The EPA Lead and Copper Rule:

Strengths, Loopholes, and Visions for Revisions

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Outline

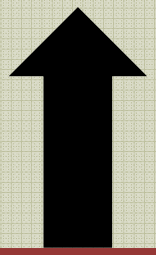
- Intro to the LCR
- Main strengths/weaknesses
- New vision for proactive LSL replacement

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,

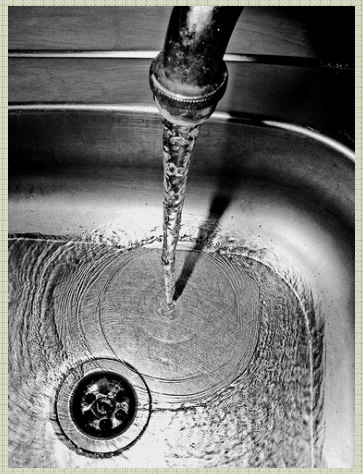
No safe level of lead in water for human consumption



Maximum Contaminant Level Goal for lead = zero

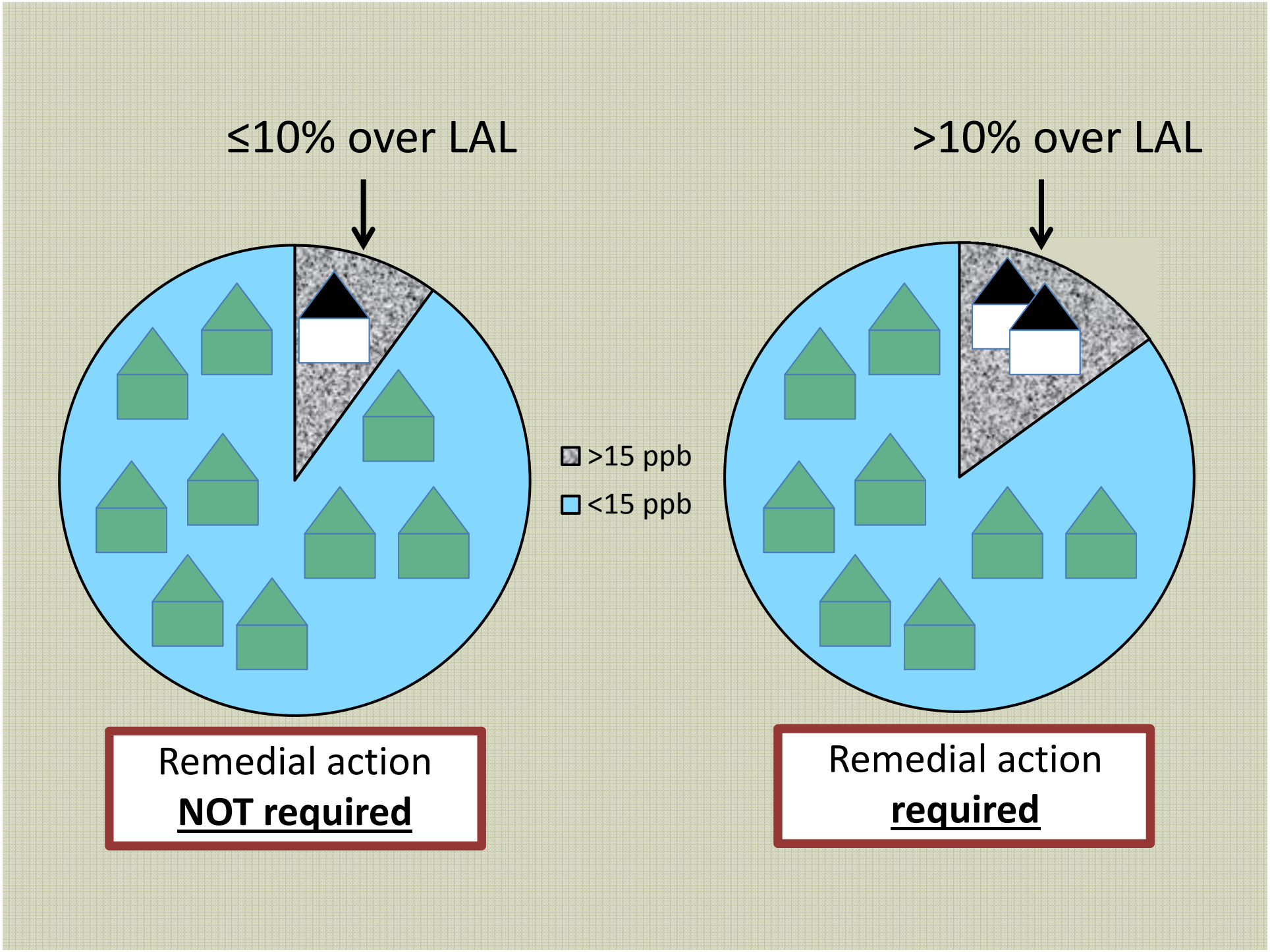
Federal Register, Vol. 56, No. 110 (1991), Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper, pp. 26470, 26478.

