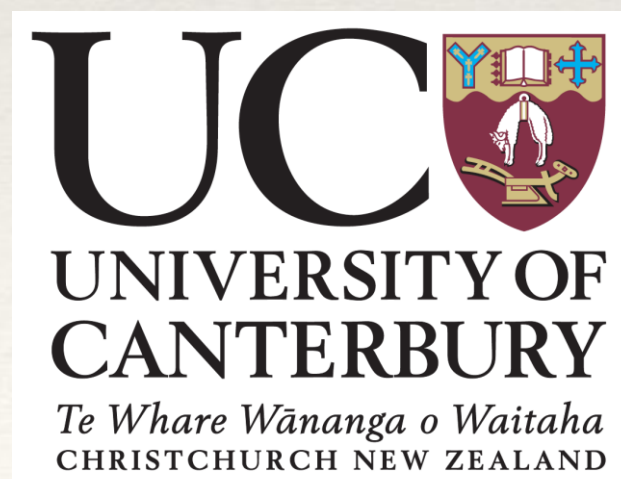




What happened in Flint, MI?

...and what can we learn
from this story?



Dr. Laurie McNeill
University of Canterbury Visiting Erskine Fellow
Professor of Civil and Environmental Engineering
Utah State University, USA



Disclaimers:

- ❖ The opinions in this presentation are my own and not those of the University of Canterbury or Utah State University
- ❖ I am not directly involved in any research projects in Flint
- ❖ Marc Edwards (Virginia Tech) was my MS and PhD advisor

What happened in Flint?

“Flint water customers were needlessly and tragically exposed to toxic levels of lead and other hazards through the mismanagement of their drinking water supply.”

—Flint Water Advisory Task Force, March 2016

What happened in Flint?



