With the ever-increasing complexity of drinking water systems, water professionals want tools that can provide the best operational management practices for their utilities. The AWWA Utility Management Standards (also known as the G-Series Standards) allow utilities to easily assess system limitations, optimize operations, and identify needed changes. These standards were developed to help utilities foster excellence through continuous improvement and evaluation as well as provide a framework for self-assessment, counsel, and assistance. The standards can also be used to optimize management and operational practices, evaluate and overcome challenges, improve customer service, maintain record keeping, enhance staff knowledge, and ultimately strengthen customer confidence and satisfaction. More importantly, the standards help utilities follow industry best practices and keep their systems up to date.

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Using Utility Management Standards to Optimize Operations

As shown in three case studies, AWWA’s Utility Management Standards provide guidance for utilities to achieve peak management performance.
THE DEVELOPMENT OF UTILITY MANAGEMENT STANDARDS

AWWA’s formal process has been used for more than 90 years to develop standards that are approved by the American National Standards Institute and recognized throughout the world. The Utility Management Standards were created using this same process developed by the AWWA Standards Council and its affiliated committees, although these standards are voluntary. The Utility Management Standards were defined and structured by members of the AWWA Utility Quality Management Committee, which included water professionals from water and wastewater utilities, engineering and consulting firms, academia and research organizations, and state and provincial regulatory agencies. Groups of professionals with expertise and experience in different subject areas developed the standards, and associated guidebooks were written by subject matter experts to help utilities perform self-assessments.

Numerous standards have been created to address different components of water and wastewater utilities. The first few standards address water treatment plant operation and management (AWWA 2011), distribution system operation and management (AWWA 2015), and source water protection (AWWA 2014). In order to test the applicability of these standards before they were finalized, a workshop in Denver, Colo., was conducted in 2004, and then an 18-month pilot project took place from 2004 to 2006. A team of volunteer professionals, auditors (also volunteers) from NSF International, Underwriters Laboratories, and Canadian Standards Association, as well as AWWA support staff worked on the pilot study, which included Birmingham Water Works and Sewer Board in Alabama and Washington County Service Authority in Virginia. The two utilities helped AWWA evaluate standards that focused on treatment, distribution, and source water protection. As a result of the pilot study, the following standards were developed:

- Water Treatment Plant Operation and Management
- Distribution System Operation and Management
- Source Water Protection
- Utility Management System
- Business Practices for Operation and Management
- Communications and Customer Relations
- Security Practices for Operation and Management
- Emergency Preparedness Practices
- Water Conservation Programs
- Reclaimed Water Program Operations and Management
- Wastewater Treatment Plant Operations and Management

INCENTIVES AND BENEFITS OF USING STANDARDS

By comparing operational management practices with industry standards, utilities can examine potential limitations in areas of operation. Some of the areas include assessment of source water, treatment processes, management of distribution systems, budget needs, record keeping, energy management, capacity, permits, training, quality, regulations, security, emergency preparedness, conservation, knowledge transfer, outreach, customer confidence, and human resources. Conforming to standards can also help utilities cope with heightened regulatory requirements, increasing stakeholder interest in utility efficiency, closer public scrutiny of tap water quality issues, tightening budgets and increasing pressure to reduce costs, and increasing concern about environmental issues. A utility that incorporated the standards noted, “Applying the management standards to utility operations was the best tool we’ve used to manage our utility in a way that guarantees peace of mind and knowing that we can maintain safe performance based on good practices and not just good luck.”

Conformance with these standards is founded on the water industry’s long-standing commitment to protecting public health. These standards establish uniform assessment procedures and promote public and regulatory acknowledgments of excellence. AWWA’s voluntary management standards also address issues that are likely to remain of concern to utilities in the future:

- Heightened stakeholder interest in the efficiency and effectiveness of utilities
- Increased government regulatory requirements
- Closer public scrutiny of tap water quality issues—particularly ones related to health
- Lower budget levels resulting in reduced spending in the public and private sectors without risk to quality
- Greater concern about the environment and sustainability among consumers
- Increased customer service expectations from consumers

The Utility Management Standards complement and support the attributes of effectively managed utilities as presented in Effective Utility Management (EUM), a program born of a collaboration of the US Environmental Protection Agency (USEPA) and several other organizations, including AWWA (USEPA). These standards help utilities foster excellence through continuous improvement and evaluations, as well as provide a framework for self-assessment, counsel, and assistance.
These standards establish uniform assessment procedures and promote public and regulatory acknowledgments of excellence.

The Utility Management Standards serve water utilities and their customers, owners, and government regulators by promoting service quality and management efficiency. They are designed for all utilities, regardless of size. Ten elements described in the USEPA’s Effective Utility Management: A Primer for Water and Wastewater Utilities (USEPA 2008) are also supported in the Utility Management Standards. These attributes are product quality, customer satisfaction, employee and leadership evaluation, operational optimization, financial viability, infrastructure stability, community sustainability, operational resiliency, water resource adequacy, and stakeholder understanding and support. Utilities that conform to these standards can expect minimum reporting requirements, less regulatory oversight, and improved customer satisfaction.

