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**NYWEA Asset Management Task Force  
White Paper**

Adopted by the Board of Directors on April 24, 2014

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## Introduction

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### What is Asset Management?

In many communities, wastewater infrastructure assets are increasingly stressed from overuse, underfunding, and aging.

Public sector managers have been managing assets for decades. However, it is becoming clear that what we have been doing in the past will not be sufficient to address the growing and increasingly complex challenges that lie ahead.

Practical, advanced techniques for better managing physical assets have been developed and refined over the past several decades around the world. These techniques — a blend of processes and practices — have been slowly integrated into a holistic management framework over the past two decades.

Asset management means maintaining a desired level of service for what an organization wants its assets to provide at the lowest life cycle cost. Lowest life cycle cost refers to the best appropriate cost for rehabilitating, repairing, or replacing an asset. Asset management is implemented through an asset management program and typically includes a written asset management plan.

Implementing an asset management program consists of essentially answering and acting upon five core questions with regards to an organization's assets:

1. What is the current state of my assets?

To answer the first core question, the organization can develop an asset registry, identifying what assets the organization owns and where they are located. A condition assessment of the assets can determine their performance and failure modes, and determine their residual life. Finally, their current values and replacements costs should be assessed.

2. What is my required level of service?

Taking into account the current state of the assets, the organization must identify its levels of service, or those characteristics of a product or service that describe its required minimum level of performance. These characteristics typically include aspects such as how much and how frequently the service will be delivered. Level of service helps to do the following:

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- Focus management efforts and resources on well-defined, agreed-upon service levels
  - Communicate service expectations to customers/stakeholders to better manage expectations
  - Agree on service level expectations with respect to budget capabilities. Tying LOS directly to budget requirements reduces the disconnect created when there is an expectation of service response that is not supportable by budget realities.
3. Which assets are critical to sustained performance?

Not every asset failure presents the same degree of risk to the organization. Consequently, those assets critical to sustained performance and likely to fail must be identified so that the risk posed by those critical assets can be controlled. An asset’s risk consists of the product of three components:

- Probability of failure: How likely is an asset to fail due to poor condition, age, and etc.?
  - Consequence of failure: What are the costs (economic, social, and environmental) that are associated with the asset failure?
  - Mitigation: What are the existing controls in place that can mitigate the existing probability or consequence of failure?
4. What are my best O&M and CIP investment strategies?

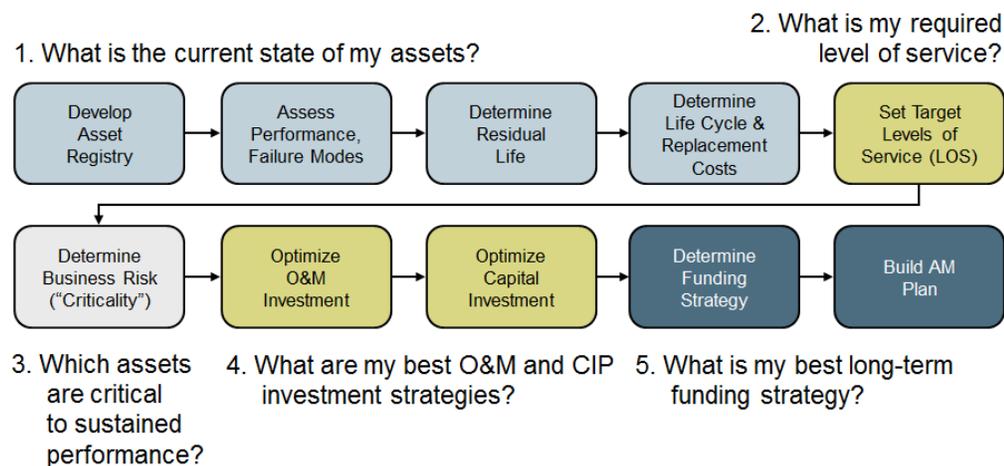
After critical assets are identified and prioritized according to risk, the lowest-cost investment strategies must be planned and implemented to control the existing risks. The organization can achieve these risk treatment options by optimizing the operations and maintenance (O&M) work being done and/or implement capital improvement project (CIP) for the right assets at the right time.

5. What is my best long-term funding strategy?

Once the appropriate O&M and CIP investment strategies have been selected, the existing and future costs of funding these efforts must be forecasted so that appropriate steps can be taken to sustain these efforts. These may include revising the rate structure or dedicating a reserve fund for future CIPs.

Figure 1 below illustrates the steps involved in answering the five core questions of asset management.