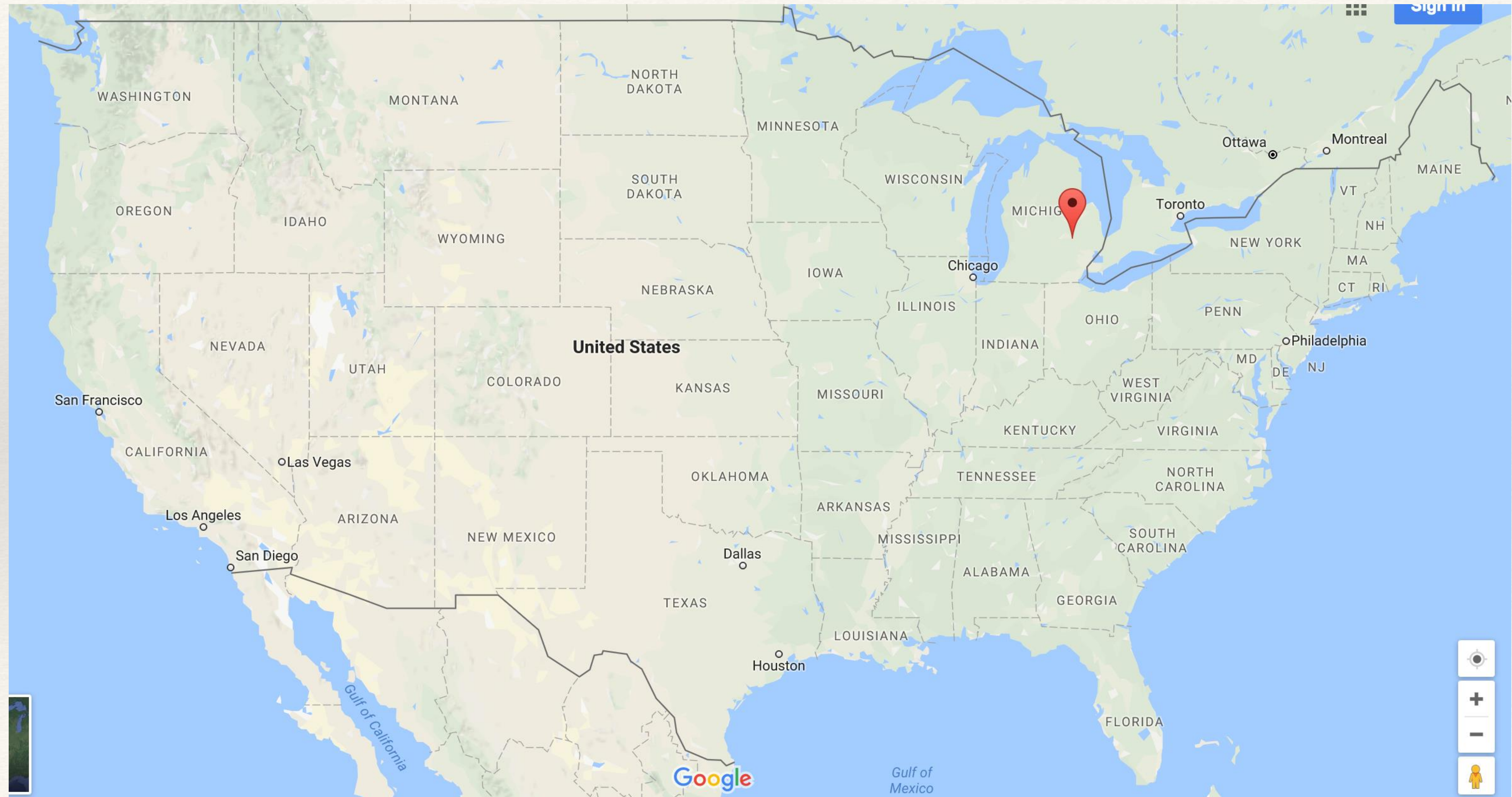
FlintWaterStudy.org

**DON'T
DRINK THE
WATER**

The water test done by
Virginia Tech indicates a
high level of lead.



A short history of Flint



A short history of Flint

- ❖ General Motors (GM) Town
- ❖ Early 1980s: 200,000 people
- ❖ Now < 100,000 people
- ❖ 57% of residents are Black or African-American
- ❖ 42% of residents live below the poverty line
- ❖ “The Most Dangerous City in America”

A short history of Flint, continued

- ❖ 2011: Flint enters receivership; Emergency Managers appointed
- ❖ March 2013: Flint votes to join Karegnondi Water Authority (KWA)
- ❖ April 2014: Flint stops buying Detroit water and starts “treating” Flint River
- ❖ Chaos ensues



The Flint situation

- ❖ Discolored water; taste and odor complaints



The Flint situation

- ❖ Discolored water; taste and odor complaints
- ❖ Skin rashes, especially in children; hair loss
- ❖ Increased water main breaks
- ❖ Low chlorine residual → *E.Coli* and *Legionella* → Boil water orders
- ❖ Increased Cl₂ = High disinfection byproducts
- ❖ GM stopped using the water because it was corroding auto parts
- ❖ **...and then came the lead results**

Our sampling of 252 homes demonstrates a high lead in water risk: Flint should be failing to meet the EPA Lead and Copper Rule

🕒 September 8, 2015 👤 Siddhartha Roy 📁 [Articles, Research Updates](#) 🔖 [epa lead and copper rule, flint water, lead, lead filter, lead in water, mdeq, public health concern](#)

Over the weekend, we analyzed all samples shipped to Virginia Tech from Flint to date. Flint residents have already returned an **astounding 84%** of the sample kits we sent out (252 out of 300 samples). We will continue to analyze water samples as they are returned. However, mathematically, even if the remaining 48 samples returned have non-detectable lead, our conclusion will not change — **FLINT HAS A VERY SERIOUS LEAD IN WATER PROBLEM.**



Flint WATER STUDY UPDATES

[Home](#)[Articles in the Press](#)[FlintWaterStudy.org Guide](#)[Frequently Asked Questions](#)[Information for Flint residents](#)[About](#)

