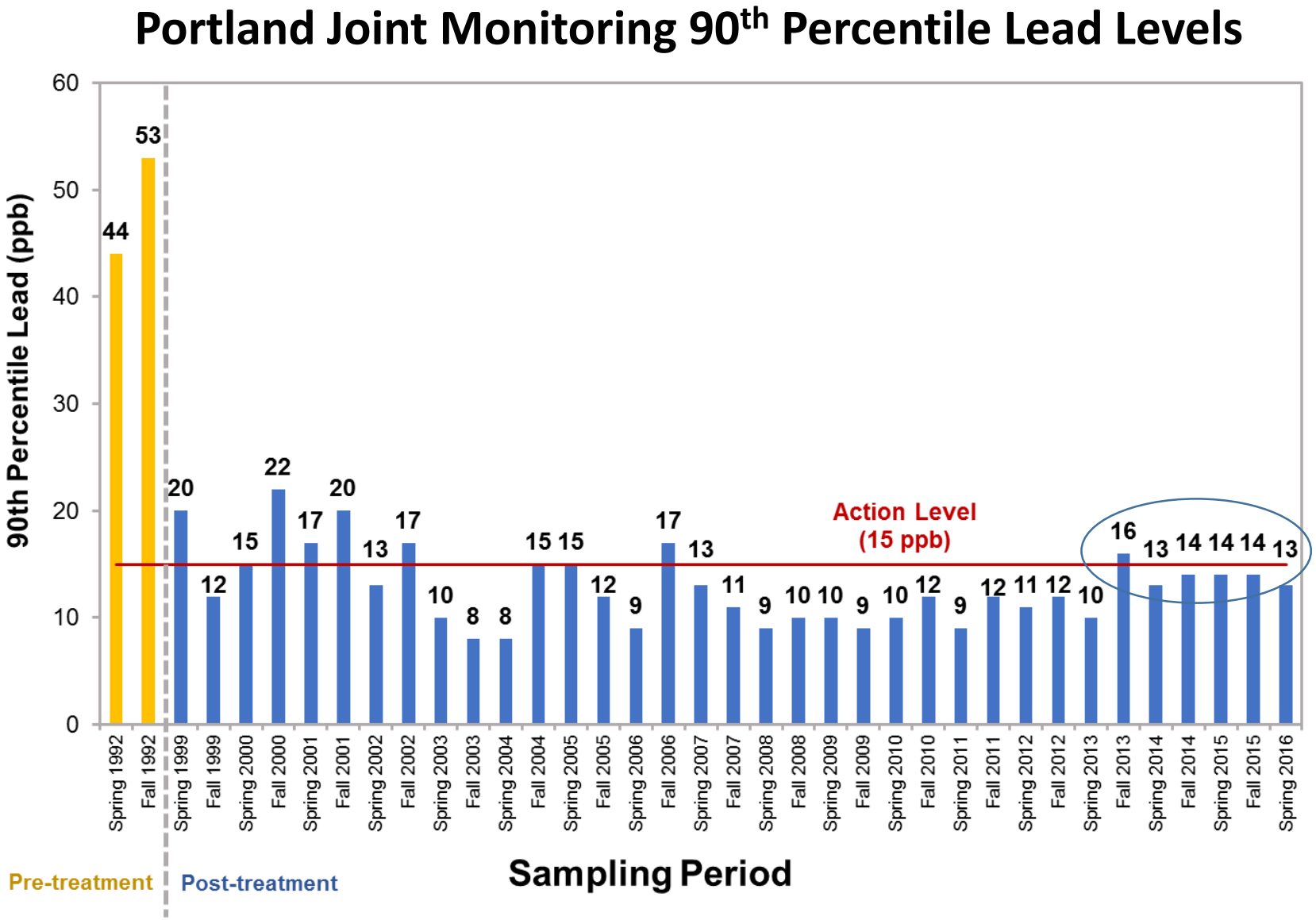


Education & Testing

Public Education & Community Outreach