Figure 1



## Problem and Current State

Numerous reports attempt to document the need for additional investment in (and the physical state of) municipal infrastructure in the United States and New York. Focusing on the wastewater industry, these are some examples:

- The latest Report Card for America's Infrastructure (American Society of Civil Engineers, March 2013) graded the nation's wastewater infrastructure as a "D", below America's overall infrastructure grade of "D+".
- The Wastewater Infrastructure Needs of New York State report (New York State Department of Environmental Conservation, March 2008) notes that over \$36 billion is required in the next 20 years for wastewater infrastructure.
- The U.S. Environmental Protection Agency and the Congressional Budget Office estimate a \$500 billion investment gap for water and wastewater infrastructure over the next twenty years to address aging and ailing pipes and systems.

In large part due to the need for infrastructure renewal to maintain / improve wastewater service levels, the cost necessary to provide sanitary sewer services continues to increase. Enhanced regulatory requirements, more stringent water quality standards, and unfunded mandates necessitate additional upgrades. With little to no federal or state grant funding, these asset investments are almost exclusively funded by local ratepayers.

The National Association of Clean Water Agencies (NACWA) surveys municipal sewer service providers to benchmark the typical charges levied on ratepayers. The NACWA Service Charge Index annually demonstrates that wastewater charges far outpace the consumer price index – with the trend expected to continue. Typical challenges for many New York wastewater utilities are the resistance of government boards and the public to rate increases.

The recent "2% Tax Cap" enacted by the State compounds the issue by limiting the amount by law that certain municipalities may raise their tax revenue. With a large need for investment and limited funding capacity, it is imperative that management of the infrastructure be optimized to smartly utilize resources and best serve the community.

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## Benefits of Asset Management

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Asset management by water and wastewater service providers may achieve benefits in the following areas:

### PLANNING

- Setting a solid framework of current assets: location, condition, criticality
- Developing benchmarks for improvements
- Identify risks and formulate risk mitigation programs
- Setting sound asset replacement and capital investment programs
- Plan for long-term sustainability of the utility
- Promote system reliability and resiliency

### OPERATION AND MAINTENANCE

- Implement best practices
- Prolong asset life through sound decision-making and focused o&m practices
- Opportunity to reduce operation & maintenance costs
- Improve system security and safety of assets
- Potential to reduce energy present usage and future needs

### BUSINESS PRACTICE

- Provide asset-based platform and database for setting realistic rates
  - Transparently demonstrate fiscal responsibility
  - Meeting service expectations and regulatory requirements
  - Budgeting focused on activities critical to sustained performance
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## CUSTOMER SATISFACTION

- Improve customer-complaint response times and consistently meeting customer demands
- Anticipate areas of potential problems in the system
- Opportunity to develop public relation campaigns based on asset-based criteria
- Reducing occurrences of and improving response to emergencies

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## Training

NYWEA has been committed to providing training on asset management at both its conferences and technical meetings as well as through targeted training programs provided by the Member Education Committee. Several full-day asset management training workshops have been provided around the state, which provided WWTP operators with a full day hands on workshop and operator credits. Below are details of this full-day training program:

### Training Program Summary:

Asset management can be described as a collection of best management practices that systematically guides an organization's investment decisions in all stages of an asset's life-cycle: planning, acquisition, operations, maintenance, renewal, and decommissioning. This investment decisions are intended to represent the best mix of operations, maintenance, and capital for sustained performance over the life of the asset, where performance is measured against a clearly defined level of service.

The objective of asset management is to develop a concise but comprehensive set of integrated management strategies (including operations, maintenance, and capital) for all assets in the enterprise. These strategies, when integrated in written form, constitute the heart of an Asset Management Plan. This Plan systematically;

- Identifies the current state (performance) of the assets;
- Articulates the level of performance (service) that the assets need to sustain into the future;
- Identifies those assets that are "critical" to sustained performance;
- Integrates operations, maintenance, and capital investment strategies to sustain performance at lowest total cost of ownership; and
- Describes a fiscal strategy to fund the integrated strategies.

This course instructs in the fundamental concepts, skills and practices necessary to develop an Asset Management Plan specific to wastewater assets.

### Training Program Goals:

- At the conclusion of this workshop, attendees are be able to
- Prepare a simple but complete Asset Management Plan;
- Organize and execute an asset management program at a basic level consistent with best practices;
- Develop and execute a basic Asset Management Improvement Plan that guides the strengthening of identified weaknesses in an organization's approach to asset management.

The Asset Management task force, in coordination with the NYSDEC is interested in refreshing this training program and offering it around the state over the next couple of years through the Membership Education Committee and Local Chapters.

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## Conclusions and Recommendations

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Asset management involves the total organization including executive leadership, management, operations and maintenance. It ensures that there is buy-in from all levels within the organization to commit to the appropriate programs and funding to ensure that risk is properly managed and agreed to level of service is achieved.

Asset management is as much a philosophy and vision as it is a process to ensure hard assets are properly maintained. As we all are aware, aging water infrastructure in the United States is a concern from a public risk perspective. Competing needs for limited funds, as well as the complex nature of our systems, requires that the allocation of resources be based on risk and criticality, and that the decision making process is clear..

