Reference Guide for Asset Management Tools

Asset Management Plan Components and Implementation Tools for Small and Medium Sized Drinking Water and Wastewater Systems

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EPA

ACKNOWLEDGEMENTS

DISCLAIMER

This document is not intended to be a regulation; recommendations contained within this guide are not legally binding. Any changes in implementation of state programs are purely voluntary and must comply with legally binding requirements.

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WHAT IS ASSET MANAGEMENT?

Asset management is the practice of managing infrastructure capital assets to minimize the total cost of owning and operating them, while delivering the service level customers desire. Asset management is a framework widely adopted by the water sector as a means to pursue and achieve sustainable infrastructure. Asset management can open communications between drinking water system staff and decision makers, help move systems from crisis management to informed decision making, facilitate more efficient and focused system operations and improve financial management to make the best use of systems' limited resources. An asset management plan serves as a tool to record all of a system's asset management practices and strategies.

Systems implementing asset management develop detailed asset inventories, perform operation and maintenance tasks, conduct long-range financial planning and undertake other activities to build system capacity, all of which help move systems along the path to long-term sustainability. Asset management can have numerous benefits to a system, including, but not limited to prolonging asset life, meeting customer demands, identifying sustainable rates, institutionalizing budget planning, meeting regulatory requirements, and improving emergency response times and methods.

Table 1 provides acronyms frequently used within this document to discuss drinking water systems and asset management.

TABLE 1. ASSET MANAGEMENT ACRONYMS

ACRONYM	TERM
CIP	Capital Improvement Plan
DWSRF	Drinking Water State Revolving Fund
ETT	Enforcement Targeting Tool
EUM	Effective Utility Management
LOS	Level of Service
O&M	Operation and Maintenance
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
TMF	Technical, Managerial and Financial
WARN	Water and Wastewater Agency Response Network

ASSET MANAGEMENT CONNECTION TO OTHER DRINKING WATER PROGRAMS AND INITIATIVES

Pursuing and achieving sustainable water infrastructure through asset management practices aligns with many other EPA drinking water programs and initiatives, including the following:

- **Capacity Development Program**. The asset management process can result in a long-term plan that supports the operation and management (O&M) of systems and the services they provide, thereby enhancing their overall technical, managerial and financial (TMF) capacity. Asset management is a scalable approach that can be implemented by, and build the capacity of, systems of any size, including small systems. Benefits for this program include a decreased need for direct technical assistance, improved compliance, and better prepared and positioned to respond to emerging challenges.

- **Operator Certification Program**. Asset Management can be applied to all classes of systems. For systems to properly implement an asset management program, it is first important for staff to be knowledgeable about the system and its operations. Systems may achieve this first step by ensuring their operators receive proper certification or re-certification through their state's operator certification program. Certified operators may be more likely to implement a robust asset management program focusing on proper operation, proactive maintenance, and repair of assets. By implementing an asset management program, systems can share information with management, boards, and other decision makers about system operations.
- **Drinking Water State Revolving Fund (DWSRF)**. The DWSRF makes funds available to drinking water systems to finance infrastructure improvements. Systems performing asset management will be well-positioned to understand and justify their short- and long-term capital needs, and the DWSRF program is available to help fund these systems' efficient and cost-effective projects. As a result of the asset management process, systems will have strong TMF capacity and thereby will be better able to effectively manage DWSRF funds.
- **EPA Clean Water and Drinking Water Infrastructure Sustainability Policy**. This policy emphasizes the need to build on existing efforts to promote sustainable water infrastructure, including working with states and water systems to employ robust, comprehensive planning processes to deliver projects that are cost-effective over their lifecycles, resource efficient and consistent with community sustainability goals. The policy is consistent with the goals of asset management.
- **Effective Utility Management (EUM)**. EUM is a self-evaluation process that uses a series of 10 attributes to explain the focus and goals of effectively managed systems. EUM can help systems to enhance the stewardship of their infrastructure, improve per-formance in critical areas, and respond to current and future challenges. As part of the EUM process, systems have access to both a self-assessment tool and an associated resource toolbox that can assist the utilities with improving upon key areas identified through the self-assessment. The goals of the EUM assessment process can be achieved through completion of the asset management plan components presented in this guide. The corresponding EUM attributes for each plan component are described in Sections 1 and 2.

> **What is Effective Utility Management?**
>
> In 2008, six national water and wastewater associations collaborated with EPA to develop the EUM concept. EUM identifies "ten attributes of effectively managed water sector utilities."
>
> 1. Product Quality
> 2. Customer Satisfaction
> 3. Employee and Leadership Development
> 4. Operational Optimization
> 5. Financial Viability
> 6. Infrastructure Stability
> 7. Operational Resiliency
> 8. Community Sustainability
> 9. Water Resource Adequacy
> 10. Stakeholder Understanding and Support
>
> The presence of these attributes indicates a well-run, highly productive, sustainable utility. For more information about EUM, visit:
> http://www.waterEUM.org.

DOCUMENT PURPOSE

The *Reference Guide for Asset Management Tools* is designed for state staff and technical assistance providers who are assisting small- and medium-sized drinking water or wastewater systems in identifying resources that can be used to implement asset management practices. This guide also provides a framework to assist systems in all aspects of developing and implementing an asset management plan. Users of the guide should take into consideration each system's unique characteristics (e.g., size and technical capabilities) and progress in implementing asset management (e.g., new to the process or fine-tuning their strategy) when recommending tools or suggesting revisions to the plan, as applicable. This guide can also be used by water systems interested in learning about the components of an asset management plan and associated implementation tools that can be used in implementing specific asset management practices.

How To Use This Document

This guide is organized according to the various asset management plan components.

- *Section 1: Components of an Asset Management Plan* describes the nine components that **should** be included in every asset management plan to maximize the effectiveness of asset management implementation.
- *Section 2: Additional Components of an Asset Management Plan* describes five additional components that **could** be included to enhance and improve an asset management plan.
- *Asset Management Plan Updates* describes when systems should revisit and update the components of their asset management plan.
- *Appendix A* provides additional details about the tools included in the guide and indicate the asset management plan component(s) for which the tools can be useful. In addition, the Appendix A provides links to useful asset management websites that may help states or systems in the development of an asset management plan.

The discussion of each component includes: a brief description of the component; a list of implementation tools that can be used to implement that particular asset management component; and a description of corresponding EUM attribute(s). **In this document, the term "tool" refers to any resource that may guide or aid systems while developing their asset management plan** including, but not limited to, software, guidance manuals, handbooks, websites, spreadsheets and more. Three general types of tools are used in this document and are denoted using an icon each time the tool appears, as described in Table 2.

Components:
1. Introduction
2. Staff Information
3. Level of Service
4. Asset Inventory
5. Operation and Maintenance
6. Capital Improvements
7. Financial Strategy
8. Compliance
9. Preparedness

Additional Components:
1. Other Sustainable Practices
   a. Energy Management
   b. Water Efficiency
   c. Climate Change
2. Regional Planning
3. Multi-Sector Asset Management

TABLE 2. TOOL ICONS USED IN THIS GUIDE

TOOL ICON	MEANING
	Microsoft Excel-based Tools
	Manual and Guidance Tools
	Programmatic Tools (e.g., software, websites, campaigns, templates)

SECTION 1: COMPONENTS OF AN ASSET MANAGEMENT PLAN

Based on input from the EPA/State Asset Management Workgroup, EPA has identified the following components of an asset management plan:

Introduction

Component Description

The *Introduction* component should provide the reader the necessary context for the asset management plan (e.g., system overview) and help explain the system's goals.

This component of the asset management plan should:

- ✓ Identify the purpose(s) of the plan.
- ✓ Present the system's strategic plan and mission statement, which define the goals of the system and frame the level of service discussion.
- ✓ Provide a general overview of the system and its facilities, including general system design, water usage, population served (current and projected), water sources, etc.
- ✓ Broadly explain how the system approaches asset management, such as a brief description of tools used for implementation of specific practices.

Implementation Tools

EPA, *Asset Management: A Best Practices Guide*
- ▪ The **Challenges Faced by Water Systems/Benefits of Asset Management** Table explains how asset management can help systems overcome many challenges to operating a water system and can help systems to identify the purpose and goals of their plan.
- ▪ **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000LP0.txt

EPA, *Asset Management: A Handbook for Small Water Systems*
- ▪ The **How Can Asset Management Help Me?** Section, as well as the **How Does Asset Management Relate to Strategic Planning?** Section explains the benefits of implementing an asset management plan for a small water system.
- ▪ The **What is the Asset Management Process?** Section describes the 5 main steps to an Asset management plan.
- ▪ **Visit:** https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U7T2.txt

EPA, *Strategic Planning: A Handbook for Small Water Systems*
- ▪ **Step 1: Developing a Strategic Roadmap** includes a **Defining Your Ideal, Goals, and Values Worksheet** that provides examples of ideals, goals and values for systems to use in developing a strategic roadmap.
- ▪ **Step 2: Defining Your Area of Service** guides systems to begin to define their area of service. **The Current and Future Areas of Service Workshop** helps systems outline their service area(s) and provides space for systems to define their current and future roles.
- ▪ **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000JTPU.txt

Introduction

EPA, *Successfully Protecting Your Investment in Drinking Water Infrastructure: Best Practices from Communities and Local Experts*
- The **Getting Started** section contains resources and tips for designing and implementing your own asset management program.
- **Visit:** https://www.epa.gov/sites/production/files/2017-07/documents/asset_management_fact_sheets_20170602.pdf

West Virginia, Asset Management Webpage
- The **Mission Statement Example** highlights a series of examples to help systems develop a mission statement.
- The **Level of Service Goals Guidance** workbook guides on what to consider as you develop your LOS Goals including actions to consider and method of tracking and measuring.
- The **Advance Asset Management Guidance Workbook** gives an overview of the benefits of each aspects of an asset management plan including your mission statement and level of service goals.
- **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Staff Information

Component Description

The *Staff Information* component describes the system's staffing structure and asset management team. Developing this component can help the system evaluate whether staff roles and responsibilities are appropriate and adequate. This component also addresses the system's approach to stakeholder education and outreach.

