A GUIDE TO ASSET MANAGEMENT FOR SMALL WATER SYSTEMS

Developed by
The Asset Management Committee of the
Georgia Association of Water Professionals

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Asset Management

The process of documenting maintaining, and managing both existing and future assets.

Asset Management Program

The plan, processes, and technology that work together to assist the employees of a Utility with implementing defined strategies for managing their assets.

Strategic Asset Management Plan (SAMP)

A guidance document for employees that summarizes and outlines action items toward implementing a Strategic Asset Management Program. The SAMP for a specific Utility requires regular updates in order to remain effective.

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Quick Start: Basic Asset Management Planning Checklist

- **Identify Sustainable Leadership.** Assign an asset management champion / team to represent the interests of the stakeholders. Ideally, form a steering committee from key areas of the utility.

- **Define the goals.**
  Describe the SAMP benefits and what it will encompass.
  What concerns need to be addressed?
  What budget is available?
  What level of sophistication is attainable?

- **Develop an inventory of assets**. (include manufacturer's information, replacement cost, life expectancy) *Focus on the critical assets!*

- **Condition & Criticality Assessment.** Assign scores (1 to 5) for both Likelihood of Failure and Consequence of Failure (where 5 is highest level of likelihood and highest level of consequence).

- **Risk Assessment.** Calculate Risk Value (Likelihood of Failure X Consequence of Failure). Rank by Risk Value

- **Prioritized Strategic Asset Management Plan.** Develop both a Near-Term and Long-Term Plan for asset replacement and renewal based on the risk score ranking.

- **Choose suitable technology to fit goals and budgets established.**
  Database software for documenting asset inventory.
  Geospatial Mapping software / hardware to locate assets.
  Maintenance Tracking System for asset condition & repairs.

- **Track progress.** Document that the plan is meeting established goals – make changes as required.

- **Develop Long-Term Asset Management Plan**
  Identify budgets, resources, time-frame, etc.
  Update the plan often. At least one a year.

Congratulations! This is the start of good strategic asset management plan.

1: Purpose of this Document

This document is intended to assist small water systems to learn, relatively quickly, why they need to develop an Asset Management plan, how to start setting up a plan, and what benefits will be derived from the plan.

Every water system is unique in terms of size, age, and the condition of its assets, therefore one plan doesn't fit all. However, there are some guidelines for a successful asset management plan and some helpful advice for small systems in developing one.

Good stewardship of assets has long been a goal of Owners of water, wastewater, and stormwater systems. In the last two decades, aging systems have required significant investment in both maintenance and replacement. Owners have sought new methods of maximizing their maintenance and reinvestment dollars. This has given rise to the development and implementation of strategic asset management plans, processes and procedures within large utilities to manage assets in a manner that keeps costs low. The cost savings being obtained by larger utilities due to their asset management plans, processes and procedures are now being realized. Small utilities typically have more limited resources to invest in asset management and consequently do not feel empowered to develop asset management programs. However, large or small, good asset management is about planning and implementing strategies to become more efficient and effective with utility dollars. Strategic asset management is not necessarily based on the quantity of resources you have, it is more about developing an appropriate plan and implementing streamlined processes and procedures to maximize the investment in those resources. **This document will provide small utilities with a quick guide to develop and implement a Strategic Asset Management Plan (SAMP).**

For more detailed and in-depth information, additional resources and references are summarized in Sections 5 and 6.

2: Introduction & Background

Large and small utilities manage the assets for which they are responsible, but some have strategies for maintenance and replacement which affect how they plan and react. In many respects, large or small utilities face similar challenges:

- Aging infrastructure
- Managing stakeholder expectations (regulators, customers, commissioners, environmental groups)
- Reporting/data management
- Inadequate funding
- Needing new assets to control risk of failure
- Needing new assets to support risk of not meeting future growth and development
- Challenging economy
- Low rates currently paid by the customer for value received

Asset management is about good planning and asset implementation given available resources. Strategic Asset Management is about aligning a utility's strategic goals and expected levels of service with available resources and maximizing the value of those resources.

