Using a Measured Framework to Plan and Implement an Asset Management Program

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Starting in 2011, the Tulsa (Okla.) Metropolitan Utility Authority (TMUA) engaged a multidisciplinary team, comprised of engineering, financial, and legal firms, to conduct a comprehensive assessment of the city's water and wastewater systems. This comprehensive, phase-one effort included evaluation and recommendations for organizational structure, communication, operational optimization, and asset management. The implementation of recommendations proceeded as the Utility Enterprise Initiative (UEI), starting in early 2013. The UEI has included a far-reaching set of tasks and objectives, including a utility strategic plan, performance management system, operational optimization, and implementation of an asset management program based on International Organization for Standardization (ISO) 55001 principles.

Overall, the comprehensive assessment found that the Tulsa metropolitan region enjoys water and sewer services that operate within industry norms for service quality and cost-efficiency; however, without significant changes, increasingly stringent regulations and the system's aging infrastructure will combine to force water and sewer rates to grow significantly in the coming decades. To address these concerns, TMUA has initiated the UEI as the second phase of the assessment program, which includes governance issues, strategic management improvement, performance management improvement, operational optimization, and implementation of a comprehensive asset management program.

As part of the first phase, the project team performed an asset management gap assessment that identified the major program elements to be implemented in phase two of the project. The assessment was useful and helped provide the foundation for recommending asset management improvements as part of the second-phase UEI. Building on the phase-one recommendations, it was then agreed to build an asset management framework based on the British Standards Institution (BSI) publicly available specification (PAS), known as PAS55, for the optimized management of physical assets, to establish a baseline, and to allow measurement of progress as improvements are implemented. The PAS 55 was subsequently superseded by ISO

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55001, and the utility is considering ISO 55001 certification as part of its UEI.

The framework implementation effort of the project has just completed its third year. Annual progress assessments have been carried out for 2014, 2015, and 2016..

Methodology

Year 1: Initiation of the Asset Management Framework with Publicly Available Specification 55

At the start of the initiative, the project team performed a PAS 55 asset management gap assessment that identified the major program elements needed for an effective asset management program. The assessment was conducted by a team of Institute of Asset Management-approved assessors and was comprised of 26 interviews with staff in three city departments, a document review, and three workshops. The assessment was insightful and provided a structured roadmap with prioritized tasks, including level of effort, responsibility, and expected timing.

PAS 55 was selected as the basis for the assessment because it takes a utilitywide asset management system approach and provides a framework for an organization's strategic vision and goals to be achieved through asset-centric strategies and plans. This is referred to as a single "line of sight," from the organization's leadership team to the asset operators and maintainers, so all parties have a clear understanding of what they are required to do in order to achieve the organization's strategic goals. The PAS 55 was born out of the need for utilities in the United Kingdom to demonstrate to regulators that they were effectively managing their assets, to clarify what is meant by asset management, and to define good practice.
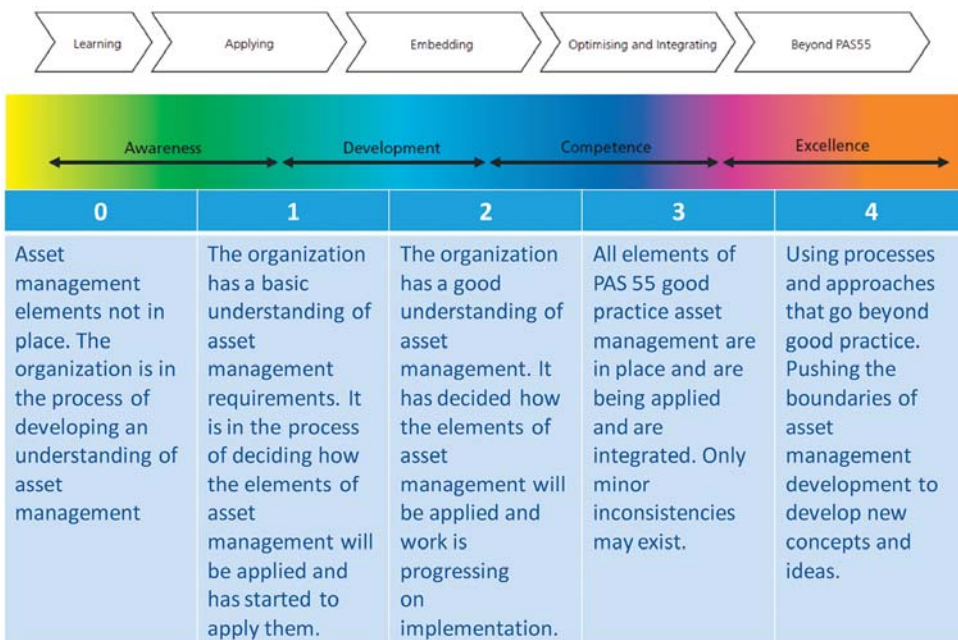

