



Opportunities for Improving Human Health by Capitalizing on Past Experience in Water Management in the U.S.



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Water Forum
Cutting-Edge Technologies for Water Services:
Applications in Africa
Washington, DC
June 27, 2008



U.S. EPA Mission

To protect human health and the environment





Outline

Water Management in the U.S.

Priority water issues

Steps Toward Sustainable Water Management

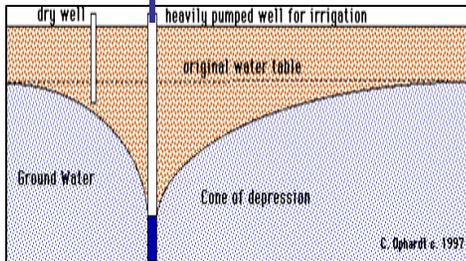
Sustainable Water Technologies

EPA projects in Africa

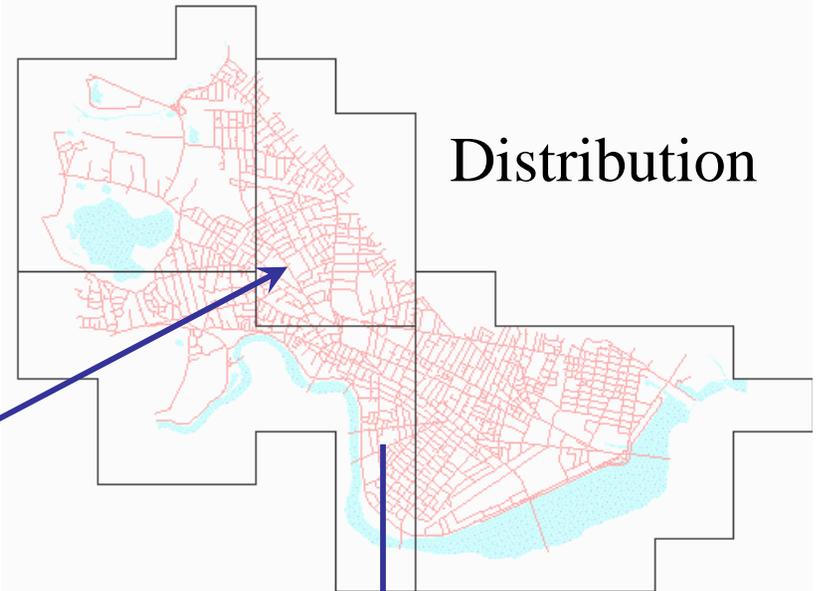
