

## financial planning

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# Asset Management Planning

## AND REPORTING OPTIONS FOR WATER UTILITIES

ELEVEN UTILITIES' EXPERIMENTS  
WITH THREE ASSET MANAGEMENT  
OPTIONS PROVIDE USEFUL  
INSIGHTS.

**T**his article highlights the study design and key findings of an Awwa Research Foundation (AwwaRF) sponsored research project. The foundation designed the project, Asset Management Planning and Reporting Options for Water Utilities (AMPRO), to compare case studies in asset management reporting. Case studies were developed for 11 participating utilities (see sidebar on page 86) to illustrate the outputs that could result from adopting varying levels of asset management programs for a sample of their assets. In addition to contributing data for a sample of their system assets, these utilities worked as part of the project team to shape the options being studied, identify and refine the performance measures for study, and identify the evaluation parameters used to rate the options. The individual participants led their utilities' participation in AMPRO and represented their respective utilities at project focus meetings. In most cases, these representatives were supported by teams of engineers, planners, financial planners, and utility managers who helped to develop the information required for the project test and to select assets for study, develop data hierarchies, and conduct project evaluations.

The 11 utilities were chosen to represent a diverse geographic mix (e.g., Seattle Public Utilities, Washington and Pittsburgh Water and Sewer Authority, Pennsylvania); size (e.g., San Francisco Public Utilities Commission, California and City of Ann Arbor Water Utilities, Michigan); and infrastructure age (e.g., Santa Clara Valley Water District [SCVWD], California and the City of Portsmouth Department of Public Utilities, Virginia). The study compares, side by side, the reports that would be generated by basic and higher-level asset management programs.



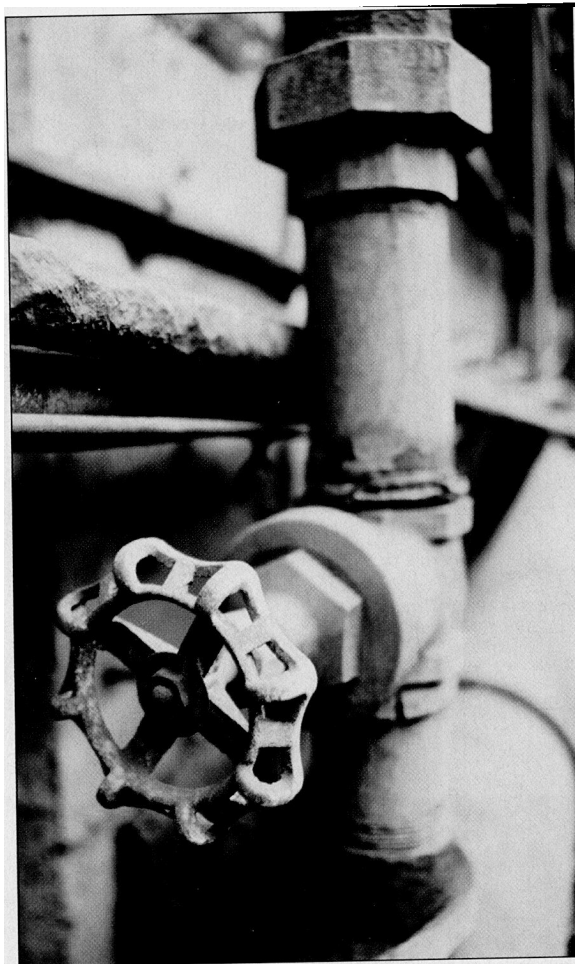
The published report of this project, *Asset Management Planning and Reporting Options for Water Utilities* (91095), will be available in early 2006 from the AWWA Bookstore (1-800-926-7337) or from [awwa.org/bookstore](http://awwa.org/bookstore). Reports will be free to AwwaRF subscribers by calling 303-347-6121 or logging on to [www.awwarf.org](http://www.awwarf.org).

This article gives an overview of the options studied and highlights key findings from the utility evaluations, which are further detailed in the full report (Matichich et al, in press). An appendix to the forthcoming report includes sample outputs for three asset management options studied for the 11 utilities, along with the utilities' evaluations of the options and outputs.