Additionally, the Utility Management Standards provide best practices that can be used to implement the USEPA’s 2014 Moving Toward Sustainability: Effective and Sustainable Practices for Creating Your Water Utility Roadmap (USEPA 2014). The 10 management areas listed in the USEPA roadmap are supported at each business level and are vital in maintaining, optimizing, and transforming business best practices. The standards are specifically referenced in the “Performance Measurement and Continual Improvement Management” section of the roadmap but can be applied in other management areas.

The 2001 National Consumer Water Quality Survey commissioned by the Water Quality Association, an association devoted to selling home-treatment devices for tap water, revealed that nearly nine out of 10 Americans have concerns about their tap water. One in three Americans believes that household drinking water is not as safe as it should be (WQA 2001). The Utility Management Standards offer utilities a recognizable “seal of approval,” which in turn assures consumers that their utilities are providing efficient service and high-quality drinking water.

Water and wastewater utilities recognize the need for health and environmental regulations to protect the public. However, utilities are best equipped and experienced in deciding how to achieve these levels of quality. The Utility Management Standards help verify that industry standard practices are being employed to produce self-regulated and high-quality water. This recognition can provide a “credibility check” that signifies to customers and stakeholders that the utility is doing the right things in its quest to provide high-quality service.

There are additional benefits that can be attained through using the standards:

- Utilities can promote themselves to lenders and investors by highlighting their efficiency.
- Improved effectiveness translates into higher productivity and a better bottom line.
- Conforming to the standards can add value to their municipal system.
- Lower liability could reduce insurance costs.
- Achieving optimal performance can reduce the burden of regulators since the water utility is meeting all federal and state drinking water standards.
- Less oversight and reporting requirements from agencies will allow utilities to focus on continuous improvement.
- Optimal performance enables tap water providers to protect the public against known and unknown health threats.
- Water and wastewater utilities can optimize their operations, which improves the quality of services they offer to their ratepayers.
- Water and wastewater utilities can strengthen their reputation among municipal leaders, stakeholder groups, and ratepayers.

PUTTING IT TOGETHER

The Intermountain Section of AWWA saw the benefits of promoting the Utility Management Standards as part of its efforts to encourage utility management optimization. The Intermountain Section Utility Quality Management Committee, composed of utility, consulting, and regulatory professionals, organized “train the trainer” sessions for each of the three initial G-Series Standards. The sessions were conducted voluntarily by authors of various standards and guidebooks. The authors covered source-to-tap optimization topics, such as G-300 for source water protection, G-100 for water treatment plants, and G-200 for distribution systems. Once the train-the-trainer sessions were completed, the committee advertised and promoted utility participation in self-assessments and offered technical assistance, promoted the corresponding guidebooks, and facilitated the peer-review process. Twelve utilities in Utah completed self-assessments in all three standards, and most of them submitted...
self-assessment results and applied for peer reviews. Utilities that completed the peer-review step were awarded certificates and plaques during the Intermountain Section Annual Conference. The participating utilities were satisfied with the time and effort invested in the self-assessments, noting the payoff in improvements in utility management, employee confidence, enhanced drinking water quality delivered to customers, efficiency, customer satisfaction, and improved sustainability.

G-100 CASE STUDY: WATER TREATMENT PLANT OPERATION AND MANAGEMENT
The G-100 Standard describes critical requirements such as maintaining water quality, system management programs, and the operation and maintenance of facilities for the operation and management of water treatment plants. The standard requires that a utility establish measurable goals for the following:

- Regulatory compliance requirements
- Operational management practices
- Real property management and maintenance
- Water quality management

The G-100 guidebook provides a self-assessment tool to identify gaps in these categories, which can be prioritized according to needs and resources. A monitoring system is required to measure performance against goals, as well as a system to identify opportunities for continuous improvement.

In this case study, Hank Childers, a field operations manager, incorporated the G-100 Standard and guidebook in 2010 at Washington County Water Conservancy District (WCWCD) located in St. George, Utah. Childers and his staff used the standard as a reference tool to examine what they were doing well and what needed improvement. The entire staff (including the office staff) was involved and participated in the self-evaluation process, which later led to the development of a prioritized improvement list.

WCWCD’s first priority was compliance. The staff used G-100 to establish water quality goals and objectives. The team then used the standard as a check sheet for developing improved procedures in areas such as chemical use, power consumption, lab practices, and water quality goals. The standard was also helpful in the team’s efforts to develop a structured filing system to track needed improvements for creating electronic manuals, standard operating procedures, and as-built drawings. The filing system ensured that critical documents were in place for training, operations, and preventative maintenance programs.