Figure 1. Publicly Available Specification 55 Scoring Scale

The PAS 55 specification consists of 28 elements of good asset management practice that can be used as a checklist for implementation of improvement programs. The elements of good practice are set out under the following sections:

♦ General requirements
♦ Asset management policy and strategy
♦ Objectives and plans
♦ Asset management enablers and controls
♦ Implementation of asset management plans
♦ Performance assessment and improvement
♦ Management review

This provides an integrated approach to asset management that is systematic and risk-based, and optimizes the asset life cycle for performance, cost, and risk. Each of the 28 sections is scored on a 0 to 4 scale, as defined in Figure 1.

Initially, TMUA achieved an asset management maturity score indicative of an organization developing its approach to asset management. Trends in the scoring were found to be similar to other water utilities in the United States. Areas of good practice that were identified include:

♦ Emergency action plans
♦ Controls on outsourced activities
♦ Training and competency assessment of staff
♦ Laboratory quality manual
♦ Stalking assessment and management (SAMS) risk assessments
♦ Processes to ensure regulatory compliance

Areas for development included creating an asset management policy, framework, strategy, and objectives, as well as risk management processes, management review, and an audit. The assessment results and established targets for development are presented in Figure 2.

The TMUA staff was found to be enthusiastic about the program and clearly expects to see benefits. It is clear that individual groups have made good progress in implementing asset management approaches. Recurring themes were the issues of low pay, high turnover, and difficulty attracting quality staff. Combined with an aging workforce and limited succession planning, these issues represent the highest risk in the long term for TMUA to meet its objectives in providing safe and efficient service.

The next step was to develop an asset management improvement plan (roadmap) that set out the actions, timescales, and resources required to close the gaps and implement identified improvement activities. This plan forms the basis of the TMUA asset man-
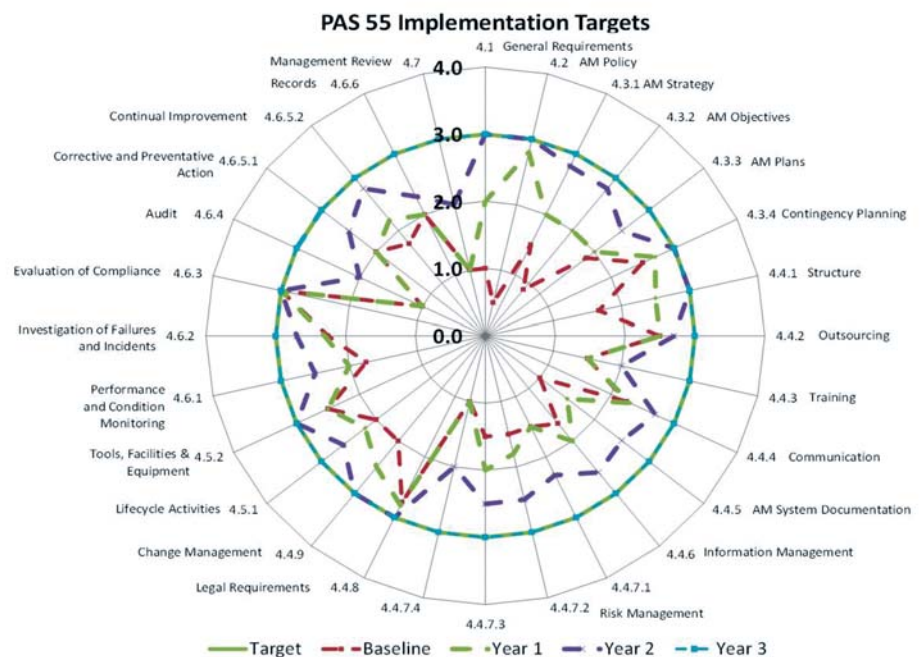