Drinking Water - Source to Tap

Daily, over 240 million Americans consume water supplied by public providers

Source Water



Treatment

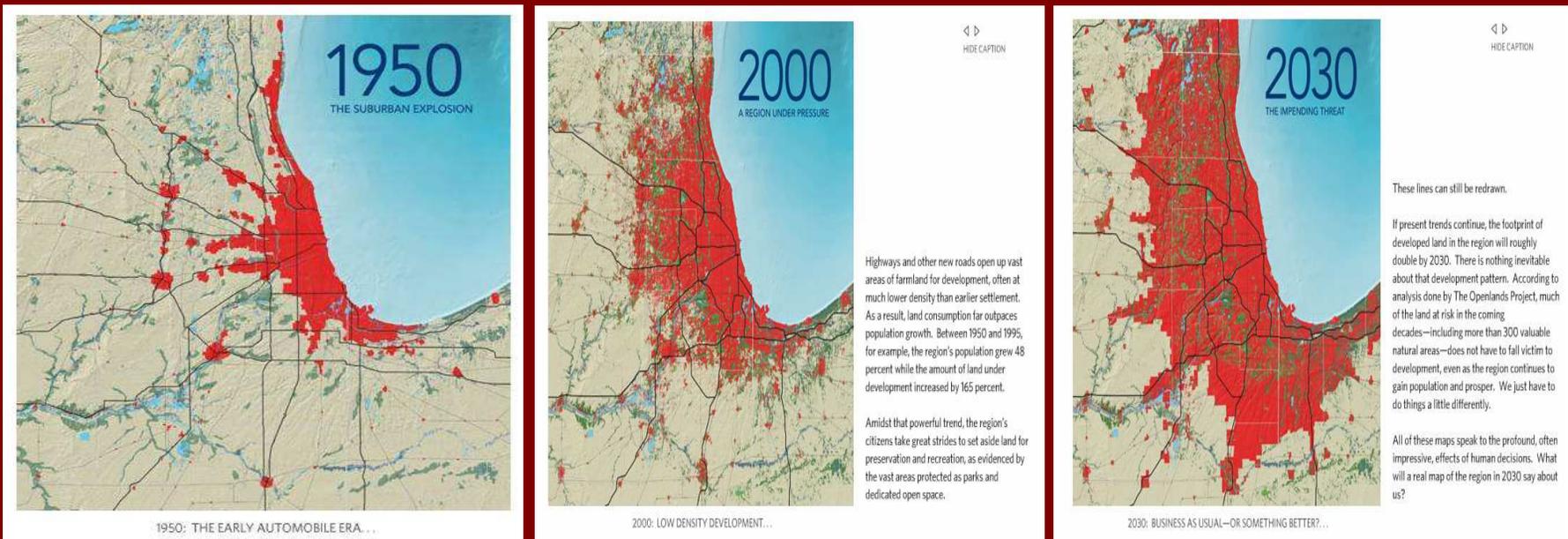


Distribution



Consumption

Urban growth in the Chicago metropolitan region



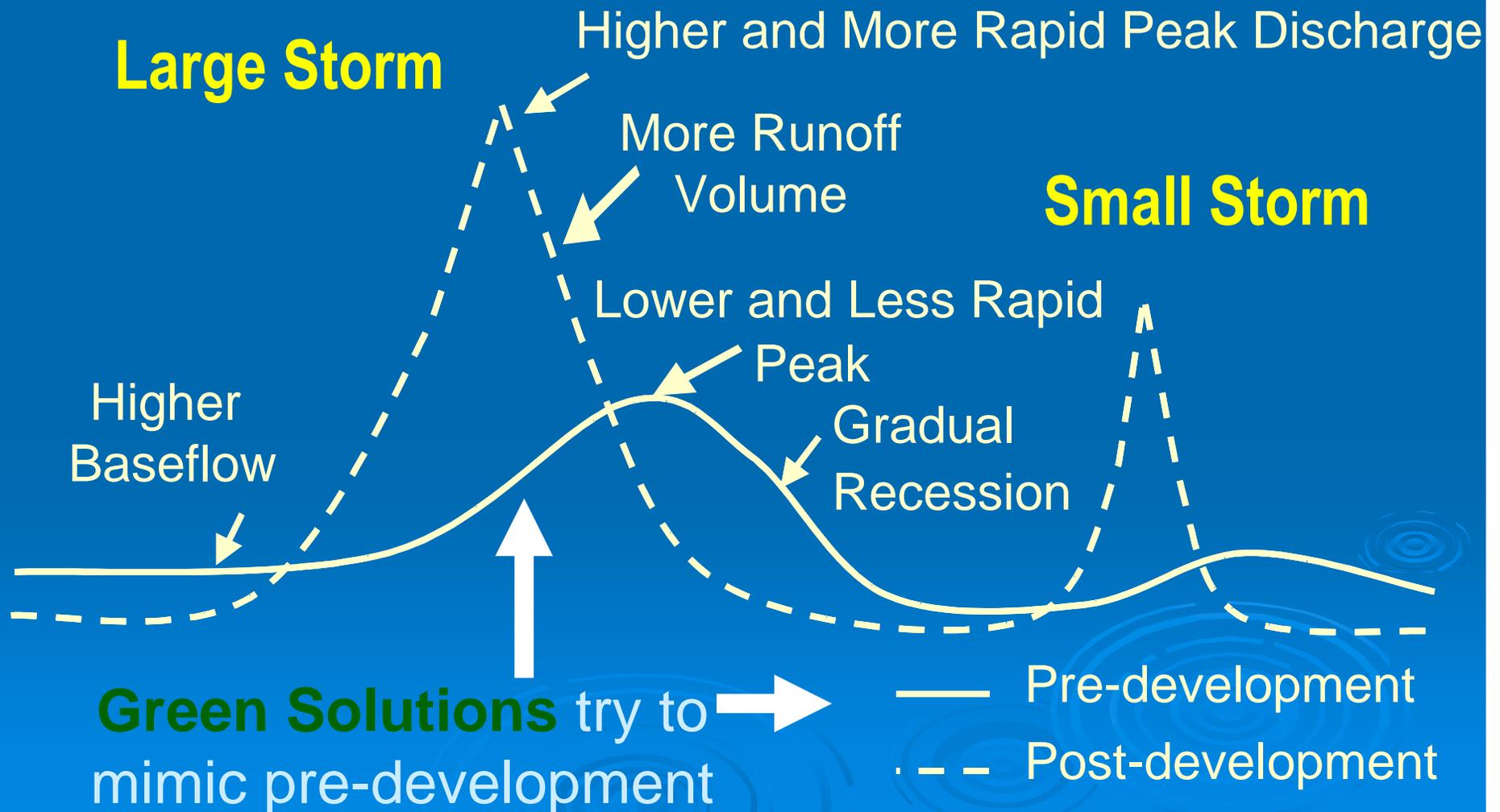
Dr. Thomas Theis
TARDIS, 2006

Water-Energy Nexus

- Water and wastewater energy use for US cities consumes about 4-5% of the national electricity production
 - with some 1.5% used in wastewater treatment alone
- > 10% of a US water utility's total operating cost is for energy