The GAWP Asset Management Committee routinely discusses these challenges to identify and share recommended solutions. This guidance document was written by the GAWP Asset Management Committee in response to the need small utilities have for better asset management planning and implementation. It outlines the components of a Strategic Asset Management Plan (SAMP) – the plan to help you get your Asset Management Program started.

3: Creating a Strategic Asset Management Plan….Getting *Your* Program Started

There are nine recommended sections of a SAMP, which are described below:

1) Strategic and Level of Service Goals

The identification and development of strategic goals establishes the guiding direction of any SAMP. Strategic goals should be based on a utility's overall vision/mission statement.

Outside groups interested in a utility's activities are known as stakeholders. Stakeholders have expectations on how a utility should achieve its strategic goals and to what level. It is important to understand the expected level of service (LOS) goals for each identified stakeholder to clarify what is and what is not possible given available resources. If a LOS goal cannot be met due to resource limitations, then there is business justification for either lowering LOS expectations or increasing resource capabilities to meet LOS goals. LOS goals can be used to prioritize projects and programmatic activities. Examples of LOS goals are: maintaining specific minimum system pressures at a customer's meter; responding to water leaks within a specific timeframe; no taste or odor complaints; etc.

2) Asset Inventory

It is important to know what assets you have. All assets should be listed in a master inventory database and all known information should be collected about that asset, including data such as: location, size (diameter, volume, flow rate, horsepower, etc.), composition material, power usage, vendor information, model and serial number, date brought in service, condition, cost to replace, useful life, and service history. This information may not have been documented from the beginning, but it is important to gather it over time. Every time a crew touches an asset, there is an opportunity to collect data.

There is no single correct way to develop the initial inventory. The utility should use the most effective resources they have available to obtain this information:

- Use the knowledge of those present during the installation of the major assets. Gather as much information as possible regarding their recollections of what assets were installed and where they were installed. If there are maps of the system, these can be used during the discussions.
- Use as-built record drawings or other engineering drawings of the system. Additionally, use visual observations of above-ground assets (e.g., hydrants, pumps, manholes, treatment works).

- Interview neighboring residents who may have lived in the area during construction and others who are familiar with the construction activities.
- Estimate buried assets using above ground assets as a guide (e.g., using manholes to estimate locations, size, and type of pipe between the manholes; or using isolation valve locations to estimate buried water pipe locations).

After the master inventory database of the assets has been created, it is important to know where the assets are located. The most important factor is to have a visual picture of the asset locations, especially the buried assets. The map can be as simple (hand drawn) or as complex (Geographic Information System) as the system is capable of producing. The most important factor is that it is useable to track any changes to the asset inventory and can be used to track asset failures in maintenance records.

After the map has been created, the location of the asset should be listed in the asset inventory database, and referenced to the mapping system. This could be by street name, street address, or building location, such as pump house or treatment building. And in linear systems, GPS (Global Positioning System) coordinates are recommended. Maps assist maintenance staff with trouble shooting and understanding system layout. Location information is also helpful to group assets based on their location, and if a single asset is replaced in a particular area, the question of whether other assets in that same area should be replaced at the same time can be answered.

After the assets are located on a map, it is important to know the condition of the assets. An initial condition assessment can be completed by gathering people who have current or historical knowledge of the system and asking them to rate the condition of the asset based on a numbering system of 1 (poor) through 5 (excellent). For linear assets, the industry trend is to train staff to record condition using standardized Pipeline Assessment & Certification Program (PACP) coding. Gathering condition information is a commitment to a continuous process and can improve through the use of more sophisticated techniques over time.

3) Critical Assets

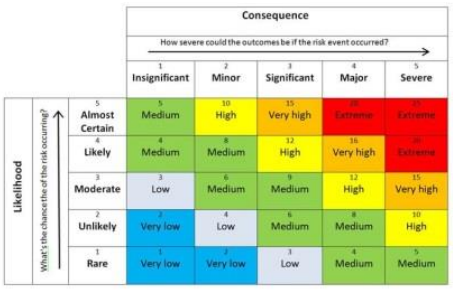
Identifying the critical assets within a system is important to help prioritize where to focus limited maintenance and capital improvement dollars. Understanding which assets are the most critical helps a utility to manage its risk.