The study was conducted to aid utilities in developing responsive asset management strategies that comprehensively address utility infrastructure planning, with an emphasis on infrastructure renewal. The examples and analyses are intended to help water utilities identify asset management options that are worth considering and performance measures that are worth tracking. Information is included on data development and maintenance efforts required to implement the reporting options. In addition, potential benefits of the information for management decision-making and advocacy for appropriate renewal and replacement funding with governing bodies and other stakeholders are discussed.

### **AWWARF HAS STRONG BACKGROUND IN ASSET MANAGEMENT**

AwwaRF has been conducting research in the area of asset management for more than 15 years; nearly 50 projects have been completed to date. The drinking water industry has only recently embraced asset management as a technique for optimizing investments in infrastructure. Although definitions of asset management differ, an industry report gives one definition: "Managing infrastructure assets to minimize the total cost of owning and operating them, while continuously delivering the service levels customers desire." (AMSA et al, 2001).



**When an accurate inventory and condition assessment is derived, water utilities can weigh potential value-added replacement and renewal strategies in terms of their effects on facility condition, water rates, and other key financial indicators such as debt-service coverage.**

the water industry's need for increased replacement and renewal (R&R) spending. Other catalysts for seeking new approaches and perspective for utilities come from the new financial reporting requirements for general infrastructure assets in Government Accounting Standards Board (GASB) Statement 34 (GASB, 1999). The statement offers some insights into developing asset management programs for water utilities. It also identifies both a standard (depreciation) and optional (asset management) method for cities and counties to report on components of their general infrastructure, such as roads and bridges.

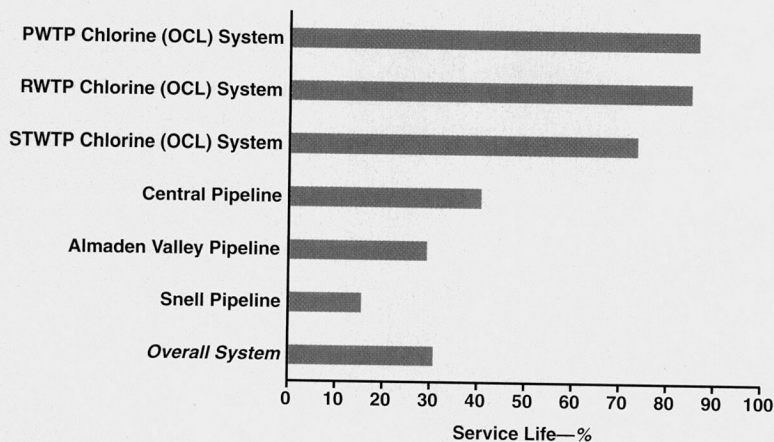
Projects funded by AwwaRF have developed many different tools and manuals—covering asset tracking and tagging, asset-condition assessment, risk assessment, and general asset-related planning—to aid water utilities in managing their assets.

AwwaRF subscribers continue to provide leadership in optimized asset management by funding numerous projects on the topic. A few of these AwwaRF projects form the framework that has been used to objectively document the magnitude of the asset management challenge and some specific issues (Crotty, 2004; Deb et al, 2002a, 2002b; AWWA, 2001; Deb, Hasit, & Norris, 1999; Deb et al, 1998; Deb et al, 1990). The AwwaRF studies and others completed by the US Environmental Protection Agency, AWWA, and the General Accounting Office do not identify utility-specific strategies. They do, however, call attention to

Most water utilities are organized as enterprise funds for financial reporting purposes, and therefore are not subject to the requirements of the asset management reporting option identified in GASB's Statement 34. Technically, their reporting requirements may still be limited to documenting and depreciating their assets as part of their enterprise fund reporting. Many water utility managers, however, have discovered the benefits of employing the knowledge obtained from GASB Statement 34 and projects that have advanced asset management technology. Utility managers have also discovered that asset management practices and tools help them communicate their renewal needs to customers and policy boards.