The United Kingdom long ago established PAS55 as a framework for implementing asset management across all sectors, including water. Identifying and managing risk, as well as optimizing utility operations, are key to effective AM. Implementation of PAS55 has resulted in significant increased efficiencies in the water utilities in the UK, from management through operations, maintenance and development of repair and replacement programs. It is an example that we can look to from a historical perspective.

The NYWEA Board of Directors endorses and supports the concept of Asset Management, and encourages every utility in New York State to begin or continue this practice

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## Resources

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The USEPA, as well as WEF, AWWA, and many utilities, recognize the benefits of asset management. The need for utilities to “do more with less” supports the use of effective asset management. However, recognizing that each systems needs are unique, and that each utility manages their systems differently, the USEPA, AWWA and WEF, have developed and compiled extensive resources on asset management, to be used as guide. A summary of these resources was included herein. There is no one approach that is being suggested.

It is recommended that water/wastewater utilities take advantage of these resources, and begin or continue AM practices throughout your organization. At this time, there is no “requirement” for AM. However, the USEPA, as well as other state regulatory agencies including NYSDEC, recognizing the benefits of AM, are beginning to consider the implementation of AM as a requirement of NPDES permitting or state funding.

Table 1 summarizes 38 available resources organized by category and date published. The categories include: general asset management, financial analysis and case studies, collection systems (CMOM), risk assessments methods, and maintenance management systems. The table includes links, media types, publisher, and cost along with a brief description to help with selection of appropriate resources.

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#	Title	Category	Link	Media Type	ISBN	# Pages	Date Published	Cost	Publisher	More details
1	Fact Sheet: Asset Management for Sewer Collection Systems	Collection Systems - CMOM	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/8e6f88d7b69d21b885256c4100538c02!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/8e6f88d7b69d21b885256c4100538c02!OpenDocument</a>	PDF File	EPA# 833F02001	16	April, 2002	Free	EPA	This fact sheet describes the asset management approach and shows how it can be used to help public sewer utilities accomplish multiple goals of protecting and extending the life of sewer system assets, meeting new financial reporting requirements, and abating sanitary sewer overflows or wastewater treatment plant peak flow violations.
2	Condition Assessment for Wastewater Pipelines	Collection Systems - CMOM	<a href="http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=IN10SG09caww">http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=IN10SG09caww</a>	PDF File	IN10SG09caww	212	1/1/2013	Free for Members	WERF	This report provides a synthesis of utility practices on wastewater pipe condition assessment, through literature reviews and direct data mining from utilities participating in the project. The information was compiled and compared to find discrepancies, trends, gaps, and utility needs, to direct further research and work. A standard data structure was developed and is presented in this report to collect standardized information about wastewater pipe condition assessment projects. The benefits of collecting this data are described in detail.
