

Lead in Drinking Water

The Science and Public Health Safeguards

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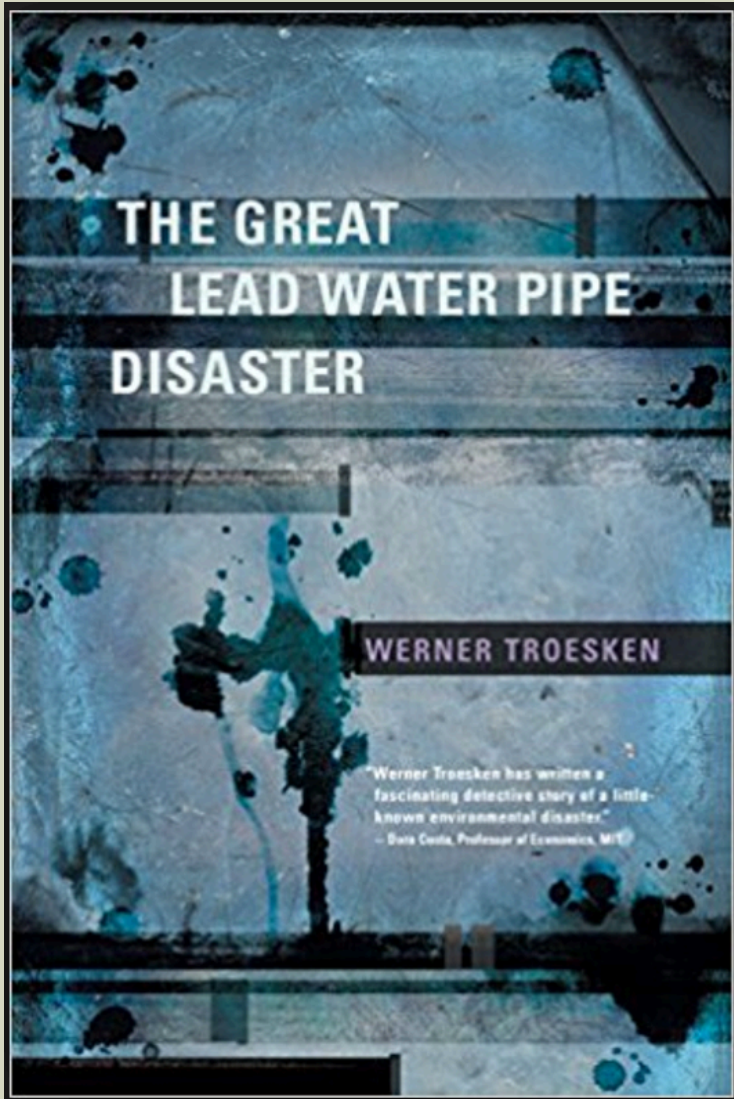
Collaborative on Health and the Environment

July 10, 2019

Outline

- Background
- The four pillars of the LCR
- Needed improvements

Background



“...the available evidence indicates that in Massachusetts and the north of England lead water pipes increased infant mortality rates and stillbirth rates by between 8 and 25 percent.

[...]

During the late nineteenth and early twentieth centuries, women of child-bearing age sometimes purchased pills made of lead plaster to induce abortion and/or disrupt menstruation. In several towns in Massachusetts one need have consumed only 10-20 ounces of tap water per day to have ingested the same amount of lead as was contained in the recommended daily dose of these abortion pills.”

Troesken 2006, pp. 15-16

Lead plumbing in the US

Plumbing material	US homes affected
Leaded brass	Almost all
Lead solder	Approx. 81 million
Lead service lines/goosenecks/pipes	6-10+ million