Clearly defining staff responsibilities helps team members understand their individual roles in the proper implementation of an asset management plan and helps outside stakeholders understand how the system is managing its asset management program.

This component should:

- ✓ Identify the asset management team, including system staff and any non-system members such as technical assistance providers, state or EPA staff or outside consultants.
- ✓ Provide the names, titles and responsibilities of the:
    - System's management.
    - Owner(s).
    - Decision-making body (such as board members).
    - Operators (including level of certification).
    - Other system staff (such as engineers or planners).
- ✓ Provide an organizational chart that shows the system's chain of command or reference another document in which an organizational chart can be found.
- ✓ Reference any internal coordination efforts, such as standing committees comprising board members and system staff.
- ✓ Describe knowledge management techniques employed at the system.
- ✓ Describe education and outreach efforts, such as methods for communicating with system stakeholders and decision makers.
- ✓ Include a discussion of succession planning and any activities to ensure the retention of institutional knowledge at the system.

Implementation Tools

EPA, *Asset Management for Local Officials*
- ▪ The **Key Role for Local Officials: Building Community Support Section** of this fact sheet describes the unique position of local officials in helping PWSs overcome barriers in asset management plan implementation.
- ▪ **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000LTX.txt

EPA, *Building an Asset Management Team*
- ▪ The **Components of a Successful Asset Management Team Section** provides systems with a description of the roles and necessary knowledge base of key asset management team members and other stakeholders.
- ▪ **Visit**: https://nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=P1000LTZ.txt

EPA, *Talking to Your Decision Makers: A Best Practices Guide*
- ▪ The **General Responsibilities of Decision Makers Table** describes financial, managerial and communication roles.

- The **Communicating Effectively with Decision Makers Table** provides information on how staff can speak to decision makers.
- **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZB6.txt

EPA, *Water System Operator Roles and Responsibilities: A Best Practices Guide*
- Roles and responsibilities of a water system operator are described for **System Operations.**
- **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZBE.TXT

EPA, *Water System Owner Roles and Responsibilities: A Best Practices Guide*
- Roles and responsibilities of a water system owner are described for **System Operations**.
- **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZBC.TXT

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*
- **Chapter 9: The Human Aspect of Asset Management** discusses communication-related topics, such as training, leadership and community involvement.
  - **Section 9.3: Knowledge Management** explains the importance of knowledge management and its role in asset management.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

New England Water Works Association, *The Drinking Water Workforce Crisis on the Horizon: What Can Be Done to Recruit and Develop Future Operators and Who Can Do It?*
- The **What Can Utilities Do as Stakeholders** and **What Can Public Officials and Community Water System Owners Do as Stakeholders** sections describe the role of systems in recruiting and identifying future operators to facilitate the system's succession planning and ensure retention of institutional knowledge at the system.
- **Visit:** https://capcertconnections.files.wordpress.com/2014/01/dw-workforce-flyer-final-6-30-11.pdf

New York and New York Rural Water, Small System Template for Standard Operating Procedures
- The Standard Operating Procedure forms include template lists for personnel **Contact Information** including: name, primary phone number, emergency phone number and e-mail.
- **Visit:** https://nyruralwater.org/sites/all/themes/nywater/pdf/SOPFormsforSmallSystemsvJuly2009.pdf

Washington, *Small Water System Management Program Guide*
- **Chapter 1.1, Management Structure and the Governing Board**, helps systems document their management and ownership structure.

Staff Information

- Visit: http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- In the **Advance Asset Management Guidance Workbook**, the **AM Team and Mission** worksheet provides example titles, roles and responsibilities, schedule, and utilities mission statement.
- Visit: http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Employee and Leadership Development Attribute:
- Toolbox resources include team-building training, workforce checklist and succession management handbook.

Stakeholder Understanding and Support Attribute:
- Toolbox resources include management manuals, a media guide and a public outreach toolkit.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Level of Service

How a system operates and manages its assets to meet customer expectations is called its *Level of Service (LOS)*. LOS determines the amount of funding and time required to maintain, renew and upgrade water system infrastructure. Changes to the LOS will have an impact on funding requirements and staffing.

This component should describe:

✓ Measurable internal goals, which define system operations and performance.
✓ Measurable external goals, which directly impact customers.
✓ How the system's performance toward its LOS goals is communicated to the customers, including the methods and frequency of communication.
✓ How the system receives information from customers regarding the satisfaction with the LOS and the LOS goals.

This information may be taken directly from the system's existing LOS Agreement (i.e., a document outlining the system's LOS goals), or may be developed specifically for the asset management plan.

The LOS component can discuss any goals the system and customers decide are relevant and important, as long as all regulatory requirements are met. The system should communicate progress made towards meeting the external LOS goals to the public on at least an annual basis. This information can be conveyed to customers through the annual Consumer Confidence Report (CCR) or through public webpages.

EPA, *Lean and Water Toolkit: Achieving Process Excellence Through Water Efficiency*
- **Chapter 5: Lean and Water Beyond the Factory Floor** includes a discussion on **Engaging with the Community**, which explains that engaging proactively with the community on water conservation can be an effective way to mitigate water-related business risks.
- **Visit**: https://www.epa.gov/sustainability/lean-water-toolkit-contents-and-acknowledgements

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*
- **Chapter 4: Level of Service** discusses developing a LOS Agreement, balancing LOS and cost, measuring and adjusting the LOS Agreement, energy efficiency and LOS and communicating the LOS Agreement.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

San Diego Public Utilities Department, Customer Satisfaction Survey
- After reviewing the questions, format and information collected via San Diego's **online survey**, systems can design their own customer satisfaction survey. Questions and formats can be adapted from the example, with modifications or additional questions to make the survey most useful for the system and its LOS goals.
- **Visit:** https://www.sandiego.gov/public-utilities/sustainability/water-conservation/water-survey

Level of Service

Washington, *Small Water System Management Program Guide*
- **Chapter 1.3**, **Service Policies**, helps systems document their policies on water rate structure and fees, system improvement funding and existing/new customer responsibilities.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/ WaterSystemDesignandPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- The **Level of Service Goals Guidance** workbook guides on what to consider as you develop your LOS Goals including actions to consider and method of tracking and measuring.
- The **Advance Asset Management Guidance Workbook** includes the **Developing Performance Target** which shows overarching goals for each service area category and the actions to consider to reach those goals. Also included is the **LOS Goals Worksheet,** which used to identify at LOS goals from each service area. Systems are encouraged to develop goals that are Specific, Measurable, Attainable, Realistic and Time Based (SMART).
- **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Product Quality Attribute:
- Toolbox resources include guidance on water quality and service assessments and a water treatment handbook.

Customer Satisfaction Attribute:
- Toolbox resources include: a study on communicating water rates, a customer relations best practices guide and a publication for water system customer service representatives.

Stakeholder Understanding and Support Attribute:
- Toolbox resources include management manuals, a media guide and a public outreach toolkit.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Asset Inventory

An *asset inventory* is a critical underlying component of all the other aspects of a system's asset management plan. As such, it is crucial for systems to have an inventoried list or survey of all system assets (e.g., source, treatment, transmission and distribution infrastructure). Along with the asset inventory, the system should provide service area and facility maps.

This component should include each asset's:

- ✓ Age.
- ✓ Location.
- ✓ Condition.
- ✓ Criticality.
- ✓ Probability of failure.
- ✓ Consequence of failure.
- ✓ Remaining useful life.

The inventory should recognize natural asset groupings. For example, assets related to source, treatment or distribution should be grouped together.

To develop this component, systems should:

- ✓ Review service area and facility maps, Geographic Information System (GIS) databases and other databases (if available), sanitary surveys and facility plans and manuals.
- ✓ Perform visual inspections of the system facilities and service area.
- ✓ Conduct discussions with system management and staff with current or historical knowledge of system assets.
- ✓ Determine the criticality of each asset. The system may want to use a risk matrix to plot the probability of failure versus the consequence of failure.

Systems may also find it useful to include photographs of their assets to further document location and condition data. In addition, documenting latitude and longitude data of each asset will aid in creating GIS maps; GIS maps can serve as a useful tool to inventory system assets.