3	Development of a Tool to Prioritize Sewer Inspections (SCRAPS)	Collection Systems - CMOM		CD ROM / Software	97-CTS-7	123	1/2/2005	Free for Members	WERF	-----
4	Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems	Collection Systems - CMOM	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/d82306958283f25f85256fac0059d6a0!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/d82306958283f25f85256fac0059d6a0!OpenDocument</a>	PDF File	EPA# 305B05002	126	1/1/2005	Free	EPA	This guide identifies some of the criteria used by EPA to evaluate a collection system's management, operation, and maintenance (CMOM) program activities. The guide is intended for use by EPA and state inspectors as well as the regulated community -- owners or operators of sewer systems collecting domestic sewage as well as consultants or other third-party evaluators or compliance assistance providers. Collection system owners or operators can review their own systems by following the checklist in Chapter 3 to reduce the occurrence of sewer overflows and improve or maintain compliance. The guidance herein may also be taken a step further. If a federal or state reviewer observes a practice that does not effectively meet the elements of a CMOM program, he or she may make recommendations to educate the operator, inspector, case developer, or those involved in a settlement agreement. Additionally, having key board members (policy makers) read this guide will also allow them to better understand the benefits of investing in good CMOM programs."
5	Optimizing Operation, Maintenance, and Rehabilitation of Sanitary Sewer Collection Systems	Collection Systems - CMOM	<a href="http://www.neiwppc.org/omrmanual.asp">http://www.neiwppc.org/omrmanual.asp</a>	Web Site		229	12/1/2003	Free	NEIWPPC	This manual helps collection system owners and operators optimize system performance, enhance effectiveness of maintenance programs, and reduce the long-term costs of operation.
6	Handbook for Sewer System Evaluation and Rehabilitation	Collection Systems - CMOM	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/3bf1715386cfbcf785256b0600723c07!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/3bf1715386cfbcf785256b0600723c07!OpenDocument</a>	PDF File	EPA# 430975021	240	12/1/1975	Free	EPA	The handbook contains chapters on: (1) Methodology for conducting infiltration/inflow analysis; (2) Methodology for conducting Sewer System Evaluation Survey; (3) Information on current state-of-the-art techniques for sewer rehabilitation; and, (4) Costs associated with conducting Sewer System Evaluation Survey and rehabilitation in compliance with the Federal Water Pollution Control Act Amendment of 1972 (P.L. 92-500).
7	Computer Management of a Combined Sewer System	Collection Systems - CMOM	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/c7d6db5726260f0a85256fc10070aa4e!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/c7d6db5726260f0a85256fc10070aa4e!OpenDocument</a>	PDF File	EPA# 670274022	483	7/1/1974	Free	EPA	At the conclusion of a ten-year construction program which affected much of Seattle's combined sewer system, a computer-controlled 'total systems management' complex was proposed, funded and constructed. Computer augmented treatment and disposal (CATAD) takes advantage of storage in the sewers to limit overflows, and selects overflow points based on water quality data. Since the control system began operating in 1971, receiving water quality, especially dissolved oxygen and coliform levels, has shown significant improvement; overflow volume has decreased by 50 to 60% during supervisory control and in excess of 90% during three months of limited automatic control. Eight pollution loading parameters were measured and found to be 68% less than before advanced control techniques. Capital costs totaled \$2.6 million for the