Marc Edwards, presentation to NDWAC LCR WG, 9/9/2014

brass



solder

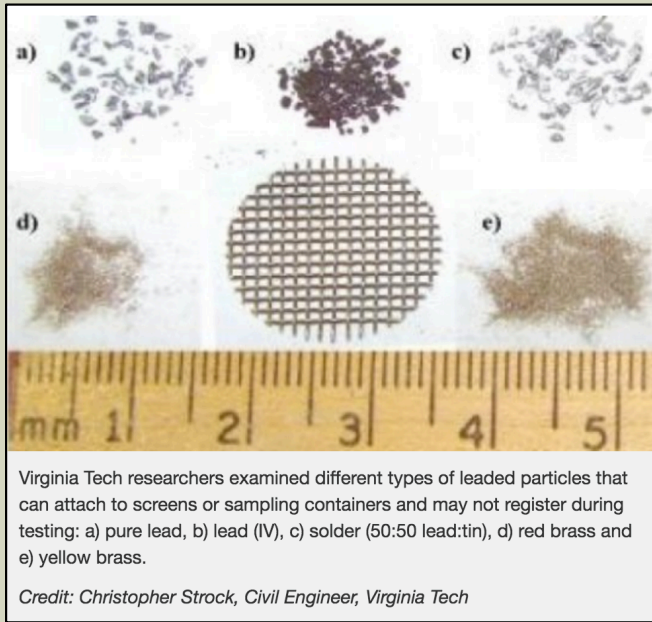


service line



“Lead-free” ≠ lead free

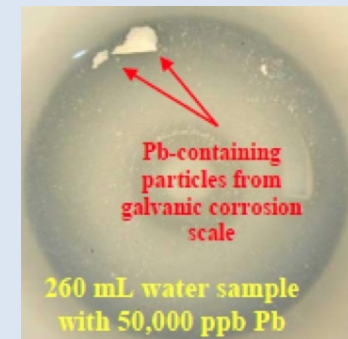
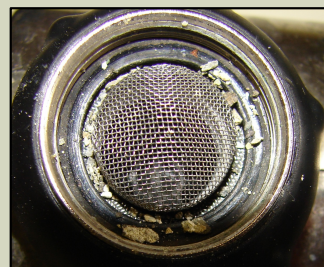
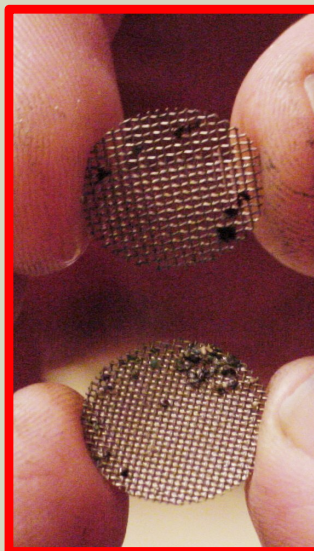
Year	EPA’s definition of “lead-free”
1986	<ul style="list-style-type: none"><li data-bbox="646 565 1451 618">• Solder and flux: $\leq 0.2\%$ lead<li data-bbox="646 643 1713 776">• Pipes, pipe fittings, plumbing fittings, and plumbing fixtures: $\leq 8\%$ lead
2014	<ul style="list-style-type: none"><li data-bbox="646 816 1451 870">• Solder and flux: $\leq 0.2\%$ lead<li data-bbox="646 894 1713 1263">• Pipes, pipe fittings, plumbing fittings, and plumbing fixtures: Weighted average of 0.25% lead as determined by the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures



different types of lead particles
(e.g., pure lead, lead from solder,
lead from brass)

lead particles in
sampling bottle

lead particles in
faucet aerator



Lead dose in one glass of water
exceeding the US Consumer Product
Safety Commission "acute health
threat" for lead 71 times

from
kitchen tap
of lead-
poisoned
child in NC

Lead Particles in Potable Water

2007 © American Water Works Association

TRIANAFYLLIDOU ET AL | 99:6 • JOURNAL AWWA | PEER-REVIEWED | JUNE 2007



Food cooked with tap water containing lead particles collected from the home of a lead-poisoned child contained more lead than a lead paint chip approximately the size of a penny.



1986 report: As many as 250,000 children have suffered measurable IQ losses as the result of drinking lead-contaminated water.

US Department of Agriculture. 2000. *Selecting and Renovating an Old House: A Complete Guide*. Mineola, NY: Dover Publications, Inc.

1991: Birth of the LCR

corrosive. As such, the total drinking water contribution to overall lead levels may range from as little as 5 percent to more than 50 percent of children's total lead exposure. Infants dependent on formula may receive more than 85 percent of their lead from drinking water. As exposures decline to sources of lead other than drinking water, such as gasoline and soldered food cans, drinking water will account for a larger proportion of total intake. The estimate

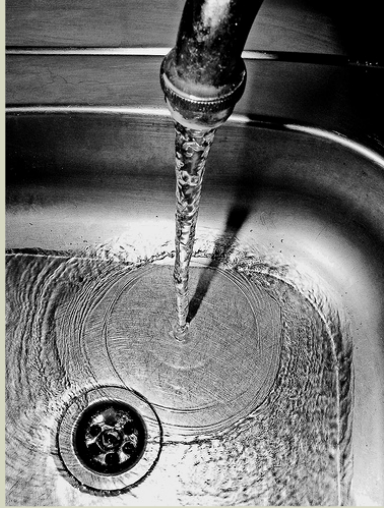
The goal of this rule is to provide maximum human health protection by reducing the lead and copper levels at consumers' taps to as close to the MCLG as is feasible. To accomplish this goal,

No safe level of lead in water for human consumption



Maximum Contaminant Level Goal for lead = **zero**

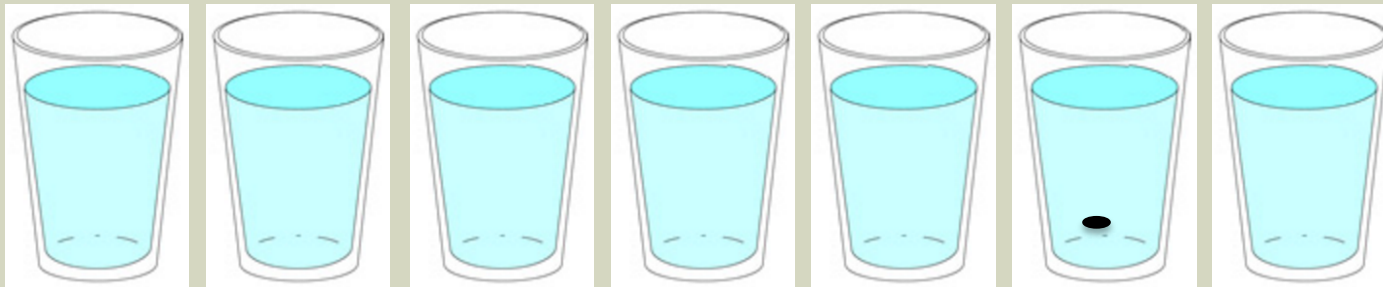
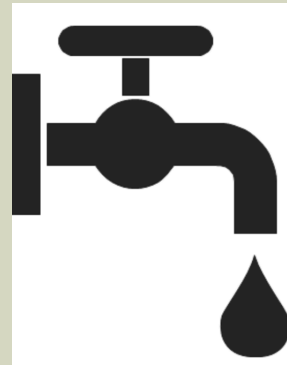
Federal Register, Vol. 56, No. 110 (1991), Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, pp. 26470, 26478.