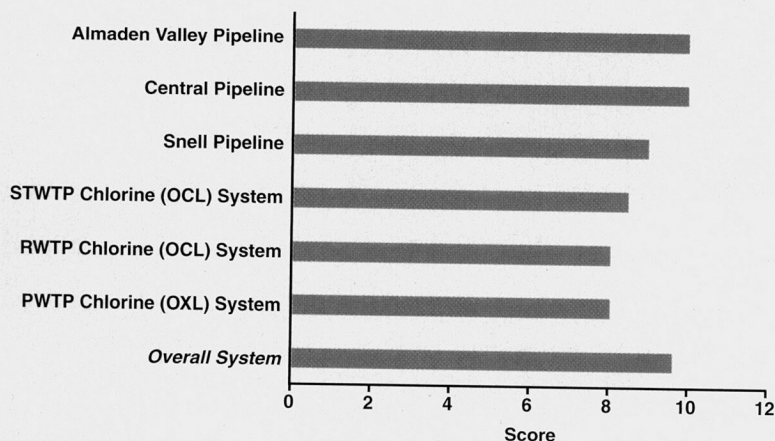
In preparing for this project, AwwaRF representatives saw that traditionally the drinking water industry has had difficulty developing information that can be used to

**FIGURE 1** Service life used by major system component and overall system



OCL—sodium hypochlorite, PWTP—Penitencia Water Treatment Plant, RWTP—Rinconada Water Treatment Plant, STWTP—Santa Teresa Water Treatment Plant

**FIGURE 2** Performance scores by major system component and overall system



OCL—sodium hypochlorite, PWTP—Penitencia Water Treatment Plant, RWTP—Rinconada Water Treatment Plant, STWTP—Santa Teresa Water Treatment Plant

Total performance scores range from 1 (worst) to 10 (perfect) and are based on various systemwide performance criteria such as service reliability and violations of water quality standards.

objectively rate infrastructure condition and potential R&R expenditures. As a result, R&R efforts have generally been underfunded. The R&R that has taken place has focused primarily on more visible assets such as treatment facilities. Several factors are causing drinking water utilities to improve their strategic decision-making process about the level of R&R investment across

their systems. Typically, improving investment decisions requires a more complete and formalized inventory and condition assessment of assets than has traditionally been done. When an accurate inventory and condition assessment is derived, water utilities can weigh potential value-added R&R strategies in terms of their effects on facility condition, water user rates, and other key finan-

cial indicators such as debt-service coverage.

### THREE ASSET MANAGEMENT OPTIONS WERE EVALUATED

The AMPRO research team defined and then refined three levels of asset management planning options for detailed evaluation:

**Basic.** Traditional concepts of valuation and service life are used to approximate conditions, estimate R&R factors, and help target renewal expenditures. Key concepts used in this option are the replacement value of the assets and realistic estimates of the useful lives of the assets.

**High-end.** Key performance measures such as service outages and regulatory compliance are identified and prioritized. Performance scores are then used to assess the condition of individual and grouped assets to help guide R&R decision-making.

**Strategic.** Elements of the basic and high-end options are incorporated, but additional features include estimating the financial effects of R&R decision-making and its effect on system value and condition over time.

**Sample graphics.** The forthcoming AMPRO report contains more than 20 sample tables and graphics illustrating the types of information that would become available through implementing each of these three options. Some of these outputs are very detailed asset- or asset-group-specific reports and figures that are intended to aid management decision-making. Others are higher-level figures and tables intended to communicate findings and options to higher-level management within utilities and to external stakeholder groups.

Four stakeholder outreach graphics (Figures 1–4) are included to give readers an idea of how the types of information that would result from each of the three options might differ; readers interested in seeing the full range of more than 20 outputs developed for the project are referred to the full report.

The four figures represent reasonable examples that any utility



could start with when fashioning an outreach program. When implementing the types of asset management options studied in this project, a utility could then modify and add to this initial set of outreach graphics to meet the communication needs of its specific stakeholder groups. These figures reflect the data set from the SCVWD.