#	Title	Category	Link	Media Type	ISBN	# Pages	Date Published	Cost	Publisher	More details
8	Guidance for Sewer System Evaluation	Collection Systems - CMOM	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/b1fff2a9e1468e8685256b0600723b31!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/b1fff2a9e1468e8685256b0600723b31!OpenDocument</a>	PDF File	EPA# 520974018	14	3/1/1974	Free	EPA	Extraneous water from infiltration/inflow sources reduces the capability of sewer systems and treatment facilities to transport and treat domestic and industrial wastewaters. Infiltration occurs when existing sewer lines undergo material and joint degradation and deterioration as well as when new sewer lines are poorly designed and constructed. The elimination of infiltration/inflow by sewer system rehabilitation can often substantially reduce the cost of wastewater collection and treatment, but a logical and systematic evaluation of the sewer system is necessary to determine its cost-effectiveness. This document is intended to provide engineers, municipalities, and regulatory agencies with guidance on sewer
9	Software to Prioritize Wastewater Asset Failure and Security Risks	Collection Systems - CMOM	<a href="http://www.werf.org/i/a/k/Search/ResearchProfile.aspx?ReportId=03-CTS-6S">http://www.werf.org/i/a/k/Search/ResearchProfile.aspx?ReportId=03-CTS-6S</a>	CD ROM / Software	03-CTS-6S	----	6/27/1905	Free for Members	WERF	Security and Emergency Response The software tool that was derived from this project developed new indices for representing security risk, an index to characterize strategic asset management information, and a platform for bridging these two independent aspects of utility management. Users are able to use it to prioritize assets in several ways, and are provided with a compelling visual display of any existing overlaps. Because the software is in the proof of principle stage, its distribution is limited. Potential users are invited to watch the automated walk-through that will offer a more hands-on tour of the software and its functionality. This will serve as a good introduction to the modules and provide a basic understanding of how to manipulate the screens and access the features described in the digest. The tour is available at the WERF website.
10	An Examination of Innovative Methods Used in the Inspection of Wastewater Systems	Condition Assessment	<a href="http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=01-CTS-7">http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=01-CTS-7</a>	CD ROM / Software	01-CTS-7			Free for Members	WERF	High-quality investigation and diagnosis is fundamental to the decision-making process and to the development of effective strategies for rehabilitation and replacement of our wastewater systems. This report provides a comprehensive review of the current state of the art of investigation technology for both gravity and force mains. It also reviews data management and interrogation, and a structured approach to investigation of gravity and pressure pipe is suggested. Additionally, this report includes detailed reviews of nine current technologies, providing the information utilities need to determine which technology will serve
11	Case Studies of Sustainable Water and Wastewater Pricing	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/af6c8b2682edd6ff85257116006ae3ab!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/af6c8b2682edd6ff85257116006ae3ab!OpenDocument</a>	PDF File	EPA# 816R05007	25	12/1/2005	Free	EPA	This document provides information about sustainable water and wastewater pricing
12	A Utility Manager's Guide to Water and Wastewater Budgeting	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/852887bbc1ca359585256ad400705867/875e6071d461403685256b0600722fa8!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/852887bbc1ca359585256ad400705867/875e6071d461403685256b0600722fa8!OpenDocument</a>	PDF File	EPA# 832B94010		9/1/1994	Free	EPA	The guide provides suggestions for water utility managers to manage their local water systems within their budgets.
13	Developing Public/Private Partnerships: An Option for Wastewater Financing	Financial	<a href="http://nepis.epa.gov/Exe/ZyNET.exe/2000CZHA.TXT?ZyActionD=ZyDocument&amp;Client=EPA&amp;Index=1991+Thru+1994&amp;Docs=&amp;Query=&amp;Time=&amp;EndTime=&amp;SearchMethod=1&amp;TocRestrict=n&amp;Toc=&amp;TocEntry=&amp;QField=&amp;QFieldYear=&amp;QFieldMonth=&amp;QFieldDay=&amp;IntQFieldOp=0&amp;ExtQFieldOp=0&amp;XmlQuery=&amp;File=D%3AWzyfilesWIndex%20DataW91thru94WtxtW0000004W2000CZHA.txt&amp;User=ANONYMOUS&amp;Password=anonymous&amp;SortMethod=h -&amp;MaximumDocuments=1&amp;FuzzyDegree=0&amp;ImageQuality=r75g8/r75g8/x150y150g16/i425&amp;Display=plf&amp;DefSeekPage=x&amp;SearchBack=ZyActionL&amp;Back=ZyActionS&amp;BackDesc=Results%20page">http://nepis.epa.gov/Exe/ZyNET.exe/2000CZHA.TXT?ZyActionD=ZyDocument&amp;Client=EPA&amp;Index=1991+Thru+1994&amp;Docs=&amp;Query=&amp;Time=&amp;EndTime=&amp;SearchMethod=1&amp;TocRestrict=n&amp;Toc=&amp;TocEntry=&amp;QField=&amp;QFieldYear=&amp;QFieldMonth=&amp;QFieldDay=&amp;IntQFieldOp=0&amp;ExtQFieldOp=0&amp;XmlQuery=&amp;File=D%3AWzyfilesWIndex%20DataW91thru94WtxtW0000004W2000CZHA.txt&amp;User=ANONYMOUS&amp;Password=anonymous&amp;SortMethod=h -&amp;MaximumDocuments=1&amp;FuzzyDegree=0&amp;ImageQuality=r75g8/r75g8/x150y150g16/i425&amp;Display=plf&amp;DefSeekPage=x&amp;SearchBack=ZyActionL&amp;Back=ZyActionS&amp;BackDesc=Results%20page</a>	PDF File	EPA# 832F92003	20	10/1/1992	Free	EPA	Financing the construction and expansion of wastewater treatment facilities using private resources, specifically Public/Private Partnerships (P3s), is a viable option for community decision makers. As an introductory document, this brochure presents some background on P3 financing, outlines the steps necessary to move toward P3 financing, and addresses some issues about structuring a successful partnership agreement.