Monitor at consumer taps to capture worst-case lead levels at highest risk homes

Treat water to minimize lead at consumer taps

Limitations of testing

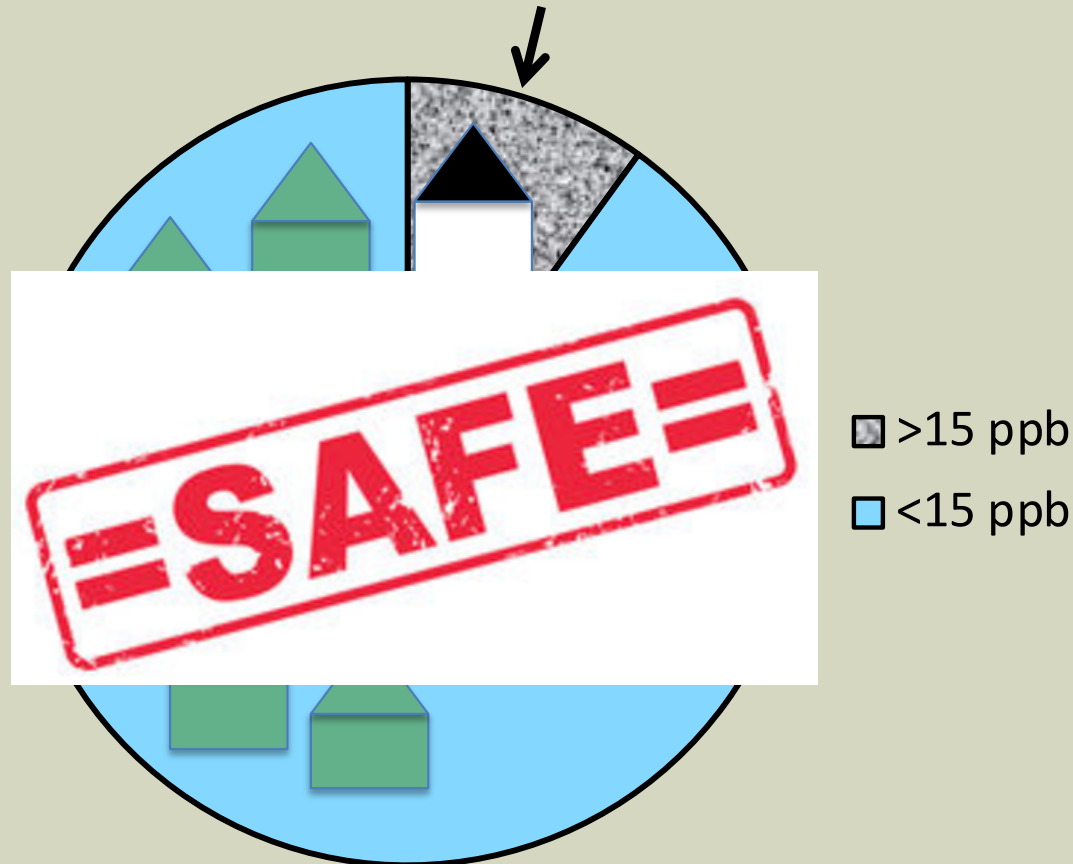


↑
lead particle

High-risk homes

Health-based
standard = 0

$\leq 10\%$ over 15 ppb



Remedial action
NOT required



DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY | 3900 DONALDSON PLACE, NW | WASHINGTON, DC 20016

Lead and Copper Compliance Report January through June 2018

Table 1 summarizes the District of Columbia Water and Sewer Authority's (DC Water) Lead and Copper compliance results for the monitoring period January through June 2018.

Table 1. Lead and Copper Summary Data

Number of Samples	
Lead and Copper	118
90th Percentile First Draw Concentrations	
Lead mg/L	0.003
Copper mg/L	0.112
Service Line Materials	
Full Lead	96
Partial Lead	22

90th percentile lead value
(1 L, 1st draw sample)