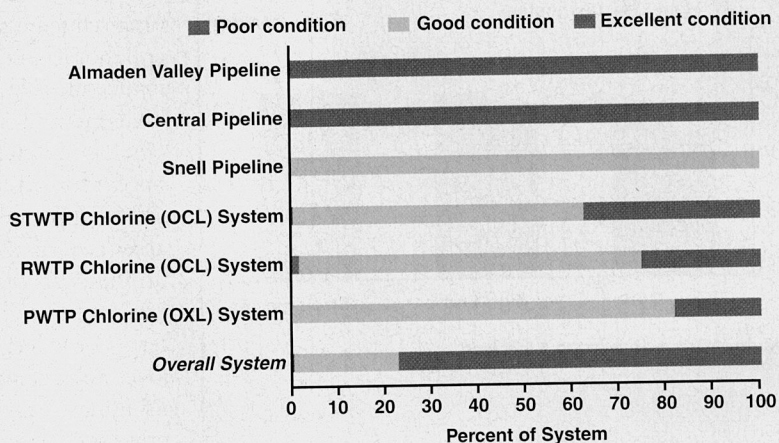
**Basic.** Figure 1 shows the service life used by major system component and by overall system. This example would be available for utilities implementing the basic option. It incorporates key summary information from more detailed technical support figures and could be used to help explain the need for investment if a significant portion of the service lives of key systems is depleted. For the SCVWD example, the overall service life used is about 30%. Because the SCVWD is a relatively new system, it shows less service life used than other water utilities, including most of those that participated in AMPRO.

**High-end.** Figure 2 displays the overall performance for the entire system and by major system component. This is an example of a figure that would be available for utilities implementing the high-end option. It summarizes key information from more detailed management figures developed for the project and helps to explain both the overall condition of the system and why investment should be targeted toward certain portions of the system that have lower performance scores.

Figure 3, another outreach figure for utilities implementing the high-end option, shows the condition of the major system components divided into the poor, good, and excellent condition categories. This figure can also help to inform stakeholders why investment is needed and why it is targeted toward certain asset groups.

**Strategic.** Figure 4 is an example that would serve utilities implementing the strategic option. A simplified version of one of the decision-support graphics developed for this option, it demonstrates the effects of

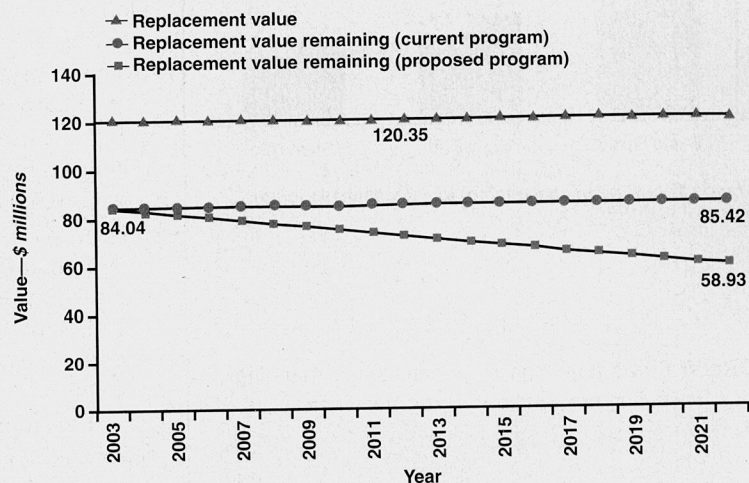
**FIGURE 3** ACR by major system component and overall system



ACR—asset condition rating, OCL—sodium hypochlorite, PWTP—Penitencia Water Treatment Plant, RWTP—Rinconada Water Treatment Plant, STWTP—Santa Teresa Water Treatment Plant

ACRs are based on performance scores of individual assets within each system component, weighted by asset value.