Forty percent (40.1%) of the first draw samples are over 5 parts per billion (ppb). That is, 101 out of 252 water samples from Flint homes had first draw lead more than 5 ppb. Even more worrisome, given that we could not target “worst case” homes with lead plumbing that are required for EPA sampling, **Flint’s 90%’ile lead value is 25 ppb in our survey.** This is over the EPA allowed level of 15 ppb that is applied to high risk homes. This is a serious concern indeed. **Several samples exceeded 100 ppb, and one sample collected after 45 seconds of flushing exceeded 1000 ppb.**

Highest sample measured: 13,200 ppb

USEPA action level = 15 ppb

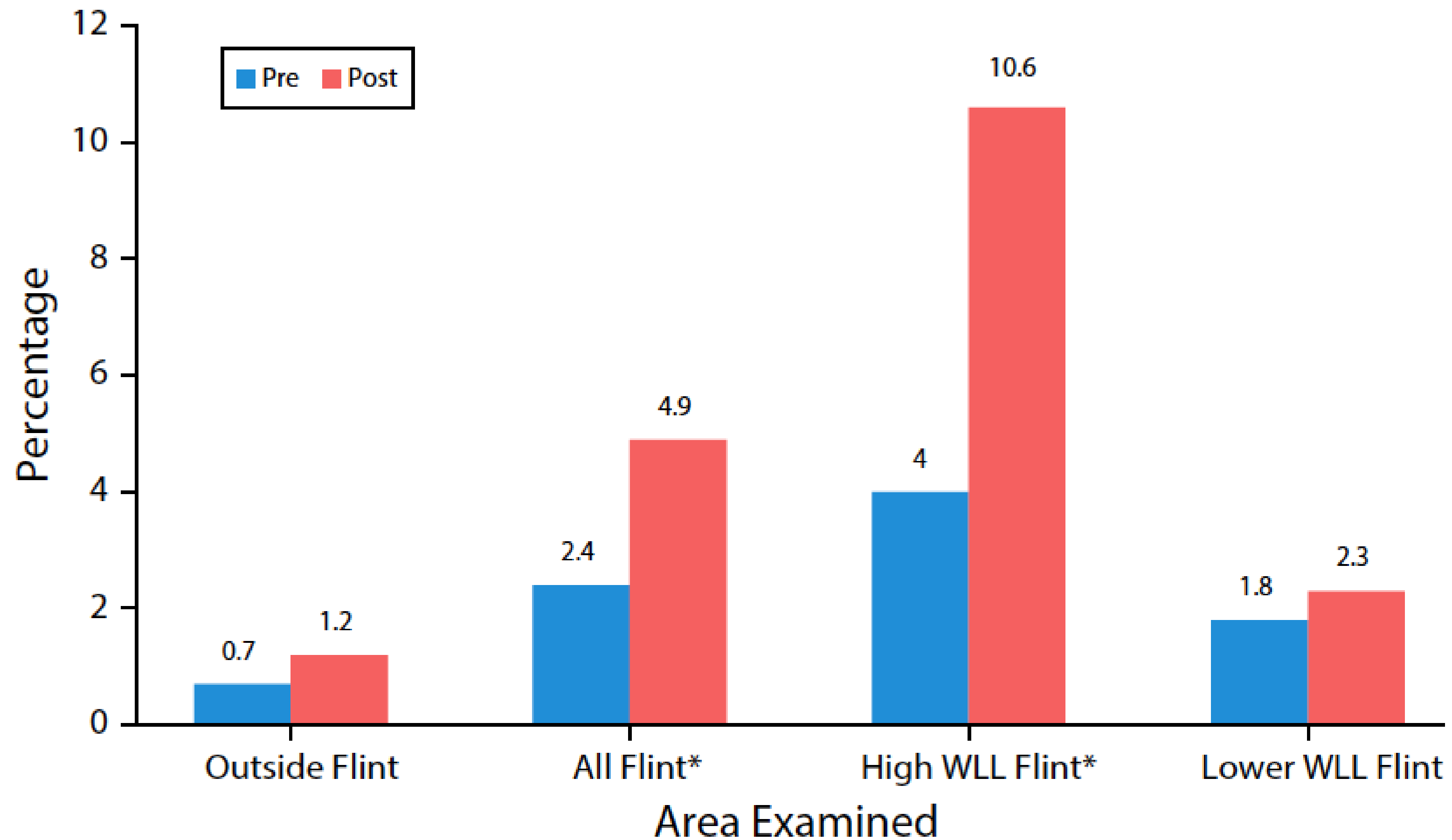
WHO, NZ max acceptable value = 10 ppb

There is no safe level of lead

— CDC, WHO

Elevated Blood Lead Levels in Children Associated With the Flint Drinking Water Crisis: A Spatial Analysis of Risk and Public Health Response

Mona Hanna-Attisha, MD, MPH, Jenny LaChance, MS, Richard Casey Sadler, PhD, and Allison Champney Schnepf, MD



There is no safe level of lead

— CDC, WHO