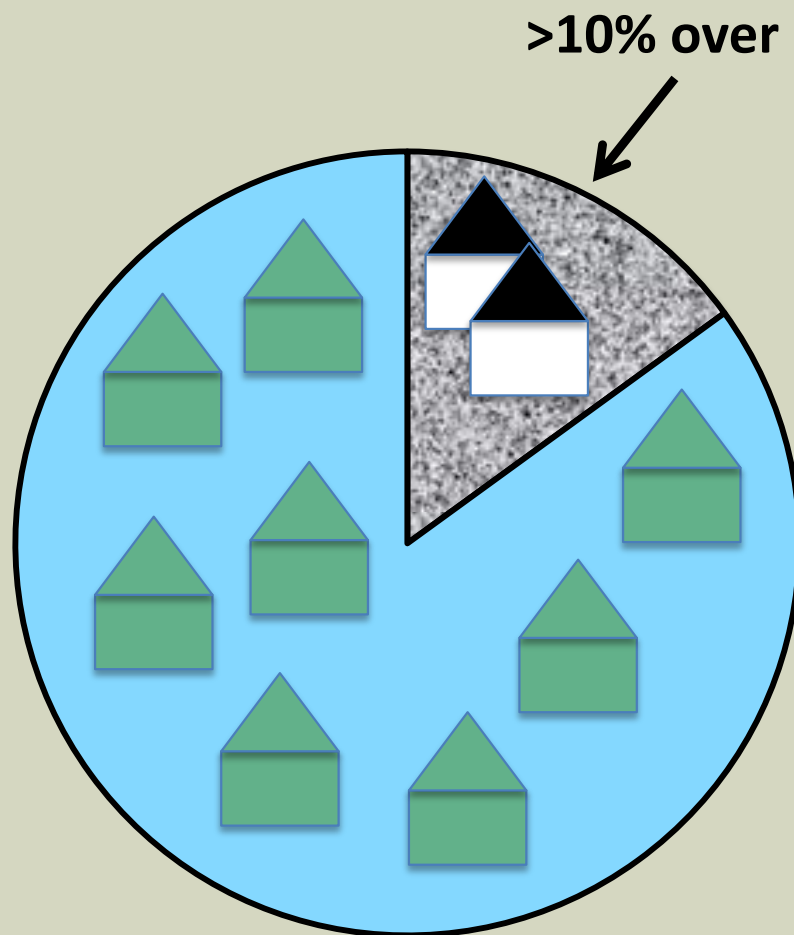
106	3205 38TH ST NW	Lead	2/27/2018	0.0027
107	1346 F St NE	Lead	1/30/2018	0.0029
108	1004 NEWTON ST NE	Lead	5/16/2018	0.0033
109	1816 Minnesota Ave SE	Lead	1/29/2018	0.0037
110	125 Madison St NW	Lead	1/30/2018	0.0039
111	2719 O ST NW	Lead	2/28/2018	0.0044
112	1221 F ST NE	Lead	4/30/2018	0.0047
113	3221 OLIVER ST NW	Lead	2/27/2018	0.0085
114	722 5th St NE	Lead	3/27/2018	0.0093
115	1505 Buchanan St NW	Lead	1/31/2018	0.0135
116	126 16TH ST NE	Partial Lead	4/26/2018	0.0288
117	5731 3rd Pl NW	Lead	3/28/2018	0.0530
118	2921 7th St SE	Lead	2/28/2018	0.6096



highest lead values
(1 L, 1st draw samples)