#	Title	Category	Link	Media Type	ISBN	# Pages	Date Published	Cost	Publisher	More details
14	Determining Wastewater User Service Charge Rates: A Step by Step Manual	Financial	<a href="http://nepis.epa.gov/Exe/ZyNET.exe/200041G5.TXT?ZyActionD=ZyDocument&amp;Client=EPA&amp;Index=1991+Thru+1994&amp;Docs=&amp;Query=&amp;Time=&amp;EndTime=&amp;SearchMethod=1&amp;TocRestrict=n&amp;Toc=&amp;TocEntry=&amp;QField=&amp;QFieldYear=&amp;QFieldMonth=&amp;QFieldDay=&amp;IntQFieldOp=0&amp;ExtQFieldOp=0&amp;XmlQuery=&amp;File=D%3A\zyfiles\Index%20Data\91thru94\Txt\00000003\200041G5.txt&amp;User=ANONYMOUS&amp;Password=anonymous&amp;SortMethod=h -&amp;MaximumDocuments=1&amp;FuzzyDegree=0&amp;ImageQuality=r75g8/r75g8/x150y150g16/i425&amp;Display=p f&amp;DefSeekPage=x&amp;SearchBack=ZyActionI&amp;Back=ZyActionS&amp;BackDesc=Results%20page&amp;">http://nepis.epa.gov/Exe/ZyNET.exe/200041G5.TXT?ZyActionD=ZyDocument&amp;Client=EPA&amp;Index=1991+Thru+1994&amp;Docs=&amp;Query=&amp;Time=&amp;EndTime=&amp;SearchMethod=1&amp;TocRestrict=n&amp;Toc=&amp;TocEntry=&amp;QField=&amp;QFieldYear=&amp;QFieldMonth=&amp;QFieldDay=&amp;IntQFieldOp=0&amp;ExtQFieldOp=0&amp;XmlQuery=&amp;File=D%3A\zyfiles\Index%20Data\91thru94\Txt\00000003\200041G5.txt&amp;User=ANONYMOUS&amp;Password=anonymous&amp;SortMethod=h -&amp;MaximumDocuments=1&amp;FuzzyDegree=0&amp;ImageQuality=r75g8/r75g8/x150y150g16/i425&amp;Display=p f&amp;DefSeekPage=x&amp;SearchBack=ZyActionI&amp;Back=ZyActionS&amp;BackDesc=Results%20page&amp;</a>	PDF File	EPA# 832B92003	30	9/1/1992	Free	EPA	(Includes disk) This publication was designed to help small to medium-sized wastewater utility operators decide how much they should be charging their residential, commercial, and industrial customers for wastewater services. It includes a Lotus 1-2-3 computer model and procedures manual to help operators calculate specific values for their systems' user service charges.
15	Managing Your Utility's Money: The Participant's Manual	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/2a080b905f8abb5d85256b0600723ee4!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/2a080b905f8abb5d85256b0600723ee4!OpenDocument</a>	Web Site	EPA# 430991015	39	9/1/1991	Free	EPA	This purpose of the workshop is to present financial management and user fee training for local officials. These seminars will provide local officials with information they can readily understand and use to improve the financial health of their water and wastewater treatment operations. The workshop will enable the participant to establish sound financial management practices, assess the financial health of water and wastewater systems and raise revenues through increasing user fees.
16	Financial Management Evaluation Handbook for Wastewater Utility	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/accba26e5f942e4885256b0600723a4d!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/accba26e5f942e4885256b0600723a4d!OpenDocument</a>	PDF File	EPA# 832K89100	51	8/1/1989	Free	EPA	Wastewater facilities are capital intensive and highly complex systems involving management techniques that are not typical of normal government operations. The United States Congress expects these wastewater utilities to have sophisticated management procedures, since these facilities are governed by the laws and regulations of the country. Many systems were built using funds appropriated by the Congress requiring that they be managed properly for the benefit of the people. The handbook has been specifically designed for on-site inspectors to use in evaluating the financial management capability of wastewater utility systems that have been funded by federal construction grants. It has been specifically designed for small systems treating less than 5 mgd of wastewater per
17	Is Your Proposed Wastewater Project Too Costly?: Options for Small	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/95aed72a1bce3c2285256b0600723e20!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/95aed72a1bce3c2285256b0600723e20!OpenDocument</a>	PDF File	EPA# 832R84106	9	5/1/1984	Free	EPA	This document discusses wastewater management alternatives for small communities faced with high costs.
18	Analysis of Operations and Maintenance Costs for Municipal Wastewater Treatment Systems	Financial	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/df51ec8395b62f0085256b06007230e8!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/df51ec8395b62f0085256b06007230e8!OpenDocument</a>	PDF File	EPA# 430977015	282	5/1/1978	Free	EPA	The purpose of this report is to present the results and analyses of the most comprehensive survey made to date on the operations and maintenance (O&M) costs of the Nation's municipal wastewater treatment plants and collection systems. The results have been derived from actual plant operating records across the continental United States. Costs are presented for different levels of wastewater treatment, types of plants and collection systems, and segregated cost categories. A number of analyses are also presented as relative costs for certain treatment variables and characteristics. The cost data utilized in the study range from fourth quarter 1972 to first quarter 1977. All costs have been adjusted to third quarter 1977 dollars. Only treatment plants of 1.0 million gallons per day (mgd) capacity or larger were sampled in this survey. The analyses in this study were performed with the assistance of a computer statistical package.
19	Assessing Utility Practices with the Strategic Asset Management GAP Analysis Tool (SAM GAP)	General Asset Management	<a href="http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=SAM2R06COa">http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=SAM2R06COa</a>	Web Site	SAM2R06COa	12	1/1/2010	Free for Members	WERF	The Strategic Asset Management (SAM) gap analysis tool is an online, self-assessment process that allows an organization to rapidly measure their performance against data from over 170 of the world's best asset management practitioners. This report presents an overview of the development and structure of the SAM GAP tool and summarizes 37 utility self assessments using the SAM GAP tool in a benchmarking research project.