Lead Paint Removal Grants

Sampling History

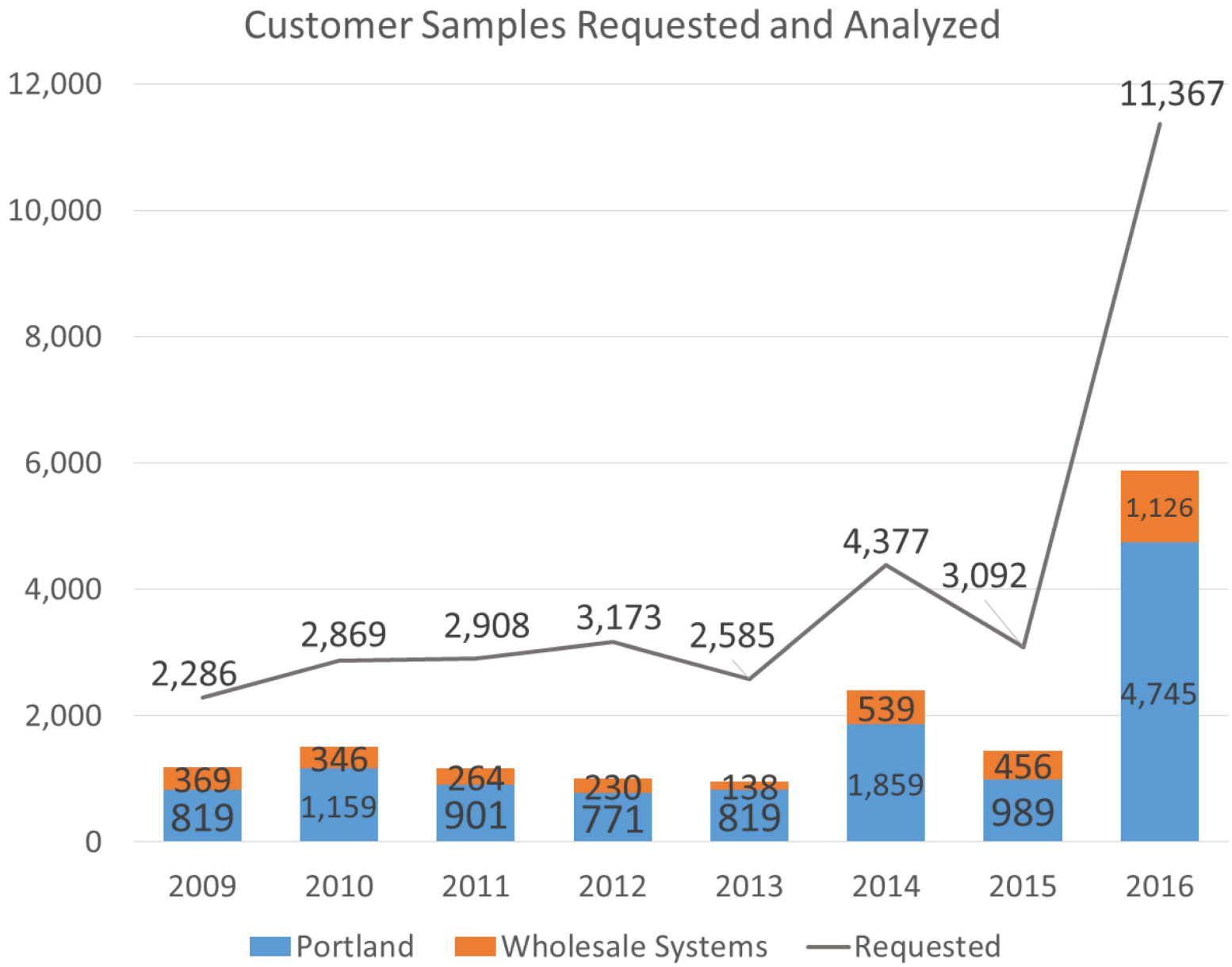


What is an Action Level Exceedance?