The criticality of assets depends on their importance to the functioning of a system and the consequences should that asset fail. Some assets are highly critical to the system and others are not. For example, a pipe that serves three houses in a rural area is less critical than a pipe located in the downtown area and linked to many houses or a variety of businesses. Further,

assets that are critical to one specific system may not be critical to another, due to having a redundant system or adequate spare parts to repair the asset quickly.

Criticality is determined by understanding likelihood and consequence of failure. A utility first needs to assess what it knows about the likelihood that a given asset is going to fail. To assist in this examination, a utility should look at: asset age, condition assessment, failure history, designed life expectation, historical knowledge, current maintenance practices, construction methods, experiences with that type of asset in general, and knowledge regarding how likely that type of asset is going to fail. An asset may be highly likely to fail if it is old, has a long history of failure, has a known failure record in other locations, and has a poor condition rating. An asset may be much less likely to fail if it is newer, is highly reliable, has little to no history of failure and has a good to excellent condition rating. The criticality factor associated with the asset can be assigned similar to the condition rating.

In determining consequence of failure, a utility should consider all of the possible impacts and costs of failure. The costs may include: cost of repair, social cost associated with the loss of the asset (e.g. customer inconvenience during repair or a loss of the level of service), repair/replacement costs related to collateral damage caused by the failure, legal costs related to those collateral damages caused by the failure, environmental costs created by the failure (e.g. a spill or permit violation), and any other associated costs or asset losses. The consequence of failure can be high if any of these costs are significant or if there are several of these costs that will occur with a failure. The consequence factor associated with the asset can be assigned similar to the condition rating and criticality factor. For example a consequence factor rated as a 1 means very little impact to the system, whereas a rating of 5 means a very significant impact if the asset fails.



To calculate the risk associated with the failure of the asset, the score for the likelihood of failure is multiplied by the score for the consequence of the failure of the asset. The assets can then be ranked by their risk score (1 having the least amount of risk associated with failure and 25 having the highest risk associated with failure). This ranking now serves to identify the highest priority assets for renewal and replacement considerations.

4) Asset Renewal and Replacement

It is important to understand when repairs and replacement to existing infrastructure will be needed and how much it will cost so a utility can financially plan to maintain the system.

In order to plan for the replacement of an asset, it is important to know the cost of replacement and the useful lifecycle of an asset. The replacement cost is the estimate of what it would cost to replace the existing asset with a new asset, plus the cost of disposing of the replaced asset. If the new asset would not be of the same make/material as the existing, that should be taken into account. The replacement cost should be the estimated cost to replace it in today's dollars.

The useful life can be estimated by using the manufacturer's recommendation for useful life and applying actual experiences based on using the history of replacement of that particular asset or the environment to which that asset is exposed. For example, if a certain valve has historically required replacement every 20 years, then 20 years would be used for its useful life rather than the recommended 35-40 years.

5) Data Management

Asset data should be gathered and updated continually. There are many levels of technology to support the management of gathered data. A data management system could be as simple as a paper work order tracking system combined with a summary spreadsheet to track maintenance and capital expenditures. A more complex system could include an asset management software package or a CMMS (computerized maintenance management system) software package that is configured with asset inventory information, to which work orders and service requests can be generated and the cost of work performed on an asset basis can be tracked.

The best option is a specifically designed asset management software program. This type of program provides the greatest level of flexibility in terms of use and is already programmed to contain asset inventory data.

Another option, a generic database software program, is much less expensive but will require a time commitment on the part of someone at the utility to configure the database and perform data entry. However, this option will allow utility staff to retrieve and sort the information more quickly and easily, thus making the data more usable. This option is recommended for smaller utilities that cannot afford commercial software. If the utility staff cannot initially develop a database for their asset inventory, they should develop a plan for how they will obtain a database in the future. For example, if they need to purchase a computer or software, they should begin setting aside funds for that purpose.