#	Title	Category	Link	Media Type	ISBN	# Pages	Date Published	Cost	Publisher	More details
20	Implementing Asset Management: A Practical Guide	General Asset Management	<a href="https://www.ewef.org/OnlineStore/ProductDetail/tabid/55/ProductId/4130/Subsystem/INV/ProductCode/P07011/Default.aspx">https://www.ewef.org/OnlineStore/ProductDetail/tabid/55/ProductId/4130/Subsystem/INV/ProductCode/P07011/Default.aspx</a>	Book	IN10SG09caww	76	6/29/2007	\$150 for Members	AMWA, NACWA, WEF	Implementing Asset Management: A Practical Guide provides utility professionals a step-by-step guide to continued improvement in the management of their infrastructure assets. The concepts and processes presented are applicable to utilities of all sizes. Depending on the availability of resources, utilities can address their infrastructure assets at a broad, system-wide level by grouping assets or drill-down to individual assets components and elements.
21	Virtual Water Treatment Plant Tour [CD-ROM]	General Asset Management	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/067bfd5f59e06a1b85257176004fb94c!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/067bfd5f59e06a1b85257176004fb94c!OpenDocument</a>	CD ROM / Software	EPA# 816C06002	N/A	2/1/2006	Free	EPA	Your public water system is the first line of defense against waterborne disease. View step-by-step how water is treated and delivered to your home or business as water that is safe to drink. Your drinking water is inexpensive compared to other household costs. Learn why it is important to keep the environment clean and find out what you can do to protect our nation's sources of drinking water. Fun facts and classroom activities are also featured
22	Finding a Pathway for Sustainable Water and Wastewater Service	General Asset Management	<a href="http://www.google.com/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0CCQQFjAA&amp;url=http%3A%2F%2Fwater.epa.gov%2Faboutow%2Fowm%2Fupload%2F2008_08_14_assetmanages_allbee-presentation.pdf&amp;ei=1LDnUv6xKJHMsQTL64CQDg&amp;usq=AFQjCNFHVEFncJ9QyVarsdEQhpOwwW">http://www.google.com/url?sa=t&amp;rct=j&amp;q=&amp;esrc=s&amp;source=web&amp;cd=1&amp;ved=0CCQQFjAA&amp;url=http%3A%2F%2Fwater.epa.gov%2Faboutow%2Fowm%2Fupload%2F2008_08_14_assetmanages_allbee-presentation.pdf&amp;ei=1LDnUv6xKJHMsQTL64CQDg&amp;usq=AFQjCNFHVEFncJ9QyVarsdEQhpOwwW</a>	PDF File		6	12/1/2005	Free	EPA	Underground Infrastructure Management
23	Decision Support Systems for Wastewater Facilities Management	General Asset Management		PDF File	00-CTS-7	66	1/1/2005	Free for Members	WERF	-----
24	Asset Management: A Handbook for Small Water Systems - One of the Simple Tools for Effective Performance (STEP) Guide Series	General Asset Management	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/a99f1dd1e776852785256d5800482844!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/a99f1dd1e776852785256d5800482844!OpenDocument</a>	PDF File	EPA# 816R03016	50	9/1/2003	Free	EPA	This guide presents basic concepts of asset management and provides the tools to develop an asset management plan.
25	Liquid Assets: A Summertime Perspective on the Importance of Clean Water to the Nation's	General Asset Management	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/645b3c7e46cc524285256d83004fd866!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/645b3c7e46cc524285256d83004fd866!OpenDocument</a>	Web Site	EPA# 800R96002	32	5/1/1996	Free	EPA	This report reviews the importance of clean water to a healthy economy. Recreational waters and the concomitant tourist spending, as well as agriculture, commercial fishing, real estate and manufacturing are considered.
26	Decision-Makers Guide in Wastewater/Drinking Water Management	General Asset Management	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/065ca07e299b464685256ce50075c11a/9041537af78054f685256b06007233a6!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/065ca07e299b464685256ce50075c11a/9041537af78054f685256b06007233a6!OpenDocument</a>	PDF File	EPA# N/A	46	1/1/1991	Free	EPA	This handbook will aid local decision-makers in addressing, in an informal and competent manner, an effective, coordinated approach to the development and implementation of an infrastructure for rural areas and small communities. The important topics addressed in this handbook include methods for determining the best system for a community's money and needs, and strategies for increasing a public service district or community's financial base as it pertains to water/wastewater facilities. This handbook will aid communities in identifying proactive management techniques, and provide a protocol for choosing the correct agencies to contact for expertise and funding. Small rural communities will find information for self-help programs contained in the handbook.
27	Wastewater Management Handbook for Local Representatives - Second Addition (Chapter 2: Asset Management and Sustainability)	General Asset Management	<a href="http://www.nywea.org/images/temp/Wastewaterhandbook013013.pdf">http://www.nywea.org/images/temp/Wastewaterhandbook013013.pdf</a>	PDF File		21	7/5/1905	Free	NYWEA	This chapter introduces the concepts of asset management and reviews all of the components and elements important in implementing an asset management program.
28	International Infrastructure Management Manual 2011 Edition	General Asset Management	<a href="http://www.nams.org.nz/pages/273/international-infrastructure-management-manual-2011-edition.htm">http://www.nams.org.nz/pages/273/international-infrastructure-management-manual-2011-edition.htm</a>	Book				~\$450	NAMS	NAMS and its international partners are committed to updating the IIMM (typically every 5 years) to ensure it continues to lead the international asset management industry.