A short history of Flint, continued

- ❖ 2011: Flint enters receivership; Emergency Managers appointed
- ❖ March 2013: Flint votes to join Karegnondi Water Authority (KWA)
- ❖ April 2014: Flint stops buying Detroit water and starts “treating” Flint River
- ❖ Chaos ensues
- ❖ October 2015: Flint switches back to Detroit water
- ❖ December 2015: Mayor declares State of Emergency
- ❖ Jan 2016: President Obama mobilizes FEMA and the National Guard but does not declare a natural disaster

The Flint situation

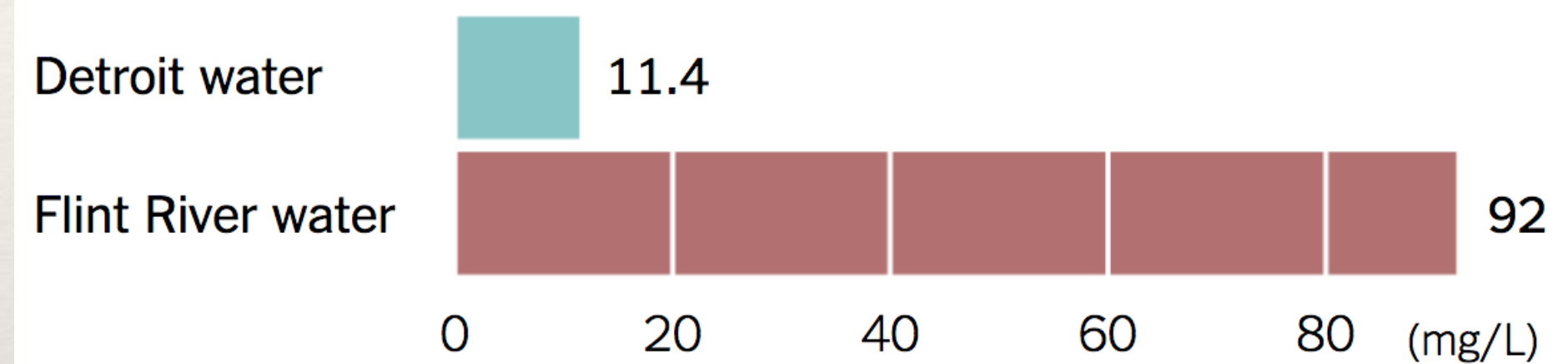
- ❖ ~8,000 children with lead poisoning
- ❖ 12 deaths from Legionnaires' Disease (*Legionella*)
- ❖ \$395 Million in “social costs”; up to **\$1.5 Billion** in total costs
- ❖ Complete loss of trust in government at all levels
- ❖ Flint residents are still advised to filter their tap water before drinking or cooking

The Flint situation

- ❖ The plant was unprepared to treat water (see Matsen et al. 2016)
- ❖ Flint River water was much more corrosive than Detroit water
- ❖ They did not add any corrosion inhibitor