EPA Region 1, Asset Management and Debt Capacity Tool
- ▪ The **Asset Management Worksheet** can help systems to develop an asset inventory including determining asset age, condition and importance. This information can help a system to prioritize asset repair and maintenance.
- ▪ The **Debt Capacity Worksheet** is used to track general financial data for assets.
- ▪ **Visit:** https://swefcamswitchboard.unm.edu/am/product/asset-management-and-debt-capacity-tool/

EPA, *Asset Management: A Handbook for Small Water Systems*
- ▪ **Step #1: How Do I Inventory My Assets?** provides a worksheet to help systems develop an asset inventory and keep track of information such as an asset's condition and remaining useful life.
- ▪ **Step #2:** How Do I Prioritize My Assets? provides a worksheet that helps rank assets based on their remaining useful life, importance, and redundancy. This allows systems to decide on how to fund the necessary rehabilitations and/or replacements.
- ▪ **Visit:** https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U7T2.txt

Asset Inventory

EPA, *Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water Systems*

- The **How Long Will It Last? Using the Typical Life Expectancies Table Section** provides systems with typical life expectancy of various assets. Associated worksheets help systems to calculate the remaining useful life of each asset based on its adjusted useful life and estimated age. Both completed examples and template worksheets are available for drinking water sources, intake structures, treatment systems, tanks, distribution systems, valves, electrical systems, buildings, service lines and hydrants.
- The **Prioritization Table** helps systems to use the information on the asset worksheets to determine the criticality of their assets. The **Prioritizing Your Assets Worksheet** can be used to prioritize assets. A completed example is provided.
- **Visit:** https://www.epa.gov/sites/production/files/2015-04/documents/epa816k03002.pdf

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*

- **Chapter 3: Current State of the Assets** discusses how to develop an asset inventory by determining asset location, conducting condition assessments, calculating asset value and remaining life and evaluating asset energy use. This chapter also includes information on the importance of updating and maintaining the asset inventory and the use of work order systems.
- **Chapter 5: Critical Assets** explains how to determine asset criticality using a risk-based process (i.e., consequence of failure versus the probability of failure) and discusses criticality related to energy use (i.e., feasibility of addressing energy usage versus energy usage ranking). This chapter also discusses performing criticality analyses over time.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

Michigan, Asset Management Workbook

- The **Asset Inventory Worksheet** is used to record asset information and organize assets by asset groupings (e.g., source, treatment and storage/distribution).
- **Contact:** Bob Schneider, Michigan Department of Environment Quality (SCHNEIDERR@michigan.gov, 517-388-6466)

Pennsylvania, Asset Management Tool

- The **Asset Entry Worksheet** is used to record system assets, year the assets were installed, estimated rehabilitation or replacement year and estimated future rehabilitation or renewal costs. The asset cost information from the inventory sheet automatically generates a financial forecast.
- **Visit:** https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/AssetManagement.aspx

Asset Inventory

Washington, *Small Water System Management Program Guide*
- **Chapter 2.4**, **Component Inventory and Assessment**, helps systems create an inventory of system components, separate them into short-lived and long-lived assets and determine each component's remaining useful life.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesign andPlanning/SmallWaterSystemMgmt.aspx

Water Research Foundation, Pipe Risk Screening Tool
- Pipe inventory information entered on the **DataBase and DataEntry Worksheets** can be used to calculate a likelihood of pipe failure and the consequences of those failures.
- The **Results Worksheet** can be used to create a table of selected pipes, which can be saved for future reference, such as during capital improvement planning.
- **Visit:** https://www.waterrf.org/resource/pipe-risk-screening-tool

Water Environment Research Foundation and Water Research Foundation, Sustainable Infrastructure Management Program Learning Environment (SIMPLE)
- The **Asset Management for Small Utilities Section** of this website walks through five key asset management steps, including: developing an asset inventory, prioritizing assets, planning for the future, carrying out the plan and next steps.
- **Visit:** https://www.waterrf.org/resource/sustainable-infrastructure-management-program-learning-environment-simple-foundation

West Virginia, Asset Management Webpage
- The **Assets-O&M LCC Guidance** workbook provides guidance on how to create and complete asset registry and useful life estimates.
- The **Advanced Life Cycle Costs Tool** is an excel spreadsheet that is used to track critical assets and provide recommendations for action and associated costs. The tool can calculate total planned and unscheduled O&M and track the costs and expected useful life of assets over a ten year period.
- The **Advance Asset Management Guidance Workbook** includes worksheets to help organize, assess and rank critical assets.
- **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Infrastructure Stability Attribute:
- Toolbox resources include a report on the costs of infrastructure failure, guidance on asset maintenance and information on asset inventories for small systems.

Product Quality Attribute:
- Toolbox resources include a public works management practices manual and a publication on infrastructure management.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Operation and Maintenance

Component Description

The proper *operation and maintenance (O&M)* of a system's assets are necessary elements of an effective asset management program. Proper use and service of assets are important to the long-term viability of a water system. The strategy for O&M varies based on each asset's criticality, condition and operating history. A system should maintain a record of each asset's maintenance history, needs and costs.

This component should discuss the system's operational activities (i.e., the basic activities necessary to keep a water system running) and maintenance activities (i.e., activities that help keep an asset in good working order). These include:

- ✓ Standard operating procedures.
- ✓ Alternate operating procedures.
- ✓ Emergency operating procedures.
- ✓ Routine maintenance.
- ✓ Preventive maintenance.
- ✓ Emergency/reactive maintenance.
- ✓ Deferred maintenance.

The plan does not need to include all of the information contained within the system's O&M manual, but should reference specific aspects as needed.

Implementation Tools

EPA, *Preventive Maintenance Card File for Small Public Water Systems Using Ground Water Log Cards*
- These **log cards and guidance booklet** provide a schedule of daily, weekly and monthly tasks for routine operation and maintenance tasks for small drinking water systems with a ground water source.
- **Electronic Preventative Maintenance Logs** include interactive pdf files to help operators of small ground water systems record and plan regular maintenance duties. This file set contains fillable pdf logs for each month, which includes common daily, weekly, and monthly tasks performed by water system operators, as well as a suggested schedule of annual tasks.
- **Visit:** https://www.epa.gov/dwcapacity/resources-small-public-water-system-operators

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*
- **Chapter 6: Life-Cycle Costing**, **Section 6.3: Operation and Maintenance Costs**, discusses operation procedures and types of maintenance, as well as information on asset failure and criticality with respect to O&M.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

Missouri Rural Water Association, Water Tools
- The **Well Water Loss Tracking Tools** helps calculate water loss based on the hole in pipe, and the circular and rectangular break around the pipe.
- The **Disinfection Formula Calculator** is useful for pipes, tanks, and well castings.
- The **Wastewater Infiltration Calculator** helps calculate total amount of inflow and infiltration in circular holes, circular and rectangular breaks.

Operation and Maintenance

- The Water Tools webpage also includes **Special Calculators** for Monthly and Annual Water Loss, Percent Efficiency Calculator, Hydrant or Pipe Flush Flow, Well Drawdown and Specific Capacity, Solution Strength Mix, and NPDES Permit Design Flow Exceedance.
- **Visit:** https://moruralwater.org/water-tools/

Washington, *Small Water System Management Program Guide*
- Chapter **2.2**, **Operations and Maintenance Program** helps systems identify the operating parameters and maintenance duties to maintain effective operations and compliance with drinking water regulations.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesign andPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- The **Assets-O&M LCC Guidance** workbook provides an example of an O&M Activity worksheet based off of an asset registry.
- The **Advanced Life Cycle Costs Tool** is an excel spreadsheet that is used to track critical assets and provide recommendations for action and associated costs. The tool can calculate total planned and unscheduled O&M and track the costs and expected useful life of assets over a ten year period.
- The **Advance Asset Management Guidance Workbook** includes an overview of all various tracking methods in the **O&M Summary** section. An example of a task list of O&M activities can be found in the **My O&M List** section.
- **Visit**: http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Operational Optimization Attribute:
- Toolbox resources include operation manuals and performance indicators.

Operational Resiliency Attribute:
- Toolbox resources include guides on security threats and health and safety.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Capital Improvements

Component Description

Capital improvement planning determines a system's short- and long-term asset rehabilitation and replacement projections, based on the asset inventory and O&M data.

For the Capital Improvements component, the asset management plan should describe the following:

- ✓ Future capital projects (and anticipated associated expenditures) for plans to add new assets to the system that upgrade or improve existing capacity.
- ✓ Renewal projects (and associated expenditures) for plans to restore an existing asset to its original capacity, without increasing an asset's design capacity.

The asset management plan should include all projects within a minimum 5-year timeframe. However, a 20-year timeframe is preferred to accurately assess and plan for improvements. Reference to capital improvements beyond 20 years also should be included with a discussion of long-term financial planning.

If a system has already developed a Capital Improvement Plan (CIP), the asset management plan can reference it, specifically the timing and cost of the rehabilitations and replacements. Because the expected needs of the system will change, the CIP projects listed in the asset management plan should be updated as necessary to reflect those changes.

Implementation Tools

EPA, *Asset Management: A Handbook for Small Water Systems*
- The **Required Reserve Worksheet** guides a system to evaluate the prioritized assets to calculate the amount of money needed to be set aside every year in order to pay for the rehabilitation and replacements of their assets in.
- **Visit:** https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U7T2.txt

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*
- **Chapter 6: Life-Cycle Costing**, **Section 6.6: Capital Improvement Planning** discusses capital planning and validation of capital projects to ensure that they are necessary.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

Michigan, Asset Management Workbook
- Capital **Improvements Worksheet** is used to evaluate CIP projects by considering timeframe (e.g., year until project must begin), costs and reserve funding requirements.
- **Contact:** Bob Schneider, Michigan Department of Environment Quality (SCHNEIDERR@michigan.gov, 517-388-6466)

University of North Carolina Environmental Finance Center, Plan to Pay: Scenarios to Fund Your Capital Improvement Plan
- The **20-Year Projections Worksheet** calculates annual rate increases necessary to cover capital reserve allocations and debt service over a 20-year planning period.
- The **Dashboard Worksheet** displays results in tables and easy-to-read graphics.
- **Visit:** https://efc.sog.unc.edu/resource/plan-pay-scenarios-fund-your-capital-improvement-plan

Capital Improvements

Washington, *Small Water System Management Program Guide*
- **Chapter 3.1, Short-Lived Asset Replacement and Other Planned Improvements** helps systems document the short-lived assets requiring replacement in the next 6 years, the estimated schedule and cost.
- **Chapter 3.1**, **Long-Lived Asset Replacement**, helps systems document the long-lived assets that must be replaced in the next 6 years, the estimated schedule and cost.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesign andPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- Found in the **Asset Management Guidance Workbook,** the **Capital Improvement Plan and Action Plan** section provides an example of a table used to define objective, targets, and improvements where the utility needs to take action.
- **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Infrastructure Stability Attribute:
- Toolbox resources include guides for inventorying assets for capital planning and a report on sustainable asset management.