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29	ISO55000/55001/55002	General Asset Management	<a href="http://www.assetmanagementstandards.com/">http://www.assetmanagementstandards.com/</a>	Book/PDF				~\$300	BSI	ISO 55000 provides an overview of the subject of asset management and the standard terms and definitions to be used. ISO 55001 is the requirements specification for an integrated, effective management system for asset management. ISO 55002 provides guidance for the implementation of such a
30	EPA Check up Program for Small Systems	General Asset Management	<a href="http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/">http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/</a>	CD ROM / Software				Free	EPA	CUPSS is a free, easy-to-use, asset management tool for small drinking water and wastewater utilities. CUPSS provides a simple, comprehensive approach based on EPA's highly successful Simple Tools for Effective Performance (STEP) Guide series. Use CUPSS to help you develop
31	Asset Management Guidance and Best Practices	General Asset Management	<a href="http://www.nj.gov/dep/watersupply/pdf/guidance-amp.pdf">http://www.nj.gov/dep/watersupply/pdf/guidance-amp.pdf</a>	PDF File				Free	NJDEP	A guidance document that that summarizes the elements of an asset management strategy that will meet applicable regulatory requirements and promote more responsible investment and rehabilitation of New Jersey's drinking water and wastewater system infrastructure.
32	Liquid Assets Documentary	General Asset Management	<a href="http://liquidassets.psu.edu/index.html#overview">http://liquidassets.psu.edu/index.html#overview</a>	Video				\$24.95	PSU	Liquid Assets is a public media and outreach initiative that seeks to inform the nation about the critical role that our water infrastructure plays in protecting public health and promoting economic prosperity.
33	Sustainable Infrastructure Management Program Learning Environment (SIMPLE)	General Asset Management	<a href="http://simple.werf.org/home">http://simple.werf.org/home</a>	Web Site				Free for Members	WERF	This web-based knowledge management tool assists wastewater treatment facilities in developing a proper life-cycle asset management system. By gathering asset management best practices and processes from around the world, SIMPLE offers users a look at state-of-the-art asset management programs and provides the tools they need to begin a program of their own. Users will learn how to determine the most cost-effective investments -acquisition, maintenance, renewal - in their facilities asset portfolio. Moreover, SIMPLE lets users learn how to extend the life of existing assets by implementing optimal maintenance practices and rehabilitation interventions, ultimately improving operational efficiency and reducing operational costs.
34	Maryland Center for Environmental Training Asset Management Website	General Asset Management	<a href="http://www.mcet.org/am/assetmgmt.html">http://www.mcet.org/am/assetmgmt.html</a>	Web Site				Free	MCET	Useful website with resources, training presentations, free software for implementing asset management.
35	EPA Advanced Asset Management Training Workshops	General Asset Management	<a href="http://water.epa.gov/infrastructure/sustain/am_training.cfm">http://water.epa.gov/infrastructure/sustain/am_training.cfm</a>	Web Site				Free	EPA	The EPA Office of Water has worked in collaboration with partner organizations to hosts and co-sponsor training sessions on best practices in asset management
36	Maintenance Management Systems for Municipal Wastewater Facilities	Maintenance Management	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/f39048760f854b3e85256b0600723ebe!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/f39048760f854b3e85256b0600723ebe!OpenDocument</a>	PDF File	EPA# 430974004	123	10/1/1973	Free	EPA	The basic information for the manual came from individuals experienced in maintenance management systems at facilities of many different types and sizes. A wide range of existing maintenance management systems--for municipal wastewater treatment facilities, industry, and the Department of Defense--were also reviewed. The manual includes recommendations covering each of the basic elements required to develop an effective maintenance management system. These are not intended to be rigidly applied, but should be tailored to specific equipment and plant types. The procedures are comprehensive and complete and will aid the development of effective systems
37	Critical Assessment of Stormwater Treatment and Control Issues	Risk Assessment	<a href="http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=02-SW-1">http://www.werf.org/a/ka/Search/ResearchProfile.aspx?ReportId=02-SW-1</a>	PDF File	02-SW-1	290+452	10/26/2005	Free for Members	WERF	This guidance document attempts to offer assistance to stormwater managers in cities and other public agencies, and the consultants who serve them on choosing, sizing, and design of urban runoff controls as a function of mitigation goals, site-specific needs, and regional and local characteristics. It does not attempt to be a stand-alone design manual; rather it is intended to provide a thorough background on the theory and state-of-the-practice of stormwater management supported by methods, equations, and references useful for making sound stormwater management decisions.

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38	Emergency Response Tabletop Exercises for Drinking Water and Wastewater Systems [CD-ROM]	Risk Assessment	<a href="http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/9963da7b59b4cbc985256fbe004a7ecd!OpenDocument">http://yosemite.epa.gov/water/owrcCatalog.nsf/e673c95b11602f2385256ae1007279fe/9963da7b59b4cbc985256fbe004a7ecd!OpenDocument</a>	CD ROM / Software	EPA# 817C05001	N/A	1/1/2005	Free	EPA	This CD contains exercises to help train water and wastewater utility workers in preparing and carrying-out emergency response plans. The 12 unique exercises can help strengthen relationships between a water supplier and their emergency response team and users can adapt the materials for their own needs. Trainers or users can select the threat warning from the eight basic types described in the Response Protocol Toolbox and choose from five basic event types: intentional contamination, security breach, cyber security, physical attack, and interdependency.