Childers mentioned that initially some of the staff were hesitant with the new program. The team introduced concepts covered in G-100 gradually, which eased anxiety and eventually empowered the staff to be more successful in their jobs. Childers also noted that the guidebook not only was useful but also critical for effectively following and implementing the standard. The guidebook had resources, examples, and documents that provided clarity and direction for change. The WCWCD team used the recommendations in the guidebook and gave employees responsibility for evaluating plant operations. This led to significant improvements, including an energy management program throughout the plant. The result was an annual cost saving of $15,000. The utility also made changes in filter operations by following best management practices, which resulted in better filtration performance and decreasing back-wash water use by 25%.

G-200 CASE STUDY: DISTRIBUTION SYSTEMS OPERATION AND MANAGEMENT
The G-200 Standard describes the critical requirements for the operation and management of water distribution systems. This includes maintaining water quality through the use of

- documentation, monitoring, and control of regulated parameters;
- maintenance of disinfection residuals;
- corrosion control;
- control of taste, odor, color, and other aesthetic parameters;
- system flushing; and
- customer complaint monitoring and resolution.

The standard also requires various programs to monitor and control system pressure and flow, backflow prevention, permeation prevention, water-contact-material quality requirements, water loss, valve exercising and replacement, maintenance and testing of fire hydrants, metering, and energy management. The standard encourages systems for conducting inspections and maintenance of water storage facilities, pump stations, and pipeline rehabilitation and replacement.

David Bries, utility superintendent for the City of Montrose, Colo., explained how the G-200 Standard and its associated operational guidebook were used to address distribution system operations and management within the utility. The staff started using the standard around 2007 in an effort to evaluate any
The Utility Management Standards offer utilities a recognizable “seal of approval,” which in turn assures consumers that their utilities are providing efficient service and high-quality drinking water.

The G-300 Standard defines the minimum requirements for the protection of source water and consists of six primary elements:

- Source water protection program vision
- Characterization of source water and source water protection areas
- Source water protection goals
- Water protection action plan
- Program implementation
- Periodic evaluation and revision

Robert Morgan of the Beaver Water District (BWD) in Arkansas explained how the G-300 Standard and its associated operational guidebook were used to address source water protection at the utility. The standard was used in 2010 to check and update BWD’s 2006 source water protection plan. The operational guidebook was found to be very useful, especially the worksheets associated with the six elements of a successful source water protection program. Morgan commented that the worksheets provided the team with an excellent tool to identify strengths and weaknesses in the utility’s source water protection program. Additionally, the structure of the questions was sufficiently flexible so that the team did not have to dictate how these questions should be adapted to the utility’s unique situation.

Morgan pointed out that using the G-300 Standard enhanced the efficiency of BWD’s source water protection program. The standard and its guidebook helped BWD set priorities for programs and research projects and also derived goals and strategies, which helped the utility stay focused and on track with its source water protection efforts. In other words, it was more proactive and less reactive in moving the source water protection program forward. Furthermore, the inclusion of partners and stakeholders in the program allowed BWD to communicate effectively and leverage valuable resources from entities such as the USDA Natural Resources Conservation Service.

Morgan added that a successful source water protection program should be adaptive in nature. The six elements outlined in the G-300 Standard and the worksheets in the supporting guidebook provide a flexible framework that can accommodate a wide range of conditions associated with source water characteristics and operational gaps within the utility. In the utility’s staffing system, responsibilities were spread over a large number of departments. The standard provided a checklist that made sure someone was responsible for

The structure of the questions was sufficiently flexible so that the team did not have to dictate how these questions should be adapted to the utility’s unique situation.
implementation challenges. In other words, a one-size-fits-all solution does not exist for source water protection. Because of the flexibility of the G-300 Standard, it is possible to integrate and leverage source water protection programs with other programs (such as elements of a watershed management plan and protection strategies through the integration of Clean Water Act and Safe Drinking Water Act programs).

CONCLUSION
The Utility Management Standards were developed to help utilities foster excellence with continuous improvement and evaluation processes. These voluntary standards and associated guidebooks allow utilities to identify gaps in their management systems and to improve them before they fail. It would take dozens of consulting engineers to equal the amount of management advice contained in these 11 standards. In addition, utilities can save energy, improve efficiency, prevent water loss, and improve water quality, as is demonstrated by the case studies in this article of utilities incorporating these standards. They have also been used successfully to justify investments and secure funding.

The AWWA Utility Quality Management Committee has also identified asset management and energy efficiency as two areas in which standards may be needed. Recommendations have been made to improve the guidebooks by adding examples of successful management programs and converting the guidebooks into an electronic format that could provide direct links to an online library of manuals and examples of standard operating procedures. This could also provide a forum where utilities can access a knowledge-sharing platform.

ACKNOWLEDGMENT
The authors wish to thank the members of the AWWA Utility Quality Management Committee for their help in conducting surveys, interviewing utility staff, and contributing to the development of this article. A special thanks to Dan Roberts, Dave Purkiss, and Elizabeth Foster.

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REFERENCES

AWWA RESOURCES

These resources have been supplied by Journal AWWA staff. For information on these and other AWWA resources, visit www.awwa.org.