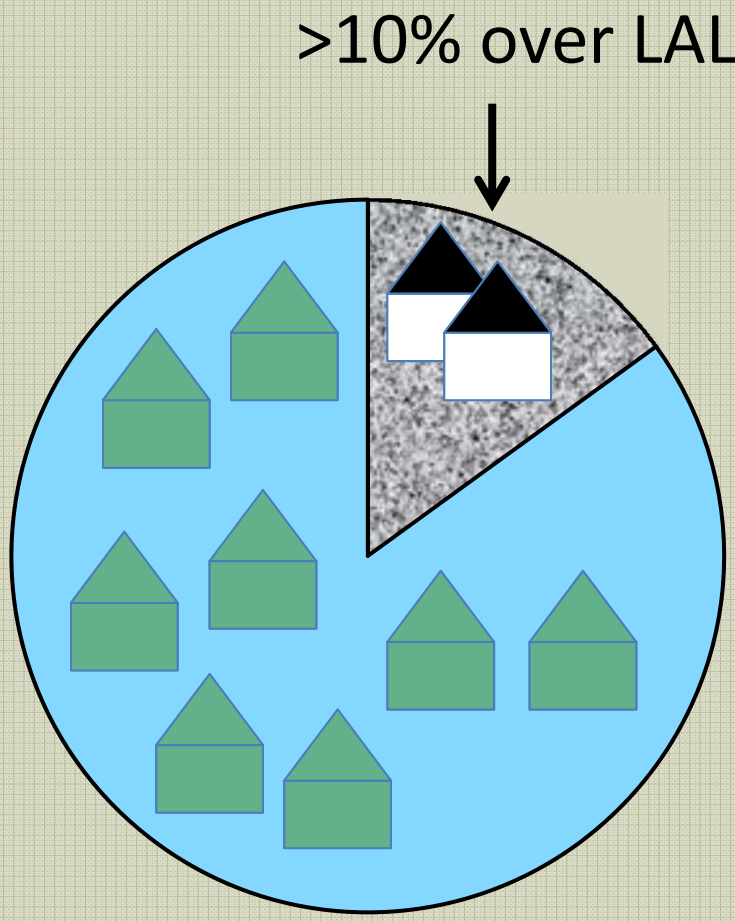
The LCR's Treatment Technique



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

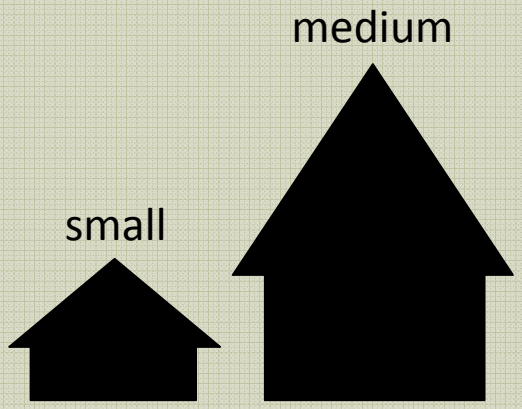
Treat water to minimize lead at *consumer taps*


≤10% over LAL
>10% over LAL
>15 ppb
<15 ppb
Remedial action
NOT required
Remedial action
required

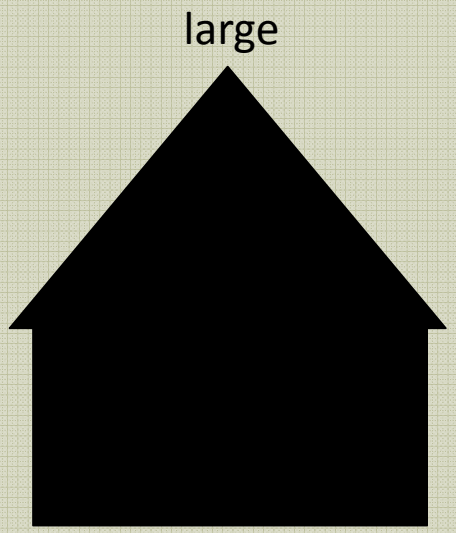


Remedial action **required**

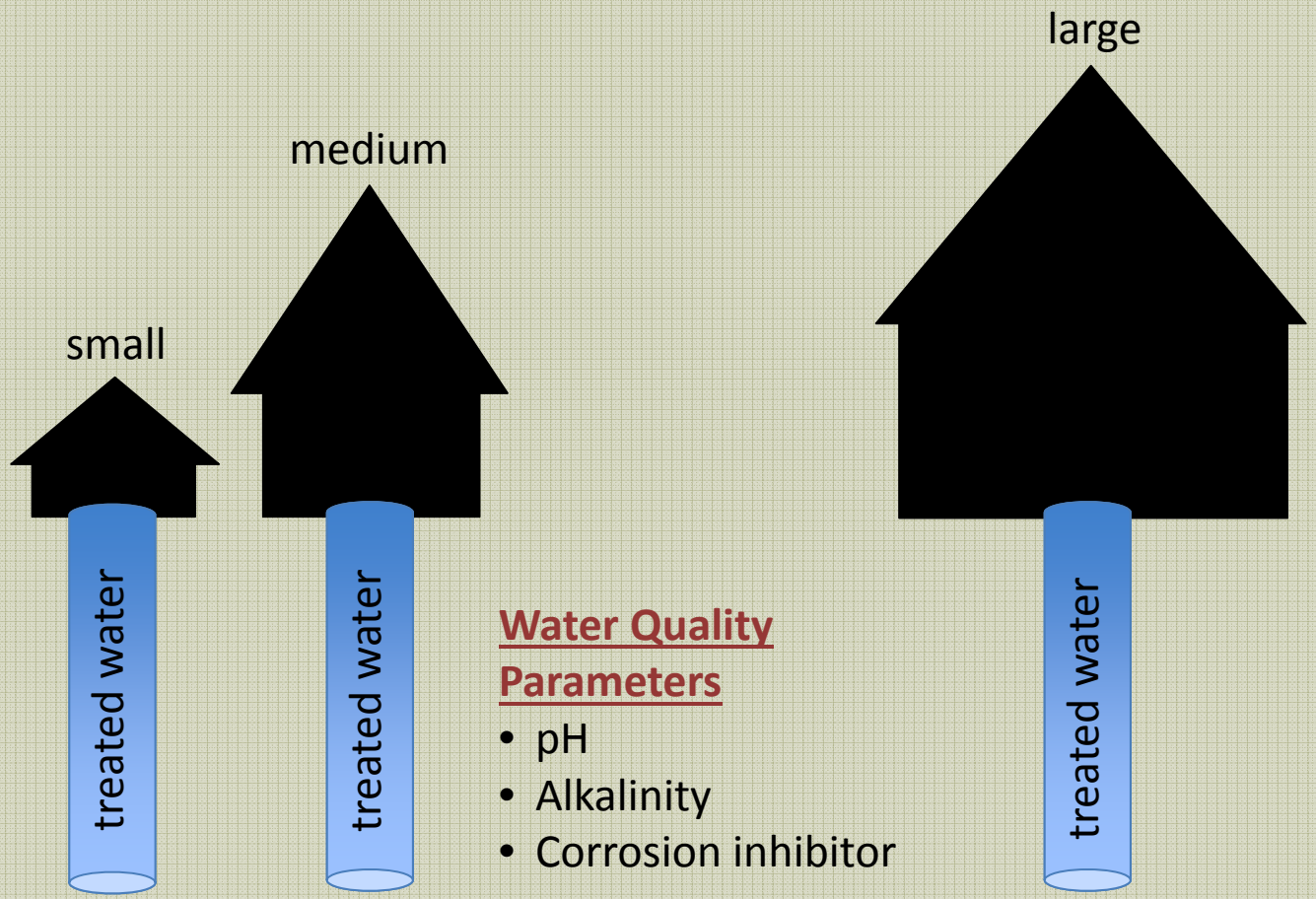
- Source water treatment
- CC treatment (re-)optimization
- Public education
- LSL replacement



Optimized CCT = PWS meets the LAL



Optimized CCT = PWS achieves the lowest possible levels of lead at consumer taps without violating any other national primary drinking water regulation



Water Quality Parameters

- pH
- Alkalinity
- Corrosion inhibitor

What does compliance mean?