Another option available - spreadsheets and handwritten inventories should be considered only temporary solutions until the utility can obtain a database of some type (the first two options). While these simple approaches allow the utility to easily categorize information, both can be very cumbersome to use when making future planning decisions. Neither approach allows the type of complex querying that an asset management database needs. For example, a database can answer the question, "Provide me a list of all pipes installed in 1950 that are cast iron and

have had at least one break in the last ten years." This list can be obtained in a matter of moments with a software database. However, with a handwritten list or a spreadsheet, answering a question like this would be an extremely tedious and time consuming activity.

Perhaps the most easily available tool for a small utility is Microsoft Excel. This spreadsheet software can be used to collect and track all the data needed for managing your systems component lifecycles. With a number of new collaboration features, small utilities can share files amongst employees so that this becomes a central repository for knowledge.

The key with the inventory is to structure it to provide the information the system needs in an easy to retrieve fashion. If the data is not easily obtainable, the utility will tend not use it and the inventory will have limited value and will quickly become outdated.

6) Maintenance

It is challenging for any utility to find the balance between spending resources on preventive/routine maintenance versus corrective maintenance and the reactive responding to customer calls. Many utilities find themselves spending 90% of their resources on corrective maintenance and 10% on preventive maintenance. An asset management focused utility is balanced at 50% corrective maintenance and 50% preventive maintenance. Shifting toward this balance takes strategic decision-making.

Assets should be maintained to reduce the likelihood of failure and to operate it in accordance with the expected level of service. One way to do this is to operate and maintain the asset according to the manufacturers' recommendations and known wear and tear in the local system. Preventative Maintenance (PM) is often recommended at certain intervals by the manufacturer and adjusted based on known conditions. PM usually extends the useful life of an asset, lowering its cost of ownership and reduces risk of failure. A computerized maintenance management system (CMMS) can assist with tracking when PM needs to occur and on which assets. The critical asset evaluations should also be utilized for prioritizing maintenance planning.

7) Staff Workflows

Streamlining the way staff work together to implement asset management processes and how they gather data, is critical to achieving a strategic asset management organization. Some recommended processes to develop and document include:

- Responding to Customer Requests;

- Work Identification, Planning and Scheduling;
- Responding to Work Orders;
- Identifying CIP Projects;
- Managing Construction;
- Budgeting.

8) Financial Plan

It is important to understand how much funding is required to manage the system's assets in accordance with the stakeholder's level of service expectations (regulators, customers, commissioners, environmental groups). Additionally, it is important to understand the current and future asset renewals, repairs, and replacements. These costs form the basis for the operations, maintenance, and capital improvements budgets that can be discussed with decision makers. It is critical to begin financial planning well in advance to secure the funding needed to manage long-term needs. There are a variety of funding sources available which are summarized below:

- Customer rates
- Bonds
- Grants
- Loans

The Water Resources Reform and Development Act of 2014 (WRRDA) implemented changes to the Clean Water State Revolving Fund (CWSRF) loan program which affect the asset management and capital planning activities required of each CWSRF borrower. The CWSRF is administered in the state of Georgia by the Georgia Environmental Finance Authority (GEFA). Federal Water Pollution Control Act (FWPCA) Section 603(d)(1)(E) requires a recipient of a SWSRF loan for a project that involves the repair, replacement, or expansion of a publically owned treatment works to develop and implement a Fiscal Sustainability Plan (FSP) or certify that it has developed and implemented an FSP. This provision applies to all loans for which the loan recipient submitted an application on or after October 1, 2014.

9) Implementation and Update Process

Create an Asset Management Steering Committee. The SAMP is a long term commitment to effective planning. This requires sustainable leadership and a utility-wide commitment.

The SAMP needs to be actively managed because the organization and environment, within which the SAMP is being implemented, is expected to change, along with stakeholder level of

service goal expectations. For this reason, it is recommended that an ***Asset Management Steering Committee*** be established, with the primary responsibility being to implement the AMP and adjust its direction as needed. It is recommended that the Asset Management Steering Committee be comprised of representatives from key areas or Departments such as:

- Customer Service
- Operations and Maintenance Crew
- Asset Repair and Renewal Crew
- Information Technology
- Finance
- GIS
- Planning and Development

Recognizing that small utilities may not have individuals in all these areas, the point is that a successful AMP must include active involvement throughout the organization.