Financial Viability Attribute:
- Toolbox resources include a report on best practices to promote capital investment.

Stakeholder Understanding and Support Attribute:
- Toolbox resources include management manuals, a media guide, and a public outreach toolkit.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Financial Strategy

A f*inancial strategy* is necessary to ensure that the system has adequate sources of funding for current and future O&M and capital needs, and is able to meet its established LOS goals.

The financial strategy component should describe the following:

- ✓ Water rate methodologies, including the system's current rate structure and plans for future rate modifications.
- ✓ The system's annual operating budget and capital budget, which should be updated frequently.
- ✓ The types of reserve accounts that the system has (e.g., operating cash reserve, emergency reserve, short-lived asset reserve, capital reserve).
- ✓ System loans and bonds.
- ✓ Financial history.
- ✓ Financial forecasts.

When developing this component, the system should review annual financial statements, budgets, audits and the system's master plan.

The system's financial projections should show predicted revenue and expenses over the next 5 to 10 years. To help inform these projections, the system should determine its financial health using financial ratios, including:

- ✓ Operating Ratio—the relationship between revenues and operating expenses (Operating Revenue / Operating Expense).
- ✓ Debt Ratio—how much debt the system is using to operate (Total Liabilities / Total Assets).
- ✓ Sales Ratio—how much of the system's revenue is generated from service fees (Sales / Total Revenue).
- ✓ Expense Ratio—amount of operating expenses compared to total expenses (Operating Expense / Total Expense).

EPA Region 1, Asset Management and Debt Capacity Tool
- ▪ The **Debt Capacity Worksheet** is used to enter general financial data, (including a debt service schedule), predict future debt (based on prioritized and scheduled capital expenditures and available funding) and calculate future rate requirements.
- ▪ **Visit:** https://swefcamswitchboard.unm.edu/am/product/asset-management-and-debt-capacity-tool/

EPA, *Asset Management: A Handbook for Small Water Systems*
- ▪ **Step #4: How Do I Carry Out This Plan?** discusses financial steps in order to carry out an asset management plan, including a budgeting worksheet that allows systems to better understand their financial position.
- ▪ **Visit:** https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U7T2.txt

EPA, *Setting Small Drinking Water System Rates for a Sustainable Future*
- ▪ **Step 1 – Determining Your Costs** provides an example of and instructions on how to complete an **Annual Costs Worksheet** to determine annual costs of running the system.

- **Step 2 – Determining Your Current Revenue** provides an example of and instructions on how to complete an **Annual Revenue Worksheet** to help the system calculate how much money they collect annually.
- **Step 3 – Setting Aside a Reserve** provides steps to help systems determine how much money they need to raise annually to implement the capital improvement plan.
- **Step 4 – Determining Actual Revenue Required from Your Customers** contains an explanation and example of the **Short–term Revenue Required from Your Customers Worksheet** to help systems determine the total revenue they need to collect to cover the full cost of doing business.
- **Step 5 – Designing a Rate to Cover Your Costs** helps systems to design their rate structure and estimate the amount of water used by customers. This step includes an explanation and example of an **Average Monthly Usage Worksheet** to help summarize customer monthly water usage to ensure the system meets the revenue requirement.
- **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000D2NM.txt

EPA, *Successfully Protecting Your Investment in Drinking Water Infrastructure: Best Practices from Communities and Local Experts*
- The **Cost Efficiency** section includes case studies that highlight efforts to reduce planned and unexpected operation and maintenance costs, developing partnerships with other water systems, and solve issues with water loss and energy inefficiencies.

Visit: https://www.epa.gov/sites/production/files/2017-07/documents/asset_management_fact_sheets_20170602.pdf

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*
- **Chapter 6: Life-Cycle Costing** discusses life-cycle cost components, including O&M costs (**Section 6.3**) and rationale to balance O&M and capital costs (**Section 6.8**).
- **Chapter 7: Funding Strategies** focuses on long-term funding strategies, including internal and external funding, funding for energy efficiency and comprehensive funding strategies.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

Michigan, Asset Management Workbook
- The **Budget and Rate Worksheet** is used to track budget items and compare rate methodology options.
- The **Five-Year Budget Worksheet** is used to track current and anticipated expenses.
- **Contact:** Bob Schneider, Michigan Department of Environment Quality (SCHNEIDERR@michigan.gov, 517-388-6466)

Pennsylvania, Asset Management Tool
- The **Forecast Worksheet** is used to forecast surplus/deficit. The worksheet uses data entered in the **Inventory Worksheet**.
- The **Forecast Chart Worksheet** graphs the reserve fund balance, total cash needs and total revenues based on the **Forecast Worksheet**.

Financial Strategy

- **Visit:**
  https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/AssetManagement.aspx

Rural Community Assistance Partnership, *Formulate Great Rates: The Guide to Conducting a Rate Study for a Water System*
- The **Income and Expense Worksheet** is a monthly tracking tool for systems to record their revenue, fixed and variable costs and profit or loss.
- **Worksheet #3 – Fairness Check** calculates the equity from the total average revenue and target revenue.
- **Worksheet #4 – Calculate Rates** determines the basic flow charge for the system, based on water usage and flow rate revenue.
- **Visit:** http://www.rcapsolutions.org/wp-content/uploads/2013/06/RCAP-Formulate-Great-Rates.pdf

Washington, *Small Water System Management Program Guide*
- **Chapter 3.3**, **Six-Year Budget**, helps systems develop a 6-year operating budget that addresses system revenues, expenses and improvement project financing.
- **Chapter 3.4**, **Water Rates**, shares key principles for establishing a water rate structure that will meet the needs of the system.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- The **Annual Financial Workbook** allows utilities to fill out information and compare the budget with actual expenses and revenues.
- The **Advance Asset Management Guidance Workbook** guides utilities on what to consider as they develop a financial strategy and long term funding plan
- **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Financial Viability Attribute:
- Toolbox resources include a conference summary report, a public finance primer, water rate tools, and guidance.

Stakeholder Understanding and Support Attribute:
- Toolbox resources include management manuals, a media guide, and a public outreach toolkit.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Compliance

Component Description

Effective asset management helps to ensure *compliance* with state and federal drinking water regulations, while also allowing the system to reliably and continuously deliver safe drinking water.

This component should include a discussion of:

- ✓ The system's compliance history with state and federal drinking water regulations, along with plans for meeting future requirements.
- ✓ Significant deficiencies, as determined by the state, including the system's responses and action plans. Systems may summarize significant deficiencies and follow-up actions in a summary table.

The system should use the following to inform the discussion:

- ✓ Sanitary surveys.
- ✓ Monitoring schedules.
- ✓ Wellhead protection plans.
- ✓ Source water protection plans.
- ✓ Operator certifications.
- ✓ Enforcement Targeting Tool (ETT) scores.
- ✓ Enforcement orders (as applicable).

Implementation Tools

EPA, *Record Keeping Rules: A Quick Reference Guide*
- ▪ The **General Record Keeping Requirements Section** summarizes the records (e.g., analyses, sanitary surveys, etc.) systems must keep and how long the information must be retained.
- ▪ The **Additional Rule Specific Record Keeping Requirements Section** organizes additional record keeping requirements (e.g., types of records and the duration they must be retained) by drinking water rule and type of water system.
- ▪ **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZB2.TXT

Washington, *Small Water System Management Program Guide*
- ▪ **Chapter 2.3**, **Water Quality Monitoring Program**, helps systems identify the type, frequency and location of required water quality monitoring (sampling).
- ▪ **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystem DesignandPlanning/SmallWaterSystemMgmt.aspx

West Virginia, Asset Management Webpage
- ▪ The **Advanced Life Cycle Costs Tool** is an excel spreadsheet that is used to track critical assets and provide recommendations for action and associated costs.
- ▪ **Visit:** http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

For a full description of tools, see Appendix A.

Compliance

Product Quality Attribute:
- Toolbox resources include information on optimization plans and water quality guidance.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Preparedness

Component Description

The *Preparedness* component outlines the measures that the system will take to ensure that assets are sustained, in the event of an emergency or other unexpected situation. This component should discuss:

- ✓ Security measures used to ensure safe, continuous operations, (e.g., locks, fences, supervisory control and data acquisition (SCADA) systems and backup generators).
    - – Also, this component may include a description of an all-hazards approach to emergency preparedness, (i.e., a comprehensive framework in preparing for, responding to and mitigating the impact of a variety of disasters, emergencies and security threats).
- ✓ Mutual aid agreements through the national Water/Wastewater Agency Response Network (WARN) or otherwise, into which the system has entered, or any plans to establish such agreements.
    - – Contingency plans used to ensure continuity of service. Certain assets may only be needed on a contingent basis (e.g., backup generators, surplus treatment chemicals or an alternative water source).
- ✓ The asset management plan may not need to include all of the information contained within the system's emergency response plan, but should reference it.