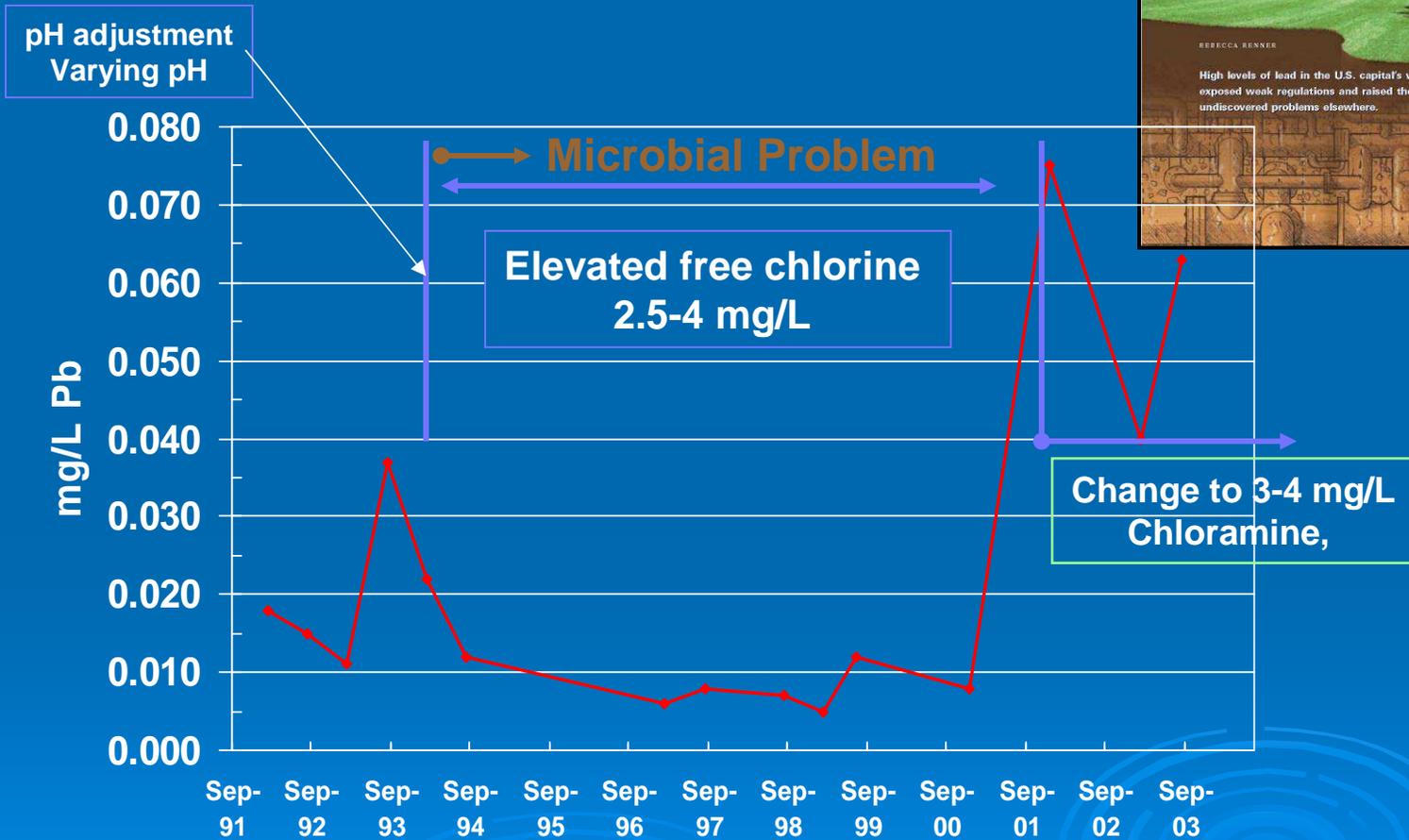
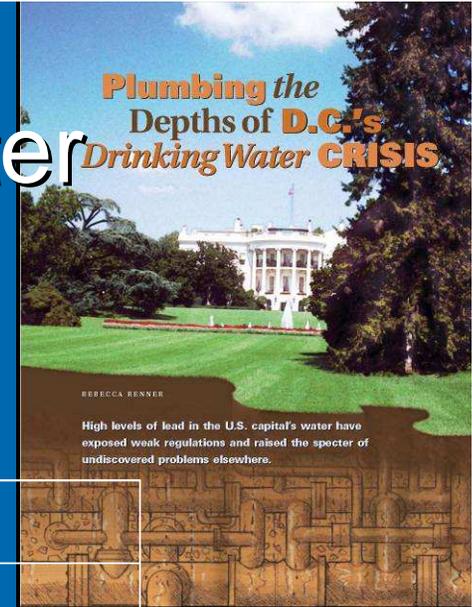
Carlson, S.W. and Walburger, A. (2007) *Energy Index Development for Benchmarking Water and Wastewater Utilities*. Denver: American Water Works Association Research Foundation.