- Action level is measurement of treatment effectiveness – not a violation

- Actions to take with an exceedance (within 60 days):
  - Notify public
  - Notify sensitive populations
  - Test source water

Education & Testing



Community Partners: Schools

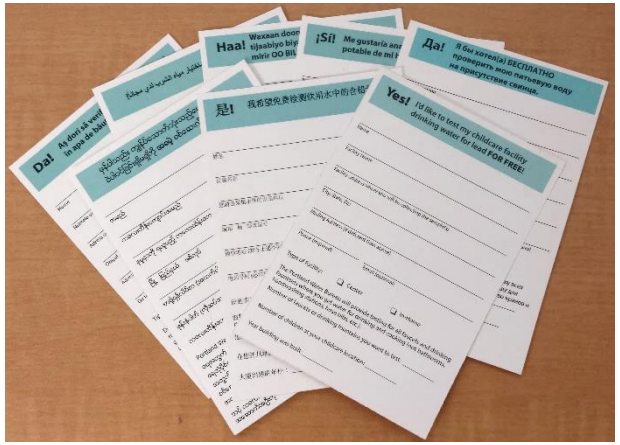
Portland Public Schools (PPS)

- Provided analysis of 1,814 samples from PPS
- Offering assistance in follow-up testing

Other Schools

- Offered technical assistance and free sample analysis to all public and private schools in PWB service area

Community Partners: Daycares



In-home daycares

- 612 emails and letters sent
- Offered free lead-in-water test kit

Daycare centers

- 261 emails and letters sent
- Offered analysis and technical assistance in sampling per EPA's guidance

Community Partners: City Facilities

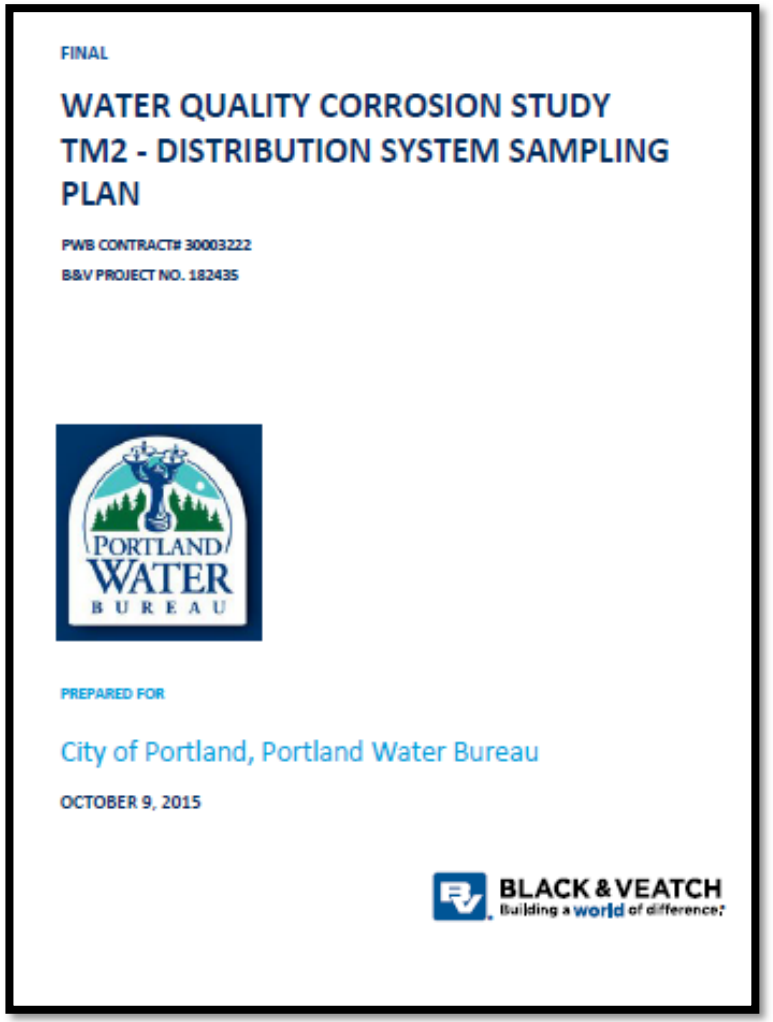
Prioritized sites based on:

1. Primarily serve infants, children, pregnant women
2. Primarily serve the public
3. Built or plumbed before 1985
4. All other

More than 750 facilities, requiring up to 2 years to test

Water Quality Corrosion Study

- Authorized by Council in 2014
- Data gathering over entire year to see seasonal variations (Nov. 2015 – Jan. 2017)
- Goal is to better understand the role of water quality on release of metals
- Panel of utility, consultant, and academic experts are assisting
- This is <u>not</u> a treatment study
    - Any significant changes to treatment would require pilot testing and Council approval


FINAL

WATER QUALITY CORROSION STUDY
TM2 - DISTRIBUTION SYSTEM SAMPLING PLAN

PWB CONTRACT# 30003222

B&V PROJECT NO. 182435

PORTLAND WATER BUREAU

PREPARED FOR

City of Portland, Portland Water Bureau

OCTOBER 9, 2015

BLACK & VEATCH
Building a world of difference.