The Asset Management Steering Committee would be required to meet regularly to oversee implementation of the prioritized strategies included in the SAMP, reprioritize and/or add to them as conditions change, and perform the annual update actions as listed below:

- **Perform an Annual SWOT Assessment** - Assessing an organization's strengths, weaknesses, opportunities and threats (SWOT) helps to identify action items. Taking advantage of strengths and opportunities, working on weaknesses, and mitigating threats help to formulate key action items and strategies for improvement.
- **Confirm Prioritization of SAMP Strategies** - A yearly assessment of the prioritization of strategies to implement the SAMP should be reassessed and confirmed. New drivers can alter priorities and other opportunities may surface.

External Stakeholder Coordination Opportunities

Implementation of a SAMP should be coordinated between the Asset Management Steering Committee and external stakeholders either as individual interactions or as an External Steering Committee group. External stakeholders could include:

- Regulators
- Customers/Developers
- Board of Commissioners
- Other Jurisdictions
- Environmental Advocacy Groups

Coordination should include the provision of reports on progress towards goals at specific frequencies and using established communication mechanisms to obtain feedback on changing needs to take advantage of avenues that allow for streamlined SAMP implementation.

4: Track the Plan Over Time… and Look for Cost Savings

Tracking information and data can be used for the following reasons:

- Reporting to stakeholders on progress towards LOS goals;
- Enabling informed decision-making about asset management investments and efficiency strategies;
- Comparing SAMP results to other similar sized utilities.

Key performance indicators (KPIs) can be used to assist with tracking an organization's progress towards asset management goals. For this reason, KPIs should be established to be directly in alignment with strategic goals so that progress can be measured and reported. Data can be extracted from supporting data management tools and pulled together to calculate the metrics, or KPIs, that provide insight into progress towards asset management goals.

One real value of a good asset management program is that it provides cost savings over the long term. This requires that the plan be tracked systematically for some time, depending on the size and complexity of the asset base, before documented savings are realized. Total lifecycle costing is very important in this regard. This includes initial installation costs, O & M expenditures and costs associated with renewal/rehab of assets or final disposition. Building the discipline of tracking these costs over time will result in the identification of opportunities for long term cost reductions and savings.

5: Resources… for Developing Your SAMP

This guide outlines how to get started with your small system asset management planning, but there are many other resources available that can help in developing a plan to fit your individual system's needs.

Georgia Association of Water Professionals (GAWP) Asset Management Committee.

This committee meets regularly (usually monthly) and is a great forum for those interested in sharing or learning more about the benefits of Asset Management for water systems in Georgia. Attendees are professionals represented from various areas such as utility owners, consulting firms, system developers & suppliers, funding agencies, software developers, etc. It is an excellent opportunity to learn, teach, and network with others of similar interests. It is easy to attend. For meeting dates, see the Asset Management Committee webpage on the GAWP website and register for an upcoming committee meeting.

Videos and Workshops

- *Bridging the Gap* is a groundbreaking online video designed to help elected officials and water and wastewater managers make smart choices as they address water and wastewater infrastructure issues.

- *Bridging the Gap*. https://courses.worldcampus.psu.edu/public/buried_assets/

- The National Environmental Services Center
  (800) 624-8301 or http://www.nesc.wvu.edu/netcsc/netcsc_index.htm

- U.S. EPA Advanced Asset Management Training Workshops
  (202) 564-0581 or http://www.epa.gov/owm/assets_management.htm

- Missouri Department of Natural Resources
  P.O. Box 176, Jefferson City, MO 65102
  (800) 361-4827 or (573) 526-6627
  http://www.dnr.mo.gov/oac/lgov.htm#asset

- The Maryland Center for Environmental Training
  P.O. Box 910, La Plata, MD 20646-0910
  (301) 934-7500 or http://www.mcet.org

Asset Management Software Platform Options

- Commercially available software for asset inventory
- Generic database software (e.g., Microsoft Access, etc.)
- Spreadsheet software (e.g., Microsoft Excel, etc.)
- Handwritten inventory

Asset Management Software

A free asset management software for small communities developed for Microsoft Office Suite 97 or later.