Consequences of Urbanization

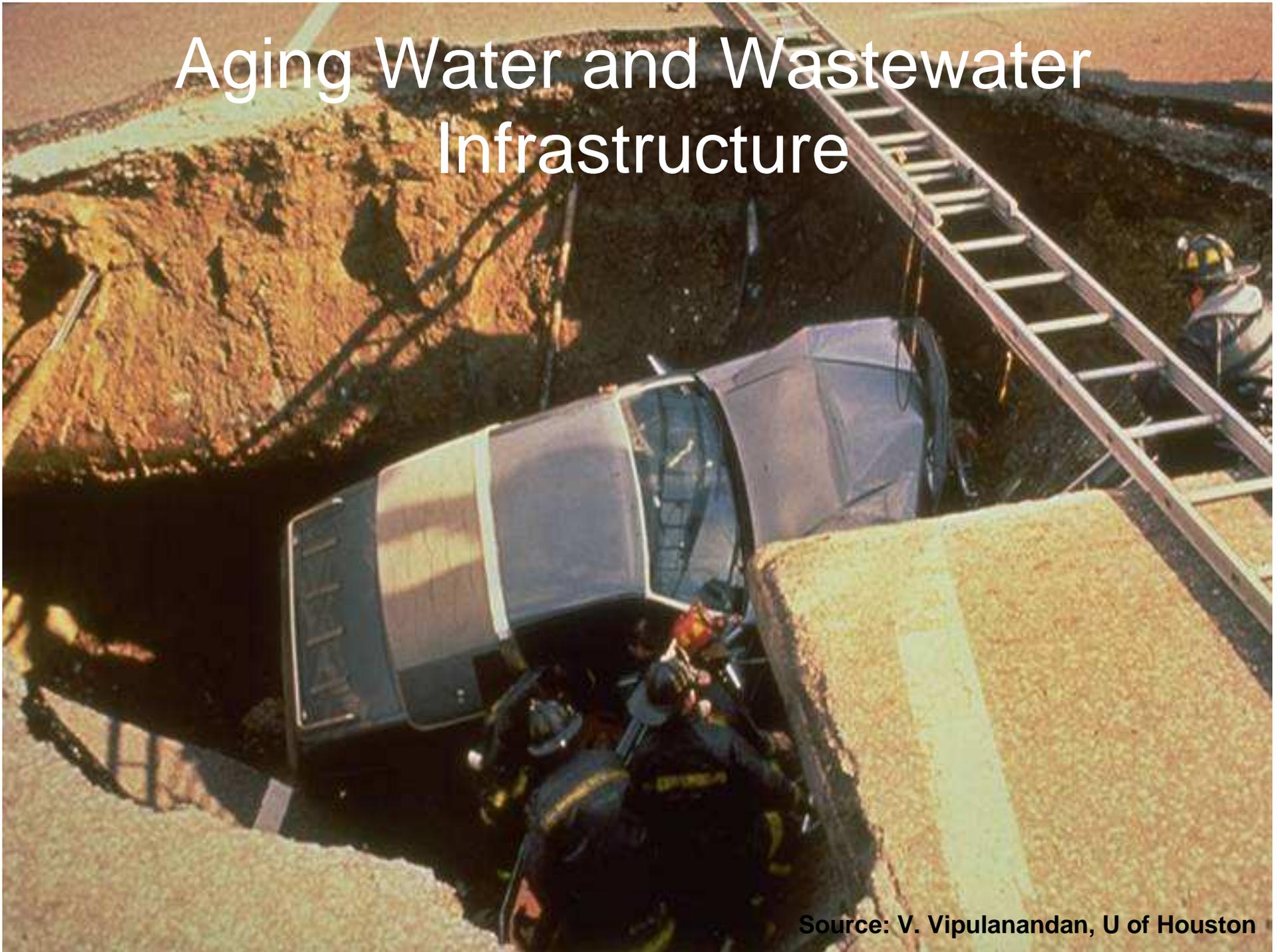


Lead in DC Drinking Water

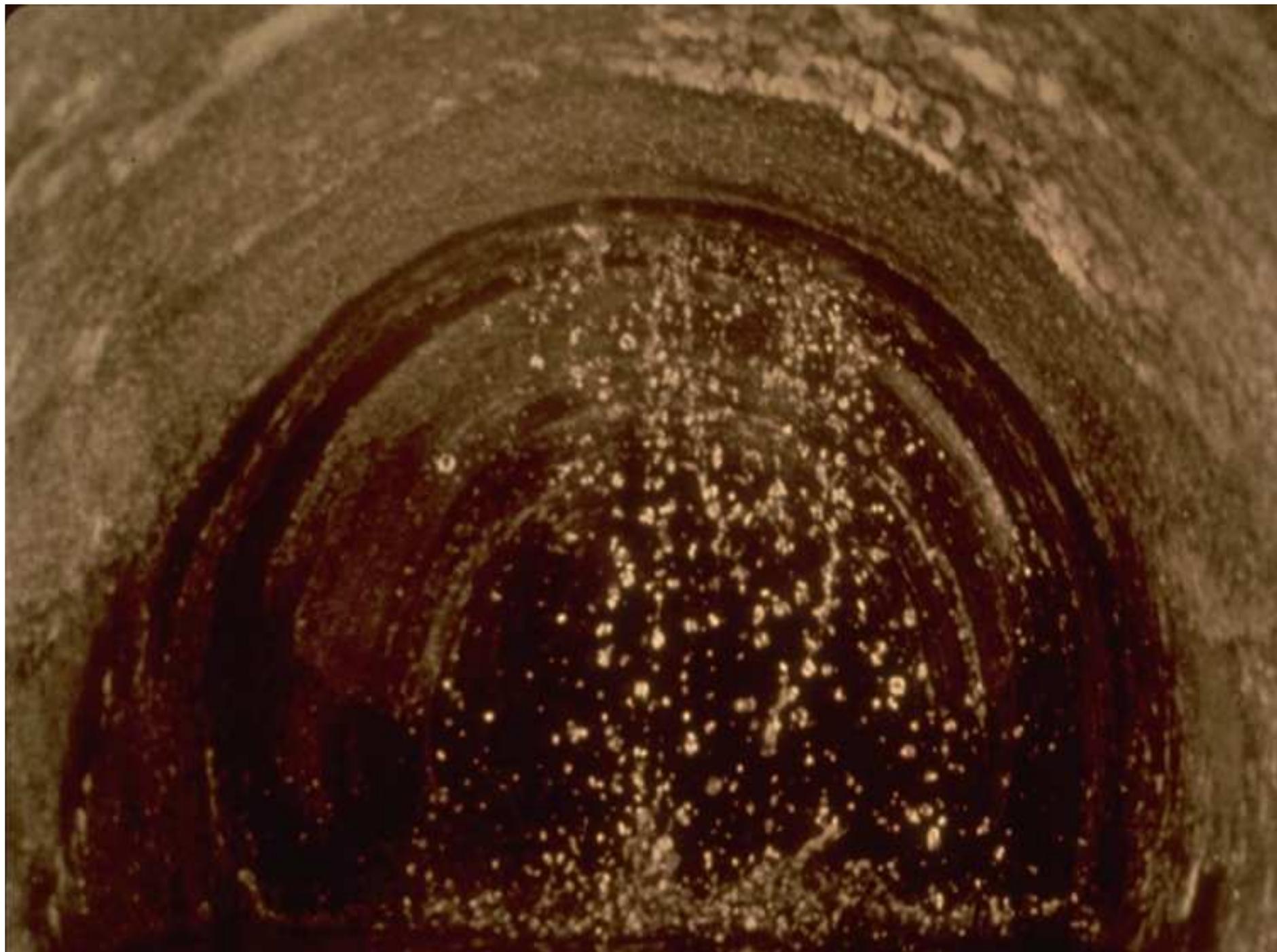