High-risk homes

Health-based
standard = 0



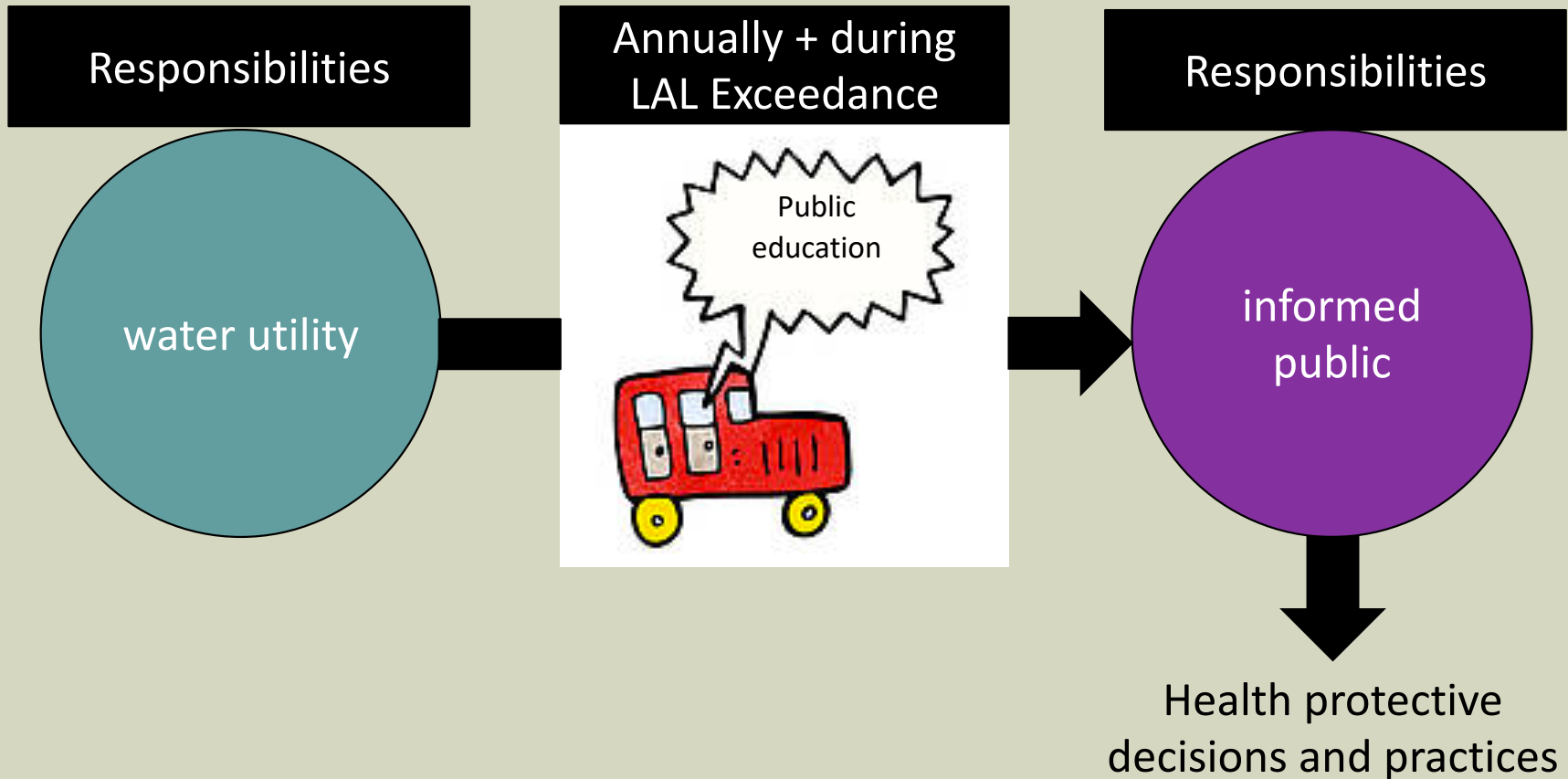
■ >15 ppb

■ <15 ppb

Remedial action
required

- Source water
- Corrosion control
- Public education
- Lead pipe replacement

“Shared responsibility” regulation





JUNE 2016
R-16-06-A

REPORT

WHAT'S IN YOUR WATER? FLINT AND BEYOND

ANALYSIS OF EPA DATA REVEALS WIDESPREAD LEAD CRISIS
POTENTIALLY AFFECTING MILLIONS OF AMERICANS

AUTHORS

Erik Olson
Kristi Pullen Fedinick



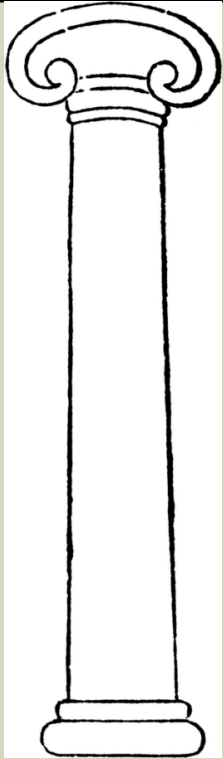
June 2016, Erik Olson & Kristi Pullen Fedinick

2015

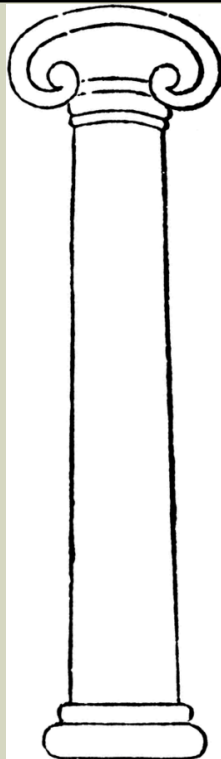
- 1,110 utilities exceeded the 15 ppb standard (3.9 million people)
- Some utilities failed to tell consumers about the exceedance
- State agencies and EPA took enforcement action in only 11.2% of the total number of LCR violations (involving 5,363 utilities)

The Four Pillars of the LCR

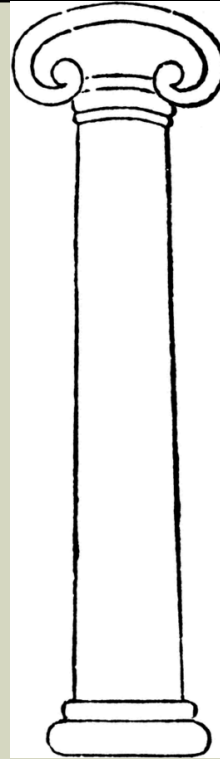
Lead and Copper Rule



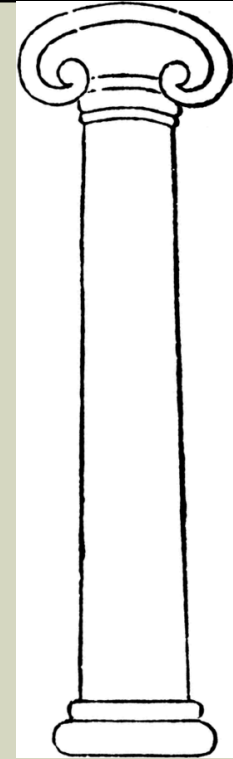
Tap monitoring
that captures worst-
case lead



Corrosion control treatment
that achieves required lead
minimization at consumer taps



