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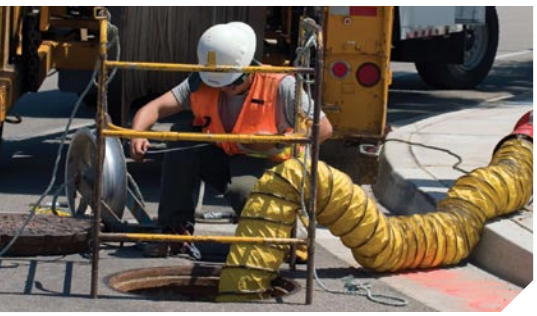
science BRIEF
BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS



National **Risk Management** Research Laboratory
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Aging Water Infrastructure Research Program

Addressing the Challenge Through Innovation

Advanced Concepts

"Our nation's extensive water infrastructure has the capacity to treat, store, and transport trillions of gallons of water and wastewater per day through millions of miles of pipelines. However, as our infrastructure deteriorates, there are increasing concerns about the ability of this infrastructure to keep up with our future needs."

George Gray, Ph.D.
Assistant Administrator for
Research and Development
United States Environmental
Protection Agency

EPA has begun a new research program intended to generate the science and engineering that will address our aging water infrastructure. The program, entitled "Innovation and Research for Water Infrastructure for the 21st Century," calls for research relating to condition assessment, system rehabilitation, and advanced concepts.

Research on advanced concepts will evaluate and demonstrate the application of innovative infrastructure designs, management procedures, and operational approaches. Advanced concepts go beyond simple asset management. The infusion of these advanced concepts into established wastewater collection systems is especially challenging.

Current Issues

There are several issues related to the adoption of advanced concepts:

- Existing collection systems, many of which were designed and constructed when performance expectations and technical knowledge were less advanced, must now perform to today's standards.
- Broad goals, such as sustainability, are not being achieved by current design practices.
- Proper transport of solids in sewers is still not well understood; the transport of solids can cause clogs, overflows, and surcharges.
- There are limited performance data, which leads to engineering conservatism.
- It is difficult to retrofit old systems using new design technology.

State of the Technology

Collection system technology in the U.S. represents a combination of separate sanitary sewers, combined and separate storm sewers, and associated components (such as manholes and pump stations). In some cases, sections of our collection system infrastructure are over 100 years old. But as our urban fringe expands with increased development, new collection systems are being added.

For the most part, current design practices are not markedly different from those applied 30 years ago. However, older systems, which were designed and constructed when performance expectations and technical knowledge were less advanced, are now being challenged to meet evolving regulations and the needs of ever-increasing populations.

As our collection systems age, utility managers and system designers must look to advanced concepts and approaches for new and expanding systems, and for retrofitting our existing collection system infrastructure.

Successfully blending these advanced concepts with an established wastewater collection system is challenging. Innovative concepts can evolve in existing systems through system retrofit opportunities, but compatibility with the in-place system is critical. As existing systems expand with new development, opportunities for the application of advanced concepts grow to include maximizing the benefits from green infrastructure, low-impact development, water reuse, source water protection, and watershed management.

Research in advanced concepts includes investigation, evaluation, and demonstration of:

- Innovative collection and conveyance designs
- Advanced system configurations and relationships
- System and watershed/sewershed management strategies
- Source control and innovative recycling and reuse practices
- Advanced concept integration into expanding and existing systems

New Research

Beginning in fiscal year 2007, EPA's new research program will initiate projects that address advanced concepts in the following areas:

- Assess State of the Technology
  - Convene technology forum
  - Document case histories
- Develop Innovative Design
  - Large-diameter and steep sewers
  - Sewer sediment traps
  - High-capacity wastewater treatment plants for wet-weather flow
  - Innovative systems guidance
- Initiate Field Demonstrations
  - Green solutions for wet-weather flow control
  - Storm water and wastewater beneficial use
  - Innovative sanitary sewer design

The Door Is Open for Collaboration

EPA, whose primary role is that of advocate for a sustainable water infrastructure, is only one partner in this effort. The Aging Water Infrastructure research program presents opportunities for utilities, vendors, researchers, academics, water associations (trade and professional), and other agencies and organizations to collaborate. In fact, the success of the program depends on stakeholder involvement, sharing information and tools, and working together toward the long-term stewardship of our water infrastructure.

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