Implementation Tools

EPA, *Drinking Water Security for Small Systems Serving 3,300 or Fewer Persons*
- ▪ The **What Is a Vulnerability Assessment? Chapter** describes the six steps necessary to complete a vulnerability assessment and helps systems to understand and evaluate their risk to different threats.
- ▪ The **What Is an Emergency Response Plan? Chapter** gives a step-by-step description of the preparation and action steps needed for a small system to create an emergency response plan.
- ▪ **The How Should I Communicate with My Customers?** and **What Security Improvements Can I Make Immediately? Chapters** provide additional information on effective communication and security measures.
- ▪ **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20017JWD.TXT

EPA, *Manual Interstate Mutual Aid and Assistance: EMAC Tips for the Water Sector*
- ▪ The **Before an Event Section** of this factsheet identifies and briefly explains steps to take prior to an emergency event, including raising awareness, training and educating personnel and reviewing paperwork.
- ▪ The **During an Event Section** of this factsheet identifies and briefly explains steps to take during an emergency event, including making prompt, specific requests, utilizing personal contacts and announcing advisories.
- ▪ **Visit:** http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004B98.txt

EPA, Tabletop Exercise Tool for Drinking Water and Wastewater Utilities (TTX Tool)
- ▪ This PC-based tool includes 12 scenarios with fully customizable **Situation Manuals** that address emergency preparedness and response. Each scenario also comes with discussion questions and PowerPoint presentations.
- ▪ **Visit:** https://www.epa.gov/waterresiliencetraining/develop-and-conduct-water-resilience-tabletop-exercise-water-utilities

Preparedness

EPA, *Successfully Protecting Your Investment in Drinking Water Infrastructure: Best Practices from Communities and Local Experts*
- The **Proper Management** Section highlights case studies that solved common challenges with record keeping and scheduling maintenance of assets.
- The **Resiliency** Section discusses contingency planning and long-term benefits of asset management.

Visit: https://www.epa.gov/sites/production/files/2017-07/documents/asset_management_fact_sheets_20170602.pdf

Washington, *Small Water System Management Program Guide*
- Chapter **1.6**, **Emergency Response Plan**, helps systems identify and document responses to routine and uncommon emergencies that may affect system operations, and establish procedures to notify customers.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesign andPlanning/SmallWaterSystemMgmt.aspx

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Operational Resiliency Attribute:
- Toolbox resources include guidance on developing an operations manual, a security threats handbook, and a health and safety guide.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

SECTION 2: ADDITIONAL COMPONENTS OF AN ASSET MANAGEMENT PLAN

Based on input from the EPA/State Asset Management Workgroup, EPA has identified the following additional components of an asset management plan to help increase the plan's value and effectiveness:

Energy Management

Component Description

Systems should ensure that all assets—not just those connected to a power source—are evaluated for energy efficiency. Employing *energy management* strategies, such as conducting an energy assessment and/or audit, will allow the system to understand the energy requirements of its assets.

This component of the asset management plan should reflect any energy management initiatives that the system has undertaken or plans to undertake in the future.

The energy management component should describe:

✓ Any energy assessments undertaken to determine areas in need of energy efficiency.
✓ Any energy audits performed and the system's progress in implementing energy management recommendations such as installing energy efficient infrastructure and/or making operational changes to increase energy efficiency at the system.

Underperforming assets with a negative impact on the system's energy usage should be flagged for rehabilitation or replacement.

Implementation Tools

EPA, Energy Star Portfolio Manager
- The **Benchmarking Starter Kit** assists systems with the first key step in understanding and reducing their energy consumption and carbon footprint. Portfolio Manager is used to assess all buildings' energy performance, water efficiency and carbon emissions.
- **Visit:** https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

EPA, Energy Use Assessment Tool
- Systems can enter data and track energy usage for each building's lighting and heating, ventilation and air conditioning (HVAC)/non-process energy using the **Building 1 Data Worksheet**, and for numerous assets, including source water, treatment and distribution using the **WTP Energy Usage Worksheet**.
- The **Summary Report Worksheet** is generated using the building and water treatment plant worksheets, and includes summary data, graphs and tables.
- **Visit:** https://www.epa.gov/sustainable-water-infrastructure/energy-efficiency-water-utilities

EPA, *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities*
- **Session 4: Identifying Energy Objectives and Targets** helps systems to set energy objectives and establish targets to measure progress, in order to improve overall energy performance.

Energy Management

- **Session 5: Implementing Energy Improvement Programs and Building a Management System to Support Them** guides systems through the process of developing an action plan to implement energy improvements.
- **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1003Y1G.TXT

Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*

- **Section 1.3: Energy Efficiency** discusses the importance of incorporating energy efficiency objectives into an asset management program.
- **Cost:** $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend a sponsored asset management training workshop.
- **Contact:** Amelia Springer, Kansas Department of Health and Environment (amelia.springer@ks.gov)

Rural Community Assistance Corporation, *Sustainable Infrastructure for Small System Public Services: A Planning and Resources Guide*

- **Chapter 2: Energy Efficiency** contains templates, checklists and tools that systems can use to review their energy consumption and to identify objectives, strategies and actions to increase their energy efficiency.
- **Visit:** https://www.rcap.org/resource/sustainable-infrastructure-for-small-system-public-services-a-planning-and-resource-guide/

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Operational Optimization Attribute:
- Toolbox resources include guidance on developing an operational manual and performance indicators.

Community Sustainability Attribute:
- Toolbox resources include information on creating a livable community and on triple bottom-line reporting.

For more information, visit: **http://www.watereum.org/resources/resource-toolbox/**

Water Efficiency

Component Description

For drinking water systems, unaccounted for water represents lost revenue. It is important for systems to incorporate *water efficiency* measures (e.g., leak detection testing) into their asset management strategy to minimize water loss.

This component of the asset management plan should discuss any water loss prevention and water efficiency initiatives that the system has undertaken or plans to undertake in the future.

The water efficiency discussion should address:

- ✓ Leak detection auditing, including methods and frequency.
- ✓ Water loss reduction strategies, such as an annual pipe replacement program.
- ✓ Consumer-based water conservation methods, such as incentive programs (e.g., installing low flow showerheads or toilets) or education campaigns (e.g., for school children or customers).

Implementation Tools

American Water Works Association, Water Audit Software
- The **Water Balance Worksheet** uses the data entered in the **Reporting Worksheet** and populates a system's water balance to quantify the magnitude of water losses.
- The **Loss Control Planning Worksheet** interprets the results of water audits and performance indicators and provides guidance to minimize water loss.
- **Visit:** https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control

EPA, *Control and Mitigation of Drinking Water Losses in Distribution Systems*
- **Section 4: Water Loss Control Program Elements** outlines components of an effective water loss prevention program. Systems should refer to the techniques in this document when outlining their water loss prevention initiatives.
- **Visit:** https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009VCZ.TXT

EPA, *Lean and Water Toolkit: Achieving Process Excellence Through Water Efficiency*
- **Chapter 4: Lean and Water Efficiency Improvement Strategies** discusses facility operations and other activities which may provide opportunities to reduce water waste.
- **Visit**: https://www.epa.gov/sustainability/lean-water-toolkit-contents-and-acknowledgements

EPA, *Successfully Protecting Your Investment in Drinking Water Infrastructure: Best Practices from Communities and Local Experts*
- The **Water and Energy Efficiency** Section highlights a case study who used benefited from an asset management plan to identify and solve water and energy losses.
- **Visit:** https://www.epa.gov/sites/production/files/2017-07/documents/asset_management_fact_sheets_20170602.pdf

Water Efficiency

EPA, WaterSense Program
- The **WaterSense Specifications and Certifications** contains information on technical specifications, program guidelines, and professional certifications, and rules governing certification procedures to earn the WaterSense label.
- The **WaterSense for Kids** is an outreach program to encourage water conservation and provides tools for educators.
- **Visit:** https://www.epa.gov/watersense

Missouri Rural Water Association, Water Tools
- The **Well Water Loss Tracking Tools** helps calculate water loss based on the hole in pipe, and the circular and rectangular break around the pipe.
- The Water Tools webpage also includes **Special Calculators** for Monthly and Annual Water Loss, and Percent Efficiency Calculator.
- **Visit:** https://moruralwater.org/water-tools/

Rural Community Assistance Corporation, *Sustainable Infrastructure for Small System Public Services: A Planning and Resources Guide*
- **Chapter 1: Water Conservation** gives small systems a step-by-step procedure for developing and implementing a water conservation program; information on leak detection and public education and outreach is provided.
- **Visit:** https://www.rcap.org/resource/sustainable-infrastructure-for-small-system-public-services-a-planning-and-resource-guide/

Washington, *Small Water System Management Program Guide*
- **Chapter 2.9**, **Water Use Efficiency Program**, helps systems develop a water use efficiency program.
- **Visit:** http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystem DesignandPlanning/SmallWaterSystemMgmt.aspx

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Water Resource Adequacy Attribute:
- Toolbox resources include a tool for water supply planning, a guide to water reuse, and water conservation guidelines.

Community Sustainability Attribute:
- Toolbox resources include a handbook on watershed planning and information on low-impact development.

Operational Optimization Attribute:
- Toolbox resources include a report on selection and definitions of performance indicators.

For more information, visit: **http://www.watereum.org/resources/resource-toolbox/**

Climate Change

Component Description

Natural disasters, sea level rise or other effects of *climate change* may damage or destroy assets.