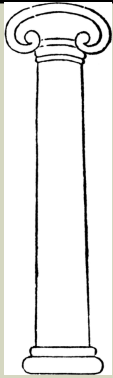
Remediation
that is health-protective



Compliance mechanism
that corresponds to lead
levels at consumer taps

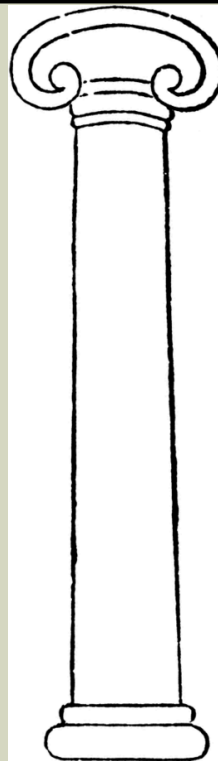
The Four Pillars of the LCR

Lead and Copper Rule

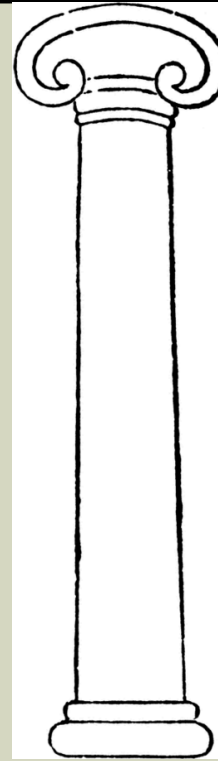


- Worst-case lead not captured in LSL homes

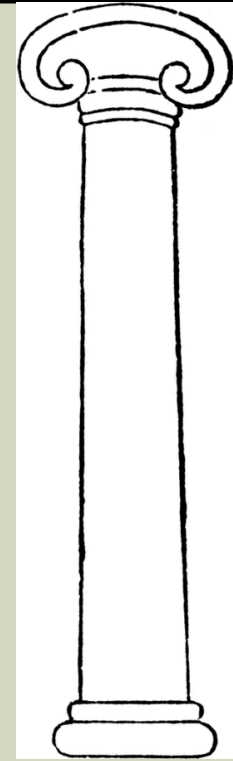
Tap monitoring



CCT that achieves lead minimization at consumer taps to lowest levels feasible



Mandated remediation following LAL exceedance



Compliance mechanism that corresponds to lead levels at consumer taps

Evaluated Three Potential LT-LCR Tap Sampling Requirements to Identify Impacted Systems

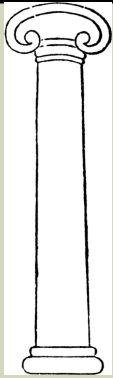
Scenario No.	Description	Percent of Systems Above AL with LT-LCR Changes	Population Impacted (in Millions)
1	Changing sample site Tier Definition – Tier 1 Sites Served by a LSL	12.5% of systems with LSLs	15.2
2	Sampling Directly from LSLs – Temperature Variation Method	9.5% of systems with LSLs	11.8
	Sampling Directly from LSLs – Standard Volume Flushing Method	54.5% of systems with LSLs	74.0
2	Sampling Directly from LSLs – Sequential Sampling Method	70.5% of systems with LSLs	96.4
	Targeted Cu Monitoring	8% of systems with high alkalinity and low pH	10.9

54.5-70.5% of systems would exceed the 15 ppb lead standard

Slabaugh, R. M. 2014. Optimized Corrosion Control—An Estimate of National Impact [Power Point presentation]. American Water Works Association/Water Quality Technology Conference, Nov. 16-20, New Orleans, LA.

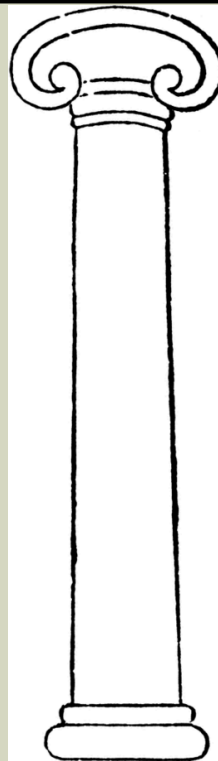
The Four Pillars of the LCR

Lead and Copper Rule

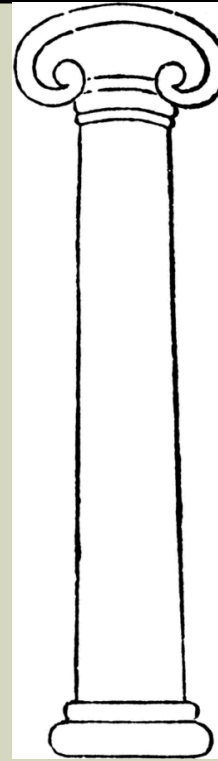


- Worst-case lead not captured in LSL homes
- Sampling protocols known to miss lead

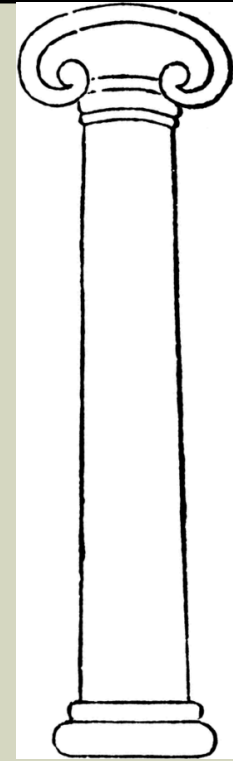
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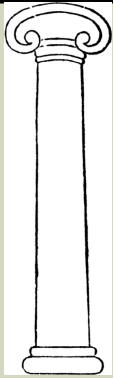
Mandated remediation following LAL exceedance