Figure 2. Publicly Available Specification 55 Assessment Results and Implementation Targets

agement program over the next three years and contains a near-term approach with prioritized activities to quickly close the more significant gaps, as well as a longer-term approach to continue developing areas with smaller gaps and develop the necessary documentation for compliance with the PAS 55 specification and ISO 55001. This plan was originally developed as a spreadsheet table and was then migrated to a Microsoft Project schedule to align asset management framework implementation activities with the broader UEI and information system implementation activities.

The implementation targets shown in Figure 2 for future years reflect the anticipated outcomes of the improvement initiatives. The baseline represents the starting point of the evaluation, which was the PAS55 gap analysis undertaken in 2013. The planned year-one improvements, as stated in the TMUA asset management strategy, would be compared with the progress in the first year of the TMUA UEI asset management program. Maturity targets were also set for 2015 (year two) and 2016 (year three). The target for year three was compliance in all areas, with a score of 3.

Using this roadmap, TMUA has been able to logically implement new and major elements of its asset management program, while having the flexibility to reprioritize efforts as needs and available resources changed. Following the promulgation of ISO 55001 in 2014, the roadmap and assessment were restructured to align with the new international asset management standard.

Year 2: Continuing Framework Implementation and Transition to International Organization for Standardization 55001

The focus of the PAS 55 update was to assess progress in implementing elements of the improvement roadmap developed following the baseline PAS 55 assessment in 2013. The work consisted of:

♦ Review of the documentation and processes developed since the 2013 assessment.
♦ Interviews with select staff to review how new processes and asset management approaches have been implemented and embedded, and to review progress on closing the main gaps identified in the initial assessment.
♦ Updating the maturity scoring against each of the 28 PAS 55 elements based on the assessed progress.

The TMUA asset management strategy specifies using ISO 55001 to develop the asset management framework going forward. The transition to ISO 55001 was agreed to be the best approach because PAS 55 was planned to be phased out with the adoption of ISO 55001, and it was expected to be rapidly recognized and adopted as the leading standard, not just internationally, but in the U.S. as well.

Table 1. Comparing Elements of International Organization
for Standardization 55001With Publicly Available Specification 55