The climate change component should address:

- ✓ Water availability, including current and future water use projections and any actions taken with respect to watershed planning.
- ✓ Water use projections.
- ✓ Other anticipated climate change-induced impacts.
- ✓ Strategies for mitigating climate change-induced impacts.

Any documents in which a system has previously referenced impacts of climate change (e.g., watershed plan, long-range planning document) can be noted in the asset management plan.

Implementation Tools

EPA, *Adaptive Response Framework for Drinking Water and Wastewater Utilities*
- The document walks systems through approaches for becoming climate ready, including: **awareness**, **adaptation**, **mitigation**, **policies**, **community**, and **partnership**. After reviewing these six approaches and associated actions and resources, a system can work to develop or expand on their climate change initiatives.
- **Visit:** http://water.epa.gov/infrastructure/watersecurity/climate/upload/epa817f12009.pdf

National Rural Water Association, *White Paper on Climate Change Impacts on Small and Rural Public Water Systems*
- **Chapter VI, Impacts and Adaptation,** provides **Recommendations for Small Systems** to prepare for and adapt to climate change effects, as well as **Recommendations for Assessing Climate Science** for systems to use in their strategic planning.
- **Visit:** https://swefcamswitchboard.unm.edu/am/product/white-paper-on-climate-change-impacts-on-small-and-rural-public-water-systems/

For a full description of tools, see Appendix A.

Corresponding Effective Utility Management Attributes

Community Sustainability Attribute:
- Toolbox resources include information on creating a livable community and low-impact development and triple bottom-line reporting.

Water Adequacy Attribute- insufficient resources
- Toolbox resources include a tool for water supply planning, a guide to water reuse, and water conservation guidelines.

Operational Resiliency Attribute:
- Toolbox resources include guides on security threats and maintenance management systems.

Infrastructure Stability Attribute:
- Toolbox resources include guides for inventorying assets for capital planning and a report on sustainable asset management.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

Regional Planning

Component Description

Regional planning strategies bring communities together and can strengthen relationships between community partners. Water systems benefit from these regional initiatives, and associated water system partnerships, through the enhancement of emergency response capabilities, the sharing of assets (e.g., generators, leak detection equipment) and the improvement of watershed planning for source protection. In addition, many states have state- or regional-scale water resource management plans, which guide planning decisions related to water quality and/or quantity.

The regional planning component should include the following:

✓ Regional initiatives with which the system is involved.
✓ Regional planning efforts that the system plans to undertake in the future.
✓ Any nearby water systems with which the system has an established relationship or with which the system could partner.

If the system has previously been included in a regional planning document, the document can be referenced.

Implementation Tools

EPA, *Gaining Operational and Managerial Efficiencies Through Water System Partnerships*
- After reviewing these case studies, systems may discover ways to form partnerships, strengthen relationships, benefit from the managerial and operational efficiencies and expand existing regional initiatives.
- **Visit:** https://www.epa.gov/sites/production/files/2017-07/documents/p1006md0.pdf

EPA, *How to Support Water System Partnerships: Water Systems Partnership Handbook*
- This handbook is tool intended to provide state's, and their drinking water programs, including tribal systems, an opportunity to guide states through a series of interactive steps for identifying, assessing, and launching partnerships.
- **Visit:** https://www.epa.gov/dwcapacity/water-system-partnerships

Kentucky Infrastructure Authority, Water Resource Information System (WRIS)
- The **WRIS Website** provides both a geographic information system (GIS) and information on state water resources, project development, emergency response, regulations, planning and other topics.
  - The **Internet Mapping Webpage** includes links to drinking water and wastewater infrastructure projects in the state.
  - Under the **WRIS Portal**, the **Area Water Management Planning Council Members Webpage** provides a list of all members and leaders by development district.
- **Visit:** http://kia.ky.gov/wris/

For a full description of tools, see Appendix A.

Regional Planning

Corresponding Effective Utility Management Attributes

Community Sustainability Attribute:
- Toolbox resources include information on creating a livable community and low-impact development and triple bottom-line reporting.

Water Resource Adequacy Attribute:
- Toolbox resources include a guide to local and state-wide water conservation.

Operational Resiliency Attribute:
- Toolbox resources include guide on security threats and health and safety.

Operational Optimization Attribute:
- Toolbox resources include guidance on developing an operational manual and performance indicators.

For more information, visit: **http://www.watereum.org/resources/resource-toolbox/**

Multi-Sector Asset Management

Component Description

The *multi-sector approach to asset management* is intended to facilitate and encourage arrangements among partners working to protect and enhance critical infrastructure. Water systems may work with wastewater systems, transportation authorities and/or power utilities.

Incorporating a multi-sector approach into asset management can foster dialogue and help to identify commonalities in asset management approaches among the sectors.

The multi-sector component should include a description of:

- ✓ Multi-sector approaches to asset management that the system is undertaking.
- ✓ Multi-sector approaches to asset management that the system plans to undertake.
  - For example, if the system coordinates water main replacements with the local highway division, the system should describe the mechanisms for this coordination (e.g., work orders, monthly meetings, etc.) in the plan.

Implementation Tools

EPA, Smart Growth
- The **Smart Growth Network** tab includes partnership of government, business, and civic organizations that support the Smart Growth mission to encourage development that boost the economy, enhances community vitality and protects the environment. This tab also provides the link to **Smart Growth Online** for additional news, publications, and resources.
- Publications on water quality, water and wastewater infrastructure, and water conservation can be found in the **Smart Growth Topics: Water** link.
- The **Resource** section provides EPA grants and funding, technical assistance, publications, and tools to help communities learn about and implement smart growth approaches.
- Visit: https://www.epa.gov/smartgrowth

EPA and DOT Federal Highway Administration (FHWA), *Memorandum of Understanding (MOU) "Infrastructure Asset Management Technology Exchange"*
- Systems can reference the **Authority**, **Cooperative Efforts** and **Points of Contact Sections** to develop their own MOU with other entities (e.g., wastewater or transportation departments). Systems can modify this document as necessary to meet the needs of the sectors involved in the agreement.
- **Visit:** http://www.fhwa.dot.gov/infrastructure/asstmgmt/epamou.pdf

EPA and DOT Federal Highway Administration (FHWA), *Multisector Asset Management Case Studies*
- The **Hamilton, Ontario, Canada Case Study** explains the system's integrated, bottom-up approach to asset management.
- The **Henderson, Nevada, USA Case Study** explains the system's citywide asset management and maintenance program that involves all levels of staff.
- The **Saco, Maine, USA Case Study** explains the system's collaborative, top-down approach to developing a common asset management framework.
- **Visit:** https://collaboration.fhwa.dot.gov/dot/fhwa/TAMT/Lists/aReferences/Attachments/105/Multisector%20Asset%20Management%20Case%20Studies%20Final%20V1.pdf

For a full description of tools, see Appendix A.

Multi-Sector Asset Management

Corresponding Effective Utility Management Attributes

Infrastructure Stability Attribute:
- Toolbox resources include information on making the most of system assets and guides to asset management.

Community Sustainability Attribute:
- Toolbox resources include information on creating a livable community and triple bottom-line reporting.

For more information, visit: http://www.watereum.org/resources/resource-toolbox/

ASSET MANAGEMENT PLAN UPDATES

Water and wastewater systems should review its asset management plan annually to ensure that it remains relevant and up-to-date. The annual review could occur before developing an annual budget and list of scheduled or needed capital improvements. Furthermore, systems may need to revisit and update their asset management plans more frequently as water system plans are developed or modified. Updating the asset management plan also supports EUM's "Plan-Do-Check-Act" or continual improvement management framework, which can help systems understand progress, establish measures of performance, identify future improvement opportunities and guide the decision making process.

In order to accurately track each asset's condition, the Asset Inventory component should be updated more frequently than annually. For example, every time an employee inspects a particular asset, he or she can gather asset data and update the asset inventory. Additionally, as staffing changes occur, the system should update the *Staff Information* component.

Appendix A: Summary of Asset Management Plan Tools

Disclaimer: This document is not intended to be a regulation; recommendations contained within this guide are not legally binding. Any changes in implementation of state programs are purely voluntary and must comply with legally binding requirements.