Corrosion Study: What are we testing?

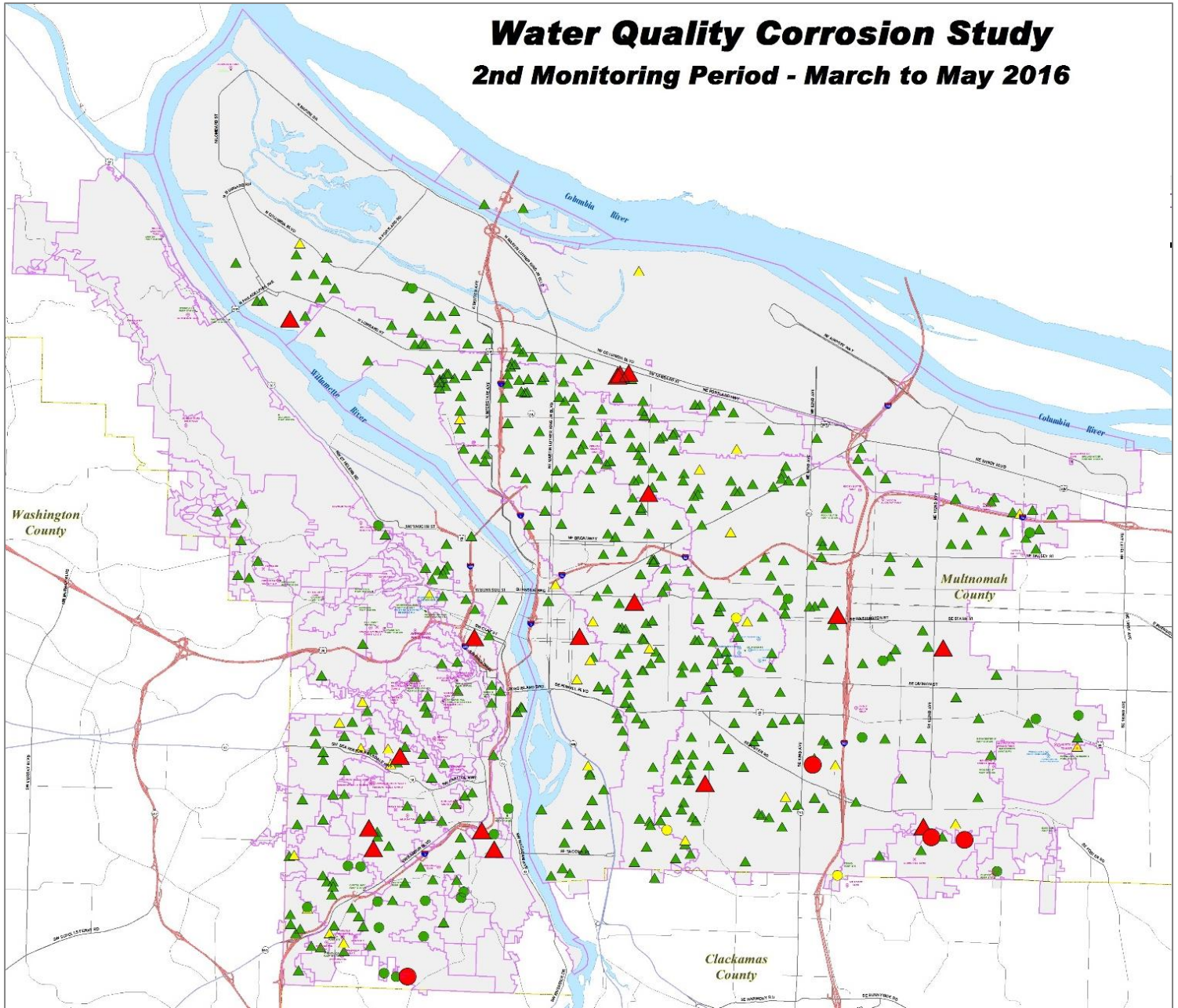
Field

- pH
- Temperature
- ORP
- Chlorine residual
- Monochloramine
- Free ammonia
- Turbidity
- Conductivity
- ATP