90th Percentile Pb Values



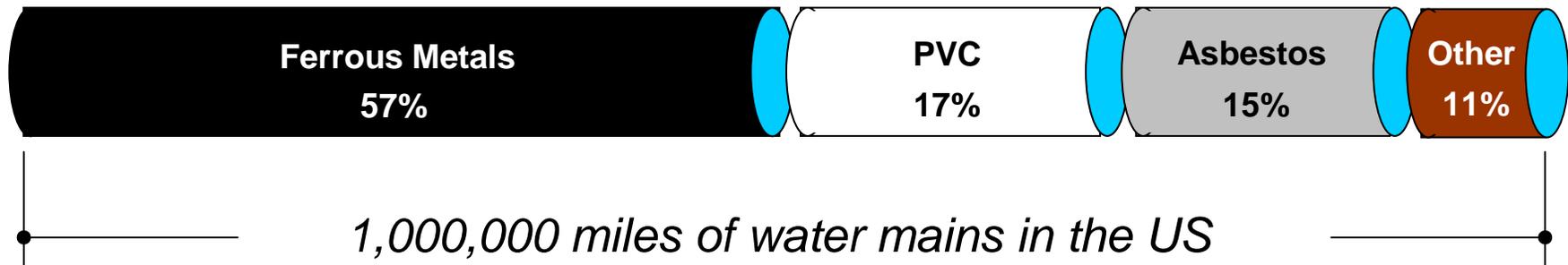
Aging Water and Wastewater Infrastructure