Implementation Tools	Introduction · Staff Information · Level of Service · Asset Inventory · Operation & Maintenance · Capital Improvements · Financial Strategy · Compliance · Preparedness · Energy Management · Water Efficiency · Climate Change · Regional Planning · Multi-Sector Asset Management

Asset Management Websites

U.S. EPA, Asset Management Website
https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities

U.S. EPA, State Asset Management Initiatives Document
https://www.epa.gov/dwcapacity/2018-state-asset-management-initiatives-document

U.S. EPA, Water Finance Clearinghouse
https://ofmpub.epa.gov/apex/wfc/f?p=165:1:8306717244384:::::

Water EUM, The Effective Utility Management Resource Toolbox
http://www.watereum.org/resources/resource-toolbox/

Southwest Environmental Finance Center, Asset Management Switchboard
https://swefcamswitchboard.unm.edu/am/

American Water Works Association, Resources & Tools: Asset Management
https://www.awwa.org/Resources-Tools/Resource-Topics/Asset-Management

U.S. Department of Transportation Federal Highway Administration, Asset Management Website
https://www.fhwa.dot.gov/asset/index.cfm

WaterOperator.Org, Resource Library
http://wateroperator.org/library

Implementation Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
Microsoft Excel-based Tools														
American Water Works Association, Water Audit Software—This Excel-based software includes a data-grading capability that allows the system to determine the validity of its water audit data. It provides guidance on water loss control planning based upon the credibility of the data and the measure of losses displayed by the water audit. The Water Audit Software Compiler is a useful tool for managing the results from completed Water Audit Software files. Users can compile all data into a master table and create charts showing audit components and basic histograms of grading values. http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx											✓			
EPA, Energy Use Assessment Tool—This Excel-based tool can be used by small to medium-sized systems to conduct a baseline energy use and cost analysis on both water and wastewater system utility bills and equipment. http://water.epa.gov/infrastructure/sustain/energy_use.cfm										✓				
EPA Region 1, Asset Management and Debt Capacity Tool—This is a free, simple Excel-based tool developed by EPA Region 1 in response to the needs identified by water systems during an Effective Utility Management (EUM) project. This tool provides a very simple way to tie asset inventory to financial planning. https://swefcamswitchboard.unm.edu/am/product/asset-management-and-debt-capacity-tool/				✓			✓							
Michigan, Asset Management Workbook—This Excel-based tool can help systems develop an asset inventory, budgets and capital improvement plans. https://www.michigan.gov/egle/0,9429,7-135-3313_71618_3682_3713-341866--,00.html Contact Bob Schneider, Michigan Department of Environment Quality (SCHNEIDERR@michigan.gov, 517-388-6466)				✓		✓	✓							
Pennsylvania, Asset Management Tool—This Excel-based tool can assist systems in developing an asset inventory and an associated financial forecast. https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/AssetManagement.aspx				✓			✓							

Implementation Tools

Description	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
University of North Carolina Environmental Finance Center, Plan to Pay: Scenarios to Fund Your Capital Improvement Plan—This Excel tool helps small systems calculate annual rate increases necessary to cover capital reserve allocations and debt service over a 20-year planning period, while restricting reserves from increasing perpetually. Results are displayed in tables and easy-to-read graphics. http://www.efc.sog.unc.edu/reslib/item/user-friendly-capital-improvement-plan-cip-tool-water-wastewater-utilities						✓								
Water Research Foundation, Pipe Risk Screening Tool—This Excel-based tool helps systems prioritize water distribution and transmission pipes for renewal projects. This prioritization helps the system identify the set of pipes most at risk for failure and with the greatest cost-based consequences for inclusion in the system's capital improvement program. https://www.waterrf.org/resource/pipe-risk-screening-tool				✓										
West Virginia, Asset Management Webpage—The WV Bureau for Public Health (WV BPH) has created a webpage containing guidance documents to aid water systems to complete an Asset Management plan. This process is a mixture of guidance, utility self-assessments, tables, worksheets, and templates. http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp	✓	✓	✓	✓	✓	✓	✓	✓						

Implementation Tools

Manual and Guidance Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, *Adaptive Response Framework for Drinking Water and Wastewater Utilities*—This document guides systems through climate-ready activities and helps with the identification of needed resources and possible incentives to support and encourage climate-readiness. http://water.epa.gov/infrastructure/watersecurity/climate/upload/epa817f12009.pdf												✔		
EPA, *Asset Management: A Best Practices Guide*—This guide provides a comprehensive overview of asset management benefits and best practices, and how to implement an asset management program. It guides systems through five core questions that serve as the foundation for many asset management best practices and as the starting point for developing an asset management plan. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000LP0.txt	✔													
EPA, *Asset Management: A Handbook for Small Water Systems* – This manual, part of the Simple Tools for Effective Performance (STEP) Guide Series, is designed for owners and operators of small community water systems (CWSs). The guide provides worksheets to help with inventory and prioritizing assets, as well as budgeting for future plans. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U7T2.txt	✔			✔	✔	✔								
EPA, *Asset Management for Local Officials*—This fact sheet serves as a guide to local officials to help them understand the basics of asset management and their role in successfully implementing an asset management program. The fact sheet explains the unique role of local officials in building community support and the potential barriers these officials can help to overcome. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000LTX.txt		✔												
EPA, *Building an Asset Management Team*—This fact sheet guides local officials and systems through the process of building a successful asset management team. It describes commitment to the team as a vital piece of system success, how to create and maintain an asset management culture, and the various roles filled by key team members. https://nepis.epa.gov/Exe/ZyPdf.cgi?Dockey=P1000LTZ.txt		✔												

Implementation Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, *Control and Mitigation of Drinking Water Losses in Distribution Systems*—This document provides information on tools and techniques that help systems tailor a program to meet water loss prevention needs and maintain infrastructure. A successful water loss prevention program will help the system balance its resources used to address economic restrictions, water availability, population and climate changes, regulatory requirements, operational costs and public and environmental stewardship. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009VCZ.TXT											✔			
EPA, *Drinking Water Security for Small Systems Serving 3,300 or Fewer Persons*—This guide is designed for community water systems (CWSs) serving 3,300 or fewer persons and presents basic information and steps CWSs can take to improve security and emergency preparedness at their water system. The guide explains why security improvements are important and discusses Vulnerability Assessments (VAs) and Emergency Response Plans (ERPs). https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20017JWD.TXT									✔					
EPA, *Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities*—This guide helps water systems serving fewer than 10,000 people understand general record keeping requirements, including which records they are required to keep and the amount of time that information should be retained to maintain a comprehensive history. The guide also provides insight into the benefits of record keeping, and how to generate and store secure records. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1003Y1G.TXT									✔					
EPA, *Gaining Operational and Managerial Efficiencies Through Water System Partnerships*—Case studies of system partnerships provide examples of the many different approaches to forming partnerships, strengthening relationships and achieving managerial and operational efficiencies. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1006MD0.TXT													✔	

Implementation Tools

Tool	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, *How to Support Water System Partnerships: Water System Partnerships Handbook* This document was updated from the EPA's 1991 Restructuring Manual, Chapter 4: Role of the Drinking Water Regulator (EPA 570-9-91-035). This document is a tool intended to provide state's, and their drinking water programs, including tribal systems, an opportunity to identify potential water system partnerships, by walking states through a series of interactive steps. https://www.epa.gov/dwcapacity/water-system-partnerships													✓	
EPA, *Lean and Water Toolkit: Achieving Process Excellence Through Water Efficiency*—This document provides practical strategies for using Lean manufacturing methods to reduce water use, while improving operational performance. Lean provides proven implementation-based methods for making significant operational improvements at systems and engaging employees in continual improvement efforts. Lean methods offer "how to" techniques to make implementation happen and deliver results. https://www.epa.gov/sustainability/lean-water-toolkit-contents-and-acknowledgements		✓									✓			
EPA, *Manual Interstate Mutual Aid and Assistance: EMAC Tips for the Water Sector*—This two-page factsheet provides a list of helpful tips to aid water sector stakeholders in accessing and using interstate mutual aid and assistance during times of emergency. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004B98.txt									✓					
EPA, *Preventive Maintenance Card File for Small Public Water Systems Using Ground Water Log Cards*—This booklet is divided into sections that outline daily, weekly and monthly maintenance tasks, plus individual sections that describe specific tasks for each month of the year. Each section contains guidance notes that provide additional information on some tasks. The notes correspond to the tasks on the accompanying cards. Electronic Preventative Maintenance Logs can be found here: https://www.epa.gov/dwcapacity/resources-small-public-water-system-operators http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1009V0M.txt					✓									
EPA, *Record Keeping Rules: A Quick Reference Guide*—This guide helps water systems serving fewer than 10,000 people understand general record keeping requirements, including which records they are required to keep and the amount of time that information should be retained to maintain a comprehensive history. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=2000ZZB2.txt								✓						

Implementation Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, *Setting Small Drinking Water System Rates for a Sustainable Future*—This manual, part of the Simple Tools for Effective Performance (STEP) Guide Series, walks CWSs serving 3,300 or fewer people through a seven-step plan to understanding the full costs of running a system. It includes worksheets to help organize and calculate: expenses, revenues, reserve requirements, customer costs and rates that will allow systems to obtain a full recovery of those costs. The guide also provides guidance on implementing and reviewing the rate. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000D2NM.txt							✓							
EPA, *Strategic Planning: A Handbook for Small Water Systems*—This manual, part of the Simple Tools for Effective Performance (STEP) Guide Series, illustrates a seven-step action plan that CWSs and non-transient non-community water systems (NTNCWSs) serving 3,300 people or fewer can take to start developing a strategic plan. The guide contains worksheets that help systems to look at all aspects of their system and develop values and goals to help systems develop a strategic plan. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000JTPU.txt	✓													
EPA, *Successfully Protecting Your Investment in Drinking Water Infrastructure* - The purpose of this document is to highlight some of the benefits of planning and maintenance of infrastructure through asset management such as improving service and reliability, reducing risk and unexpected costs, and enhancing communication with customers and stakeholders. https://www.epa.gov/dwcapacity/successfully-protecting-your-investment-drinking-water-infrastructure-0	✓						✓	✓	✓					
EPA, *Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water Systems*—This brochure provides information and worksheets for very small water systems to help them to prepare an asset inventory and to begin to develop a written asset management budget. Asset inventory worksheets (both completed examples and blank) help to calculate the remaining useful life of various types of water infrastructure equipment. https://www.epa.gov/sites/production/files/2015-04/documents/epa816k03002.pdf				✓										