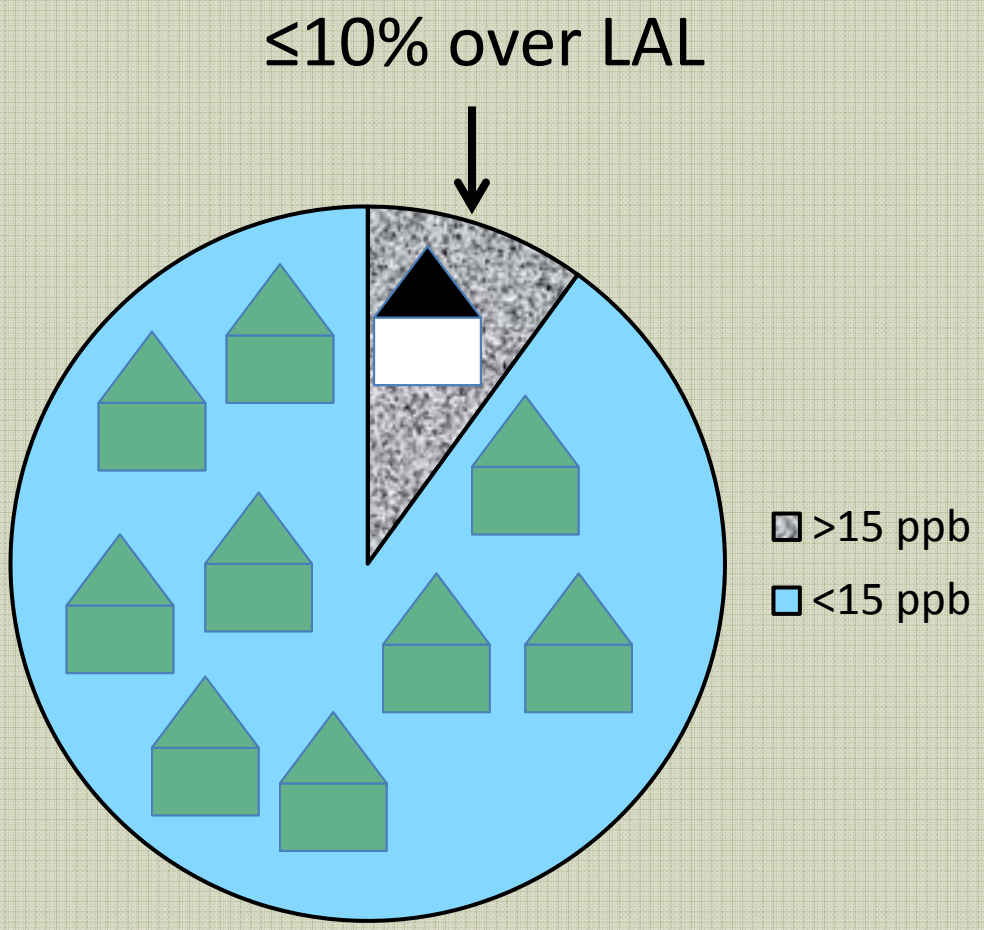
Common message in annual water quality reports:

- We meet or exceed federal standards
- Our water is safe

Philadelphia's water is safe and healthy to drink for most people. For people with special health concerns, please see the information on page 3.

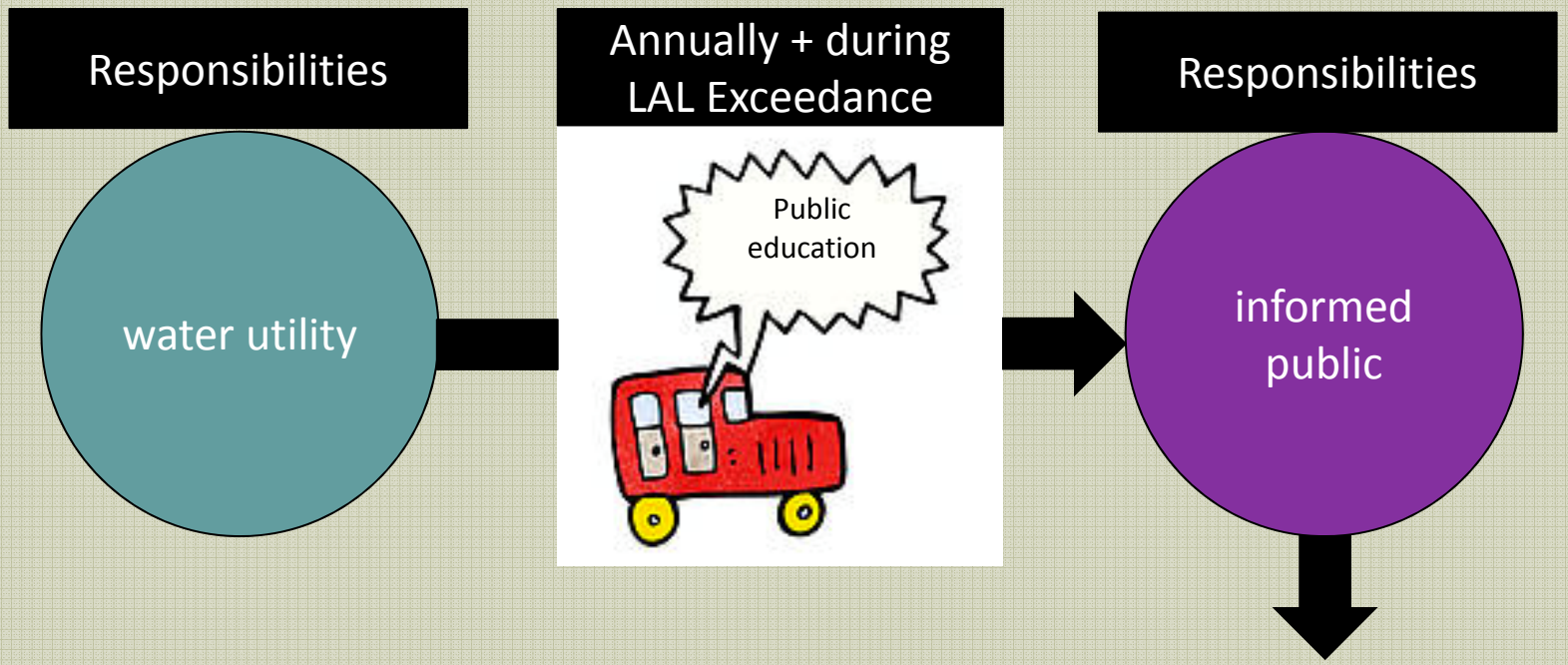
What compliance can look like:

- Many, if not most, taps can dispense low levels of lead
- Up to 10% of taps can dispense limitless levels of lead