ISO 55001 ELEMENTS	PAS 55 ELEMENTS
4 Context of the Organization	
4.1 Understand the organization and its context	4.1 General Requirements
4.2 Understand the needs and expectations of stakeholders	
4.3 Determine the scope of the asset management system	
4.4 Asset management system	
• Establish, implement, maintain and continually improve an asset management system	
• Develop a Strategic Asset Management Plan	4.3.1 Asset Management Strategy
5 Leadership	
5.1 Leadership and Commitment	4.4.1 Structure, authorities and responsibilities
5.2 Policy	
5.3 Organizational roles, responsibilities and authorities	4.2 Asset management policy
6 Planning	
6.1 Actions to address risks and opportunities for the asset management system	4.4.7 Risk Management
6.2 Asset management objectives and planning to achieve them	
6.2.1 Asset management objectives	
6.2.2 Planning to achieve asset management objectives	4.3.2 Asset management objectives
	4.3.3 Asset management plans
7 Support	
7.1 Resources	4.4.3 Training, awareness and competence
7.2 Competence	
7.3 Awareness	4.4.4 Communication
7.4 Communication	4.4.6 Information management
7.5 Information Requirements	4.4.5 Asset management system documentation
7.6 Documented Information	4.6.6 Records
8 Operation	
8.1 Operational planning and control	4.5.1 Life cycle activities
8.2 Management of change	4.9 Management of change
8.3 Outsourcing	4.4.2 Outsourcing of asset management activities
9 Performance Evaluation	
9.1 Monitoring, measurement, analysis and evaluation	4.6.1 Performance and condition monitoring
9.2 Internal audit	4.6.4 Audit
9.3 Management review	4.7 Management review
10 Improvement	
10.1Non-conformity and corrective action	4.6.5.1 Corrective and preventative action
10.2Preventative action	
10.3Continual improvement	4.6.5.2 Continual improvement

Figure 3. International Organization for Standardization 55001 Maturity Scale

| Innocent | Aware | Developing | Competent | Optimizing | Excellent |

Maturity level 0	Maturity level 1	Maturity Level 2	Maturity Level 3	Beyond ISO 55001	
The organization has not recognized the need for this requirement and/or there is no evidence of commitment to put it in place.	The organization has identified the need for this requirement, and there is evidence of intent to progress it.	The organization has identified the means of systematically and consistently achieving the requirements, and can demonstrate that these are being progresses with credible and resourced plans in place.	The organization can demonstrate that it systematically and consistently achieves relevant requirements set out in ISO 55001.	The organization can demonstrate that it is systematically and consistently optimizing its asset management practice, in line with the organization's objectives and operating context.	The organization can demonstrate that it employs the leading practices and achieves maximum value from the management of its assets, in line with the organization's objectives and operating context.

The ISO 55001 standard has significant overlap with most of the PAS 55 elements. Table 1 provides a comparison of the two standards that were used to help map results between the two systems. Thus, the results of the updated PAS 55 assessment were also used to perform a parallel gap analysis using the ISO 55001 requirements, translating the scores from the PAS 55 assessment to ISO 55001.

The ISO 55001 results are also scored using a maturity scale that is similar to, but not the same as, the PAS 55 scoring definitions. The scoring scale for ISO 55001 is defined in Figure 3. Like PAS 55, the results of an assessment may be logically presented as a radar plot, and the results of the assessment for TMUA are shown in Figure 4. From this point onwards, the ISO 55001 gap analysis has formed the revised baseline for evaluating future improvement.

The update to the assessment indicated clear direction, and progress in the improvement of the asset management information systems was identified as a key factor related to continuing 2015 improvements, in addition to developing and embedding additional business processes. Many key building blocks are in place, and the staff was developing good alignment with the program and taking pride in it. Staff has raised concerns about the amount of concurrent change that is going on, but members have risen to the challenge and are clearly enthusiastic about the program.

Priority tasks for completion consisted of:
- Completion of a TMUA strategic plan, a water and sewer department business plan, service-level objectives, and the subsequent alignment of the asset management policy, strategy, objectives, and key performance indicators with the strategic plan and business plan.
- Completion of an asset management framework document, specifically the inclusion/enhancement of:
  ◦ Risk management process and methodology
  ◦ Asset management plan methodology and guidance
  ◦ Capital delivery process
  ◦ Performance monitoring and reporting of key performance indicators
- Development of initial asset management plans
- Finalize and formalize process maps
- Internal audit and review

Furthermore, it was recommended that the asset management improvement roadmap be updated to provide more specific tasks for

staff to complete in order to close the gaps that were identified and to meet the requirements of ISO 55001, including the following areas of additional focus:

- More specific assessment and information on stakeholder needs and expectations, including the reporting of financial and non-financial information.
- Demonstrating the development and implementation of the asset management plans.
- Specific requirements for creating and documenting information, and control of documented information.
- Specific requirements to determine the information needed for analysis and evaluation, and the analysis and evaluation methodologies to be employed.
- Requirement that the organization has put in place appropriate means for monitoring the assets and asset systems to identify potential failures in performance.