Lab

- Total and dissolved metals
  - lead, copper, aluminum, arsenic, cadmium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, zinc
- Total organic carbon
- Dissolved organic carbon
- Total phosphorus
- Alkalinity
- Hardness
- Chloride
- Sulfate
- Nitrate
- Nitrite
- TDS

Corrosion Study: Early Results



◯ LCR Sites

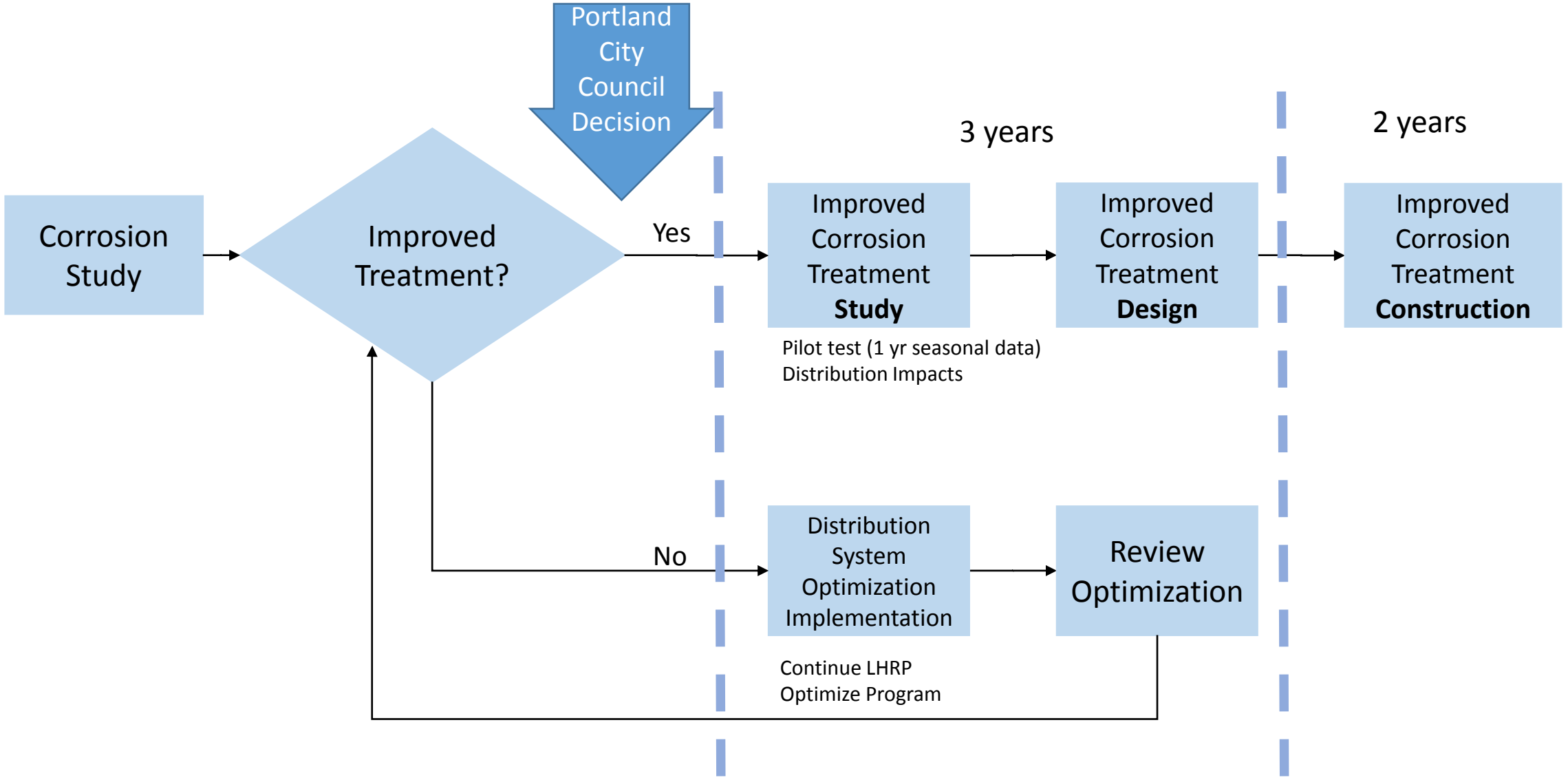
△ Customer Sites

Lead = 12 ppb or higher

Lead = 5 to 11.9 ppb

Lead = 0 to 4.9 ppb

Decision Tree

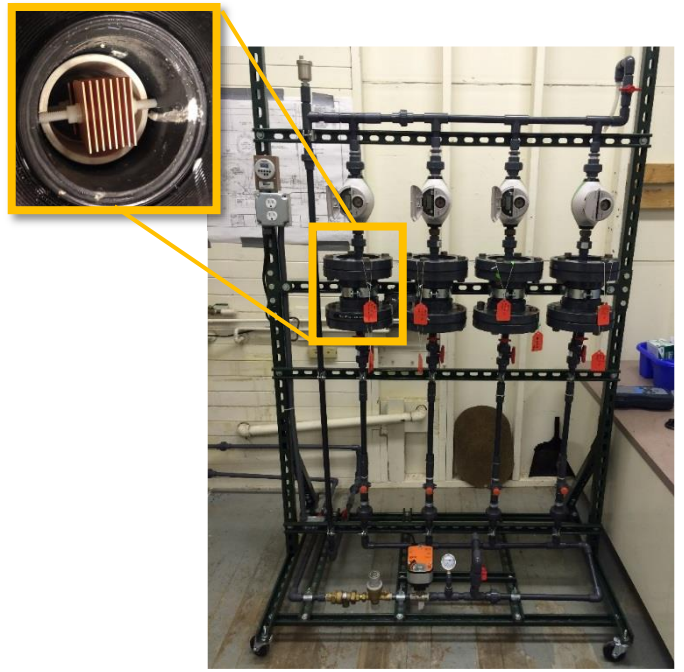


Considerations

- Meet federal requirements
- Reduce corrosiveness to reduce lead and copper and extend the useful life of our pipes
- Make our water more stable
- Avoid unintended water quality effects like red water or increased Disinfection By-Products
- Identify continued funding for reduction of other sources of lead
- Comply with discharge permit requirements
- Address capital and operational costs
- Maintain an expeditious schedule

Next Steps

- Water Quality Corrosion Study – complete Spring 2017
  - Understand mechanisms of lead release
  - Inform treatment decision
- Water Bureau develops recommendation for lead exposure reduction – 2017
- Council consideration – Summer 2017



Questions?

PORTLAND WATER BUREAU

FROM FOREST TO FAUCET

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

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

1120 SW 5th Avenue, Room 600
Portland, Oregon 97204-1926
Information: 503-823-7404
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

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^{th} percentile of 17 ppb), Fall 2013 (90^{th} percentile of 16 ppb), and most recently in Fall 2016 (90^{th} 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^{th} 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 potentially 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.

OREGON STATE PUBLIC HEALTH DIVISION