**FIGURE 4** Projected system value with proposed capital and R&R programs



R&R—replacement and renewal

the proposed capital and R&R programs on net system value. It shows the effect of a proposed investment program on the overall value of the utility system. Other management-focused graphics would likely be used along with this figure to identify the funding requirements for the recommended program. The example emulates the situation observed in many utilities in which current levels of

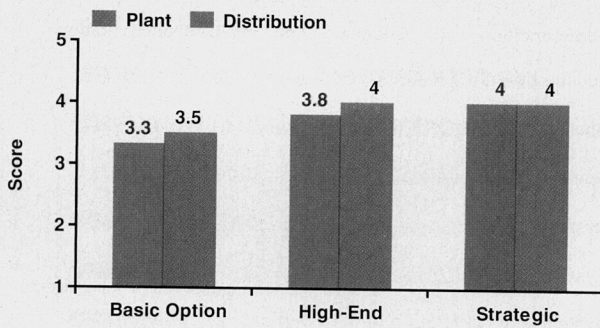
investment in R&R are resulting in an overall decline in system value over time (as investment fails to keep up with basic system depreciation).

**COLLABORATION WITH UTILITIES WAS KEY TO THE PROJECT TEAM'S SUCCESS**

To develop and then refine the three levels of asset management planning, including selecting perfor-

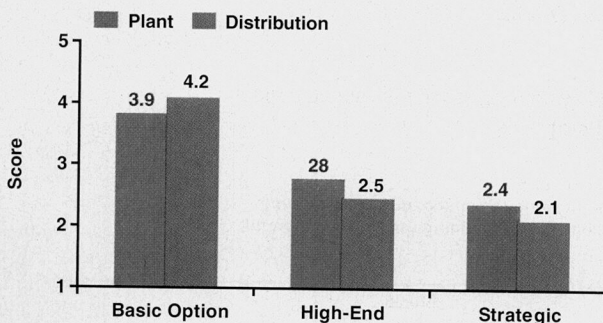


**FIGURE 5** Overall value of the three management options



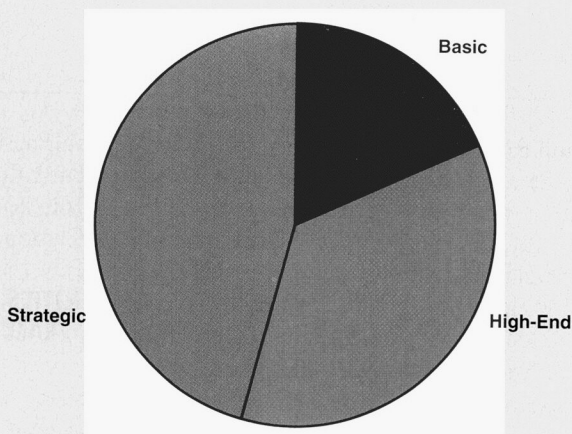
Scores range from 1 (worst) to 5 (perfect).

**FIGURE 6** Level of data management challenge for plant and pipe assets



Scores range from 1 (most challenging) to 5 (least challenging).

**FIGURE 7** Proportion of participating utilities planning to implement various program types



performance measures for study, developing appropriate hierarchy structures, and designing an evaluation framework for assessing the value of the options studied, the project research team and participating utilities worked in close collaboration. The AMPRO team selected seven performance measures out of nearly 50 options to test for the high-end and strategic options. On the basis of the specific options selected for study, the research team developed a spreadsheet template model that was used to produce sample tables and graphic outputs for up to 1,000 asset records contributed by each of the participating utilities. Scorecards and letters of comment were used to evaluate the usefulness of the options and outputs in terms of value to utilities in formulating recommended asset management programs; they also helped evaluate usefulness in making the case to governing boards and other stakeholders for required resources to support effective asset management.

The study was not intended to be a software development project; however, a template model used to generate the sample outputs was developed as a testing platform to illustrate the types of outputs that would be generated by data samples of up to 1,000 records. Readers of the report might choose a variety of software approaches to implement reporting options that they find valuable among those presented and evaluated. For example, the participating utilities used a set of diverse software-implementation approaches to incorporate lessons learned from this project:

- Incorporating reporting capabilities from the samples into existing systems already populated or partially populated by the utility, such as geographic information systems (GIS) or computerized maintenance management systems (CMMS).
- Purchasing and implementing freestanding asset management software that emulates the reporting outputs found to be valuable or that has the capability to be adapted to include reporting capabilities found to be valuable.
- Developing customized systems that emulate the reporting capabilities of outputs found to be of high value in database or other programming environments.