Remedial action
NOT required

“Shared Responsibility” Rule



Most vulnerable to lead in water

But rarely, if ever, screened for exposure…

When we look for lead…

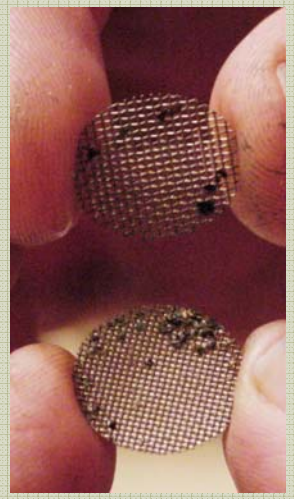
We focus on hand-to-mouth activity

Dust

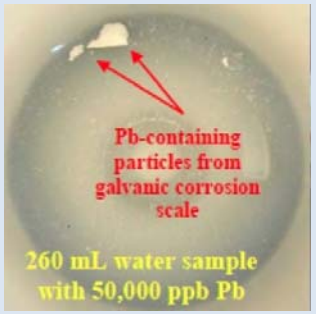
Paint

Soil

We usually ignore drinking and eating as a pathway of exposure



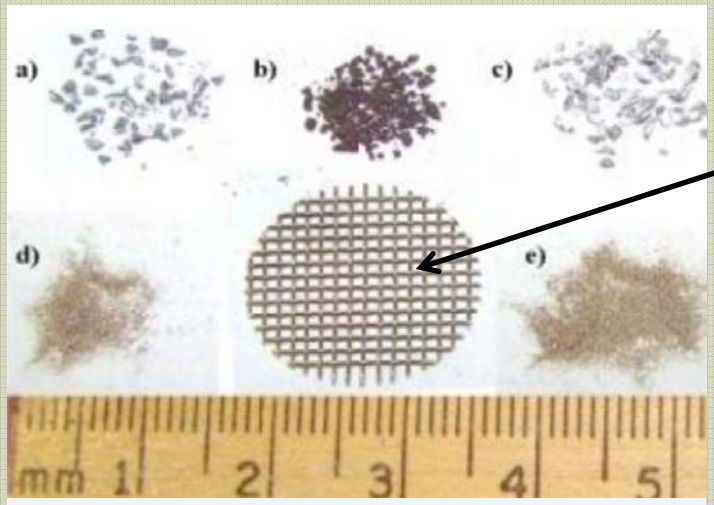
Lead particles



Lead dose in one glass of water exceeding the CPSC “acute health threat” for lead 71 times

Images courtesy of Dr. Marc Edwards, Department of Civil and Environmental Engineering, Virginia Tech & http://www.epa.gov/nrmrl/wswrd/cr/images/lead_header.jpg

- Forms, sources, prevalence
- Contributing factors
- Lead particles from plumbing materials

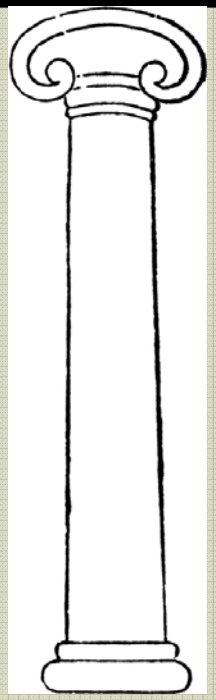


Credit: Christopher Strock, Civil Engineer, Virginia Tech

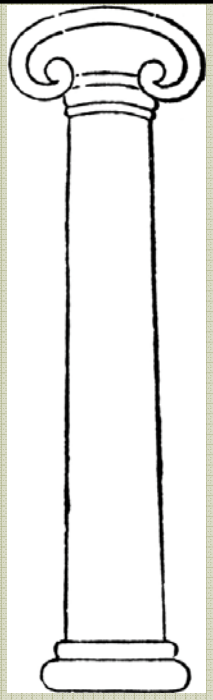
- Release erratically
- Can pose immediate and acute health risk analogous to lead paint

The LCR's Four Pillars

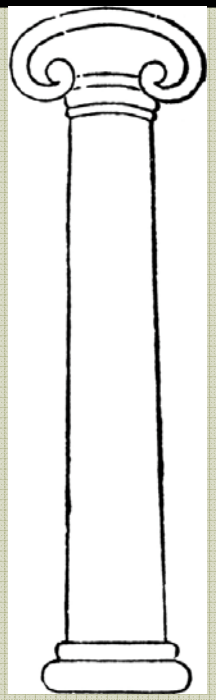
Lead and Copper Rule



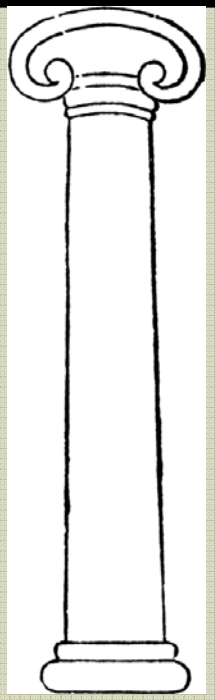
Tap monitoring that captures worst-case lead



CCT that achieves required lead minimization at consumer taps



Mandated remediation following LAL exceedance



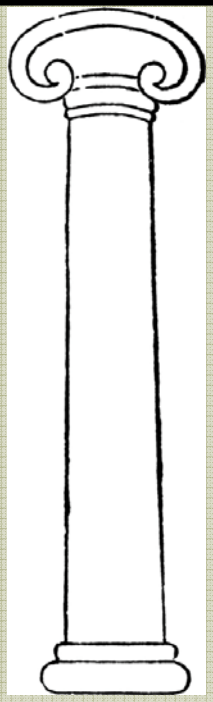
Compliance mechanism that corresponds to lead levels at consumer taps

The LCR's Four Pillars

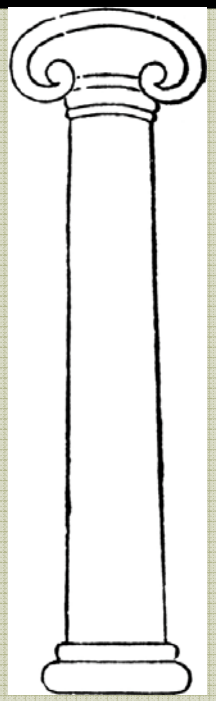
Lead and Copper Rule

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

Tap monitoring



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



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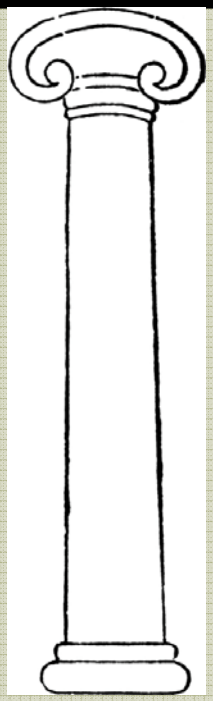
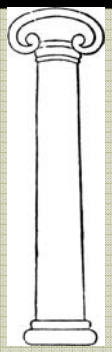


Compliance mechanism that corresponds to lead levels at consumer taps

- ✓ A significant number of systems today likely **underestimate lead levels** in tap water and do not meet the LAL even though they believe and claim they do.
- ✓ It is highly probable that these systems also **lack optimized corrosion control treatment**.