Office of the State Public Health Director
Kate Brown, Governor

Oregon Health Authority

800 NE Oregon Street, Suite 930
Portland, OR 97232
Phone: 971-673-1229
Fax: 971-673-1299

November 4, 2016

Mr. Michael Stuhr,
P.E. Administrator
Portland Water Bureau
1120 S.W. 5th Ave., Room 600
Portland OR 97214-1926

Dear Mr. Stuhr:

Thank you for your September 8 proposed schedule to enhance corrosion control treatment and further reduce lead levels at the tap. We have carefully considered your proposal, conferred with experts at EPA, and appreciate your clarifying of issues and questions during our evaluation process. We appreciate the steps the Bureau has taken to improve corrosion treatment. Portland needs to take additional immediate steps to reduce levels of lead in drinking water. Given the known elevated lead levels at some taps in the Portland water service area, we direct the Bureau to take the following interim actions take to further protect public health as it implements the corrosion control treatment improvement schedules committed to and described in this communication:

1. **Increase corrosion treatment using current facilities:** We expect the Bureau to move quickly to further reduce lead levels at the tap as much as possible using the existing treatment and water system facilities. While we agree that Portland must upgrade its water treatment facilities and infrastructure to achieve significant reductions in lead levels, there are short-term steps Portland must take within its current system to treat water and reduce lead. We expect the Bureau to submit a plan to OHA for interim lead reduction by December 2, 2016. This interim plan should include immediate steps and intermediate steps to reduce lead in drinking water. We then expect the Bureau to fully implement an OHA-approved plan as quickly as possible and report on deadlines.