Year 3: Continuing Framework Implementation Using International Organization for Standardization 55001

Assessments were continued in 2015 and 2016 to monitor the ongoing implementation of the asset management program. Over this time, significant progress has been made, as shown in Figure 5, with the following key findings identified:

- The TMUA strategic plan has been finalized and well-communicated to staff. The strategic plan framework provides clear objectives and initiatives. This has been developed and implemented by TMUA staff, and they should be congratulated on this achievement as it is a foundational element of a successful program.
- TMUA successfully developed a capital improvement program (CIP) using the business case prioritization process, without any consultant assistance. Feedback suggests that the process went smoothly and has been well-adopted, and the approach has the full support of the new mayor and his administration.
- The UEI initiatives have allowed the rate increases to be reduced for water service, which is largely a result of risk-informed decision making, targeting investment in the right way at the right time.
- The embedding of the asset management policy and other procedures that have been through their first review cycle is evidence of the sustainability of the program. This includes updating the asset management strategy and objectives to align with the TMUA strategic plan.
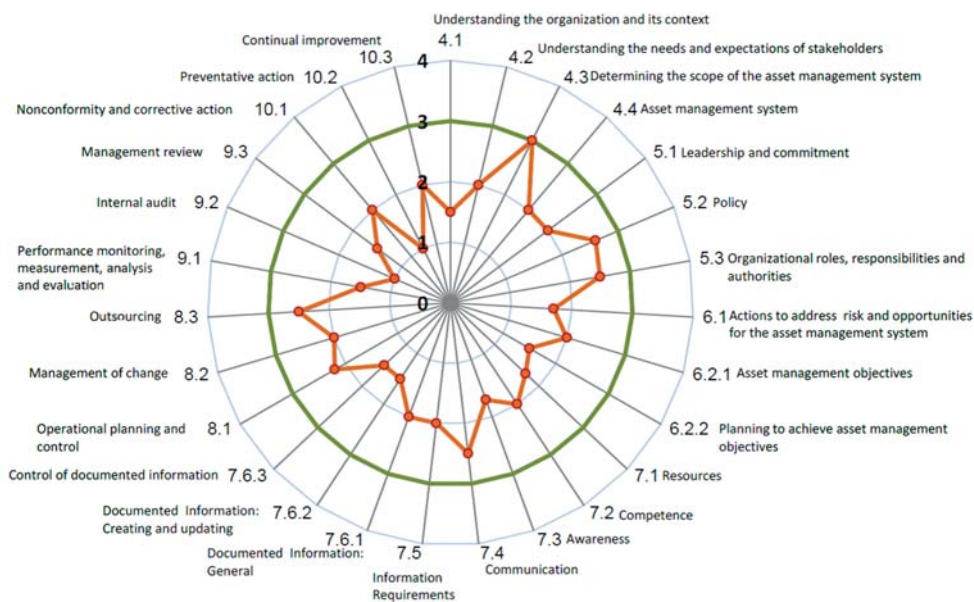