**STUDY SHOWS IMPORTANCE OF OPTIONS AND ATTENTION TO DATA MANAGEMENT**

Key overall findings and recommendations from the AMPRO project are summarized in the sections that follow.

**Options, performance measures, and outputs help aid decisions.** All three of the asset management options offer substantial value above no action or current practices for both plant and pipe assets. On a scale of 1 to 5, with 5 being a perfect score, participating utilities gave all options a rating of at least 3.3 (Figure 5).

In general, the utilities found that using prioritized performance measures was critically important in creating an effective asset management program. Other useful



features included the ability to set system-specific weights on the performance measures and to customize the scales used to “score” asset performance. The study participants found that some of the seven performance measures were substantially valuable. Several measures received ratings of 4 on a 5-point scale, either in terms of their value in aiding management decision-making or in making the case for required funds to governing boards and other stakeholders.

Data-management challenges were considered much greater for the high-end and strategic options (Figure 6). Many of the utilities found that the input information required to populate the samples for the basic option was generally available, although in many cases work was required to integrate information across data systems. The performance information to populate the performance measures for the high-end and strategic options often required much more significant data generation and management work. A number of the utility representatives thought that organizational or cultural changes would be required to successfully implement these higher-end options throughout their systems.

Despite the additional costs and staff resources associated with the high-end and strategic options, most of the participating utilities plan to implement asset management strategies that emulate either the high-end or the strategic option (Figure 7). They deemed the information and outputs from these options to be worth the additional staff and resource expenditures.

The diverse perspectives of the participating utilities illustrate the context-specific nature of developing an appropriate asset management strategy. In some contexts, the basic option is appropriate. In terms of the high-end and strategic options, factors such as the availability and complexity of system data, the number of stakeholder groups, and the specific information needs of those stake-

holders strongly influence the appropriateness of undertaking the additional data development and maintenance required. As an example, Clifford Jamile, manager and chief engineer for the Honolulu (Hawaii) Board of Water Supply, concluded, “[Because] we have implemented most critical-need projects identified through our previous asset management efforts, we find substantial value in the capabilities of the strategic option to help identify the next tier of renewal and replacement projects [requiring] attention. As such, in our case it is worth the additional data development costs to have the benefit of the outputs of the strategic option.” (Matichich et al, in press). On the other hand, James Spacek, director of the Portsmouth (Va.) Department of Public Utilities, stated, “The City of Portsmouth has adopted the basic option approach for its utility systems . . . Both the high-end and strategic options have compelling potential benefits, but for our situation, the cost and complexity seem to represent an effort with somewhat diminished benefit.” (Matichich et al, in press).

Gordon Logan, manager of water asset planning at South East Water Ltd. (Heatherton, Victoria, Australia) and special advisor to this project, helped put the diverse choices of the participating utilities into perspective:

The asset management reporting options under consideration for this project can be seen as a natural progression in an asset management continuous-improvement strategy. The initial option adopted by an individual utility will be dictated by the amount of asset-related data available at this time. An asset management-strategic plan will then consider which option the utility will move toward and over what timeframe. Regardless of which initial option is selected, in order to develop an acceptable asset management strategy, there should be sufficient information to determine a picture of requirements over the entire asset portfolio.

Several of the sample graphics and tables developed for AMPRO were found to be valuable in developing staff recommendations and in making the case to governing boards and stakeholders. Just as the overall direction forward varied significantly among the participating utilities, the usefulness of the outputs was found to vary, too. The commentary on the performance measures and outputs by the participating utilities in letters that are appended to the project report provides useful insights that can help readers to consider the usefulness of the sample outputs for their situations (Matichich et al, in press).

#### **Data-management challenges merit close attention.**

Because the data-gathering and development challenges associated with populating the 1,000-record samples were even more challenging than had been anticipated, many of the recommendations for future direction relate to data-management efforts. The recommendations center on the theme that water utilities must be selective about how they implement asset management programs. Some of the participating utilities intend to use the following strategies when implementing their asset management programs:

- Implement the selected option in phases. This approach has several variations. In some instances, assets of a certain type (e.g., all pumps or large water mains) will be addressed first. In other cases, priorities will include all assets within a limited geographic area or those that a preceding criticality analysis found to be most important.
- Start by implementing new protocols for capturing desired information assets being added to or renewed or replaced within the systems.
- Carefully investigate opportunities to mine existing databases, such as GIS and CMMS systems, either to capture information that would be imported into asset management systems or by building additional reporting capabilities directly into these systems.

