United States Environmental Protection Agency

RESEARCH PROJECT

National Risk Management Research Laboratory
Water Supply and Water Resources Division
Urban Watershed Management Branch

CONDITION ASSESSMENT FOR DRINKING WATER TRANSMISSION AND DISTRIBUTION MAINS

IMPACT STATEMENT

The integrity of buried drinking water mains is critical, as it influences water quality, losses, pressure and cost. This research complements the U.S. Environmental Protection Agency's (EPA) research on other components of the water supply system, such as source water protection, water treatment, corrosion control and biofilms. The information, procedures, and data produced will support better decisions regarding development, selection, and use of innovative condition assessment technologies. By advancing condition assessment capability, EPA will help enable utilities to manage their buried infrastructure as effectively and sustainably as technology allows.

BACKGROUND:

Over one million miles of water mains are installed in the United States. The demand for, and value from, cost-effective, structural condition assessment of installed pipes should increase significantly over the next 20 years. Pipes installed during construction booms are likely to begin to fail in large quantities. Thus, the ability to determine pipe condition will allow worst-condition pipes to be addressed first to avoid potential failures and associated risks, damages and costs. It will also help avoid premature replacement of structurally sound pipes to save resources and time. Assessment and implementation of these technologies is particularly pressing, given that the annual replacement rate is projected to peak around 2035 at 16,000 to 20,000 miles of pipe replaced each year, which is more than four times the current replacement rate.

This project addresses structural condition assessment of installed drinking water transmission and distribution mains. Where it is applicable and cost-effective, condition assessment is a vital component in water infrastructure asset management, which supports sustainable water infrastructure, a key goal of EPA's Office of Research and Development (ORD) and Office of Water. A good understanding of pipeline condition can help a utility optimize operations, maintenance, and capital improvement decisions. This helps reduce structural, water quality, and hydraulic failures and their adverse effects as well as minimize life-cycle costs. Therefore, improving the applicable range, performance, and cost of condition assessment technology will further improve the quantity and quality of data used for asset management decisions. Utilities can use the collected data as a sound basis for decisions regarding selection, use and/or further development of these technologies. The sooner these cost-effective and useful condition technologies are developed then adopted, the greater the benefits to drinking water utilities and their customers.

DESCRIPTION:

ORD's National Risk Management Research Laboratory has funded this research project in support of its Aging Water Infrastructure (AWI) Research Program. This project will assess, document, and report on the state of condition assessment for water transmission and distribution mains, as well as will support field demonstrations of water main condition assessment technologies. The integrity of buried drinking water mains is critical, as it influences water quality, losses, pressure and cost. This project includes conducting an international forum on condition assessment of ferrous water

mains; producing a state of the technology report on condition assessment of ferrous water mains; conducting a preliminary literature review of ongoing condition assessment research; evaluating innovative technology usage; conducting an overview of pipe-condition-curve status and research; and conducting a feasibility assessment of predictability and preventability indices for high-interest pipe scenarios.

This project also included a field demonstration of innovative water main leak detection and inspection technologies during the summer of 2009. The Louisville (KY) Water Company, the collaborator for the site, made available, a 75-year-old, cement-lined, cast iron pipe for the field demonstrations, and also provided on-site assistance, such as provision of pipe data, access to pipe and operation of valves. Sections of the pipe were removed to more thoroughly compare measurements of parameters via non-destructive testing with direct measurements of those same parameters. Recent innovations demonstrated included: new sensing capability added to existing platforms; use of three innovative approaches for acoustic excitation for acoustic emission monitoring-based techniques; integration of precision excavation techniques and inspection technologies to reduce cost of inspection; and scale-up of technologies for inspection of pipes smaller than the original 24-inch-diameter pipes.

EPA GOAL: Goal #2 - *Clean & Safe Water*; Objective 2.1.1- *Water Safe to Drink*
ORD MULTI YEAR PLAN: Drinking Water (DW), Long Term Goal - DW-1 *Characterize risks associated with DW sources, distribution, treatment, and use*

RESEARCH PARTNERS:
Collaborators: Louisville Water Company; *Contractors:* Battelle (prime), Jason Consultants NRC-Canada, Virginia Tech., PARS Environmental, Pressure Pipe Inspection Company, Pure Technologies, Inc. Russell Technology, Inc., Rock Solid Pty, Ltd., Echologics, Inc., and AESL

EXPECTED OUTCOMES AND IMPACTS:

The expected outcomes of this project are reduced water main failures and their adverse public health, safety, environmental and economic effects as well as reduced premature replacement of sound buried water infrastructure. These outcomes are expected to arise from improved decision-making regarding location, time, type of water main inspection, maintenance, and renewal activities; better decisions regarding development and use of, and expanded and accelerated acceptance and use of innovative and effective condition assessment devices, systems and procedures.

OUTPUTS:

Current and expected project outputs include a state of technology report- 2009 (EPA/600/R-09/055); report on Condition Assessment Technology Improvement Opportunities - 8/2009; and a report on Demonstration of Condition Assessment Technologies - 9/2011.

RESOURCES:

Aging Water Infrastructure Research Program: http://www.epa.gov/awi/

EPA (2009). *Condition Assessment of Ferrous Water Transmission and Distribution Systems State of Technology Review Report* (EPA/600/R-09/049): http://www.epa.gov/nrmrl/pubs/600r09055/600r09055.pdf

Urban Watershed Management Research: http://www.epa.gov/ednnrmrl/

CONTACTS:

Michael Royer, *Principal Investigator* - (732) 321- 6633 or royer.michael@epa.gov
Steven Doub, *Media Relations* - (513) 569-7503 or doub.steven@epa.gov
Michelle Latham, *Communications* - (513) 569-7601 or latham.michelle@epa.gov


Drinking Water


Aging Water Infrastructure