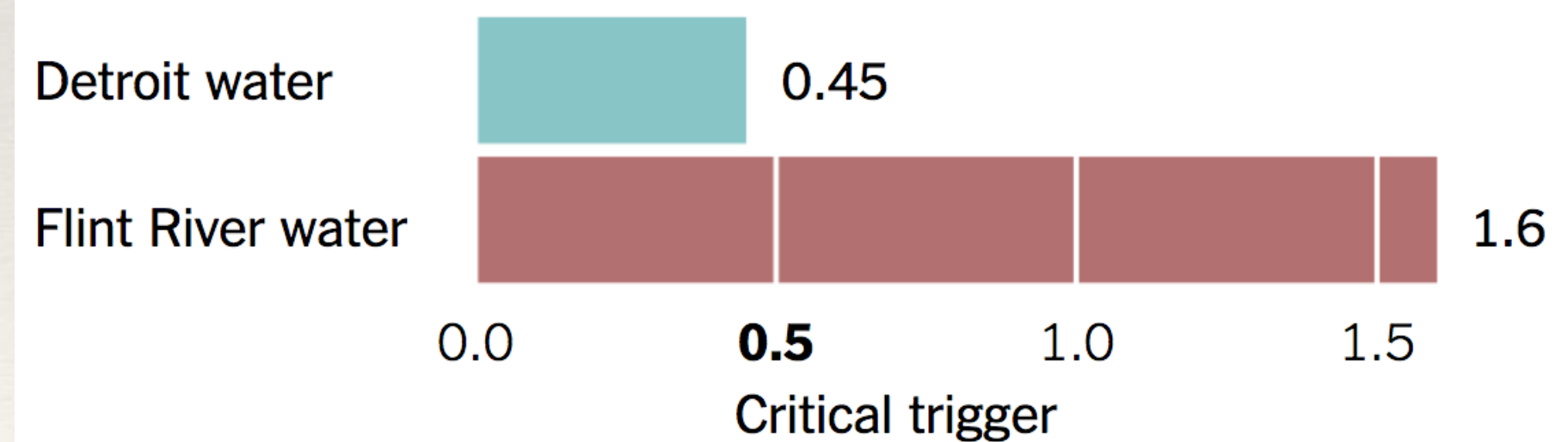
Chloride

Chloride is generally considered to be very corrosive to iron.



Chloride to sulfate mass ratio (CSMR)

Measures corrosivity to lead.



Source: City of Flint Monthly Operation Report, June 2015 and DWSD 2014 Water Quality Report.

The Flint situation

Flint official: State overruled plan for corrosion control

Posted: 2:29 AM, March 29, 2016

Updated: 6:39 AM, March 30, 2016

[Mike Glasgow](#), the plant's laboratory supervisor at the time, says he asked district engineer Mike Prysby of the Michigan Department of Environmental Quality how often staffers would need to check the water for proper levels of phosphate, a chemical they intended to add to prevent lead corrosion from the pipes. Prysby's response, according to Glasgow: "You don't need to monitor phosphate because you're not required to add it."

Recalling the meeting Tuesday in an interview with The Associated Press, Glasgow said he was taken aback by the state regulator's instruction; treating drinking water with anti-corrosive additives was routine practice. Glasgow said his gaze shifted to a consulting firm engineer in attendance, who also looked surprised.

"Then," Glasgow said, "we went on to the next question."

In hindsight, he said, it was a fateful moment. For nearly 18 months, Flint residents would drink water that had coursed through aging pipes and fixtures, scraping away lead from lines that ran from water mains to some homes and schools.

the two-way

3 Face Criminal Charges Over Flint Water Crisis

April 20, 2016 • Two Michigan Department of Environmental Quality employees and a Flint water official are being charged with misconduct, neglect of duty and tampering with evidence over the city's contaminated water.



Paul Sancya/AP

the two-way

They 'Failed': 6 More Michigan Employees Charged In Flint Water Crisis

July 29, 2016 • In announcing the charges, Michigan's attorney general said those accused attempted to "bury or cover up, downplay or hide information" about elevated lead levels in Flint's water supply.