# Participating Utilities and Their Primary Representatives

City of Ann Arbor (Mich.) Water Utilities (Craig Hupy)  
City and County of Honolulu Board of Water Supply (Clifford S. Jamile)  
Ottawa Transportation, Utilities and Public Works Department (Devesh Shah)  
Pittsburgh Water and Sewer Authority (Kelly Sikorski)  
City of Portland (Ore.), Bureau of Water Works (David Evonuk)  
Portsmouth (Va.) Department of Public Utilities (James Spacek)  
Saint Paul (Minn.) Regional Water Services (Christine Meyer)  
San Francisco Public Utilities Commission (William H. Laws)  
Santa Clara Valley (Calif.) Water District (Alan Zeisbrich)  
Seattle Public Utilities (Elizabeth S. Kelly)  
Toronto Water and Wastewater Services (Michael D'Andrea)

- Strategically justify the addition of each performance measure and other attributes maintained in the databases. Do not continue to gather data for legacy performance measures unless they are found to provide continued value.

- Start at a high level of hierarchy, with summary-level performance and financial information, and then build out detailed information by geography or other criteria as staff time and other resource availabilities allow. Critically consider the benefits and associated costs of capturing additional levels of detail.

- Consider conducting a beta test for a small sample of assets, such as the ones used for this study. Such samples can yield valuable insights into optimizing data gathering and process efforts during systemwide implementation. Conducting beta tests also increases the likelihood that selected output measures will be useful.

The appropriate data platform to store and analyze the information was also found to be system-specific, depending on factors such as the availability of data systems and the existence or lack of data protocols within utility operations or across all departments within a city, county, or other government entity. Data management strategies for moving toward

systemwide asset management implementation range from developing customized systems to purchasing and implementing dedicated software to building additional customized capabilities into existing maintenance management systems or GISs.

### **Developing an appropriate system-specific hierarchy is key to success.**

Assets can be grouped within the databases in several ways (e.g., by location, by asset type, by functioning system). The appropriate method is system-specific, depending on, for example, how assets are maintained and how capital projects are organized for inclusion in capital improvement plan and budget documents. Selecting a hierarchy had a significant influence on the usefulness of some of the reports and figures tested for decision-making within participating utilities. On the basis of their review of outputs that resulted from the project tests, several of the utilities made adjustments in their approaches to hierarchy development.

**Stakeholder profile and decision-making culture influence both high-level strategies and detailed program implementation.** The participating utilities identified a broad spectrum of stakeholder groups with an interest in asset management decisions, including governing boards, municipal govern-

ments, the financial community, the media, customers, and employees. The identified stakeholders varied not only by system size, but also by regulatory context and other factors. For example, in some cases, state public utilities commissions have a strong role through their oversight and approval responsibility for budgets and rate increases. In other cases, state agencies have no role or act only in an advisory capacity on such matters. Utilities that finance substantial portions of their capital programs through municipal bonds identified bond-rating agencies as key stakeholders of interest. The participating utilities found value in thinking of specific stakeholder groups—and even of the most influential individuals within these groups—when considering which tables, graphics, or other communication media would be most valuable to successfully make the case for the necessary resources.

### **Ancillary benefits to action on asset management can be substantial.**

In addition to helping utility staff and management identify appropriate levels of R&R investment, developing asset management programs that emulate the options tested were found to have substantial additional value for water utilities. As discussed in personal correspondence from American Appraisal Associates (AAA), the data developed to support these options may help align fixed-asset registers to more accurately reflect the actual assets in service and their value (Gruenwald, 2004). In the correspondence, Paul Gruenwald, vice president of AAA and managing principal for the firm's Milwaukee Property Appraisal Services Group, said:

From experience in appraising water utilities, we find that what appears in the capital asset ledger maintained by the Finance Department is different than what is actually in the plant. This is because there are normally no established procedures for plant personnel who are familiar with what is occurring in the plant to report retirements and additions to

the Finance Department. If an electronic interface could be established that would allow plant personnel to automatically report to the Finance Department assets that are being constructed, replaced, or disposed of, it would improve the accuracy of the capital asset ledger, reduce the manual effort in the Finance Department to capture this information, and allow the Finance Department to report better information.