Source: V. Vipulanandan, U of Houston



Drinking Water Mains Materials in the US

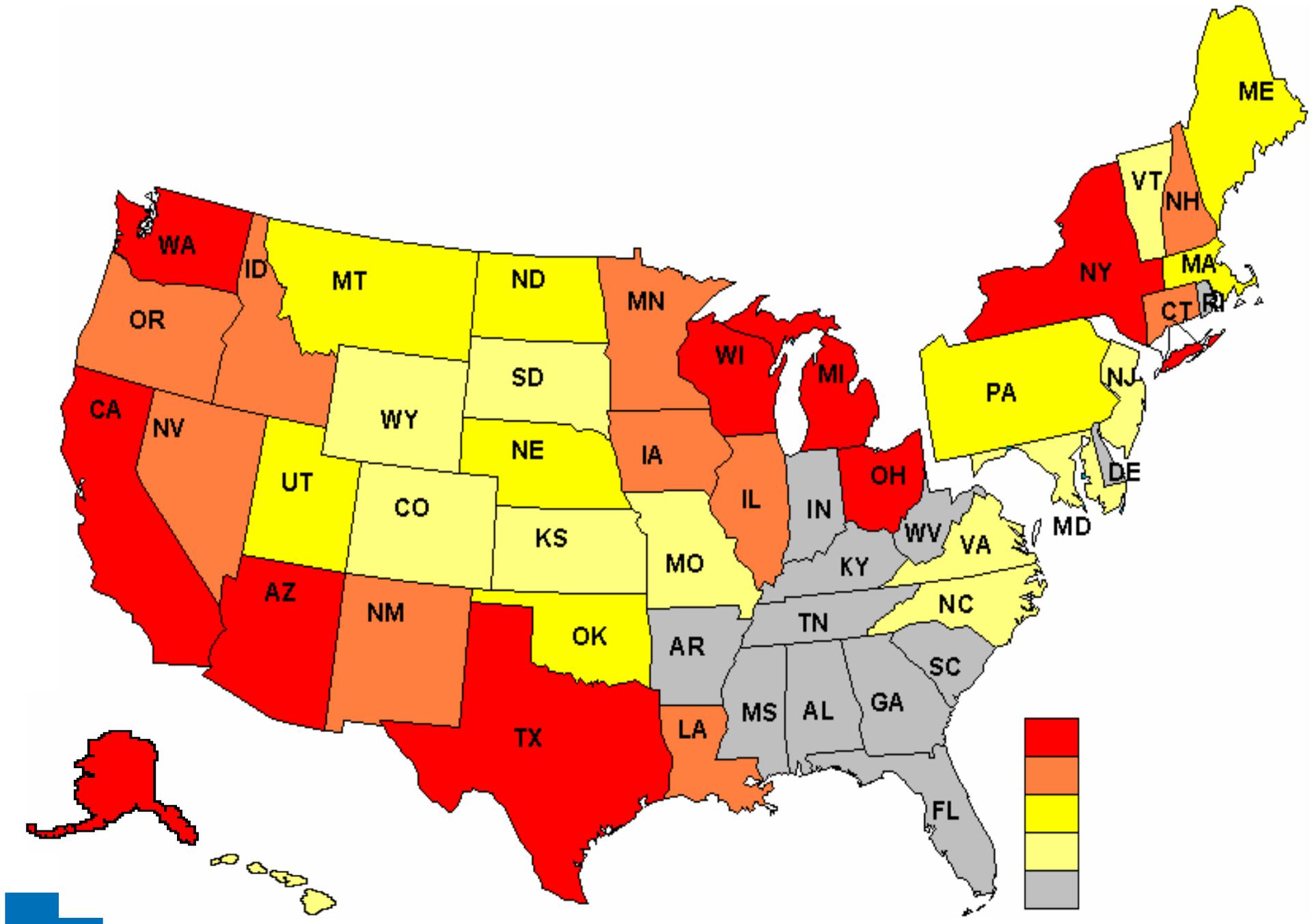


Range of pipe materials, configurations, and failure modes pose challenges



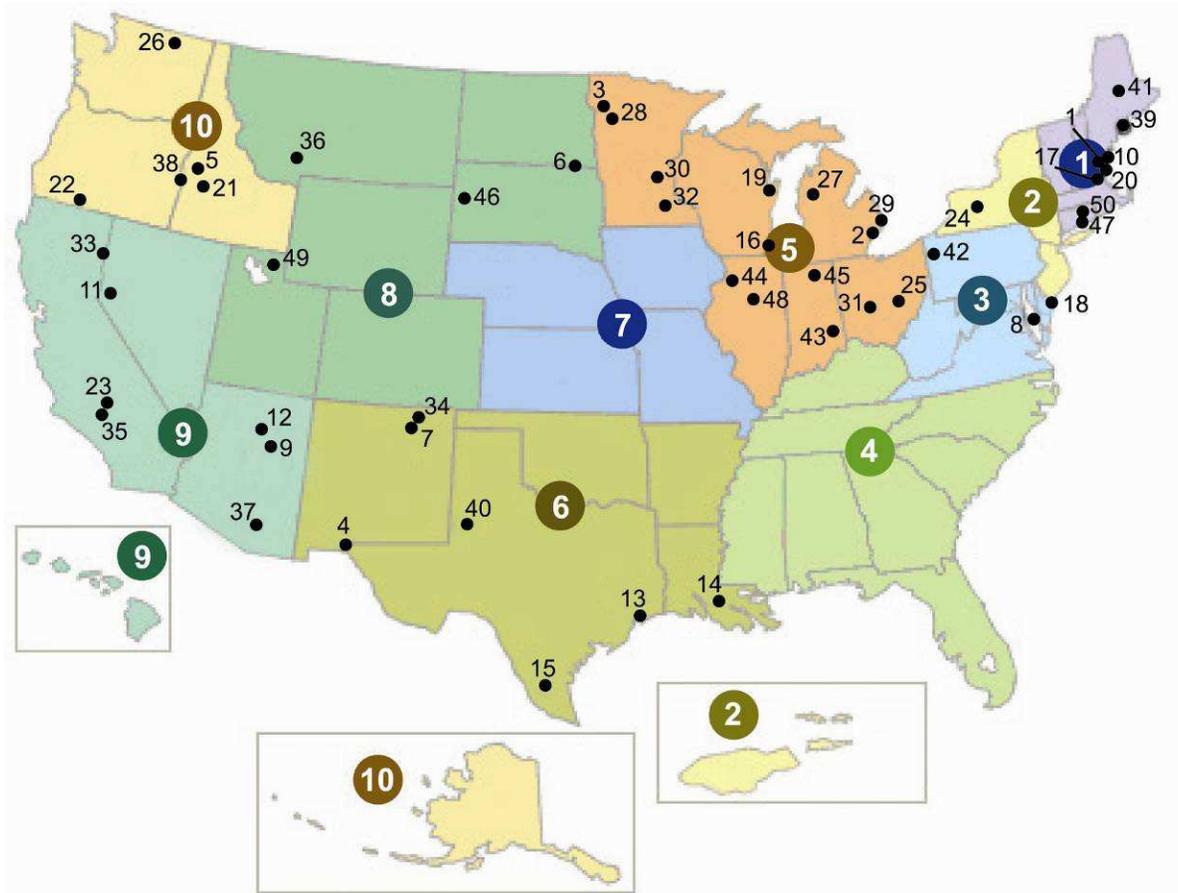
Difference between projected needs and spending trends (\$ billions/y)

For the USA 2002	Drinking Water	Wastewater	Total
Congressional budget office	0 – 8.3	3.2 – 11.1	3.2 – 19.4
Water Infrastructure Network	9.4	9.2	18.6
EPA Gap Analysis Report	2.3 – 13.3	1.6 – 13.5	3.9 – 26.7



Source: USEPA (2000a),
(2000b)

Arsenic Treatment Technology Demo Sites





Steps Toward Sustainable Water Management



Changing U.S. Mindset

U.S. EPA's Green Infrastructure

- Swales
- Green Roofs
- Rain Barrels
- Pervious Pavement
- Rain Gardens
- Watershed Planning