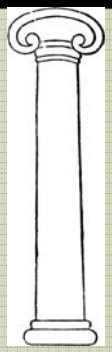
The LCR's Four Pillars

Lead and Copper Rule



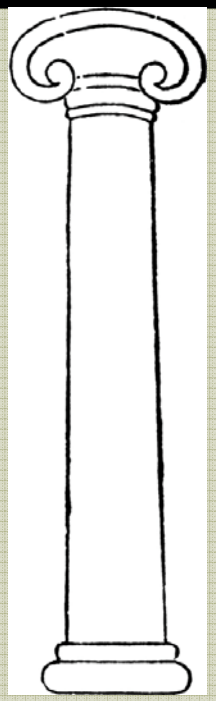
- Worst-case lead not captured in LSL homes
- Sampling protocols known to miss lead

Tap monitoring



No large system has optimized CCT

CCT



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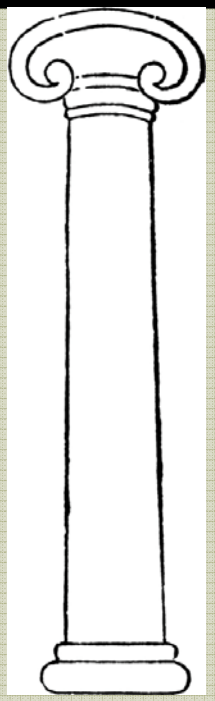
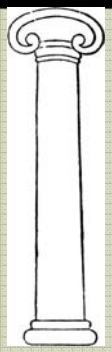


Compliance mechanism that corresponds to lead levels at consumer taps

The LCR's Four Pillars

Lead and Copper Rule



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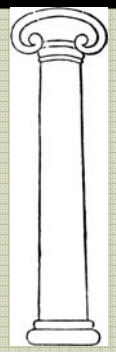
Tap monitoring

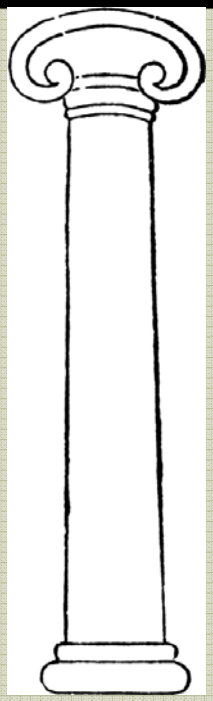
No large system has optimized CCT

CCT



- Public education is ineffective (if even implemented)

Remediation



Compliance mechanism that corresponds to lead levels at consumer taps

June 2006

EPA United States Environmental Protection Agency

Lead and Copper Rule State File Review: National Report

The file review revealed a lack of system response to action level exceedances. This was especially true for requirements to inform the public, where water systems provided the required information to their consumers less than 1/3 of the time. In addition, out of 134 occasions in which water quality parameter (WQP) and source water monitoring was required during 2000-2004, documentation in the state files indicated initial WQP and source water monitoring was conducted only 42 percent of the time.

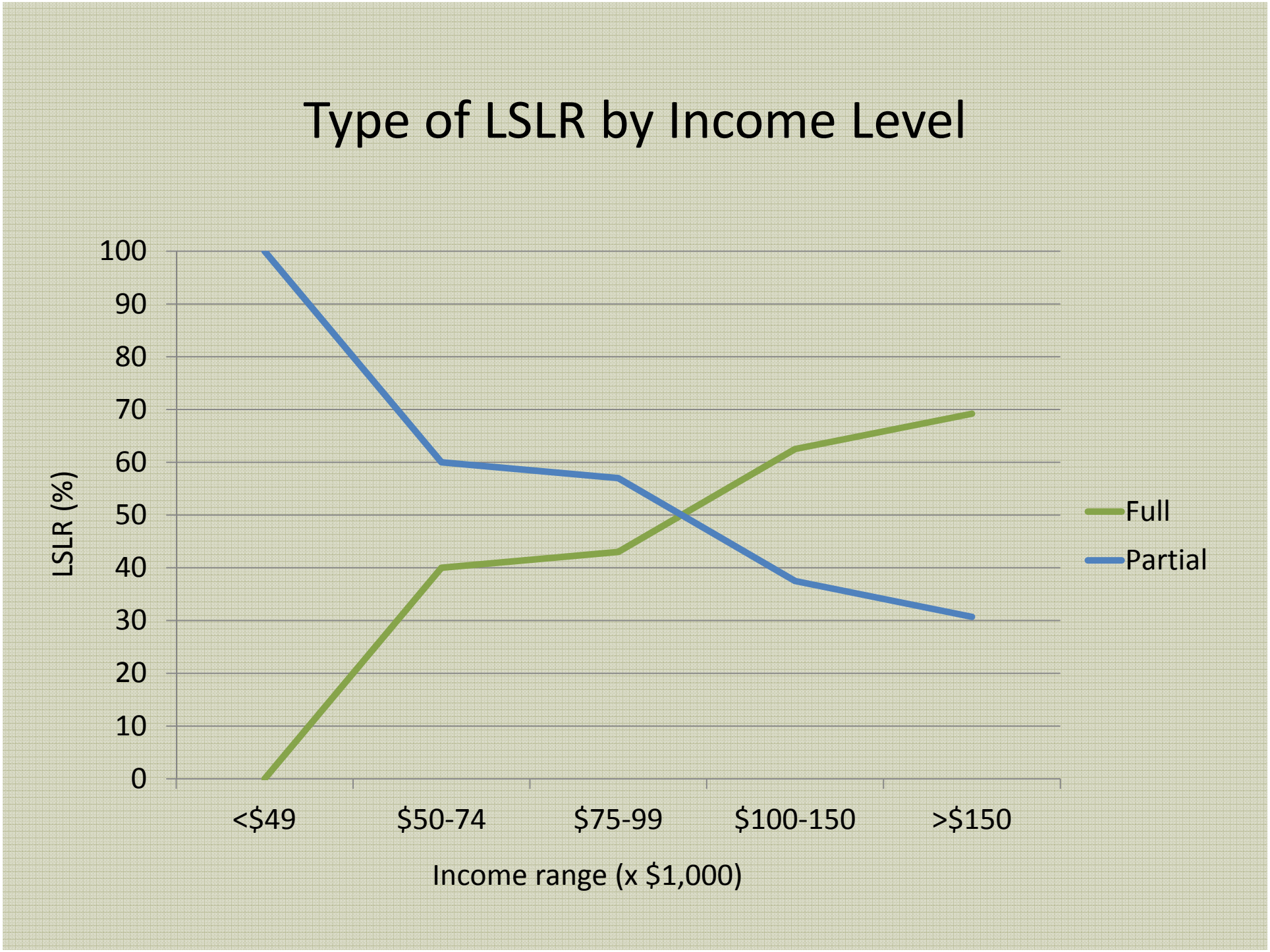
Homeowner Decisions about Full LSLR

Reasons for refusal:

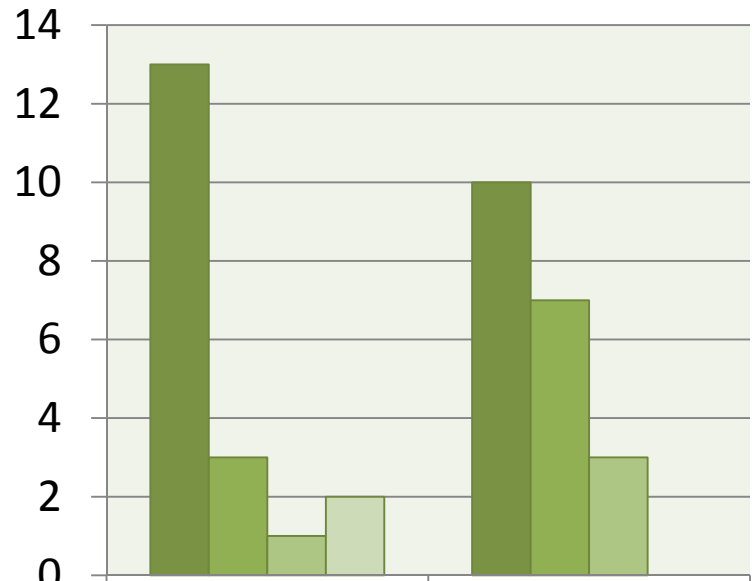
- Cost
- Belief that water is safe due to 1-time test
- No vulnerable populations in the house
- Fear of property damage
- Perception of low risk due to use of other precautions (bottled water, filters, flushing)

Characterization of utility educational material:

- Overemphasizing the logistics of the construction
- Lacking consumer-friendly information
- Lacking clear messaging about the risks of partial LSLR and the benefits of full LSLR


Type of LSLR by Income Level
LSLR (%)
100
90
80
70
60
50
40
30
20
10
0
<$49
$50-74
$75-99
$100-150
>$150
Income range (x $1,000)
Full
Partial

Type of LSLR by Race



	Full	Partial	% Full LSLR
White/Caucasian	13	10	56%
Black/African American	3	7	30%
Hispanic/Latino	1	3	25%
Other	2		