Bill Pugliano/Getty Images

2 Former Flint Emergency Managers, 2 Others Face Felony Charges Over Water Crisis

December 20, 2016 · 3:21 PM ET

Amid Flint water crisis, the lawsuits are piling up

Flint Residents Sue The EPA Over Lead Poisoning

JAZZ SHAW Posted at 8:01 am on April 26, 2016

'They Made It Worse': Michigan Sues 2 Companies Over Flint Crisis

June 22, 2016 · 1:11 PM ET

www.npr.org

Federal lawsuit filed in Flint water crisis

By STEVE CARMODY · NOV 14, 2015

 Tweet  Share  Google+  Email

www.michiganradio.org

Flint's water crisis is now the subject of a federal lawsuit.

The family of Flint water activist Melissa Mays (right) is among four families listed as plaintiffs in the lawsuit

The lawsuit filed on behalf of four families was filed Friday.

Fired Flint official files whistle-blower lawsuit against Weaver, city

Tresa Baldas, Detroit Free Press Published 3:57 p.m. ET May 9, 2016 | Updated 9:47 a.m. ET May 10, 2016

 Share your story with the legal team



Flint Water Class Action

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News

Is the Water in Flint, Michigan, Making Your Family Sick?

What can we learn from Flint?

Academic research doesn't have to be purely academic

As Flint Fought to Be Heard, Virginia Tech Team Sounded Alarm

By MITCH SMITH FEB. 6, 2016



Marc Edwards, seated, a Virginia Tech professor, led a research team of students and professors whose members included, from left, Siddhartha Roy, Pan Ji, Otto Schwake and Jeffrey Parks.