2. **Implement changes in Lead Hazard Reduction Program to protect vulnerable populations:** We expect the Bureau to aggressively conduct, assess, and improve the components of the Lead Hazard Reduction Program: 1) water treatment, 2) free lead in water education and testing, 3) public outreach and education, and 4) lead hazard reduction. The bureau must focus its efforts on vulnerable populations such as pregnant women and children under the age of six. We also expect the Bureau to aggressively and fully implement any recommendations identified by OHA Program Design and Evaluation Services in its evaluation of program elements by December 31, 2017. The Bureau must increase reporting to OHA on status, changes and improvements in the Lead Hazard Reduction Program to quarterly from semi-annually.

We recognize the efforts the Bureau is making to evaluate the impact of corrosion treatment and plan for the construction of a new water treatment facility, which is necessary to make significant and systematic reductions of lead in Portland's drinking water. The Bureau took the first step in this process in spring 2014, when it initiated the water quality corrosion study which is currently underway, and which you have been updating OHA and EPA on its progress. OHA looks forward to reviewing this study when it is completed, no later than July 1, 2017.

We concur with the Bureau's corrosion control treatment improvement schedule as proposed. The action steps of the schedule are listed below with completion dates.

Action Step	Completion Date
Complete Water Quality Corrosion Study	June 1, 2017
Review study data and agree with OHA on treatment options; submit recommendation to City Council for consideration	June 30, 2017
Submit Water Quality Corrosion Study final report to OHA	July 01, 2017
Submit Corrosion Control Treatment Pilot Study Plan to OHA	September 30, 2017
Submit Corrosion Control Treatment Pilot Study results and treatment	December 31, 2018
Begin Improved Corrosion Control Treatment Facility Design	January 01, 2019
Submit Improved Corrosion Control Treatment Plans and Specifications to OHA	September 30, 2020
Begin Corrosion Control Treatment Facility Construction	January 01, 2021
Complete Improved Corrosion Control Treatment Facility	September 30, 2022
Complete demonstration tap monitoring round	November 30, 2022
Comply with Minimum Water Quality Parameters	March 01, 2023

OHA considers the above a compliance schedule. Steps, due dates, and completion dates will be posted and tracked on the Drinking Water Services website. Any modification requires OHA approval in advance, should unforeseen technical or permitting delays occur.

If you have questions, please contact me.

Sincerely,

Lillian Shirley

Lillian Shirley, BSN, MPH, MPA
Public Health Director
Oregon State Public Health Division

Cc: Lynne Saxton, Director, Oregon Health Authority
Jere High, Administrator, Center for Prevention and Health Promotion

ORDINANCE NO. 186513

Authorize a contract with Black & Veatch Corporation for a Water Quality Corrosion Study in the amount of $240,000 (Ordinance)

The City of Portland ordains:

Section 1. The Council finds:

1. The Water Bureau plans to conduct a Water Quality Corrosion Study to evaluate the impacts of water quality changes on lead corrosion in the distribution system. This Study will help the Bureau determine if changes in the corrosion control program are needed to reduce lead levels and ensure compliance with the United States Environmental Protection Agency's Lead and Copper Rule.

2. The rate of lead corrosion is dependent on multiple water quality parameters including pH, alkalinity, water temperature, and disinfection residuals. The Water Bureau's water system will be undergoing multiple system changes (physical and operational) over the next 10 to 15 years which may produce changes in these water quality parameters and lead corrosion rates. The water system is also experiencing more pronounced seasonal changes in water quality that may influence lead corrosion.