Compliance mechanism that corresponds to lead levels at consumer taps

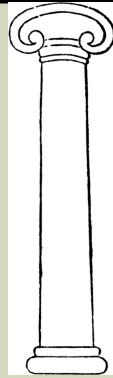
The Four Pillars of the LCR

Lead and Copper Rule



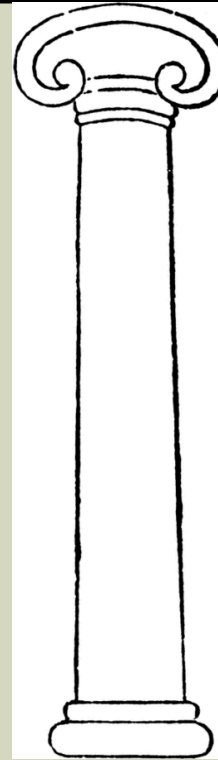
- Worst-case lead not captured in LSL homes
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Tap monitoring

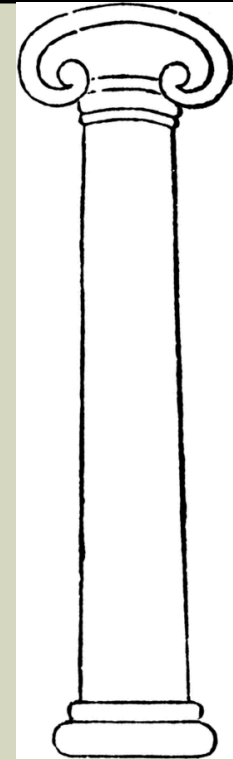


No large system has optimized CCT

CCT



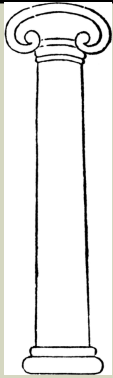
Mandated remediation following LAL exceedance



Compliance mechanism that corresponds to lead levels at consumer taps

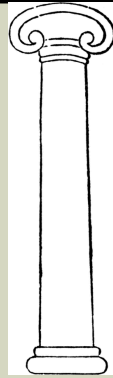
The Four Pillars of the LCR

Lead and Copper Rule



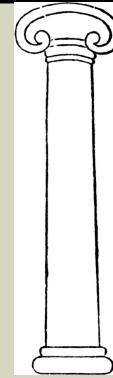
- Worst-case lead not captured in LSL homes
- Sampling protocols known to miss lead

Tap monitoring



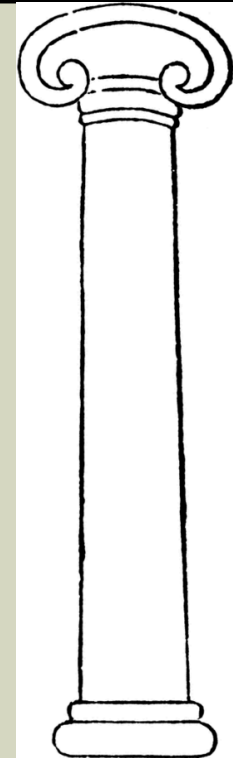
No large system has optimized CCT

CCT



- Public education is ineffective (if even implemented)

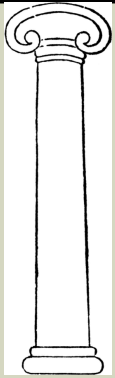
Remediation



Compliance mechanism that corresponds to lead levels at consumer taps

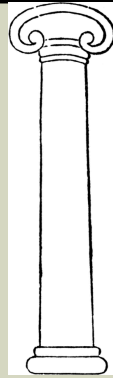
The Four Pillars of the LCR

Lead and Copper Rule



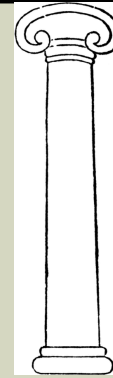
- Worst-case lead not captured in LSL homes
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Tap monitoring



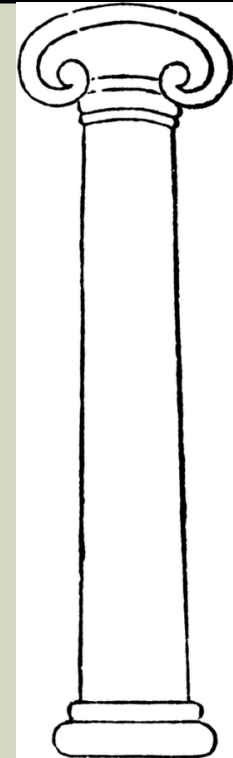
No large system has optimized CCT

CCT



- Public education is ineffective
- Partial LSL replacement can increase risk for consumers

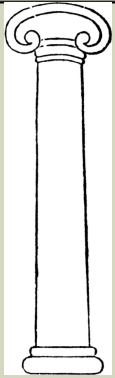
Remediation



Compliance mechanism that corresponds to lead levels at consumer taps

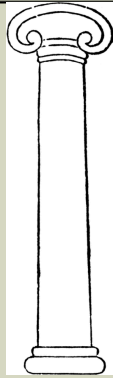
The Four Pillars of the LCR

Lead and Copper Rule



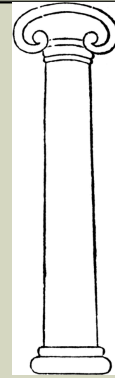
- Worst-case lead not captured in LSL homes
- Sampling protocols known to miss lead