Travis Dove for The New York Times

Academics can partner with citizen scientists

Flint Citizen Science Team



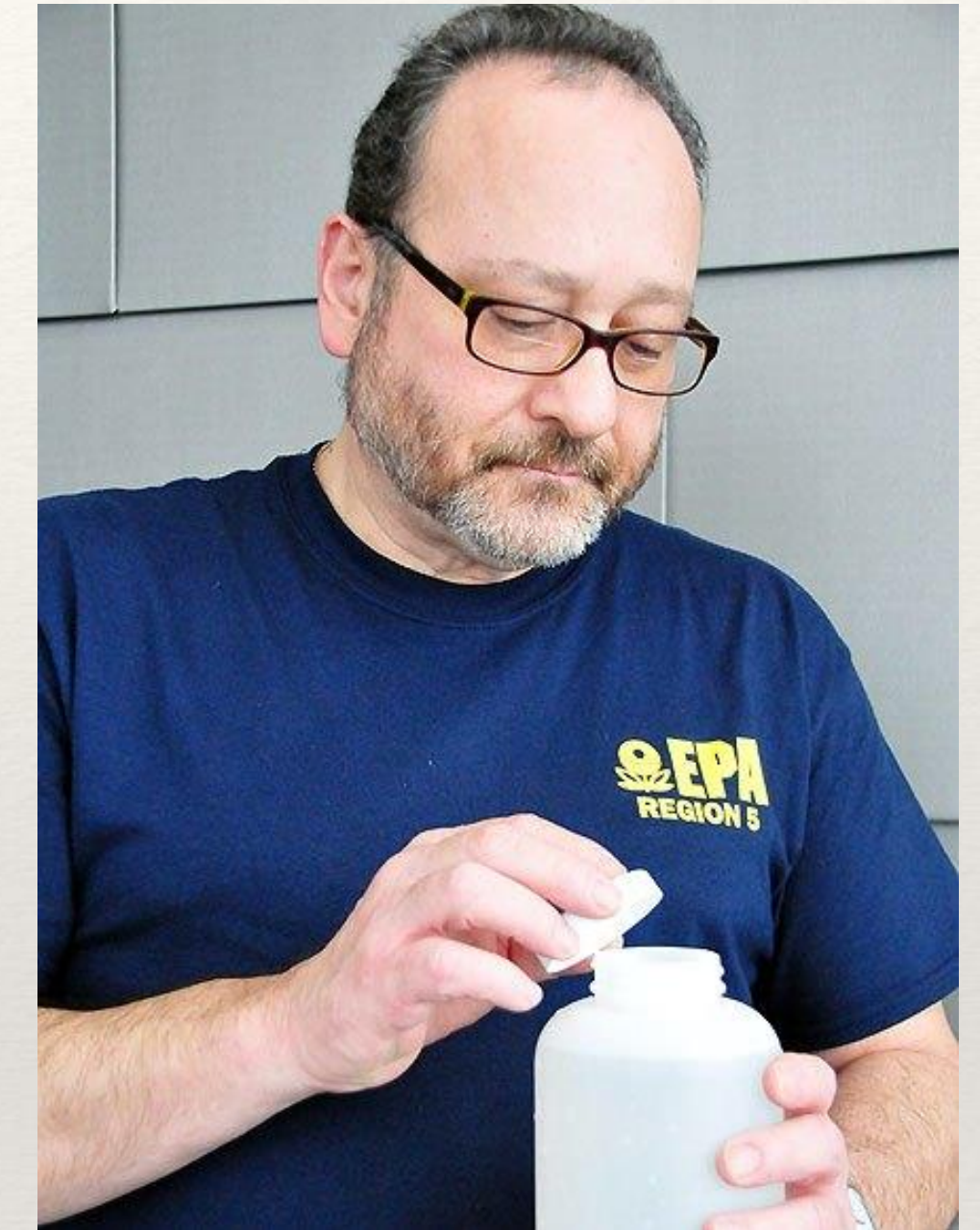
Credit the people who stepped up



Marc Edwards and Mona Hanna-Attisha
Photo: Jake May - The Flint Journal



Virginia Tech Flint Research Team
Photo: FlintWaterStudy.org



Miguel del Toral
Photo: USEPA

Credit the people who stepped up



LeeAnne Walters

Photo: Ryan Garza, Detroit Free Press



Melissa Mays

Photo: Gina Levay



Flint citizens

Photo: Brian Mitchell, Detroit News

Government must be accountable and transparent

CBS/AP / January 29, 2016, 10:48 AM

State workers in Flint got bottled water as crisis brewed

15 Comments /  Share /  Tweet /  Stumble /  Email

FLINT, Mich. -- Michigan offered fresh bottled water for state employees in Flint starting in January 2015, although residents were told that tap water was safe to drink until last fall, a state official said.

Government must be accountable and transparent

Michigan officials knew of Flint water's possible Legionnaires' link months ago

Published February 04, 2016 · Associated Press



High-ranking officials in Michigan Gov. Rick Snyder's administration were aware of a surge in Legionnaires' disease potentially linked to Flint's water long before the governor reported the increase to the public last month, internal emails show.

Environmental injustice is real

“Flint residents, who are majority Black or African American and among the most impoverished of any metropolitan area in the United States, did not enjoy the same degree of protection from environmental and health hazards as that provided to other communities.”

— Flint Water Advisory Task Force

It's not just Flint

Investigations Reveal Breadth Of U.S. Lead Contamination



By Sara Jerome

@sarmje

Two new investigations highlight the breadth of lead contamination in U.S., indicating that Flint's problems were hardly isolated incidents.

In a sweeping investigation into lead contamination in the U.S., titled "Beyond Flint," USA Today **identified** "almost 2,000 additional water systems spanning all 50 states where testing has shown excessive levels of lead contamination over the past four years."



We need to show people the value of clean water

New National Poll Finds 95% Of Americans Want Public Officials To Invest In Water Systems, 60% Are Willing To Pay More For Secure Water Service

[Contact The Supplier](#)

Americans believe that modernizing water systems should be a priority to ensure safe and reliable water and wastewater services

The Value of Water Coalition recently released the results of a new national poll on public attitudes and concerns about water. The Water

We have to get serious about teaching ethics



◦ CANON 1.

Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.

We have to get serious about teaching ethics



Code of Ethical Conduct

In force from 1 July 2016

Obligations in the public interest

1. Take reasonable steps to safeguard health and safety

You must, in the course of your engineering activities, take reasonable steps to safeguard the health and safety of people.