The LCR's Four Pillars

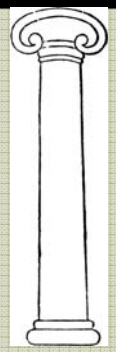
Lead and Copper Rule

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

Tap monitoring

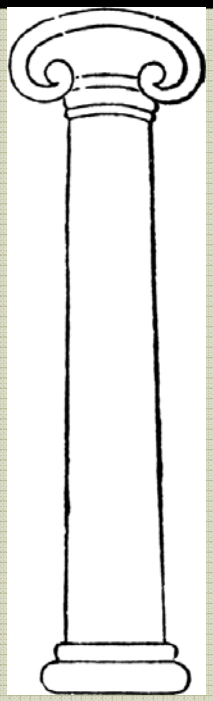
No large system has optimized CCT

CCT



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

Remediation

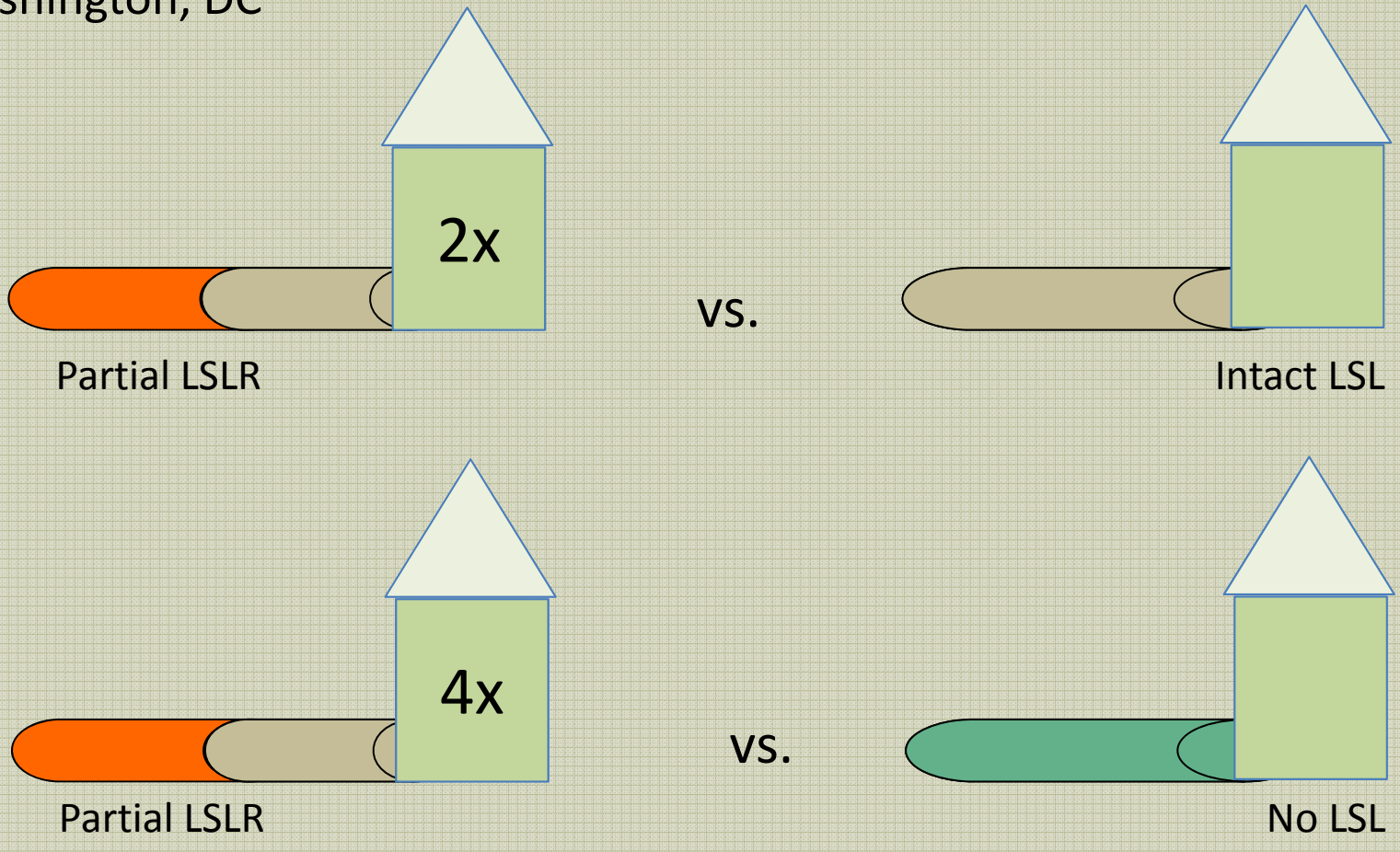


Compliance mechanism that corresponds to lead levels at consumer taps

2011 CDC study

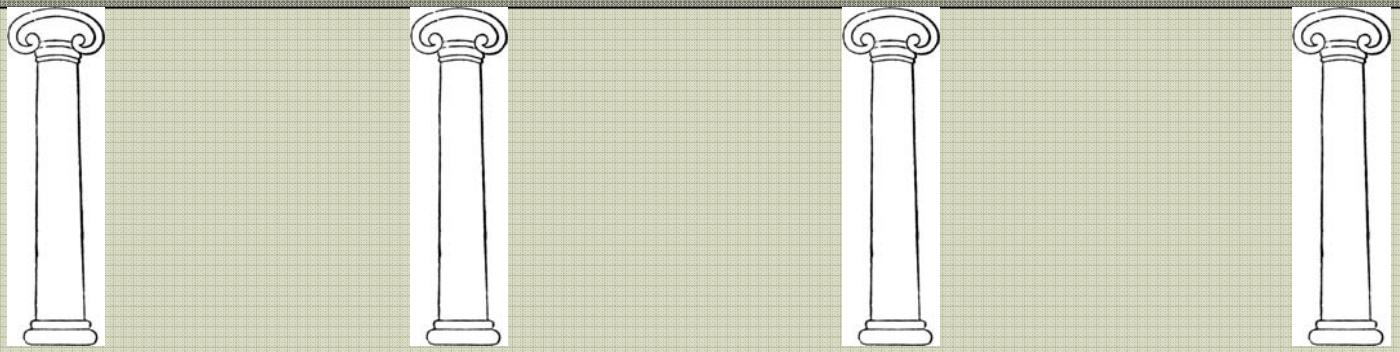
Brown MJ, Raymond J, Homa D, Kennedy C, Sinks T. Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998-2006. *Environ Res*. 2011;111(1):67–74.

Washington, DC



The LCR's Four Pillars

Lead and Copper Rule



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

No large system has optimized CCT

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

Compliance mechanism does not correspond to lead levels at consumer taps

Tap monitoring | CCT | Remediation | Compliance

Since 1991, only 172 water utilities have failed to maintain optimized WQP ranges and have been deemed in violation of the LCR.

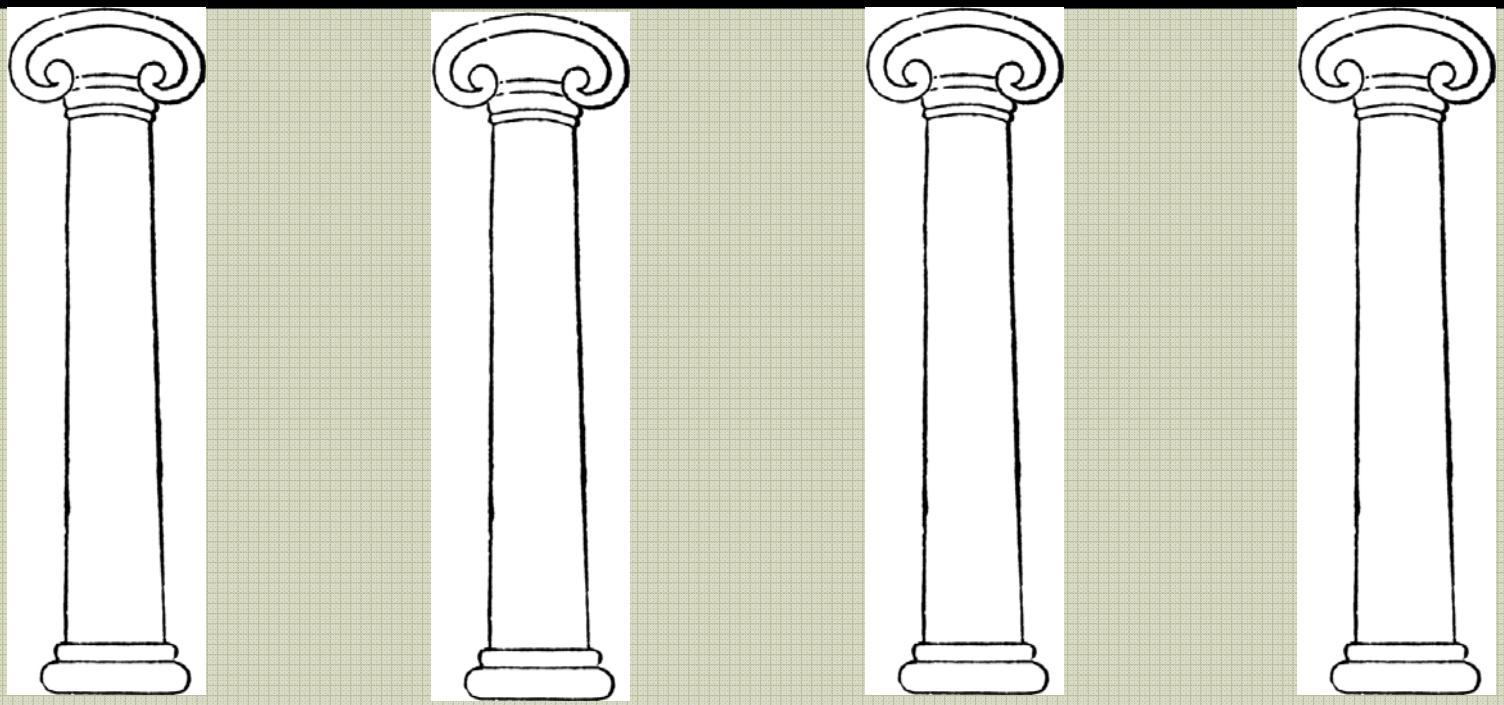
Violation

But > 6,000 systems have exceeded the LAL and have placed large numbers of consumers at significant public health risk. These systems have not been deemed in violation of the Rule.