- *Total Electronic Asset Management System.* http://www.mcet.org or http://www.mcet.org/am/index.html

- *Train-the-Trainer Toolkit: Asset Management Guide for Wastewater Utilities.* http://www.mcet.org or http://www.mcet.org/am/am/Presentations/toolkit2.html

- *CAPFinance*. Environmental Finance Center at Boise State University http://sspa.boisestate.edu/efc/Tools_Services/CAPFinance.htm

Check Up Program for Small Systems (CUPSS)

CUPSS is a free asset management software designed for small wastewater and drinking water utilities. The EPA describes CUPSS as "a comprehensive application that provides all the tools required to implement an asset management program and develop effective asset management plans." CUPSS includes several report options, an inventory, a tracker for operations and management, a budget and finances section, and an automatically populated template for an asset management plan. CUPSS can be either downloaded from the EPA website after a required registration or a kit (user's or trainer's) can be ordered by calling the EPA.

Information on CUPSS can be found here:
http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/index.cfm

CUPSS can be downloaded or ordered here:
http://water.epa.gov/infrastructure/drinkingwater/pws/cupss/software.cfm

The Wastewater Information System Tool (TWIST)

TWIST is another free download that is more focused on wastewater information and management. TWIST is a MIS system with a Microsoft Access database. It can be easily downloaded from the EPA website as a .zip file. A free CD-ROM copy can also be ordered by calling, mailing, or emailing the USEPA with the given contact information on the TWIST page.

http://water.epa.gov/infrastructure/septic/The-Wastewater-Information-System-Tool-TWIST.cfm

Quick tip: When in doubt, always do a quick Google search. Often enough, it provides the needed information!

6: References & Web Links

EPA Publications:

- Asset Management: A Handbook for Small Water Systems
  http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_asset_mgmnt.pdf

- Taking Stock of Your Water System: A Simple Asset Inventory for Very small Drinking Water Systems
  http://www.epa.gov/ogwdw/smallsystems/pdfs/final_asset_inventory_for_small_systems.pdf

- **Asset Management for Local Officials:**
  http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_assetmanagement_localofficials.pdf

- Getting Started with CUPSS (Check Up Program for Small Systems), A Workbook for Users:
  http://epa.gov/cupss/pdf/workbook_cupss_getstarted.pdf

- Asset Management: A Guide for Water & Wastewater Systems:
  http://www.nmenv.state.nm.us/dwb/assistance/documents/AssetManagementGuide.pdf

- Strategic Planning: A Handbook for Small Water Systems (STEP Guide Series):
  http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_stratplan.pdf

ESRI Publication:

- GIS Supports Sustainable and Effective Water Utility Practices
  http://www.esri.com/library/

WERF:

- WERF Sustainable Infrastructure Management Program Learning Environment
  http://simple.werf.org/
  - AMKAN Materials. http://amkan-asset-management-manual.software.informer.com/

- Guide to Water & Wastewater Asset Management, Benjamin Media, 2008 (excellent, but not a free resource) http://bmi.gostorego.com/guide-to-water-wastewater-asset-management.html

AWWA:

- Defining Public Asset Management for Municipal Water Utilities
  AWWA Journal - May,2011
  http://www.awwa.org/publications/journal-awwa/abstract/articleid/27497/issueid/33572188.aspx?getfile=/documents/dcdfiles/27497/waternet.0073765.pdf

NESC:

- A Guide to Asset Management for Small Systems
  http://www.nesc.wvu.edu/pdf/train/products/asset_management_guide.pdf

Water Research Foundation:

- Project #4187 - Key Asset Data for Drinking Water and Wastewater Utilities
  http://www.waterrf.org/ExecutiveSummaryLibrary/4187_ProjectSummary.pdf

MISC:

- Association of State Drinking Water Administrators (ASDWA)
  http://capcertconnections.asdwa.org/2013/11/06/free-webinars-on-asset-management-for-small-water-systems/

- San Diego County Water Authority Asset Management Plan
  http://www.sdcwa.org/asset-management

- Table 1. Taken from the EPA manual, ***Asset Management: A Handbook for Small Water Systems***
  http://www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_asset_mgmnt.pdf