References

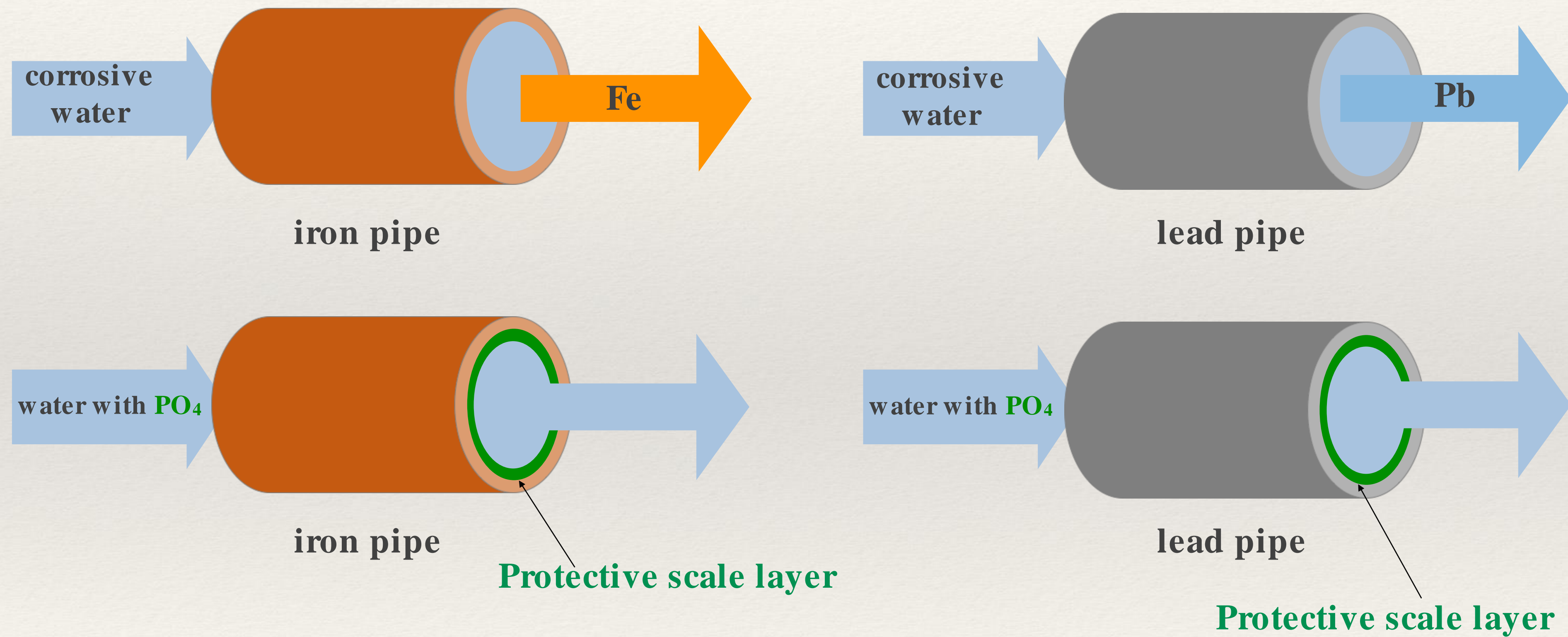
- ❖ Flint Water Advisory Task Force (2016). Final Report.
- ❖ Matsen et al. (2016) “Flint Water Crisis: What Happened and Why?” *Journal AWWA* 108(12).
- ❖ Virginia Tech FlintWaterStudy.org
- ❖ [https:// www.Michigan.gov/ FlintWater](https://www.Michigan.gov/FlintWater)
- ❖ <http:// www.npr.org/ sections/ thetwo-way/ 2016/ 04/ 20/ 465545378/ lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis>
- ❖ <https:// www.nytimes.com/ interactive/ 2016/ 01/ 15/ us/ flint-lead-water-michigan.html>

Do you have any questions?



FlintWaterStudy.org

The Flint water treatment plant



The Flint water treatment plant