No violation

The LCR's Four Pillars

Lead and Copper Rule



- Capturing worst-case lead in LSL homes
- Banning sampling protocols known to miss lead

Achieving CCT optimization based on reliable tap sampling, and consideration of *all* the factors in any given system that contribute to lead release

- Redesigning PE on the basis of CCRC principles to foster precautionary water use at all times
- Banning partial LSL replacement

Developing a new compliance mechanism that corresponds to lead levels at consumer taps

The WG's Vision

Proactive full LSL replacement

What if we sampled LSL water?

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
	Sampling Directly from LSLs – Sequential Sampling Method	70.5% of systems with LSLs	96.4
3	Targeted Cu Monitoring	8% of systems with high alkalinity and low pH	10.9

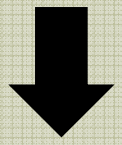
54.5-70.5% of systems would exceed the LAL

Arcadis/AWWA WQTC 2014 survey of LSLs

In Practice

Proactive full LSL replacement:

- Ambitious and taxing
- Some systems will not be able to replace the lines
- Proposed compliance mechanism:
  - Allows for long and even indefinite delays
  - Does not require corrosion control optimization in the meantime
  - Will allow systems to claim that they meet all federal requirements, which can mislead consumers into thinking that their water is safe



Risk of leaving millions inadequately protected for years and decades to come

Perhaps a 2-Track Scheme?

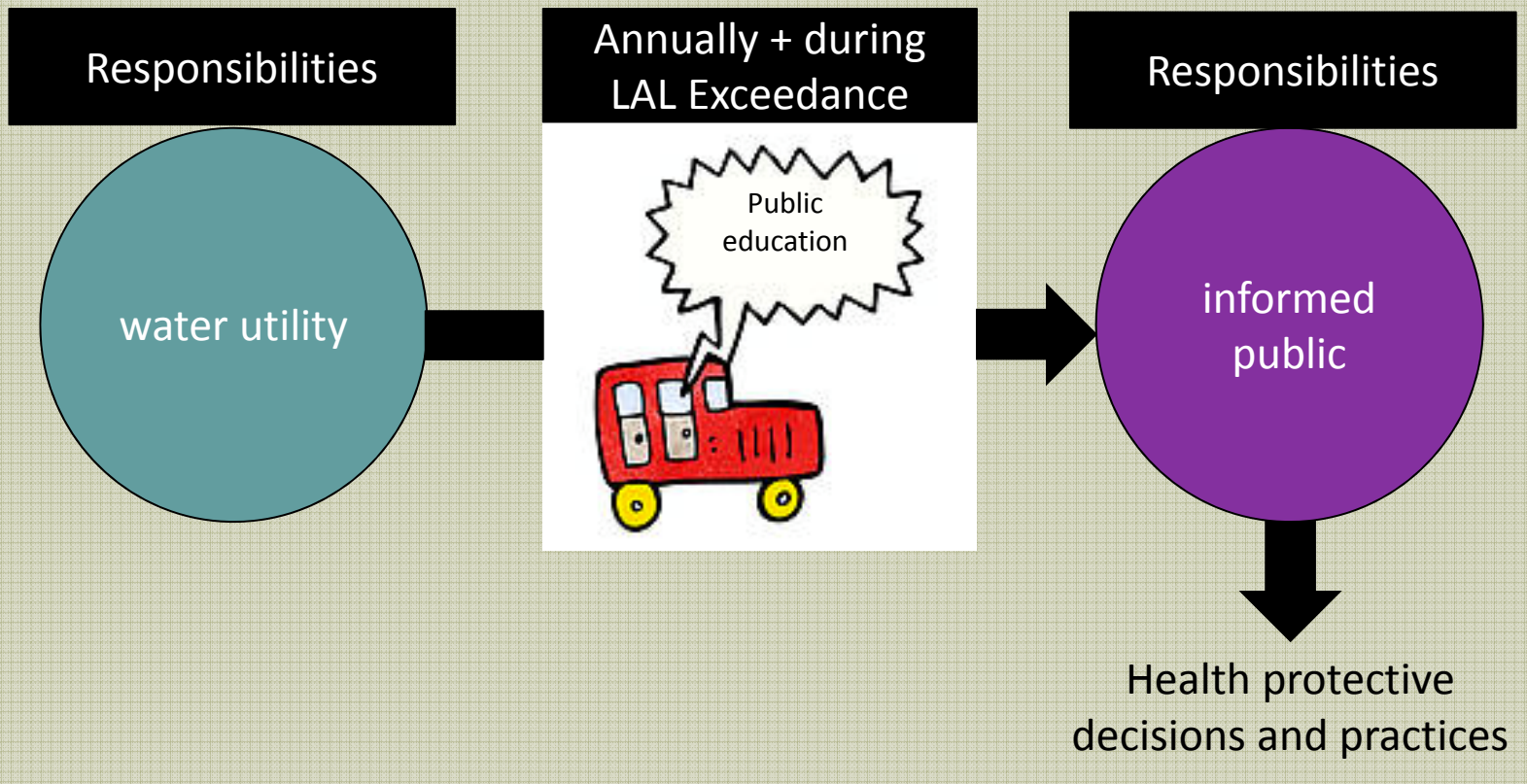
Proactive full LSL replacement

Existing LCR, revised to fill known holes and close known loopholes

Key Questions

- How can a proactive full LSL replacement requirement not leave consumers inadequately protected for decades to come?
- How can it not undermine the LCR's foundation?
- How can it be best enforced?

“Shared Responsibility” Rule



Shared responsibility must be re-imagined

- Transparency
- Public participation & oversight
- Honest & robust public education

1962

"This is an era of specialists, each of whom sees his own problem and is unaware of or intolerant of the larger frame into which it fits. It is also an era dominated by industry, in which the right to make a dollar at whatever cost is seldom challenged. ***When the public protests, confronted with some obvious evidence of damaging results of [lead in water], it is fed little tranquilizing pills of half truth. We urgently need an end to these false assurances, to the sugar coating of unpalatable facts. It is the public that is being asked to assume the risks that [their water providers] calculate. The public must decide whether it wishes to continue on the present road, and it can do so only when in full possession of the facts.*** In the words of [French biologist and philosopher] Jean Rostand, '***The obligation to endure gives us the right to know***.'"

Inspired from Carson, R. 2002. *Silent Spring*, p. 14. Houghton Mifflin Harcourt. Kindle Edition.

Acknowledgments

- The homeowners in Washington, DC and Providence, RI who agreed to participate in our study
- The Public Health Law Research (PHLR) program of the Robert Wood Johnson Foundation (RWJF)
- DC Water and Sewer Authority (DC Water)
- Marc Edwards and Ralph Scott