James Wiemken, Standard & Poor's sector leader for municipal water and sewer utility ratings and state revolving fund ratings throughout the United States, noted that developing capital and rate programs that provide for long-term sustainability of a utility system's assets is viewed favorably by credit-rating analysts: "True rate stability and transparency assumes that a system's current and likely future needs have been measured and are relatively known. The average increase in rates to be targeted over the next decade cannot be known without some idea of the cost pressures a utility may face, and without an honest effort to estimate these needs, it will be extremely difficult to educate and inform ratepayers." (Speranza et al, 2004).

**Detailed findings and recommendations provide additional guidance.** The body of the project report provides many additional findings and recommendations related to the options and

strategies evaluated in the AMPRO project. In addition, the report contains chapters that address a number of technical topics covered by the study:

- Selecting and using appropriate performance measures
- Developing and managing data
- Developing appropriate data hierarchies
- Determining an appropriate evaluation framework
- Defining the relationship of asset management to related utility planning processes.

As mentioned earlier in this article, the report is appendix contains sample outputs for the three asset management options and scorecard ratings and letters of comment contributed by the 11 participating utilities, creating a case book of examples. The utilities' examples and lessons learned can be used to gain additional insight into how and when the options studied in this project will prove most valuable.

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### **Technology trends and their implications for water utilities**

*Edward G. Means III, Joseph Bernosky, and Roger Patrick*

Technology will transform the water utility workplace—from how utilities manage and use information to how they treat and monitor water. Understanding the nature of these changes and the appropriate use of technology can reduce costs, allow for better and quicker decision-making, and enable better management of increasingly complex information databases.

This article is the final one in a six-part series on trends and their implications for water utilities. It characterizes the key technology trends in a rapidly changing water utility world, and describes the implications of these trends and potential strategies to address them. Utilities can use this information to ensure that they are adequately considering and addressing the technology trends affecting the provision of water service.—LH

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### **Prioritizing capital improvement projects to mitigate risk**

*Ryan W. Nagel and Mike Elenbaas*

Faced by the need to repair and replace aging infrastructure and at the same time build new systems to meet population growth, US water utilities must make increasingly complex decisions about where, when, and how to invest their capital improvement dollars. What's more, their decisions must involve a range of stakeholders and win their "buy in" in order for projects to receive necessary financial and community support.

A decision-making process has been developed to help utilities systematically and objectively prioritize capital improvement projects on the basis of financial risk and other defensible planning criteria. In addition, the method-

ology described in this article enhances both internal and external communication, can help stabilize rate increases, and potentially lower bond interest rates by providing rating agencies with evidence of comprehensive planning.

Water suppliers can use this information to begin transforming the way they establish and prioritize their capital improvement programs. By following the step-by-step approach described here, utilities can turn the daunting challenge of capital improvement choices into a process that leads to sound financial policies and fosters collaborative partnering with their customers and communities.—MPM

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### **Asset management planning and reporting options for water utilities**

*Mike Matichich, Jason Allen, and Robert Allen*

Industry studies in recent years have raised awareness of the magnitude of asset renewal and replacement needs in the water industry, but little comparative work has been done on asset management. To help fill this gap, the Awwa Research Foundation sponsored the study summarized in this article. The full study forms a "casebook" of comparative asset management options.

Eleven utilities of diverse sizes, asset ages, availability of automated information, and engagement in asset

management worked with the project team to test and evaluate three levels of asset management planning: basic, high-end, and strategic.

The study results showed that even a basic asset management option has considerable value for a water utility. More advanced and strategic options require significant additional investment, but 80% of the utilities that participated in this project found the benefits to outweigh the costs and plan to implement programs that emulate these options.—RSH