

# Effective Practices for Sanitary Sewer and Collection System Operations and Maintenance

A collection system is a major capital investment for a utility, and it requires regular maintenance and reinvestment to keep it in good working condition. Utility managers have many tools at their disposal to help them best allocate resources for collection system maintenance, including optimization techniques, benchmarking, asset management systems, “capacity, management, operations, and maintenance” (CMOM), and the International Organization for Standardization’s ISO 14000 compliance tools.

These tools and their applications are each documented separately in literature; however, no single document adequately describes all of them. The goal of this project was to develop a comprehensive document. The project team conducted a literature search, a nationwide review of municipalities’ current operations and maintenance practices, and case studies of different practices.

The result is an online toolkit (also available as a CD-ROM) of effective practices for the operation and maintenance, management, and capacity assurance of sanitary sewer collection systems. The toolkit homepage is shown in Figure 1. The toolkit is a useful reference for utility managers as well as technicians and operators who perform operation and maintenance functions. It can help utility managers develop, enhance, and implement programs to improve effectiveness and efficiency. It also can help utilities improve their competitiveness, reduce the risk of sanitary sewer overflows, and provide the best possible asset management.

## Methods

The project team began by conducting a literature search of online databases,

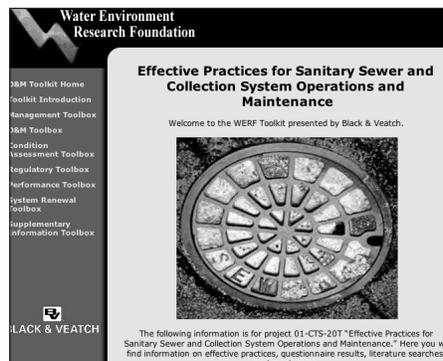


Figure 1. Toolkit Homepage.

conference proceedings, and other data sources. They also documented relevant regulatory requirements, including the essential elements of National Pollution Discharge Elimination System, CMOM, and GASB-34; issues of satellite systems and prohibition of discharge; pretreatment requirements including the role of the significant industrial discharger; and legal ordinances such as those impacting private property infiltration and inflow and grease prohibition.

The project team surveyed 27 utilities on their operations and maintenance (O&M) practices. The smallest utility had 27 miles of public sewer lines, the largest had about 11,000 miles.

Respondents also were asked to identify any new or unique O&M practices that they used.

Next, the team conducted site visits at five partner utilities to collect information for an in-depth investigation. Finally, the team prepared the web-based toolkit based on the information obtained.

## Toolkit Overview

The toolkit consists of six “toolboxes”: management, O&M, condition assessment, regulatory, performance, and system renewal. These toolboxes are

## BENEFITS

- Provides users with a toolkit of effective practices for operation and maintenance, management, and capacity assurance of sanitary sewer collection systems.
- Provides a comprehensive review of literature sources related to collection system operations and maintenance.
- Includes a questionnaire that provides guidance regarding key information utilities could routinely collect to assist in the evaluation of their utility.

## RELATED PRODUCTS

*New Pipes for Old: A Study of Recent Advances in Sewer Pipe Materials and Technology* (D00308)

*Using Flow Prediction Technologies to Control Sanitary Sewer Overflows* (D93007)

*Reducing Peak Rainfall-Derived Infiltration and Inflow Rates: Case Studies and Protocols* (99WWF8)

## RELATED ONGOING RESEARCH

Development of Predictive Tools for Measuring Sewer Degradation (97-CTS-7)

Methods for Cost-Effective Rehabilitation of Private Lateral Sewers (02-CTS-5)

## AVAILABLE FORMAT



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described in greater detail below:

### Management Toolbox

Collection system management requires good record keeping and planning. Managers must use the appropriate tools to measure desired performance and regulatory compliance. The management of a utility's organization, human resources, information database, finances, and assets impact the utility's operational efficiency and financial status. This impacts turn affect the levels of service that a utility provides to its customers, and the amount a customer is charged for the service provided. The management toolbox includes the following tools:

- Financial Management
- Information Management
- Organizational Management
- Performance Assessment

### O&M Toolbox

The O&M toolbox considers the planning, engineering construction, and administrative functions a utility performs. O&M is typically one of the more labor-intensive departments involved in delivering wastewater services. The O&M toolbox emphasizes utilization of resources, effective practices, and technology-based applications for communication and information management. It includes the following tools:

- Effectiveness of O&M Program
- Communications
- Emergency Response Plan
- Resources
- Training and Certification
- Cleaning Methods

### Condition Assessment Toolbox

Decisions regarding the maintenance, operation, and rehabilitation of a collection system can be based on the results of a condition assessment of the system. Condition assessment can include hydraulic modeling of the collection system, structural assessment (for defects such as pipe breaks and cracks), and infiltration and inflow condition assessment. Various tools such as manhole inspection, closed-circuit TV, and flow monitoring are used to perform condition assessments. The condition assessment toolbox includes the following tools:

- Flow and Rainfall Monitoring
- Capacity Assurance
- Hydraulic Evaluation/Modeling
- Inspection/Assessment Procedures

### Regulatory Toolbox

The regulatory toolbox identifies those tools designed to provide guidance and assistance to utility operators in meeting a variety of laws and permit requirements established under the framework of the Clean Water Act. The regulatory toolbox includes the following tools:

- National Pollution Discharge Elimination System (NPDES) Permits
- Capacity, Management, Operations & Maintenance (CMOM) Program
- Performance Measures
- Combined Sewer Overflow Control Policy
- Pretreatment Requirements
- Legal Ordinances

### Performance Toolbox

Defining performance criteria and regularly evaluating system performance can help a utility optimize its collection system maintenance strategy. Using performance metrics, utilities can evaluate the effectiveness of their maintenance programs. All performance metrics, though, are not necessarily equal in importance for every utility. This toolbox contains guidance on the different collection system performance indicators that can be used to evaluate a utility's maintenance program. It includes the following tools:

- Performance Measures
- Optimization
- ISO 14000

### System Renewal Toolbox

The need for collection system renewal

arises from three factors:

- Deterioration of the physical condition of an aging sewer system.
- Increased regulatory control of wet weather overflows from sewer systems.
- Additional hydraulic capacity needs for the sewer system.

Before beginning a system renewal, a utility must perform a comprehensive condition assessment of the system. The results of the condition assessment provide the basis for characterizing defects, identifying deficiencies, and prioritizing the system renewal needs. Generally, utilities develop both short- and long-term plans for system renewal—short-term plans include repair of critical defects, and long-term plans include projected, less immediate needs that can be implemented over a number of years. The system renewal toolbox includes the following tools:

- Capacity Enhancement
- Parallel or Replacement Relief Line
- Rehabilitation
- Sewer Line Rehabilitation
- Point Repair
- Manhole Rehabilitation
- Lateral Rehabilitation

### Supplementary Information Toolbox

The toolkit also includes a “supplementary information” toolbox with all of the raw data from the literature search and utility survey.

### Conclusion

Using the practices described in this online and CD-ROM toolkit will help utility managers to develop, enhance, and implement effective collection system maintenance programs.

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05/04