3. It is important to take a proactive approach to evaluating the combined effects of these system changes. Evaluating all of these system changes now will help ensure compliance with the Lead and Copper Rule during transition periods and after all system changes are in place. A proactive approach will establish solid baseline water quality data that will be used to identify potential water quality changes; evaluate the impact of water quality changes, either positive or negative, on lead corrosion; identify the need for any operational changes or adjustments to pH and alkalinity to control lead corrosion; and plan for and identify the proper timing for any recommended improvements.

4. The Water Bureau coordinated with City Procurement and used the formal Request for Proposal process for Professional Services Contracts. The evaluation criteria included specific requirements the Proposers would be required to meet in order to perform the highly specialized work for the project. Proposals were received from CH2M Hill, Black & Veatch Corporation, and HDR Engineering, Inc.

5. The corporate responsibility evaluation criteria had not been developed at the time of the evaluation which required evaluators to evaluate proposals based on the employment and contracting requirement criteria. Each Proposer identified in their proposal that they had conducted a search for opportunities to work with State of Oregon certified M/W/ESB vendors but due to the highly specialized technical expertise for the evaluation of lead corrosion in chlorinated water systems including expertise in distribution system chemistry, microbiology, biofilms, lead transfer mechanisms and monitoring techniques required, the Proposers were unable to obtain firms capable of meeting the requirements of the project.

6. Black & Veatch Corporation identified activities they participate in which focus specifically on meeting with qualified women and minorities to discuss partnering and job opportunities with the firm. Black & Veatch Corporation also identified a history of partnering with M/W/ESB subconsultants. The Contract provides $35,947 or 15% to woman-owned businesses that are not State of Oregon certified M/W/ESBs.

7. The total not to exceed value of the contract is $240,000. This project will be funded through the Capital Planning Program Regulatory Monitoring/Compliance Program. Partial funding of $50,000 is available in the FY 2013-14 Budget. Additional funding of $128,000 has been requested in the FY 2014-15 Budget and $62,000 in the FY 2015-16 Budget. The total project cost including internal costs is $380,000.

NOW, THEREFORE, the Council directs:

a. That the Chief Procurement Officer and Auditor are authorized to execute on behalf of the City a contract with Black & Veatch Corporation in a form in accordance with the contract attached as Exhibit A.

b. The Mayor and Auditor are hereby authorized to draw and deliver checks chargeable to the Water Fund when demand is presented and approved by the proper authorities.

Passed by the Council, MAR 26 2014

LaVonne Griffin-Valade
Auditor of the City of Portland
By Gayla Jennings Deputy

Commissioner Nick Fish
Michelle Cheek
February 12, 2014

~~275~~ 288

Agenda No.

ORDINANCE NO. 186513

Title

Authorize a contract with Black & Veatch Corporation for a Water Quality Corrosion Study in the amount of $240,000 (Ordinance)

INTRODUCED BY
Commissioner/Auditor:
Commissioner Nick Fish

CLERK USE: DATE FILED MAR 14 2014

COMMISSIONER APPROVAL

Mayor—Finance and Administration - Hales

Position 1/Utilities - Fritz

Position 2/Works - Fish

Position 3/Affairs - Saltzman

Position 4/Safety - Novick

BUREAU APPROVAL

Bureau: Water
Bureau Head: David G. Shaff

Prepared by: Michelle Cheek
Date Prepared: February 12, 2014

Financial Impact Statement
Completed ☒ Amends Budget ☐
Not Required ☐

Portland Policy Document
If "Yes" requires City Policy paragraph stated in document.
Yes ☐ No ☒

Council Meeting Date
March 19, 2014

City Attorney Approval:
required for contract, code, easement, franchise, comp plan, charter

LaVonne Griffin-Valade
Auditor of the City of Portland

By: _____
Deputy

ACTION TAKEN:

MAR 19 2014 **PASSED TO SECOND READING** MAR 26 2014 **9:30 A.M.**

AGENDA

TIME CERTAIN ☐
Start time: _____

Total amount of time needed: _____
(for presentation, testimony and discussion)

CONSENT ☐

REGULAR ☒
Total amount of time needed: 15 minutes
(for presentation, testimony and discussion)

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:	YEAS	NAYS
1. Fritz	1. Fritz	✓	
2. Fish	2. Fish	—	
3. Saltzman	3. Saltzman	✓	
4. Novick	4. Novick	✓	
Hales	Hales	✓	