

## Lead discovered at higher levels below the soil surface

Measuring lead soil contamination at the surface may miss higher concentrations just below the ground, according to a new study from the Brown University Superfund Research Program (SRP). Researchers analyzed hundreds of soil samples from residential properties around six water tower sites in southern Rhode Island and found that even when lead levels on the surface are low, concentrations can be greater at depths down to a foot.

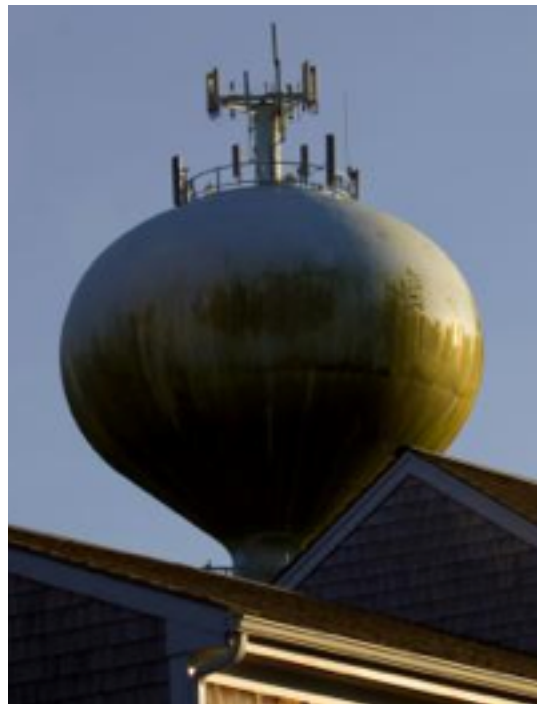
Prior to 1978, the exteriors of Rhode Island's municipal water towers were painted with lead-containing paint. Over time, this paint could flake-off and deposit on adjacent residential properties. Residents near the water towers, concerned about the health effects from possible lead contamination, challenged inconsistencies in lead levels reported by the Rhode Island Department of Health (RIDOH) and the Rhode Island Department of Environmental Management (RIDEM). The study by the Brown SRP was done at the request of the RIDOH to evaluate methods of assessing the extent of lead soil contamination from old water towers.

RIDEM and RIDOH regulations differ in the soil depth that is required to determine whether remediation is necessary. RIDOH defines "lead-free" (less than 150 mg/kg lead) and "lead-safe" (150 mg/kg to 400 mg/kg lead) based on lead concentrations taken from a depth of 2 cm. RIDEM also defines a lead-soil concentration as a "soil-lead hazard" over 400 mg/kg, but samples are taken at incremental six-inch soil depths up to 24 inches.

### Comparing data to previous sampling results

Brown SRP investigators analyzed 498 soil samples from 31 residential properties surrounding the water towers, including 348 with soil at depths of six and 12 inches. They compared their results to current regulations. No residential properties were misclassified when assessing need for remediation because multiple samples were previously taken on each property by RIDOH and RIDEM. However, analysis indicated that the potential for misclassifying properties was approximately 13 percent if only RIDOH surface soil sampling is conducted. The investigators demonstrate that the RIDEM regulations regarding soil lead measurements are more protective of human health than RIDOH's.

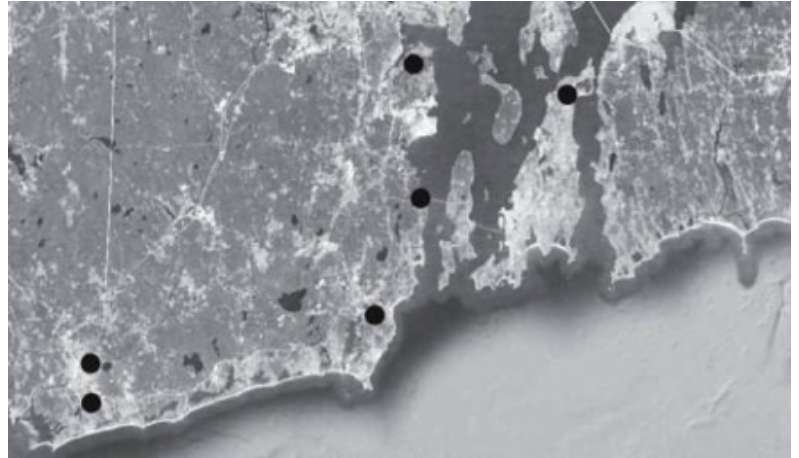
Researchers also examined the distributions of lead concentrations in the soil from the center of the municipal water towers. Overall, lead-soil concentrations were inversely related to distance. However, they also found that a significant amount of lead sometimes accumulated as far as 400 feet from the water towers. Study authors observed direction-specific patterns, suggesting that the wind carried paint flakes over long distances.



Flaking lead paint from old water towers may pose a risk to surrounding properties. (Photo courtesy of David Ornstein)

“The findings are important because the health stakes of exposure to lead are so high,” said Marcella Thompson, Ph.D., co-leader of the Brown SRP Community Engagement Core and lead author of the study. “Lead exposure has known neurobehavioral and neurodevelopmental consequences for people and animals. The greater the exposure, the greater the potential for harm, particularly to children.”

The investigators’ analysis highlights the importance of research translation and evaluation in the development of environmental health regulatory policy.



Researchers studied the land around six of the many old water towers around Rhode Island. They determined that unsafe levels of lead could occur six or 12 inches below ground even when the surface was acceptable. (Photo courtesy of Marcella Thompson)

### For more information, contact

**Marcella Thompson, Ph.D.**

Brown University  
Box G-E5,  
Providence, RI 02912-G  
Phone: (401)863-3119  
Email: [Marcella\\_Thompson@brown.edu](mailto:Marcella_Thompson@brown.edu)

**Kim Boekelheide, Ph.D.**

Brown University  
Box G-E5  
Providence, RI 02912-G  
Phone: (401) 863-1783  
Email: [Kim\\_Boekelheide@Brown.edu](mailto:Kim_Boekelheide@Brown.edu)

### To learn more about this research, please refer to the following source:

Thompson MR, Burdon A, Boekelheide K. 2013. Practice-based evidence informs environmental health policy and regulation: A case study of residential lead-soil contamination in Rhode Island. *Science of the Total Environment* 468-469C: 514-522. doi: [10.1016/j.scitotenv.2013.07.094](https://doi.org/10.1016/j.scitotenv.2013.07.094)