H.B. Fuller Company (MN) Parking Lot



- Reduced storm-water runoff 73%
- Reduced sediment 94%
- Reduced P loading 70%

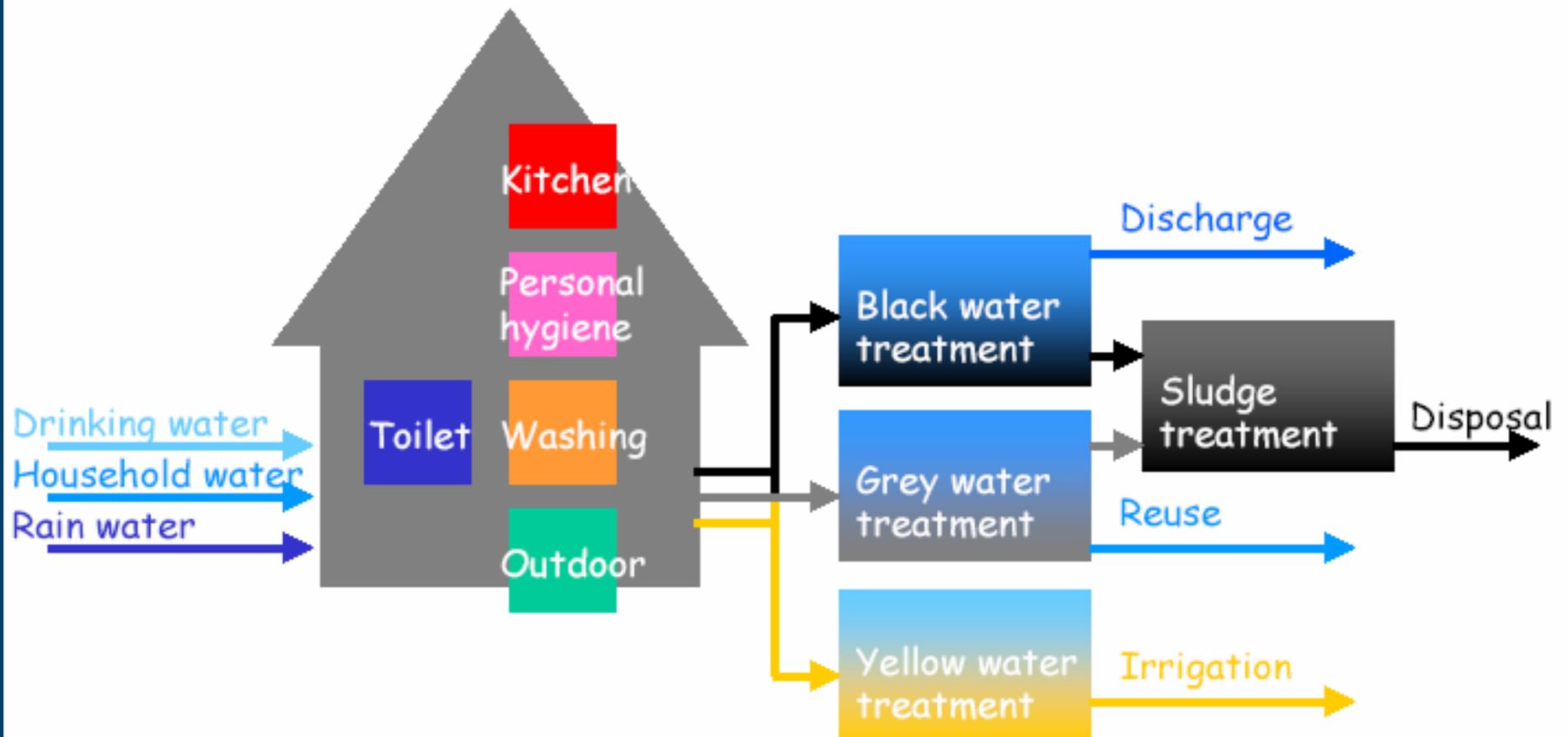
NEMO

Cost Comparison of Traditional and LID Development/Redevelopment/Retrofits

Project	Conventional Development Cost	LID Cost	Cost Difference	Percent Difference
2 nd Avenue SEA Street, WA	\$868,803	\$651,548	\$217,255	25%
Auburn Hills, WI	\$2,360,385	\$1,598,989	\$761,396	32%
Bellingham City Hall, WA	\$27,600	\$5,600	\$22,000	80%
Gap Creek, AR	\$4,620,600	\$3,942,100	\$678,500	15%
Kensington Estates, WA	\$765,700	\$1,502,900	-\$737,200	-96%
Laurel Springs, WI	\$1,654,021	\$1,149,552	\$504,469	30%
Prairie Glen, IL	\$1,004,848	\$599,536	\$405,312	40%
Tellabs Corporate Campus, IL	\$3,162,160	\$2,700,650	\$461,510	15%

Source: Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices. December 2007. EPA 841-F-07-006