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Tool	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, *Talking to Your Decision Makers: A Best Practices Guide* —This guide helps owners and operators of community water systems serving fewer than 10,000 customers to better understand: the role of local individual(s) or group(s) that oversee and make decisions affecting their water system; the benefit of having a good relationship with decision makers; and how to effectively communicate water system needs to decision makers. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZB6.txt		✔												
EPA, *Water System Operator Roles and Responsibilities: A Best Practices Guide* —This guide helps owners and operators of public water systems serving fewer than 10,000 customers to better understand operators' roles and responsibilities in delivering safe water to customers and additional responsibilities that vary based on system size, characteristics (e.g., complexity of treatment), managerial structure and regulatory requirements. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZBE.TXT		✔												
EPA, *Water System Owner Roles and Responsibilities: A Best Practices Guide* —This guide helps owners and operators of public water systems serving fewer than 10,000 customers to better understand: owners' roles and responsibilities in delivering safe water to customers; and additional responsibilities that vary based on system size, characteristics (e.g., complexity of treatment), managerial structure and regulatory requirements. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000ZZBC.TXT		✔												
EPA and DOT Federal Highway Administration (FHWA*), Memorandum of Understanding (MOU) "Infrastructure Asset Management Technology Exchange"* This MOU between EPA and the U.S. Department of Transportation's (DOT) FHWA is an example of a formal multi-sector asset management agreement. The agreement establishes authorities, cooperative strategies and points of contact for daily operations as the FHWA and EPA work to preserve, improve and expand both the national highway system and water and wastewater infrastructure. http://www.fhwa.dot.gov/infrastructure/asstmgmt/epamou.pdf														✔

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	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA and DOT Federal Highway Administration (FHWA), *Multisector Asset Management Case Studies*—These case studies were developed by EPA and DOT's FHWA. The case studies represent multi-sector or "whole of government" asset management strategies, and are designed to gather lessons learned and summarize the knowledge and experiences of entities that have adopted asset management approaches across multiple infrastructure systems. Case studies are presented from: Calgary, Alberta, Canada; Hamilton, Ontario, Canada; Henderson, Nevada, USA; Portland, Oregon, USA; and Saco, Maine, USA. https://collaboration.fhwa.dot.gov/dot/fhwa/TAMT/Lists/aReferences/Attachments/105/Multisector%20Asset%20Management%20Case%20Studies%20Final%20V1.pdf														✔
Kansas, *AM KAN Work! An Asset Management and Energy Efficiency Manual*—This manual provides guidance on assessing the current status of system operations and developing strategic plans for sustainable water service. It includes numerous video clips that present information on how a particular system completed an asset management task, the lessons learned and challenges faced. Cost is $65, which includes a hardcopy of the manual, as well as shipping costs. Free if you attend one of the sponsored asset management workshops Amelia Springer, Kansas Department of Health and Environment, (amelia.springer@ks.gov)	✔	✔	✔	✔	✔	✔			✔					
National Rural Water Association, *White Paper on Climate Change Impacts on Small and Rural Public Water Systems*—This white paper presents a critical evaluation of the possible impacts on small and rural water systems and management/operational techniques or actions that may be indicated as a result of these potential impacts. This white paper identifies specific climate change impacts that may affect small water systems and suggests approaches to deal with those impacts. https://swefcamswitchboard.unm.edu/am/product/white-paper-on-climate-change-impacts-on-small-and-rural-public-water-systems/												✔		

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	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
New England Water Works Association, *The Drinking Water Workforce Crisis on the Horizon: What Can be Done to Recruit and Develop Future Operators and Who Can Do It?*—This brochure recognizes the threat of the impending shortage of qualified drinking water operators and identifies actions stakeholders (e.g., systems, public officials, states, associations and EPA) can take to recruit, train and retain the next generation of drinking water professionals. https://capcertconnections.files.wordpress.com/2014/01/dw-workforce-flyer-final-6-30-11.pdf		✔												
Rural Community Assistance Corporation, *Sustainable Infrastructure for Small System Public Services: A Planning and Resources Guide*—This guidebook provides informational material, worksheets, examples, case studies and resources on water conservation, energy efficiency and renewable energy for small systems. https://www.rcap.org/resource/sustainable-infrastructure-for-small-system-public-services-a-planning-and-resource-guide/									✔	✔				
Rural Community Assistance Partnership, *Formulate Great Rates: The Guide to Conducting a Rate Study for a Water System*—A guide to developing a fair and equitable rate structure in a small drinking water or wastewater systems. The guide walks users step-by-step through various worksheets in a process to calculate rates. Detailed instructions (including calculations) are provided for each worksheet, which can be completed by hand or electronically. http://www.rcapsolutions.org/wp-content/uploads/2013/06/RCAP-Formulate-Great-Rates.pdf							✔							
Washington State, *Small Water System Management Program Guide*—This guidebook is divided into managerial, technical and financial chapters. Each chapter includes a table of "Next Steps," which can be used to track unaddressed items and planned future system improvements. This guidebook contains tables and links to Excel spreadsheets with an explanation of how to use them. http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/SmallWaterSystemMgmt.aspx	✔	✔	✔	✔	✔	✔	✔	✔		✔				

Implementation Tools

Programmatic Tools

Tool	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
Effective Utility Management Resource Toolbox—This tool is a compilation of resources that corresponds with the "Ten Attributes of Effectively-Managed Water Sector Utilities" (Attributes) and the five keys to management success. The EUM Attributes provide a succinct indication of where effectively-managed systems focus their efforts and what they strive to achieve, and offer a useful and concise reference point for system managers seeking to improve organization-wide performance. The Attributes comprise a comprehensive framework related to operations, infrastructure, customer satisfaction, community welfare, natural resource stewardship and financial performance. The Keys to Management Success include frequently used management approaches that have been shown to help systems manage more effectively. The Keys can help systems integrate improvement efforts across the Attributes. http://www.watereum.org/resources/resource-toolbox/	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
EPA, Energy Star Portfolio Manager—This is an interactive energy management tool that allows systems to track and assess energy and water consumption across their entire portfolio of buildings. Whether systems own, manage or hold properties for investment, Portfolio Manager can help set investment priorities, identify under-performing buildings and verify efficiency improvements. The tool works in a secure online environment, and systems can work towards receiving EPA recognition for superior energy performance. https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager										✓				
EPA, Smart Growth —The Smart Growth Networks works to development that serve the economy, community and the environment. This network includes partnerships of government, business, and civic organizations that support this mission. EPA's Smart Growth website provides smart growth-related news, publications, resources, and tools for communities to learn and implement. https://www.epa.gov/smartgrowth														✓

Implementation Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
EPA, Tabletop Exercise Tool for Drinking Water and Wastewater Utilities (TTX Tool)—This PC-based tool contains materials to assist systems interested in planning and facilitating tabletop exercises. The TTX Tool contains 15 scenarios that address an all-hazards approach to emergency preparedness and response, including natural hazards and manmade incidents, and also introduces users to the potential impacts of climate change on the water sector. The natural and manmade hazards address short-term emergency response activities, whereas the inclusion of climate change-related scenarios provides an opportunity for systems to consider and implement long-term planning measures into their operations in order to mitigate the potential impacts of climate change. Each scenario has a fully-customizable Situation Manual, Additional Discussion Questions and PowerPoint presentation. Users can modify these materials, allowing them to conduct a tabletop exercise to meet their specific needs. https://www.epa.gov/waterresiliencetraining/develop-and-conduct-water-resilience-tabletop-exercise-water-utilities									✔					
EPA, WaterSense Program—The WaterSense Program offers tools to water systems to protect the future of the nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs and practices. Water systems can apply to become a WaterSense Program partner and receive tools they can use to promote their own water efficiency programs. https://www.epa.gov/watersense											✔			
Kentucky Infrastructure Authority, Water Resource Information System (WRIS)—Kentucky's WRIS website, developed through the cooperative efforts of water and wastewater treatment systems, includes a geographic information system (GIS) and information on state water resources, project development, emergency response, regulations, planning and other topics. http://kia.ky.gov/wris/													✔	
Missouri Rural Water Association, Water Tools—Webpage that includes calculators for those to input to determine well disinfection dosage, disinfection calculations, sizing chemical pumps, well drawdown, wastewater infiltrations, water treatment dosage calculations, water leak loss calculations, and flushing flows. https://moruralwater.org/water-tools/				✔							✔			

Implementation Tools

	Introduction	Staff Information	Level of Service	Asset Inventory	Operation & Maintenance	Capital Improvements	Financial Strategy	Compliance	Preparedness	Energy Management	Water Efficiency	Climate Change	Regional Planning	Multi-Sector Asset Management
New York State and New York State Rural Water, Small System Template for Standard Operating Procedures—This Standard Operating Procedures form provides templates to help small water systems maintain effective and efficient practices by organizing system information, including personnel contact information and operating practices, into one document. https://nyruralwater.org/sites/all/themes/nywater/pdf/SOPFormsforSmallSystemsvJuly2009.pdf		✓												
San Diego Public Utilities Department, Customer Satisfaction Survey—San Diego's Public Utilities Department encourages customers to report on their satisfaction with the Department's service through periodic door-hanger surveys (also accessible to customers and other systems online). https://www.sandiego.gov/public-utilities/sustainability/water-conservation/water-survey			✓											
Water Environment Research Foundation and Water Research Foundation, Sustainable Infrastructure Management Program Learning Environment (SIMPLE)—This website contains processes, practice guidelines and templates to assist systems in developing an asset management plan. The website also contains a suite of asset management tools that walk small systems through five key asset management steps, including: developing an asset inventory, prioritizing assets, planning for the future, carrying out the plan and next steps. The tool includes corresponding resources including guidance and templates. https://www.waterrf.org/resource/sustainable-infrastructure-management-program-learning-environment-simple-foundation				✓										