Figure 4. 2014 International Organization for Standardization 55001 Assessment Results
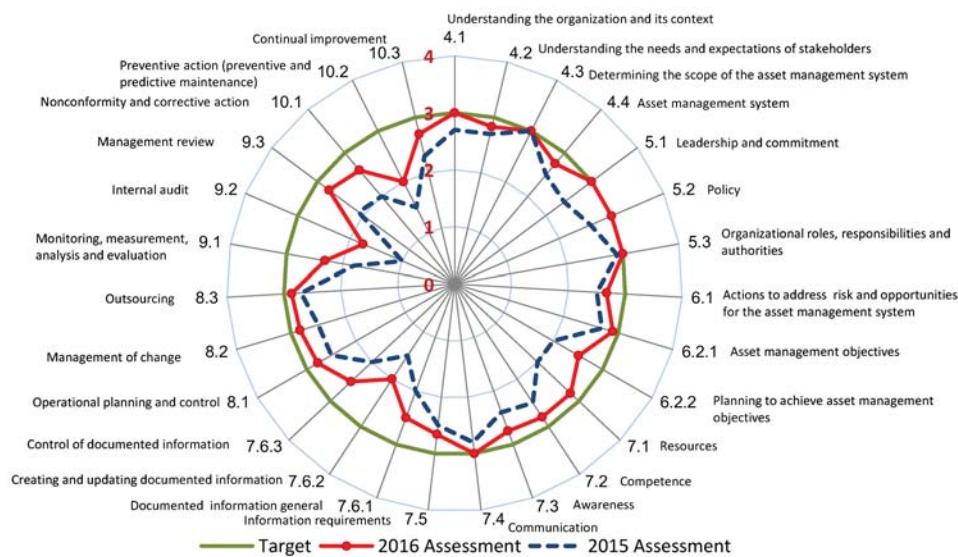

Figure 5. 2015-2016 International Organization for Standardization 55001 Assessment Results

- Continued engagement and energy of staff to adopt the new ways of working suggests that this "project" can become "business as usual."
- Key asset management positions have been recruited and other positions have been created, which are developing and sustaining the program and is evidence of the TMUA

board's commitment to providing resources.
- Proven use of the Hach Water Information Management Solution (WIMS) for operations control and dashboarding performance. Operations staff is using it effectively and enthusiastically.

- There have been great strides in increasing the awareness of the program among staff, with internal communications and meetings to promote the strategic planning framework and asset management policy, and training on the new information systems.
- Some key remaining actions include completing the computerized maintenance management system (CMMS) implementation, updating the risk process and risk assessments for the linear assets, developing asset-class asset management plans, implementing the maintenance initiatives, and developing the internal audit process.

Results

Over the course of the UEI, the substantial increase in the overall maturity score reflects the progress that staff has made in embedding and sustaining key components of the program, and meets the revised targets for 2016 set out in the roadmap. Staff has benefited from having a better-defined roadmap with more specific actions, allowing progress to be made in completing actions. Staff is seeing benefits from the UEI program, including the use of Hach WIMS for process performance monitoring, work order management using Lucity, the CIP prioritization process to justify CIP projects, and the reduction in rate increases for water services.

Annual updates to the ISO 55001 program assessments have been very useful in tracking progress and adjusting priorities in the course of implementing a utilitywide asset management program. Using these assessment updates, TMUA has been able to track its progress in program implementation and reprioritize resources or task priorities to achieve the desired results. Some of the major efforts and successes to date include the following:

- Development of a utilitywide asset management policy promulgated by the board and its directors.
- Development of a comprehensive asset management strategy, including performance objectives, that is aligned with the utility strategic plan.
- Identification of staffing needs for program implementation and development of new positions to lead and coordinate program efforts, including definitions of revised roles and responsibilities for individuals and departments within the city.
- Communicating information about the program to staff, including the development of an internal newsletter (The WAVE).
- Revision of the capital planning process to include business-case evaluations and risk-based optimization of projects that are aligned with the budget and rate-planning cycle.
- Revision of the capital delivery process to achieve better alignment between the engineering and water and sewer departments.
- Mapping of operation and maintenance processes to identify improvements and efficiencies.
- Consolidation and simplification of maintenance management, work order, and asset management systems, and combining seven disparate systems with varying quality and standards into a single utilitywide asset management information system, following a detailed, staged implementation plan. ⬲