Options for Households

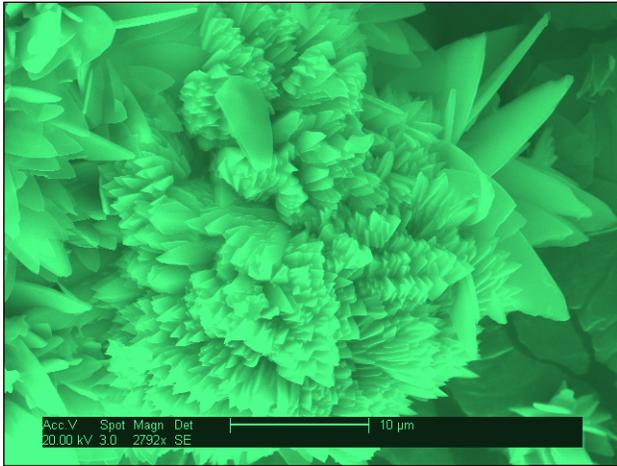




Sustainable Water Technologies



Sustainable Technology Metrics

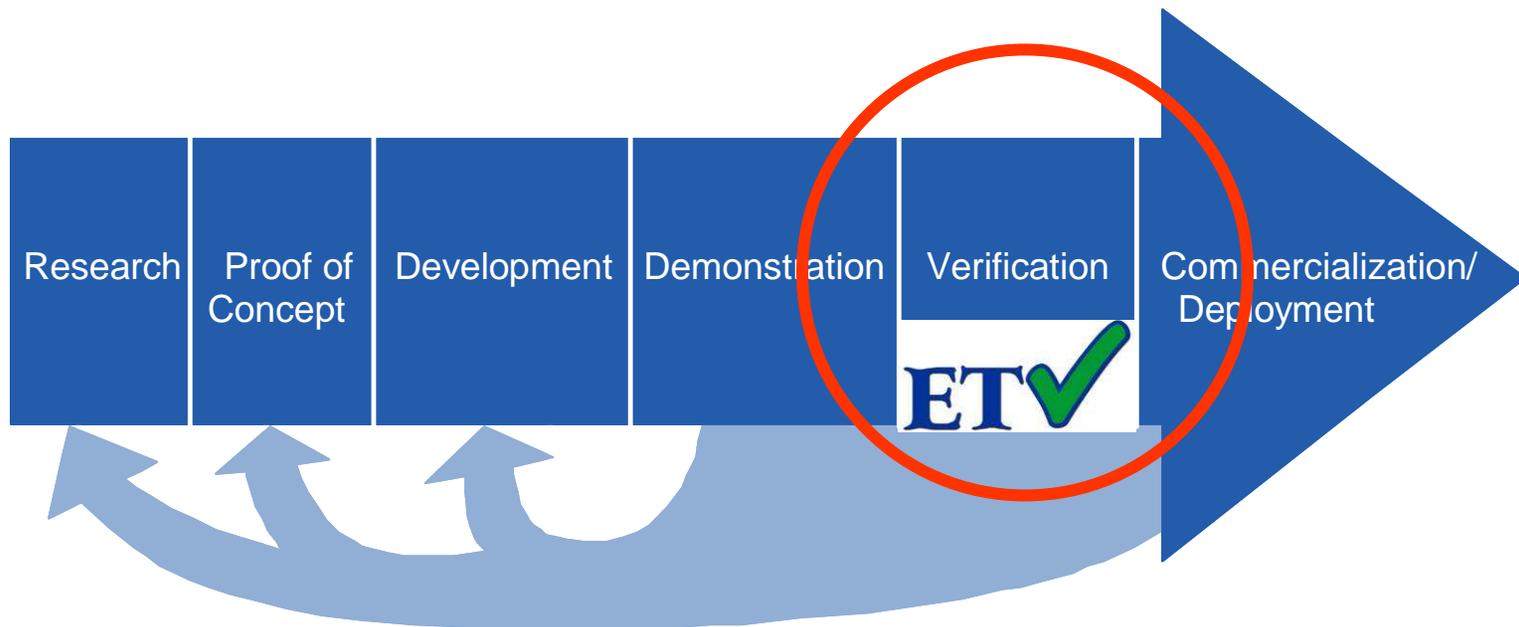


**Aligned platinum nanoflowers
synthesized using vitamin B₁ in
aqueous media**

(Varma, R., USEPA)

- Benign production principles
- Recyclable materials
- Sustainable energy use
- Economical

Environmental Technology Verification

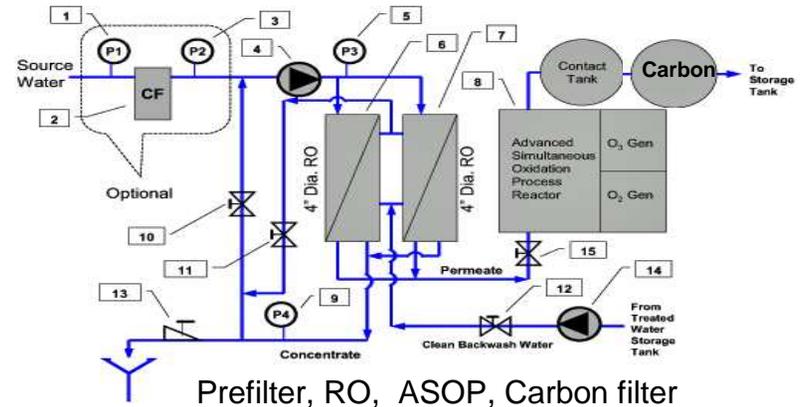


<http://www.epa.gov/etv/>



ETV Drinking Water Evaluation: RASCO Hyd-RO-Secure Series 2 POE System

- Evaluate the ASOP (UV & Ozone) and Carbon filter components for a 5 gpm configuration.
- System challenged with individual chemicals on each test run
- Assess oxidation by-products



Chemical Challenge Results

Challenge Chemical	Mean Influent (µg/L)	Mean ASOP Effluent (µg/L)	ASOP % Reduction	Mean Carbon Effluent (µg/L)	ASOP + Carbon % Reduction
Aldicarb	930	160	83	4	>99
Benzene	440	330	25	3.0	>99
Carbofuran	1100	1100	0	22	98
Chloroform	740	790	0	43	94
Dichlorvos	850	430	49	13	99
Dicrotophos	750	250	67	23	97
Methomyl	1200	830	31	8	>99
Mevinphos	940	1200	0	11	99
Nicotine	1200	80	93	4	>99
Oxamyl	1200	210	83	3	>99
Paraquat	700	600	14	340	51
Phorate	630	170	74	6	>99
Sodium Fluoroacetate	760	740	2.6	21	97
Strychnine	910	20	98	5	>99

Published Report
available
www.epa.gov/etv/



EPA – State Department Water Partnership

- Objective: Evaluate water quality in African settlements and provide recommendations to provide safer water
 - Partnered with Water for People
 - Studied water quality in selected settlements and bottled water quality
 - Helped build capacity by providing training on hygienic practices and investing in water infrastructure





Water Safety Plan

- Evaluating risk across the entire water system from source to consumption
- Pilot in Uganda
- Help prioritize investment for maximizing human health protection



Benefits to Africa

Excellent technical resource for data and information on broad set of water issues

Substantial water research expertise

Unique capability in the testing and evaluation of new water technology at all scales

International collaboration expertise



Risk Management Research

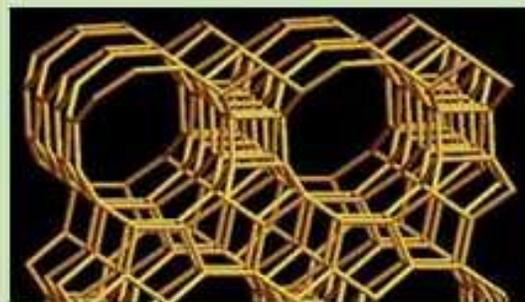
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Nanotechnology—One Tool in 'Green Chemistry' Research

Innovative NRMRL researchers who specialize in 'greener' chemistry approaches are focusing on nanotechnology, a method that allows materials to be developed at the nanoscale, i.e., at one-billionth the size.

Nanotechnology in 'Green Chemistry' Research



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EPA
 Environmental Technology Verification (ETV)



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