Tap monitoring



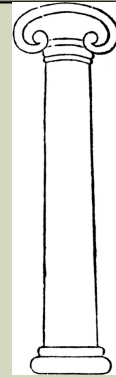
No large system has optimized CCT

CCT



- Public education is ineffective
- Partial LSLR can increase health risk for consumers

Remediation



Compliance mechanism does not correspond to lead levels at consumer taps

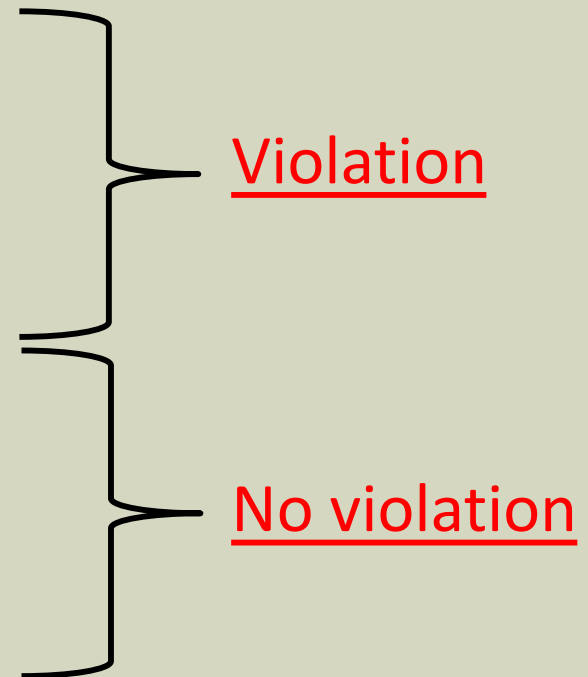
Compliance

Existing compliance mechanism

Between 1991 and 2015:

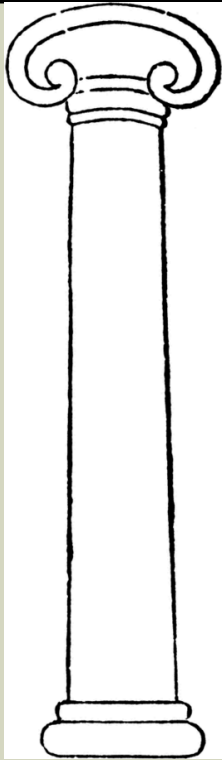
Only 172 water utilities failed to maintain target pH, alkalinity, and corrosion inhibitor levels.

But > 6,000 water utilities exceeded the 15 ppb lead standard.



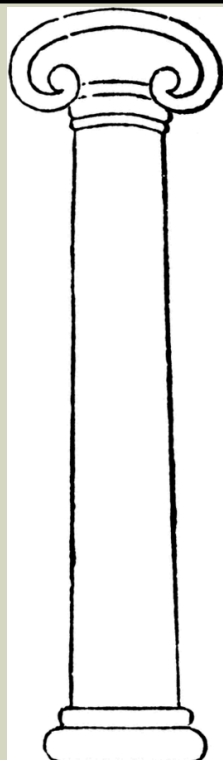
Needed Improvements

Lead and Copper Rule



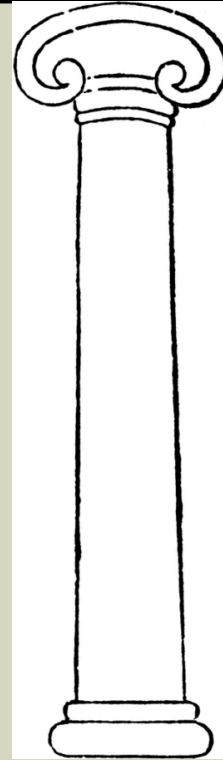
Worst-case lead in LSL homes & ban on steps known to miss lead

Tap monitoring



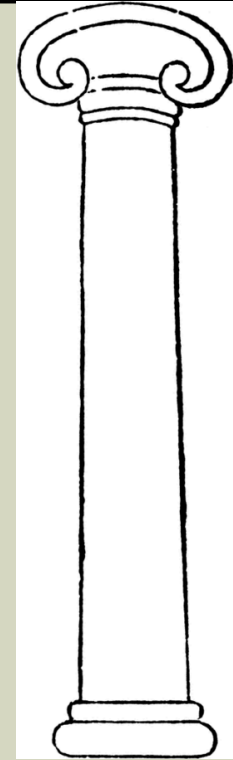
CCT based on reliable tap sampling & consideration of *all* factors contributing to lead release

CCT



Public disclosure promoting precautionary water use & ban on partial LSL replacement

Remediation



Compliance mechanism that corresponds to lead levels at consumer taps

Compliance

“Lead-free” = lead free

POLITICS 03/21/2019 04:34 pm ET | Updated Mar 21, 2019

EPA Promises, Yet Again, That It Will Do Something About America's Lead Pipes

Lead exposure can impair brain function and cause miscarriages, and yet millions of lead pipes remain in use.



By Arthur Delaney

The EPA was supposed to have updated the regulation last year. And the year before that. And the year before that. The agency has been working on a major revision to the rule since 2010, and has repeatedly blown its own deadlines since at least 2016.

Given the history, experts are skeptical this time is different. “I’ll believe it when I see it,” said Erik Olson of the Natural Resources Defense Council.

Thank you!

pnalternatives@yahoo.com



[@DrishtiEthics](https://twitter.com/DrishtiEthics)

Select Bibliography

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